Meeting Program

235th ECS Meeting

May 26-30, 2019

Dallas, TX

Sheraton Dallas

Advancing solid state & electrochemical science and technology since 1902

WIFI NETWORK
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Development: development@electrochem.org
Awards: awards@electrochem.org

www.electrochem.org

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ECS Welcomes You to Dallas

Yue Kuo
ECS President

On behalf of the board of directors, volunteer leadership, and staff of ECS, it is my pleasure to welcome you to the 235th ECS Meeting.

ECS is proud to have the Sheraton Dallas as the headquarters hotel for the meeting. Located in the city's thriving Arts District, the hotel is just moments away from world-class shopping, restaurants, and entertainment. While you're here, enjoy easy access to downtown attractions including the American Airlines Center, Fair Park, and the Dallas Symphony.

In between the sightseeing, make the most of all the perks the meeting has to offer: network with colleagues, discuss important research, and discover new opportunities for collaboration!

To kick off this exciting week, join us for the **opening reception** on Sunday in Lone Star A3/A4 (SCC) at 1900h.

You won't want to miss the **plenary session** on Monday, May 27, in Lone Star A3/A4 (SCC), where we will welcome all attendees and wrap up the first full meeting day with the **ECS Lecture** "Guardian Angels Turning Sickcare into Healthcare" by Koen Kas. We will also recognize **Society award winners** Héctor Abruña, recipient of the Allen J. Bard Award in Electrochemical Science, and David Lockwood, recipient of the Gordon E. Moore Medal for Outstanding Achievement in Solid State Science & Technology. Be sure to attend the many society, division, and section award talks in various symposia throughout the week. Check out the technical program for more details.

Of course, don't forget to visit the **exhibit hall** to learn more about our exciting lineup of industry-leading exhibitors and mingle with colleagues. The **poster sessions** on Monday, Tuesday, and Wednesday will feature hundreds of posters that you can browse at your leisure. You should also stop by the **ECS booth** to learn more about the society and ***Free the Science***, an initiative that aims to make our research freely available to anyone, anywhere to advance our sciences and solve problems for humanity.

Finally, make sure to download the **ECS mobile app** on your Apple or Android device, where you'll be able to access the **ECS meeting scheduler**. If you have any questions, please do not hesitate to stop by the **registration area** at the Lone Star Preconvene of the Sheraton Convention Center for further assistance.

We thank you again for your continued support of ECS!

Program Guide

General Information

Registration

LOCATION: Lone Star Preconvene (SCC)

Saturday..... 1600-1900h
Sunday..... 0700-1900h
Monday..... 0700-1900h
Tuesday..... 0700-1730h
Wednesday..... 0700-1600h
Thursday..... 0700-1000h

Registration Fees*

On Site Registration Fees

Member $820
Nonmember.....$1,035
Student Member.....$480
Student Nonmember $540
One Day Member.....$655
One Day Nonmember $800
Emeritus & Honorary Member $0
Nontechnical Registrant.....$65

**All prices are in U.S. Dollars*

Who must pay the registration fee?

All meeting participants, including invited speakers, are required to pay the appropriate registration fees. Individuals participating in short courses along with the meeting are required to register for both events.

Companion / Nontechnical Registrant Program

Travel companions of attendees are invited to register for the meeting as a nontechnical registrant. The nontechnical registrant fee of $65 includes admission to non-ticketed social events and a "Welcome to Dallas" gift packet.

Lost Badge or Ticket

There will be a $30 charge for reprinting lost badges or tickets. Admittance will not be granted to ticketed events without an actual ticket. Tickets must be reprinted at registration during scheduled hours and cannot be reprinted at the event itself.

Short Course Registration

Three short courses are being offered on Sunday, May 26th from 0900h to 1630h. Pre-registration for short courses is required—the deadline was May 20, 2019; however, if you are interested in registering for a short course please stop by registration to see if space is available.

Short Course Registration Fees*

	Course Only Regular Fees	Course Regular Fees (Price discounted with the purchase of a meeting registration)
Member	$625	$500
Nonmember	$775	$650
Student Member	$325	$250
Student Nonmember	$400	$325

**All prices are in U.S. Dollars.*

Abbreviation Key

SH = Sheraton Hotel
SHS = Sheraton Hotel South Tower
SCC = Sheraton Convention Center

Things to Know

Wifi

Complimentary network in the meeting space for all attendees.
Username: freethescience
Password: openaccess

ADA Accessibility

Special accommodations for those attendees living with a disability will be handled on an individual basis. Contact the meeting headquarters today if you will need assistance by emailing meetings@electrochem.org or stop by registration on site.

Permissions Granted to ECS

ECS reserves the right to electronically record any or all meeting-related events. By registering for and/or attending an ECS meeting you are granting ECS permission to use any recording or photography made of you at any meeting event or anywhere within the meeting venue.

Speaker Indemnification

The ideas and opinions expressed in the technical sessions, conferences, and any handout materials provided are those of the presenter. They are not those of ECS, nor can any endorsement by ECS be claimed.

Photography and Recording Is NOT Permitted in Technical Sessions

By attending the ECS meeting, you agree that you will not record any technical session activity, without the express written consent of ECS. If you violate this policy you will be removed from the meeting and your registration will be revoked without the possibility of a refund.

Financial Assistance

Financial assistance is limited and generally governed by the symposium organizers. Contact your symposium organizers to see if funding is available. Individuals requiring an official letter of invitation should write to the meeting headquarters office; such letters will not imply any financial responsibilities of ECS.

Letters of Attendance

Individuals requiring an official letter of attendance should visit the "Letters of Attendance" self-help computer in the registration area or see a meeting representative.

Need an Invoice?

Your registration information and invoice are available to you 24 hours a day, 7 days a week from your own computer.

Go to www.electrochem.org to log into your account to access this information today.

GET IT ON Google Play
Download on the App Store

Make the Most of Your ECS Experience

Meeting App

Download the ECS app, by searching "ECS mobile" in your app store, to put the technical program and personal meeting scheduler on your mobile device. Browse, add, and sync sessions, events, and presentations to create your own custom itinerary! Connect with ECS all year and stay informed with the latest news in the world of electrochemistry and solid state science. The online program can also be found on the 235th ECS Meeting homepage.

Tools for a Successful Meeting Experience

- Access all of the meeting abstracts online at https://www.electrochem.org/235
- Become familiar with the meeting layout by using the maps on pages 7-9.
- Turn off cell phones during presentations and remember photography and recording in the session rooms is prohibited.
- Become a Member! Stop by customer service, in the registration area, for more information.
- Visit the exhibit hall to network and learn more about the latest innovations in the industry.
- Tell us about your experience by completing the post conference survey that will be sent via email.

Advance your career in Dallas

- Attend a Professional Development Workshop, more information on page 13.
- Visit the ECS Career Expo on the exhibit floor for the opportunity to meet top employers and discuss career opportunities.
- Attend the Annual Society Business Meeting and Luncheon to learn more about the business behind the science, more information on page 12.
- Visit the exhibit hall to talk with groundbreaking companies in the field and network with poster presenters. Start researching which booths you will stop by on page 26.
- Check out the newly launched ECS Career Center, available all year round, at jobs.electrochem.org.
- Update your LinkedIn with a new photo! Receive a complimentary professional portrait at the career expo, Booth EX100.

Meeting Abstracts

Always right at hand—and as always, **FREE**! Registrants may easily access all abstracts via the meeting scheduler or may download them from the meeting website. Paper editions of meeting abstracts are not distributed; attendees who require paper should download abstracts and print them in advance of the meeting.

Get to Know ECS

The ECS Exhibit Booth

Stop by the ECS booth on the exhibit floor to engage with ECS staff and discover more about the programs and services available to you. Representatives from publications, membership, meetings, and development will be available at various times to answer your questions.

Learn more about:

- Subscribing to the ECS Digital Library
- Upcoming ECS biannual and sponsored meetings
- Individual and institutional membership at ECS
- How to publish with ECS and why publish open access
- Exhibit, sponsorship and advertising opportunities
- *Free the Science*
- Awards, educational programs and much more!

Participate in other booth activities:

- Enter to win the following raffles:
  - Monographs (*Electrochemical Impedance Spectroscopy*, second edition and *Atmospheric Corrosion*, second edition)
  - Free Meeting Registration for the 236th ECS Meeting in Atlanta, GA
  - Free Meeting Registration for the ECEE 2019 Meeting in Glasgow, Scotland
  - Free 5-Year Membership
- Pick up ECS giveaways
- Make a donation to F*ree the Science*

Conference Proceedings

Proceedings papers from select symposia have been published online in *ECS Transactions*. All 235th ECS Meeting issues are available to browse and read on an article-level in the ECS Digital Library, www.ecsdl.org, and may also be purchased in full as an instant PDF download from the ECS Online Store.

Publish with ECS Following Your Presentation

ECS has several excellent publication venues, and accepts research in a variety of formats. Consider submitting a preprint of your full-text manuscript, poster, or presentation slides, to ECS's preprint service, ECSarXiv. Submit today at www.electrochem.org/ecsarxiv.

ECS's peer-reviewed journals, *Journal of The Electrochemical Society* and the *ECS Journal of Solid State Science and Technology*, provide continuous publication while maintaining the highest standards of peer review. Both journals offer the option of publishing open access (OA) through ECS's Author Choice Open Access program. This program has various discount options, allowing most authors to publish OA for FREE through ECS membership or through the ECS Plus subscription program! To learn more, visit www.electrochem.org/oa or contact oa@electrochem.org.

Join your community. Develop your potential. Advance your career.

Ask any ECS member why they joined ECS. Their response likely will be: "My advisor was a member of the Society and encouraged me to join," or "ECS members receive great discounts on biannual meeting registrations."

Next, ask them why they have remained an ECS member. Nearly all members will attest that, after joining the Society, ECS quickly became their family, connected them to a job opportunity, or helped advance their professional career.

ECS members receive great benefits—both in discounts and in professional development. Visit www.electrochem.org/join to join today or stop by customer service in the registration area.

Free the Science

#FREE THE SCIENCE

Free the Science is ECS's initiative to move toward a future that embraces open science to further advance research in our fields. This is a long-term vision for transformative change in the traditional models of communicating scholarly research. ECS believes that openness democratizes access to the scientific process; to that end, ECS is committed to playing a crucial role in implementing the necessary changes. More openness in our sciences means faster progress and solutions to global challenges in human health and the sustainability of the planet. Support *Free the Science* by submitting your poster or slide presentation to ECSarXiv, publishing open access in an ECS journal, or stopping by the ECS exhibit booth to learn more.

Information for Presenters

Commercial advertisements or publicity will *NOT be permitted* during oral or poster presentations.

For further detailed information on oral and poster presentation requirements, please visit the Author & Presenter Info page on the 235th ECS Meeting website.

Oral presentations must be in English. Laptop computers and projectors will be available in each symposium room for presentations, and presenting authors MUST have their presentation on a USB flash drive to be used with the dedicated laptop. Speakers requiring special equipment must have submitted a written request to ECS headquarters (meetings@electrochem.org) prior to the meeting; no special requests will be handled onsite. Additional information for oral presentations are as follows:

- Arrive to your session room early and introduce yourself to the session chairs (they will have a blue chair ribbon on their nametag).
- No additional time is given for Q&A. If you plan to have Q&A, be sure to prepare your talk accordingly, based on the duration you were given in your acceptance notification.
- There is no speaker ready room.

Poster presentations must be in English, and correspond to the abstract number and assigned date of presentation, as detailed in your acceptance notification. Additional information for the poster sessions are as follows:

- No posters will be displayed without author participation, no exceptions will be granted.
- You must remove your poster at the end of each session. Any posters left will be discarded.
- Posters may be mounted from 1400-1700h on Monday, Tuesday, and Wednesday. **You may only mount your poster on the day of your presentation.**
- Pushpins and/or thumbtacks will be supplied.
- There will be two posters per board, so allow equal space for the second poster on your board.
- Authors are responsible for the security of their displays and all items of value; ECS will not assume any responsibility for lost, stolen, or broken articles.

The Z01 General Student Poster Session will be held as a part of the Tuesday General Poster Session and Technical Exhibit. Students may set up their presentations from 1400-1700h; judging of the posters will begin at 1700h and formal presentations will begin at 1800h. Winners will be announced and awards will be presented during the Wednesday General Poster Session from approximately 1815-1830h.

You may mount your poster *only* on your assigned day.

Monday..... 1400-1700h Tuesday ..... 1400-1700h Wednesday..... 1400-1700h

Go Green

Did you know that almost

11,000 lbs (4,989.5 kgs)

of paper is used to create the meeting program?

*Each program is comprised of about 250 pages of content which creates a coveted token of the meeting but also generates **a lot** of waste at the end of the week.*

Help ECS with our goal to live our mission and reduce our impact on the environment by accessing the meeting program online! Between the online version, which is available in advance of the printed copy on the meeting homepage, and the meeting app, all of the same information is available at your fingertips with little to no environmental consequences!

The best answers come out of the blue...

Battery Testers **High Current Boosters** **Potentiostats** **Accessories**

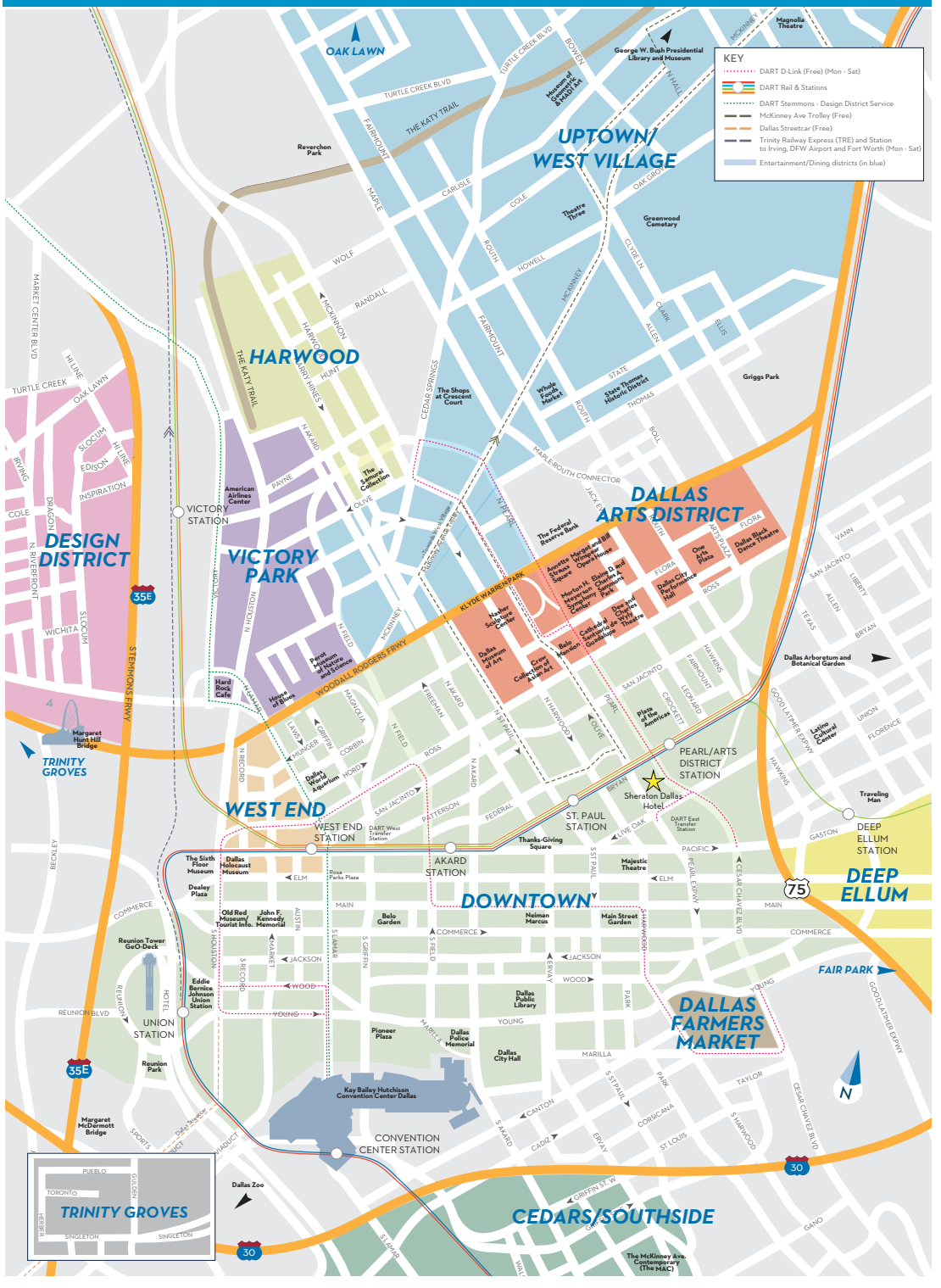
BioLogic
Science Instruments

Full range of E-Chem products available at:

www.bio-logic.net

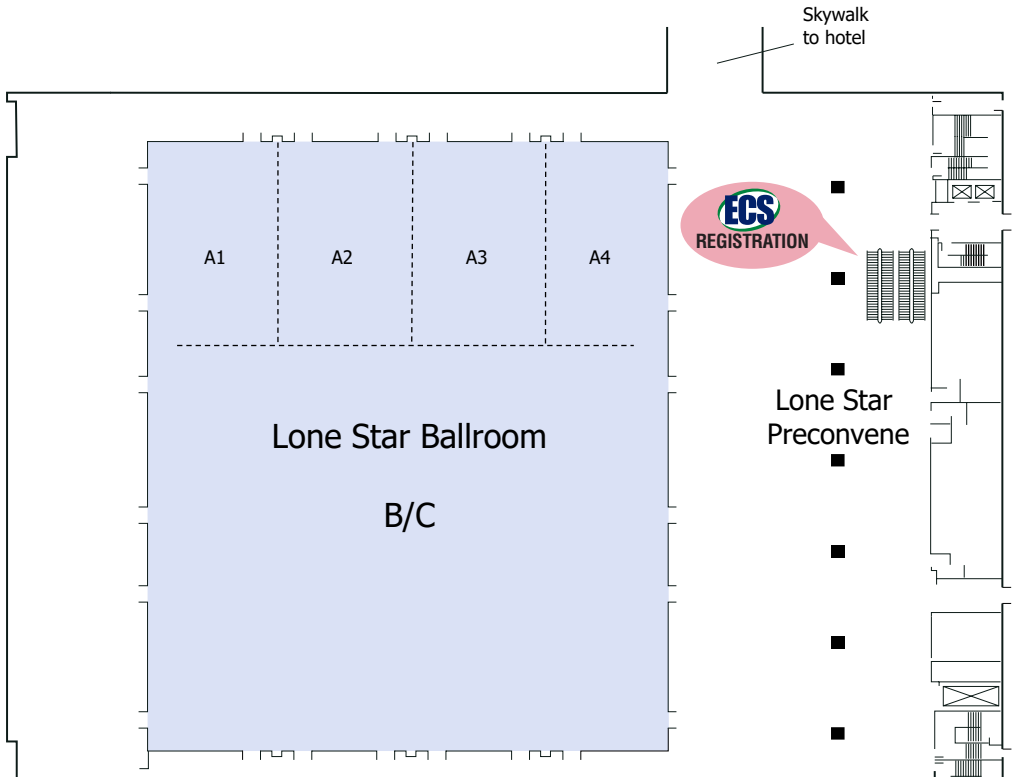
Local Area Map

DOWNTOWN DALLAS & SURROUNDING AREA

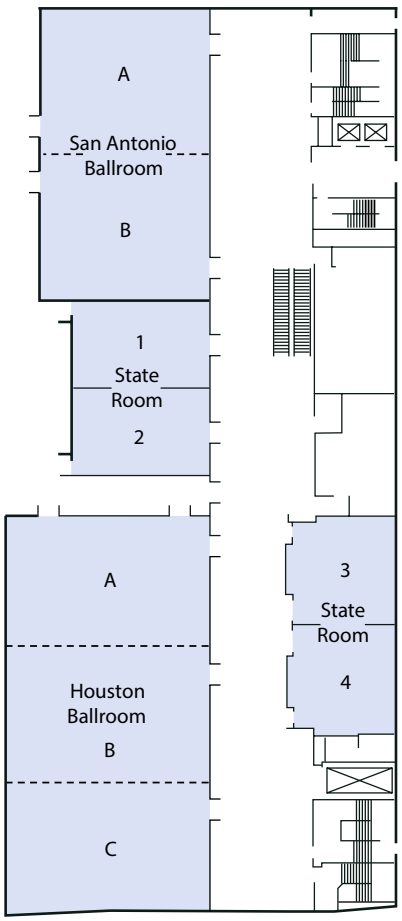


Floor Plans

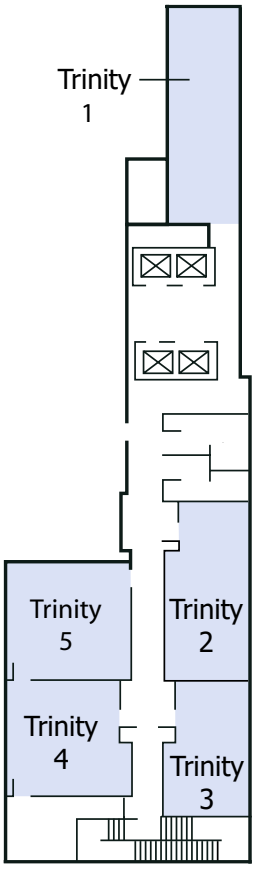
Sheraton Conference Center 2nd Floor



Sheraton Conference Center 3rd Floor

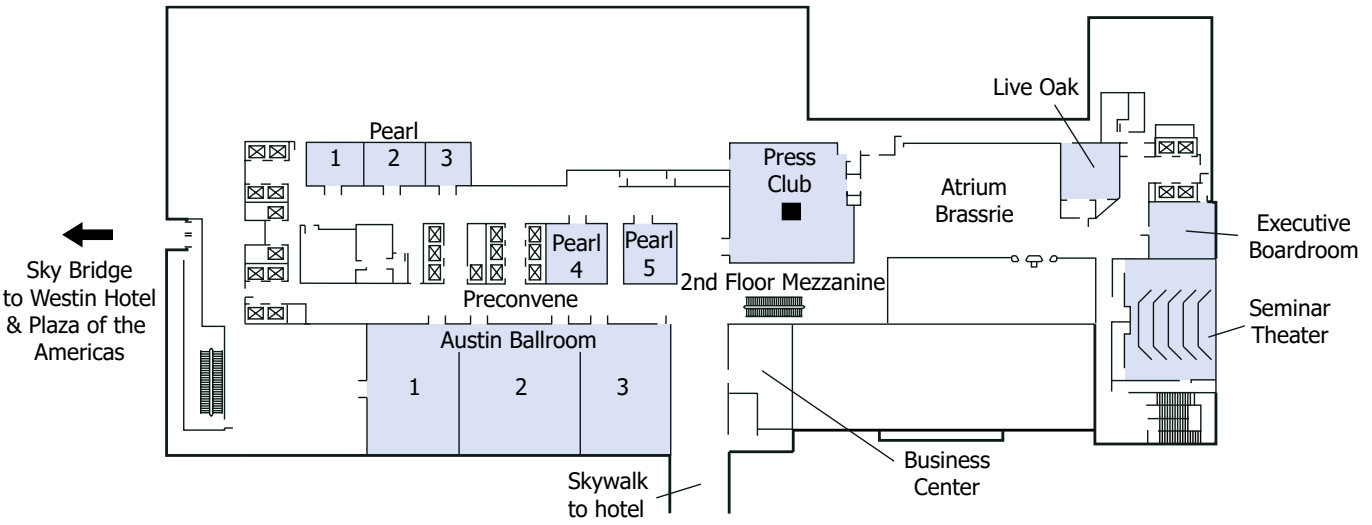


Sheraton Hotel South Tower 3rd Floor

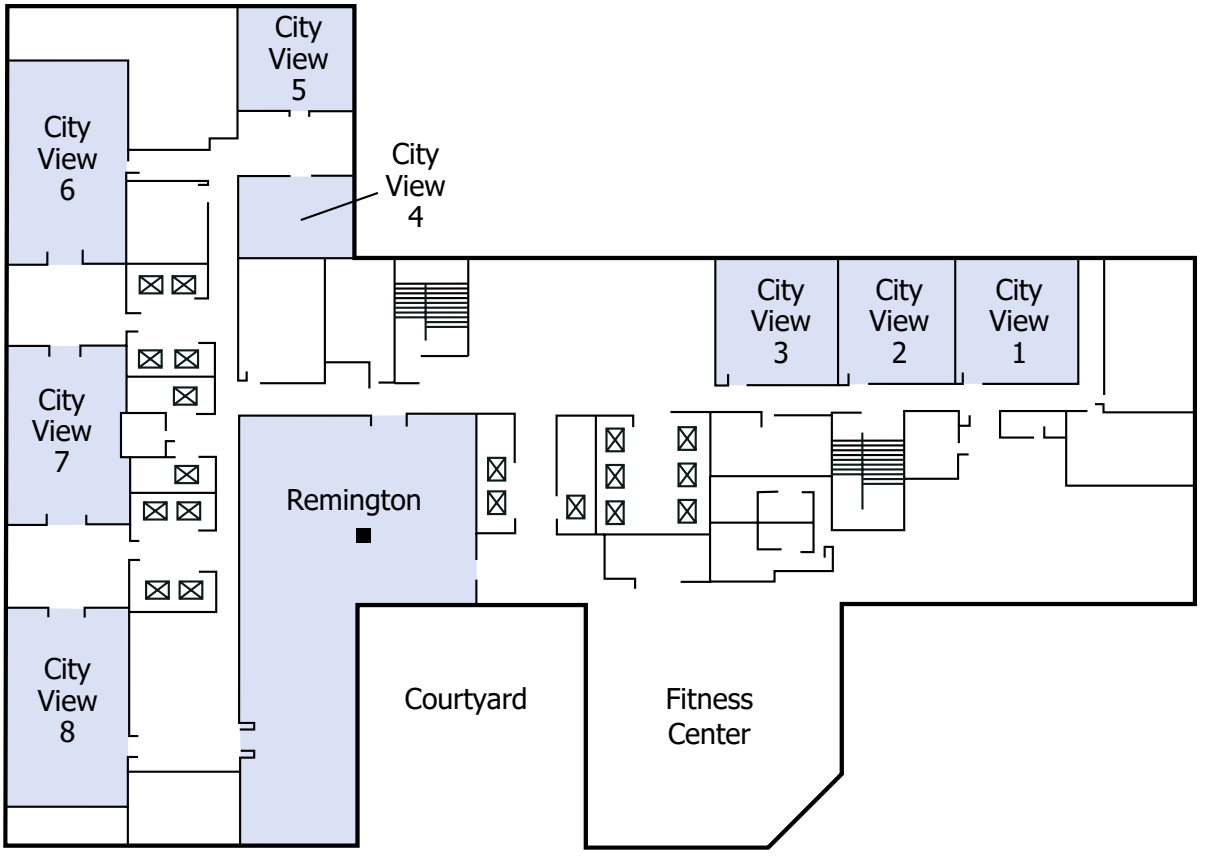


Floor Plans

Sheraton Hotel 2nd Floor

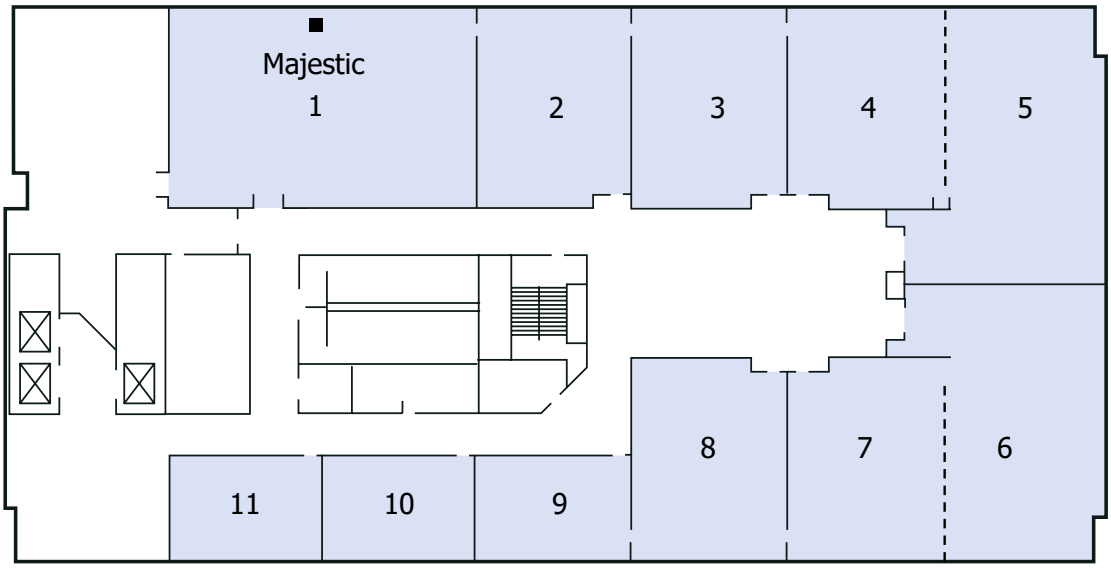


Sheraton Hotel 4th Floor

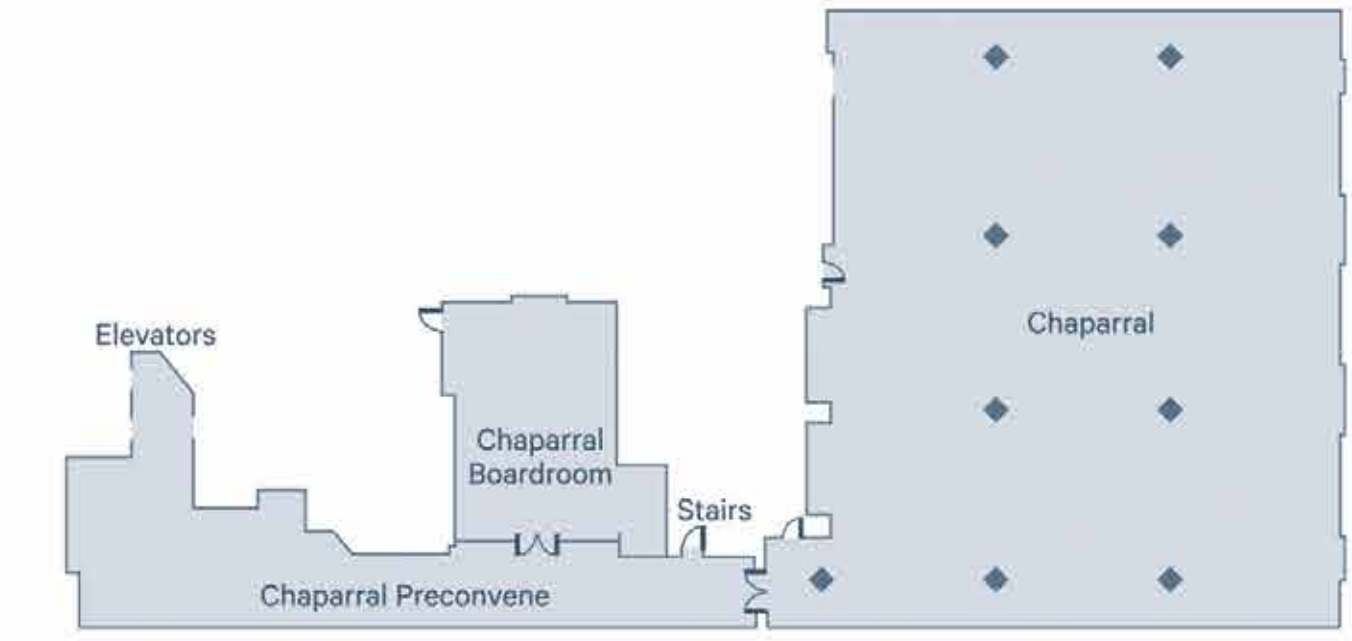


Floor Plans

Sheraton Hotel 37th Floor



Sheraton Hotel 38th Floor



235th ECS MEETING BY THE NUMBERS

60
countries represented

2,271
abstracts

47
symposia

1,839
oral talks

42
award & keynote talks

561
invited talks

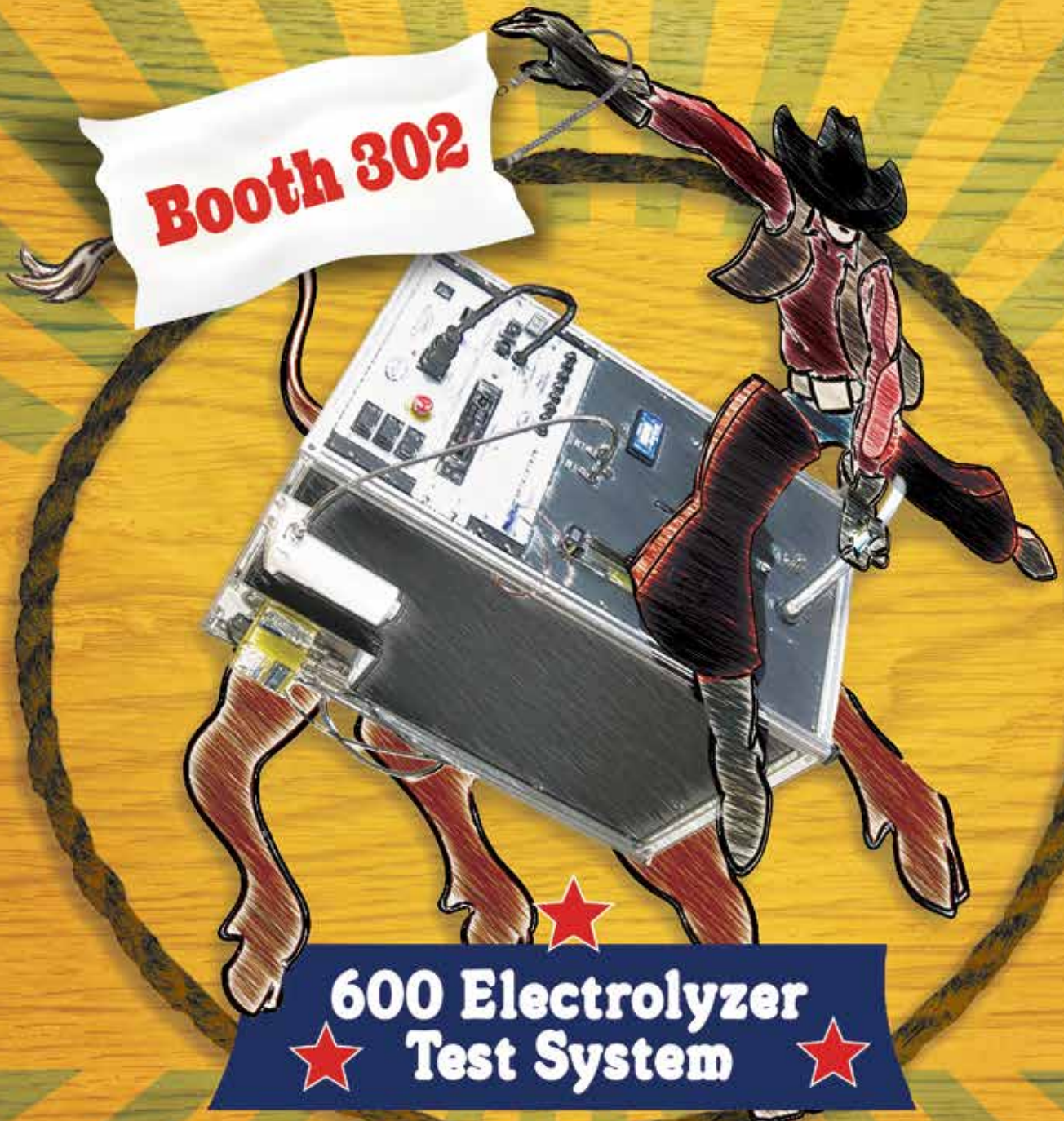
72
early career abstracts
(10 years or less since BS degree)

597
student talks

432
posters

269
student posters

TAKE CONTROL



600 Electrolyzer Test System

scribner

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Highlighted Events

Opening Reception
Lone Star A3/A4 (SCC)
Sunday.....1900-2100h

Come get a taste for Dallas and help kick-off an exciting week! All attendees are welcome to attend for light snacks, an open bar, and ample time to network.

Session Chair and Symposium Organizer Breakfast
Austin Ballroom 3 (SH)
Monday.....0700-0800h

The success of the meeting is very much due to the hard work of the session chairs, symposium organizers, and division members. All are encouraged to attend this orientation to ensure they are best prepared for their roles in the meeting, and to learn helpful information about future meetings.

Technical Exhibition
Lone Star B/C (SCC)
Monday.....1800-2000h
Tuesday and Wednesday.....1400-2000h

Take time to explore exhibits from the leading vendors in the electrochemical and solid state science fields. Make sure to also stop by the exhibit hall for Poster Sessions and the Networking Breaks. View the exhibitor listing on page 26.

Student and General Poster Sessions
Lone Star B/C (SCC)
Monday, Tuesday and Wednesday.....1800-2000h

With hundreds of posters to explore, you won't want to miss a single minute of these sessions. Grab a snack, wander the aisles, review the presentations, talk to the authors, share some laughs... these sessions are a great way to end the day!

ECS Career Expo
Monday.....1800-2000h
Tuesday and Wednesday.....1400-2000h

The career expo serves as a premier opportunity for employers and recruiters to meet and interview job-seekers, volunteers, and post-doctoral candidates. Along with the career expo, ECS will be offering several professional development workshops (see page 13) to assist job-seekers with their employment search.

Student Mixer
Chaparral Main Room (SH)
Monday.....2000-2200h

The mixer is a must attend event for students! Enjoy networking with your peers and early career professionals while light food and refreshments are served. Purchase your tickets online or visit customer service located in the registration area.

Member.....$5.00
Nonmember.....$15.00

Networking Breaks
Lone Star B/C (SCC)
Monday through Thursday.....0930-1000h
Monday through Wednesday.....1530-1600h

Take a moment to stretch your legs, reenergize with coffee or tea and network with fellow attendees and exhibitors before your next session.

Annual Society Business Meeting and Luncheon
Majestic 1 (SH)
Tuesday.....1200-1400h

Join us as we celebrate the many successes of 2018 and look forward to an even brighter future!

This luncheon will feature a special presentation, "Perspectives on the State of Science and Technology: Innovation and the Workforce of the Future," by Dr. Carol A. Bessel, Acting Division Director of the National Science Foundation Division of Chemistry.

ECS Fellow.....$45.00
Member.....$55.00
Nonmember.....$65.00

Professional Portraits
Lone Star B/C, Booth EX100 (SCC)
Tuesday and Wednesday.....1700-2000h

Update your LinkedIn with a new photo! Meeting attendees can take the opportunity to receive a complimentary professional portrait at the ECS Career Expo. *No appointment necessary.*

ECS Data Science Hack Week
Remington (SH)
Sunday - Wednesday

ECS Data Science Hack Week is part of the Society's continuing work toward building an electrochemical data science and open source community from the ground up. All electrochemical engineers, whether experimentally or theoretically focused, can benefit from this workshop program by learning how to create, share, use, and improve open source software tools and public datasets to accelerate research progress in our field. See page 15 for more information.
**Please note pre-registration was required for this program.*

Professional Development Workshops

Managing and Leading Teams

Majestic 3 (SH)
Instructor: Dennis Hess, Georgia Institute of Technology

Monday 1000-1200h

Nearly all engineers and scientists work in teams where a leader oversees and guides process/product development and direction. When technically-trained individuals undertake a leadership role, frustration is a frequent outcome, despite technical competency and good intentions. This workshop will discuss reasons why engineers and scientists often find adaptation into leadership roles disconcerting and will explore ways to smooth the transition. *This is a two-hour workshop.*

Member $15.00
Nonmember $20.00
Student Member $5.00
Student Nonmember $10.00

Win Funding: How to Write a Competitive Proposal

Majestic 3 (SH)
Instructor: Michel Foure, Berkeley Grant Writing

Monday 1400-1600h

Whether your career takes you to Industry, Academia or a National Lab, chances are that you will be intimately involved in writing research grant proposals. In fact, your career growth may largely hinge on your ability to raise funding. While each proposal is unique, lying at the intersection of the funding agency needs and your technical idea, there are very important guidelines that must be observed in order to maximize the probability of success. As this workshop is interactive, it would be particularly meaningful and useful for the participants to be prepared to work with a real example. This could be a proposal they have submitted in the past or one they anticipate to submit. *This is a two-hour workshop.*

Member $15.00
Nonmember $20.00
Student Member $5.00
Student Nonmember $10.00

Essential Elements for Employment Success

Majestic 3 (SH)
Instructor: Michel Foure, Berkeley Grant Writing

Tuesday 0900-1200h

Landing your next job requires selective and effective networking, developing and submitting specifically targeted resumes and cover letters, locating relevant job opportunities and preparing for and participating in the job interview. This workshop will provide up-to-date information and tips for employment success. *This is a three-hour workshop.*
**This workshop also includes the Resume Review*

Member $15.00
Nonmember $20.00
Student Member $5.00
Student Nonmember $10.00

Resume Review

Lone Star B/C, Booth EX102 (SCC)
Instructors: Michel Foure, Berkeley Grant Writing

Tuesday & Wednesday 1400-1800h

Bring your resume for a one-on-one session with an industry leader and expert on resume development. You will walk away with a resume that is sure to land you your next interview. To sign-up for a resume review appointment, you must first attend the Essential Elements for Employment Success; registration for a resume review occurs during the Essential Elements for Employment Success workshop. Appointments are 20-minutes in length.
**You must register for Essential Elements for Employment Success in order to participate.*

Managing Conflict

Majestic 3 (SH)
Instructor: Dennis Hess, Georgia Institute of Technology

Tuesday 1400-1500h

When more than one person is in a meeting, disagreement on the interpretation of results, conclusions, implementation, and subsequent directions is the likely outcome, which leads to conflict. An effective leader has learned how to manage conflict and use it to improve team performance. This workshop will discuss conflict sources and explore ways to minimize the disruption that often results. *This is a one-hour workshop.*

Member $15.00
Nonmember $20.00
Student Member $5.00
Student Nonmember $10.00

Patent Law for Scientists and Engineers (new)

Majestic 3 (SH)
Instructors: E. Jennings Taylor and Maria Inman, Faraday Technology, Inc.

Wednesday 1400-1700h

An interactive workshop that provides an introduction to U.S. patent law and is directed towards researchers from academia, industry, and government entities. The workshop offers a historical basis for the foundation of U.S. patent law in the U.S. constitution. Learn the statutory definitions of an invention and distinguish between an inventor on a patent and an author on a publication. In addition, the workshop will cover the classes of patentable inventions and the requirements for obtaining a patent on an invention. This is a three-hour workshop.

Member $55.00
Nonmember $95.00
Student Member $30.00
Student Nonmember $45.00

Short Courses

ECS short courses are all-day classes designed to provide students or the seasoned professional with an in-depth education on a wide range of topics. Taught by academic and industry experts, the small class size makes for an excellent opportunity for personalized instruction helping both novices and experts advance their technical expertise and knowledge. Short courses are open to the public with special discounts given to meeting attendees.

Short course registration also includes:

Breakfast	Morning Coffee Break	Lunch	Afternoon Coffee Break
Location: individual session rooms, see short course locations	*Location: individual session rooms, see short course locations*	*Location: Austin Ballroom 1 (SH)*	*Location: individual session rooms, see short course locations*
0800-0900h	**0945-1015h**	**1200-1330h**	**1500-1530h**

Battery Safety and Failure Modes

Trinity 4 (SHS)

Instructors: Thomas Barrera and Boryann Liaw

The severity of an energetic lithium-ion battery (LIB) safety incident has the potential to make high specific energy LIB chemistries an at-risk technology for some applications. As such, improvements in LIB safety design without compromising performance continues to be a major focus for researchers, manufacturers and users across all sectors of the energy storage marketplace.

This new short course provides a foundation for understanding the general principles of LIB safety and failure modes analysis. The effects of LIB chemical, electrical, thermal, and mechanical design features on safety characteristics will be presented. The course is also focused on how to use electrochemical characterizations, primarily incremental capacity based approach, to identify and quantify failure modes and effects. The principles of such analysis will be explained, examples given, and effects quantified. A systematic approach with other physical and chemical analyses will be introduced to illustrate how a holistic failure modes and effects analysis can be used to aid LIB cell design and assessment.

The course is designed to benefit R&D scientists, practicing engineers, and students who have a need to increase their knowledge to design, test and operate safe LIB energy storage systems.

Fundamentals of Corrosion

Trinity 3 (SHS)

Instructor: Luis F. Garfias

This course covers the basics of corrosion science and corrosion engineering. It is targeted towards people with no knowledge of corrosion, but with a physical sciences or engineering background. By the end of this course each student will learn: a) basic concepts of corrosion, b) learn to select appropriate materials for their particular materials/environment, and c) know which will be the common and easiest techniques and methodologies to test and qualify materials (resistant to corrosion).

The course will begin with a general, basic foundation of electrochemistry and corrosion. It will cover the terminology and definitions commonly used in corrosion, as well as the different types of passivity and corrosion. The course will cover typical engineering materials (mostly metals, but we will briefly talk about non-metals, and composites) and their interaction with their environment (temperature, pressure, gases, liquids, chemicals, soils, etc.). We will also learn some of the common methodologies to prevent and control materials degradation (for example: materials selection, adding inhibitors, applying a protective coating, using cathodic or anodic protection, etc.).

Basic knowledge of corrosion monitoring and inspection, as well as field and laboratory testing will be covered. Failure Analysis and case studies will be discussed throughout the different sessions (see below outline).

The course has a practical component where the students will learn ("hands-on") the basics of sample preparation, polishing, etching, metallography, microscopy, and basic corrosion testing. The students are invited to bring their own samples just in case we have sufficient time to run basic testing on them.

Course outline

- Introduction to Corrosion
- Types of Corrosion
- Interactions of Materials and their Environment
- Corrosion Prevention
- Corrosion Monitoring and Inspection
- Basic Corrosion Testing
- Advanced Corrosion Testing (electrochemistry and microscopy)
- Case studies and lessons learned from failure analysis and corrosion projects

Fundamentals of Electrochemistry: Basic Theory and Thermodynamic Methods

Trinity 5 (SHS)

Instructor: James Noël

This course covers the basic theory and application of electrochemical science. It is targeted toward people with a physical sciences or engineering background who have not been trained as electrochemists, but who want to add electrochemical methods to their repertoire of research approaches. There are many fields in which researchers originally approach their work from another discipline but then discover that it would be advantageous to understand and use some electrochemical methods to complement the work that they are doing.

The course begins with a general, basic foundation of electrochemistry and uses it to develop the theory and experimental approaches to electrochemical problems of a thermodynamic nature. It complements a sister course, "Fundamentals of Electrochemistry: Basic Theory and Kinetic Methods", offered alternately by the same instructor. The two courses have different emphasis, and each is designed to be a stand-alone introduction to electrochemical fundamentals. If both courses are desired, they can be taken in either order.

Course outline

- Introduction and Overview of Electrode Processes
- Chemical vs. Electrochemical Thermodynamics
  - reference electrodes, standard potentials, cell potentials, Nernst equation, electrode-solution interface, and double-layer structure
  - ion-selective electrodes, applications in analytical electrochemistry and sensors, aqueous and non-aqueous systems
- Chemical Stoichiometry vs. Faraday's Law
  - coulometry, bulk electrolysis

- Theoretical Basis for Methods
  - surface tension, adsorption and adsorption isotherms, electrocapillarity, potential of zero charge, Lippmann equation
- Methodology
  - potentiometry, differential capacity, coulometry, cyclic voltammetry, polarography
- Electrochemical Instrumentation
  - voltmeters, ammeters, potentiostats, galvanostats, design of electrochemical cells
- Coupled Characterization Methods (time permitting)
  - modified electrodes, spectroelectrochemistry, in-situ neutron scattering, surface analysis, etc.

ECS Data Science Hack Week

May 26-29

Remington (SH)

Building on the success of ECS Data Science Hack Day (October 2017), ECS Data Science Hack Week (May 2018), and the ECS Data Science Showcase (October 2018), we are pleased to offer another exciting data science opportunity at the spring meeting in Dallas. In May 2019, the program will return to an entire week as the next stage in ECS supporting a growing electrochemical data science and open source community. The goal of these events is to bring together people from different backgrounds to collaborate in order to increase awareness and impact of data science tools, open source software, and shared datasets in electrochemistry and solid state science and technology.

Hack Week will again be led by the very capable and engaging team from University of Washington: Dan Schwartz, David Beck, and Matt Murbach. The program will kick off with optional software training tutorials on Sunday, and then sessions all day Monday through Wednesday.

Meet the Organizers

Daniel Schwartz

David Beck

Matthew Murbach

Daniel Schwartz is the Boeing-Sutter Professor of Chemical Engineering and Director of the Clean Energy Institute at the University of Washington, and brings electrochemistry and modeling expertise to the team.

David Beck is Director of Research with the eSciences Institute at the University of Washington and faculty in Chemical Engineer, and leads regular hackathons; he is Associate Director of the NSF Data Intensive Research Enabling CleanTech (DIRECT) PhD training program.

Matthew Murbach is past-president of the University of Washington ECS Student Chapter, and an advanced data sciences PhD trainee; he has been leading the student section software development sessions on the UW campus, and has practical experience coaching electrochemical scientists and engineers in software development.

Schedule

Sunday, May 26

0900-1200h..... (Optional Segment) Introduction to Data Science Tools #1 (using the shell/terminal, version control)
1300-1600h..... (Optional Segment) Introduction to Data Science Tools #2 (introduction to Python using Conda and Jupyter)
1930-2030h..... Hack Week Kickoff Event

Monday, May 27

0830-1200h..... Intermediate Python Topics
1200-1330h..... Lunch Break
1330-1430h..... Project Ideation and Team Formation
1430-1800h..... Project Hacking Time

Tuesday, May 28

0830-1200h..... Advanced Topics (e.g. cloud computing, machine learning, data visualization)
1200-1330h..... Lunch Break
1330-1800h..... Project Hacking Time

Wednesday, May 29

0830-1200h..... Project Hacking Time
1200-1330h..... Lunch Break
1330-1630h..... Project Hacking Time
1700-1900h..... Project Presentations and Wrap Up

Featured Events

Events-at-a-Glance

Sunday, May 26

0700-1900h ..... Meeting Registration is open, *Lone Star Preconvene (SCC)*

0800-0900h ..... Short Course Breakfast*, *Individual Session Rooms, see page 14 for locations*

0800h..... Technical Sessions begin *(check technical program on page 74 for details)*

0900-1630h ..... Short Courses*, *see page 14 for locations*

1900-2100h ..... Opening Reception, *Lone Star A3/A4 (SCC)*

Monday, May 27

0700-1900h ..... Meeting Registration is open, *Lone Star Preconvene (SCC)*

0700-0800h ..... Session Chair and Symposium Organizer Orientation Breakfast, *Austin Ballroom 3 (SH)*

0800h..... Technical Sessions begin *(check technical program on page 82 for details)*

0930-1000h ..... Coffee and Networking Break, *Lone Star Preconvene (SCC) and 2nd Floor Mezzanine (SH)*

1000-1200h ..... Managing and Leading Teams*, *Majestic 3 (SH)*

1400-1600h ..... Win Funding: How to Write a Competitive Proposal*, *Majestic 3 (SH)*

1400-1700h ..... Poster Set-up Period - Monday Evening Posters, *Lone Star B/C (SCC)*

1530-1600h ..... Coffee and Networking Break, *Lone Star B/C (SCC)*

1700-1800h ..... Plenary Session, *Lone Star A3/A4 (SCC)*

1800-2000h ..... Technical Exhibit, ECS Career Expo, General Poster Session, *Lone Star B/C (SCC)*

1830-2200h ..... I06 Symposium Reception in Honor of Shimshon Gottesfeld, *Majestic 6 (SH)*

2000-2200h ..... Student Mixer*, *Chaparral Main Room (SH)*

Tuesday, May 28

0700-1730h ..... Meeting Registration is open, *Lone Star Preconvene (SCC)*

0800h..... Technical Sessions begin *(check technical program on page 109 for details)*

0900-1200h ..... Essential Elements for Employment Success*, *Majestic 3 (SH)*

0930-1000h ..... Coffee and Networking Break, *Lone Star Preconvene (SCC) and 2nd Floor Mezzanine (SH)*

1200-1400h ..... Annual Society Business Meeting and Luncheon*, *Majestic 1 (SH)*

1400-1500h ..... Managing Conflict*, *Majestic 3 (SH)*

1400-2000h ..... Come visit our Exhibitors!, *Lone Star B/C (SCC)*

1400-2000h ..... ECS Career Expo, *Lone Star B/C (SCC)*

1400-1700h ..... Poster Set-up Period - Tuesday Evening Posters, *Lone Star B/C (SCC)*

1400-1800h ..... Resume Review (appointment required), *Lone Star B/C, Booth EX102 (SCC)*

1530-1600h ..... Coffee and Networking Break, *Lone Star B/C (SCC)*

1700-2000h ..... Professional Portraits, *Lone Star B/C, Booth EX100 (SCC)*

1800-2000h ..... General & Student Poster Session, *Lone Star B/C (SCC)*

1830-2000h ..... Symposium I05 Reception, *Majestic 5 (SH)*

Wednesday, May 29

0700-1600h ..... Meeting Registration is open, *Lone Star Preconvene (SCC)*

0800h..... Technical Sessions begin *(check technical program on page 149 for details)*

0930-1000h ..... Coffee and Networking Break, *Lone Star Preconvene (SCC) and 2nd Floor Mezzanine (SH)*

1400-2000h ..... Come visit our Exhibitors!, *Lone Star B/C (SCC)*

1400-2000h ..... ECS Career Expo, *Lone Star B/C (SCC)*

1400-1700h ..... Poster Set-up Period - Wednesday Evening Posters, *Lone Star B/C (SCC)*

1400-1700h ..... Patent Law for Scientists and Engineers*, *Majestic 3 (SH)*

1400-1800h ..... Resume Review (appointment required), *Lone Star B/C, Booth EX102 (SCC)*

1530-1600h ..... Coffee and Networking Break, *Lone Star B/C (SCC)*

1700-2000h ..... Professional Portraits, *Lone Star B/C, Booth EX100 (SCC)*

1800-2000h ..... M02 Symposium Reception, *Majestic 2 (SH)*

1800-2000h ..... General Poster Session, *Lone Star B/C (SCC)*

1815-1830h ..... Z01 Student Poster Award Winner Presentation, *Lone Star B/C (SCC)*

Thursday, May 30

0700-1000h ..... Meeting Registration is open, *Lone Star Preconvene (SCC)*

0800h..... Technical Sessions begin *(check technical program on page 183 for details)*

0930-1000h ..... Coffee and Networking Break, *Lone Star Preconvene (SCC) and 2nd Floor Mezzanine (SH)*

**ticketed required: tickets may be purchased in advance or by stopping by customer service.*

Division Events

Sunday, May 26

1600-1700h ..... Electronics and Photonics Division Symposium Planning, *Majestic 5 (SH)*
1700-2000h ..... Dielectric Science and Technology Division Governing Body / Long Range Planning Committee and Symposium Planning, *Majestic 8 (SH)*
1800-2100h ..... Physical and Analytical Electrochemistry Division Symposium Planning Committee, *Majestic 10 (SH)*
1800-2045h ..... Sensor Division Executive Committee, *Majestic 2 (SH)*
1900-2000h ..... Electronics and Photonics Division Award and General Business Meeting, *Majestic 3 (SH)*
1900-2100h ..... Industrial Electrochemistry and Electrochemical Engineering Division Symposium Planning Committee, *Majestic 11 (SH)*
2000-2200h ..... Electronics and Photonics Division Executive Committee, *Majestic 5 (SH)*

Monday, May 27

0700-0900h ..... High-Temperature Energy, Materials, & Processes Division Executive Committee, *Majestic 9 (SH)*
0700-0900h ..... Industrial Electrochemistry and Electrochemical Engineering Division Executive Committee, *Majestic 2 (SH)*
0700-0900h ..... Physical and Analytical Electrochemistry Division Executive Committee, *Majestic 10 (SH)*
1215-1400h ..... Industrial Electrochemistry and Electrochemical Engineering Division Business Meeting and Luncheon*, *Majestic 8 (SH)*
1800-2000h ..... Organic and Biological Electrochemistry Division Executive Committee, *Majestic 9 (SH)*
1800-2000h ..... Nanocarbons Division Executive Committee, *Majestic 2 (SH)*
1830-2030h ..... Physical and Analytical Electrochemistry Division Business Meeting and Grahame Award Reception*, *Trinity 4 (SHS)*
1900-2100h ..... Energy Technology Division Executive Committee Meeting, *Majestic 5 (SH)*

Wednesday, May 29

1215-1400h ..... Energy Technology Division Business Meeting and Award Luncheon*, *Majestic 8 (SH)*
1215-1400h ..... Organic and Biological Electrochemistry Division Business Meeting and Luncheon*, *Majestic 7 (SH)*
1930-2130h ..... Nanocarbons Division Reception*, *Majestic 5 (SH)*

**ticketed required: tickets may be purchased in advance or by stopping by customer service.*

Section Events

Monday, May 27

1800-1900h ..... Europe Section Executive Committee, *Majestic 10 (SH)*
1900-2000h ..... Europe Section Meeting, *Majestic 4 (SH)*

Tuesday, May 28

0700-1000h ..... Texas Section Breakfast, *Majestic 9 (SH)*

Committee and Board Meetings

Sunday, May 26

1600-1730h ..... *Interface* Advisory Board, *Majestic 7 (SH)*
1600-1730h ..... Fellows Review Subcommittee, *Pearl 3 (SH)*

Monday, May 27

0800-1000h ..... Joint Journal Editorial Board, *Majestic 6 (SH)*
1030-1130h ..... Sponsorship Committee, *Majestic 7 (SH)*
1300-1430h ..... Education Committee, *Majestic 10 (SH)*
1300-1500h ..... *ECS Transactions* Editorial Advisory Board, *Majestic 6 (SH)*
1500-1630h ..... Individual Membership Committee, *Majestic 7 (SH)*
1530-1630h ..... Interdisciplinary Science and Technology Subcommittee, *Majestic 11 (SH)*

Tuesday, May 28

0700-0930h ..... Symposium Planning Advisory Board, *Majestic 1 (SH)*
0730-0930h ..... Council of Past Presidents, *Majestic 11 (SH)*
0930-1130h ..... Publications Subcommittee, *Majestic 6 (SH)*
1400-1600h ..... Meetings Subcommittee, *Majestic 11 (SH)*
1600-1800h ..... Honors and Awards Committee, *Majestic 10 (SH)*

Wednesday, May 29

0700-1000h ..... Technical Affairs Committee, *Majestic 11 (SH)*
1100-1200h ..... Development Committee, *Majestic 10 (SH)*

Thursday, May 30

0800-1200h ..... Board of Directors Meeting, *Majestic 1 (SH)*

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Plenary & Awards

The Plenary Session

Monday, 1700-1800h
Room: Lone Star A3/A4 (SCC)

Come together with participants from every symposium for the Plenary Session and recognize, honor, and listen to some of the greatest minds in the field. Join ECS President, Yue Kuo, as he congratulates distinguished Society award winners Héctor Abruña, receiving the Allen J. Bard Award in Electrochemical Science and David Lockwood, receiving the Gordon E. Moore Medal for Outstanding Achievement in Solid State Science and Technology. He will also honor the many Divisional award winners and welcome the highly anticipated ECS lecturer, Koen Kas from Ghent University.

The ECS Lecture

Guardian Angels turning Sickcare into Healthcare
by Koen Kas, Ghent University

Koen Kas is a healthcare futurist, entrepreneur, professor of molecular oncology, acclaimed international keynote speaker, and author of Sick No More and Your Guide to Delight.

He is founding CEO of HealthSkouts and partner at HealthStartup.eu, a social network of novel health start-ups. His team combines real world data, collected via biomarker and sensor measurements, with design and business model innovations into novel, delightful experiences redefining health, helping shape a new breed of digital health companies.

Kas is a professor of oncology at Ghent University in Belgium, and chairs the scientific committee of the European Cancer Prevention Organization. He is an ambassador for Health House and serves on the advisory board of seven pioneering healthcare companies, and is a digital health investor. He is a juror of the Prix Galien and an editor of the mHealth journal and the European Journal of Cancer Prevention.

Kas was CSO Oncology at Thrombogenics, from which he spun out the biotech company Oncurious and tested a novel drug for pediatric brain cancer. Before this, he was founder and CSO of Pronota, building a protein biomarker discovery platform and pipeline of four diagnostic programs, and was also the director of drug discovery at Galapagos. Previously he set up and directed the cancer drug discovery program at Tibotec (now part of Johnson & Johnson). He started his career elucidating the molecular basis of two types of cancers.

5 QUESTIONS with Koen Kas

"Open data is the only way to move the world forward, learning from give and take to find new ways to connect the dots and have new insights."

What got you interested in healthcare and biomedical sciences?
I think I have a natural born curiosity. What always has fascinated me, even as a little child, is basic biology. How do you create something out of nothing? How do you create a human being? Life has continued to fascinate me, and that is the real reason why I have a biomedical background and why I choose to specialize in oncology.

What got you interested in healthcare specifically?
I spent the first four or five years really in academia, elucidating the biology of a number of cancers and working with cancer patients after getting my degree. I've studied cancer to understand what went wrong at the genetic level.

That background made me think, "Why do we get sick in the first place? Why do we wait so long till we get sick?"

Then, what triggered a complete shift in my career was my first visit to mainland China where I discovered for the first time that more than 2,200 years ago, in some parts of China, the doctor got paid as long as people in the village remained healthy. Once they got sick they no longer had to pay. That blew my mind.

I started to question why we lost that Chinese system? Because in all honesty, I don't think we have healthcare. I think we have sickcare. We wait till we get sick, and very often that's too late.

That will be part of what I'm going to present at the ECS meeting. I'm going to show that although we cannot predict the future, I'm absolutely convinced that we can create the future and that what The Electrochemical Society and others working on these kinds of topics do will be fundamental in making that shift from sickcare to healthcare.

You're giving the ECS lecture which is the big lecture of the week of the 235th ECS meeting. We're a bunch of electrochemists, a bunch of solid-state scientists, and other niche areas that we cover, why do you think a bunch of electrochemists invited you to speak?
Healthcare is pretty slow in keeping up with the entire digital shift. Nevertheless, the real revolution I think is going to start on the top of the shoulders of the digital one; that's the biological revolution. And I think that electrochemical engineers are really at the interface of what digital and what biology brings together. It's electrochemistry; the name itself already implies it.

Society Awards

Allen J. Bard Award in Electrochemical Science

Monday 1000h
Houston Ballroom B (SCC)

Energy Conversion and Storage:
Novel Materials and Operando Methods
by Héctor D. Abruña

Héctor D. Abruña is the Émile M. Chamot Professor of Chemistry and the director of the Center for Alkaline-Based Energy Solutions and the Energy Materials Center at Cornell University.

He completed his graduate studies with Royce W. Murray and Thomas J. Meyer at the University of North Carolina at Chapel Hill in 1980 and was a postdoctoral research associate with Allen J. Bard at the University of Texas at Austin from 1980 to 1981. After a brief stay at the University of Puerto Rico, he joined Cornell University in 1983. He was chair of the Department of Chemistry and Chemical Biology from 2004 to 2008.

Abruña has been the recipient of numerous awards, including a Presidential Young Investigator Award, an A. P. Sloan Fellowship, a J. S. Guggenheim Fellowship, and a J. W. Fulbright Senior Fellowship. He is a recipient of the Electrochemistry Award of the American Chemical Society (2008) and the C. N. Reilley Award in Electrochemistry (2007). He was elected Fellow of the American Association for the Advancement of Science in 2007, member of the American Academy of Arts and Sciences in 2007, and Fellow of the International Society of Electrochemistry in 2008. He received the David C. Grahame Award from The Electrochemical Society in 2009, the Faraday Medal of the Royal Society in 2011, and the Brian Conway Prize from the International Society of Electrochemistry in 2013. He was named Fellow of The Electrochemical Society in 2013, and in 2017 was the recipient of the Gold Medal of the International Society of Electrochemistry. Most recently, he was elected member of the National Academy of Sciences.

Abruña is the coauthor of over 480 publications (h-index=85) and has given over 600 invited lectures worldwide. He considers his 55 PhD students and 70 postdoctoral associates his most important professional achievement.

Gordon E. Moore Medal for Outstanding Achievement in Solid State Science and Technology Award

Monday 1410h
City View 2 (SH)

Silicon-Based Photonic Integrated Circuits:
The Quest for Compatible Light Sources
by David Lockwood

David J. Lockwood obtained his PhD from Canterbury University, New Zealand, in 1969 and was awarded a DSc in 1978 from Edinburgh University, United Kingdom, for his work on the electronic, optical, and magnetic properties of solids.

He carried out postdoctoral work in physical chemistry at Waterloo University, Canada, (1970–1971) and was a research

(continued on next page)

I think what might be a reason to invite me is the vision I have. That if we understand why we get sick in the first place—and the real reason is that we hardly have any insights in who the patient is—scientific understandings and technological developments coming out of ECS will be instrumental in getting to know patients.

For example, if I send a package with FedEx or with UPS from Dallas to New York, I can go to a website and trace every single step of the package and know where it is, which I find normal. If I look to my average patient, my cancer patient, my Alzheimer's patient, my diabetic patient, that patient is 8,700 hours a year by himself or herself; not linked to the healthcare system. So a FedEx package is better off than me as a patient. That is not normal.

Facebook was recently in big trouble for sharing user information. It sounds like there may be a roadblock in getting people over the fear of sharing their medical information, for the same reasons. Do you think people will resist this idea to monitor and broadcast their health 24/7?

If I get you more in return to what you give, you'll get it.

For example, if you go to Disneyland, you get a box sent home with magic bands. It's a band with your name on it, a band with the name of your partner, and the bands with the names of your kids on it.

The product makes it so that you can pay wirelessly, and it'll alert you on the best wait times. The band tells me, "Here Koen, if you leave now from where you are in Disneyland to Avatar there is no line." I'm willing to give up my exact location in order to get a service in return.

We'll be willing to give an exchange of data because we're going to realize that giving something offers us the best chance to remain healthy.

Because ECS is big on open access and open science, where do you come down on that, as far as how important you think open science is to innovation and smart technologies?

Open data is the only way to move the world forward. It is something I evangelize everywhere.

A few years ago, Elon Musk made his entire IP open source. Not kidding. That's not altruism. You know why he did that? He did that because he wanted as much other automobile companies possible to start building electric cars, for one simple reason, he was building the Gigafactory in Nevada: the biggest battery factory which is now coming to completion. The more electric cars people build, the more batteries he can sell.

I am a big believer open data ... to find new ways to connect the dots and to have new insights. And I think at the very end that is what makes us human; it's the ability to see links across different silos and combine different domains together. That is what electrochemistry has done already for hundreds of years; it's engineering and chemistry and biology.■

fellow at Edinburgh University (1972–1978) before joining the National Research Council of Canada in 1978, where he is presently a researcher emeritus. There, his research has centered on the optical properties of low-dimensional materials and has focused on Group IV and III-V semiconductor nanostructures.

Lockwood has published more than 600 scientific articles in journals and books, and has six U.S. patents. He is a fellow of the Royal Society of Canada, The Electrochemical Society, the American Physical Society, and the Institute of Physics, and has served on the editorial boards of six physics journals in addition to being the founding editor of the Nanostructure Science and Technology book series.

He has received six major awards from within Canada and abroad. Within ECS, he has co-organized numerous symposia, served on the board of directors, and chaired the Luminescence and Display Materials Division.

Leadership Circle Award

ECS is proud to recognize long-standing institutional members through our Leadership Circle Awards.

Our institutional members are truly partners of ECS and their commitment to our organization highlights their drive towards the advancement of electrochemistry and solid state science. Our Leadership Circle Awards distinguishes those members who have maintained continuous membership in good standing with ECS.

We would like to thank and congratulate the below institutional members for reaching their milestone level in 2019. These companies have been tremendous partners to ECS and we appreciate all the support they have given the society over the years.

Silver Level – 10 years

Gelest, Inc.
Los Alamos National Laboratory

Bronze level – 5 years

El-Cell GmbH
Ford Motor Company
Ion Power Inc.
SanDisk
Tianjin Lishen Battery Joint-Stock Co., Ltd

The milestone achievements that a member can obtain are listed below:

Legacy Level (70+ years)	Gold Level (25 years)
Medallion Level (65 years)	Silver Level (10 years)
Diamond Level (50 years)	Bronze Level (5 years)

You can view what our members are saying about the Institutional Membership Program on our website: https://www.electrochem.org/institutional-membership

Contact the director of community engagement, Shannon Reed, if you would like to learn more about the Institutional Membership Program:

Shannon.Reed@electrochem.org

Division Awards

Dielectric Science and Technology Division Thomas D. Callinan Award

Tuesday 1410h
City View 2 (SH)

Colorful Adventures in the Field of Dielectrics Science: Some Highs and Lows with a Touch of a Chilly Forecast
by Sean King

Sean King has worked in the semiconductor industry for 22 years and currently serves as a senior technical contributor within Intel Corporation's Portland Technology Development Division. At Intel, King has held a variety of technical positions in the development of Intel's 0.35 mm 7 nm technologies, and presently leads the development of various dielectric materials for use in Intels < 7 nm technologies. He is also a faculty member of Intels College of Engineering, where he teaches courses in nanoelectronic fabrication, vacuum and plasma science, and thin film deposition processes.

King is highly recognized for his significant contributions to the development, implementation, and fundamental understanding of low-k dielectric materials. In 2004, he received Intel's highest achievement award for the insertion of low-k dielectrics in the 90 nm technology. Since then, King has made seminal contributions to the growth, characterization, and integration of both low-k and high-k dielectric materials.

Additionally, King is an active member of numerous technical societies, including The Electrochemical Society, the American Vacuum Society, and the Materials Research Society, for which he has served as an organizer of numerous symposia and a member of various society committees. King has authored or coauthored over 175 publications and 50 patents in the fields of dielectric and semiconducting materials.

King holds a BS degree in materials engineering from Virginia Tech and a PhD in materials science and engineering from North Carolina State University.

Division Awards

Electronics and Photonics Division Award

Monday 0800h
Austin Ballroom 1 (SH)

New Directions in GaN Electronic and Photonic Devices Enabled By Electrochemical Processes
by Jung Han

Jung Han is the William A. Norton Professor in Technological Innovation and a professor of electrical engineering at Yale University. He received his PhD in electrical engineering from Purdue University in 1992. His research focuses mainly on epitaxial growth and nanoscale synthesis of wide-bandgap semiconductors for energy-efficient lighting, display, and power applications.

Han's doctoral and postdoctoral work at Purdue resulted in one of the first semiconductor blue-green diode lasers from the II-VI ZnSe system. Between 1996 and 2001, Han led a team at Sandia National Laboratories in studying the heteroepitaxial science of III-nitride semiconductors and pioneered the usage of in situ diagnostics that have since then become industry standard. He was responsible for demonstrating some of the earliest AlGaN ultraviolet LEDs and transistors.

He is the cofounder of Saphlux, a start-up company based on his inventions for semipolar GaN light-emitting diodes.

Han has published more than 280 papers in peer-reviewed journals and holds more than 20 U.S. and international patents. Han has received numerous awards, including a Department of Commerce R&D 100 Award, an MRS Ribbon Award, and an EMC Best Paper Award. Han is a member of the Connecticut Academy of Science and Engineering and a fellow of the Institute of Physics, the Institute of Electrical and Electronic Engineers, and the Optical Society of America.

Energy Technology Division Research Award

Tuesday 1720h
Houston Ballroom C (SCC)

Transition Metal-Nitrogen-Carbon Catalysts for Oxygen Reduction Reaction: Surface Chemistry, Morphology and Reactivity
by Plamen Atanassov

Plamen Atanassov graduated from the University of Sofia with an MS in chemical physics and earned a doctorate from the Bulgarian Academy of Sciences in physical chemistry.

He moved to the U.S. in 1992 and was with the University of New Mexico until 2018. While at the University of New Mexico, Atanassov worked as a research faculty member, participated in a start-up, rose to the rank of distinguished professor of chemical and biological engineering, started the Center for Emerging Energy Technologies, and served as the associate dean for research before assuming his final post as director of the Center for Micro-Engineered Materials.

In October 2018, Atanassov became chancellor's professor of the Chemical & Biomolecular Engineering Department of the Henry Samueli School of Engineering at the University of California, Irvine. His research is in nanostructured materials and new technologies for energy conversion and storage, focusing on electrocatalysis and bioelectrocatalysis, with applications in fuel cells, electrolyzers, and bioelectrochemical systems.

Atanassov is a fellow of The Electrochemical Society and the National Academy of Inventors. He has served as a vice president of the International Society of Electrochemistry. He holds 55 issued patents, half of which have been licensed and are at the core of several catalysts. He has published more than 370 peer-reviewed papers and 20 book chapters, and has edited a book (h-index=70). He has graduated 34 PhD students.

Energy Technology Division Supramaniam Srinivasan Young Investigator Award

Monday 1440h
San Antonio Ballroom B (SCC)

Towards Deterministic Electrode Design: Elucidating the Role of Surface Chemistry and Microstructure on Flow Battery Performance
by Fikile Brushett

Fikile Brushett is an associate professor in the Department of Chemical Engineering at the Massachusetts Institute of Technology (MIT), where he holds the Cecil and Ida Green Career Development Chair. He received his BSE in chemical and biomolecular engineering from the University of Pennsylvania in 2006 and his PhD in chemical engineering from the University of Illinois at Urbana-Champaign in 2010 under the supervision of Professor Paul J. A. Kenis.

From 2010 to 2012, he was a director's postdoctoral fellow in the Electrochemical Energy Storage Group at Argonne National Laboratory under the supervision of Dr. John T. Vaughey. In 2013, he started his independent career at MIT, where his research group seeks to advance the science and engineering of electrochemical technologies that enable a sustainable energy economy.

He is especially interested in the fundamental processes that define the performance, cost, and lifetime of present-day and future electrochemical systems. His group currently works on redox flow batteries for grid storage and electrochemical processing of carbon dioxide and biomass. He also serves as the research integration co-lead for the Joint Center for Energy Storage Research, a DOE-funded Energy Innovation Hub.

Energy Technology Division Graduate Student Award sponsored by Bio-Logic

Thursday 1200h
City View 8 (SHH)

Biomass-Derived Carbon Materials for Next-Generation Electrochemical Energy Storage Systems
by Zan Gao

Zan Gao is currently a mechanical engineering PhD candidate at the University of Virginia under the supervision of Professor Xiaodong Li. Gao received both his BS degree in environmental engineering (2009) and his MS degree in applied chemistry (2012) from Harbin Engineering University.

Gao's doctoral research focuses on the design and fabrication of next-generation flexible energy storage systems (flexible supercapacitors and flexible batteries) with

(continued on next page)

mechanical durability and chemical stability. He has also made significant contributions to biomass-derived renewable carbon materials for electrochemical energy storage. He has recently begun working on understanding the failure mechanism of flexible energy systems by coupling nanomechanics and electrochemistry.

Gao has published over 40 peer-reviewed articles in various prestigious journals, such as Nature Communications, Nano Letters, Nano Energy, Advanced Functional Materials, Chemistry of Materials, and the Journal of Materials Chemistry A. Additionally, Gao has received several awards and fellowships during his PhD studies, including the Outstanding Graduate Student Award, the William L. Ballard Jr. Endowed Graduate Fellowship, and the Volkswagen Group of North America Fellowship.

Industrial Electrochemistry and Electrochemical Engineering Division New Electrochemical Technology (NET) Award

Monday 1400h
San Antonio Ballroom B (SCC)

Development and Commercialization of Large Scale PEM Water Electrolysis
by Rainey Yu Wang of Hydrogenics Corporation

Rami Michel Abouatallah worked for 15 years at **Hydrogenics Corporation**, where he was a senior research engineer from 2002 to 2008, and then manager of advanced stack development from 2008 to 2017. He was passionate about PEM fuel cells and electrolyzers, and a true believer in hydrogen technology. From 2010 to 2017, Abouatallah led the development of a large-scale PEM electrolyzer stack platform, which is the subject of the 2019 ECS Industrial Electrochemistry and Electrochemical Engineering Division New Electrochemical Technology (NET) Award.

During his career at Hydrogenics Corporation, Abouatallah coauthored more than 15 peer-reviewed journals, conference publications, as well as a number of industrial studies. He held a number of Canadian and U.S. patents.

In 2002, Abouatallah received his PhD degree from the Department of Chemical Engineering and Applied Chemistry at the University of Toronto. His doctoral dissertation was "Reactivation of Nickel Cathodes by Vanadium Species during Alkaline Water Electrolysis." During his study at the University of Toronto, he was the recipient of a dozen undergraduate and graduate awards.

Abouatallah passed away unexpectedly at home on December 8, 2017, at the age of 43. He will always be remembered by his family, friends, and colleagues.

Industrial Electrochemistry and Electrochemical Engineering Division Student Achievement Award

Wednesday 1400h
Pearl 5 (SHH)

Fundamental Understanding on Cell Performance Enhancement of Flow Batteries with Serpentine Flow Field Structures
by Xinyou Ke

Xinyou Ke received his PhD from the Department of Mechanical and Aerospace Engineering at Case Western Reserve University in fall 2018. His PhD dissertation defense was titled "Fundamental Studies on Transport Phenomena in Redox Flow Batteries with Flow Field Structures and Slurry or Semi-Solid Electrodes: Modeling and Experimental Approaches."

He has been supervised by professors Robert F. Savinell, Joseph M. Prahl, and Jesse S. Wainright. He was previously trained at the Massachusetts Institute of Technology, Harvard University, Case Western Reserve University (MSE), and the South China University of Technology (BSE with honors).

He has focused on exploring fundamentals of high-performance flow batteries with flow field structures, electronic conduction mechanisms of slurry or semi-solid electrodes used for flow batteries, and electrochemical flow capacitors through both modeling and experimental approaches.

To date, he has authored or coauthored more than 10 peer-reviewed journal articles. He was the recipient of the 2018 ECS F. M. Becket Summer Research Fellowship. He served as the treasurer of the ECS Case Western Reserve University Student Chapter from 2016 to 2017.

Industrial Electrochemistry and Electrochemical Engineering Division H. H. Dow Memorial Student Achievement Award

Tuesday 0900h
Pearl 5 (SH)

Transport Study inside Porous Layers of PEFC Using Direct Numerical Simulation
by Pongsarun Satjaritanun

Pongsarun (Boom) Satjaritanun received his BS and MS in mechanical engineering from Chiang Mai University, Thailand.

He is currently working toward his doctoral degree in chemical engineering at the University of South Carolina. His current research focuses on (1) numerical modeling of transport phenomena inside micro- to nano-structured porous materials in fuel cell systems, (2) developing a mathematical model for electrochemical impedance spectroscopy to explain the behavior of microbial activities for methane production from organic waste, (3) numerical modeling and design optimization of solid particle mixing with contra-rotating impellers, and (4) developing simulations of multiphase, reactive flow with vaporization of H2SO4 and SOX in a solar-driven sulfuric acid decomposition reactor.

Division Awards

Nanocarbons Division Richard E. Smalley Research Award

Monday 0800h
City View 6 (SH)

Multifunctional Hybrid Carbon Interfaces
by Maurizio Prato

Maurizio Prato graduated from the University of Padova, where he was appointed assistant professor in 1983. In 1992, he moved to the University of Trieste as an associate professor, later becoming a full professor in 2000. In 2015, he also took on the role of Ikerbasque research professor at CIC biomaGUNE in Spain.

He spent sabbatical terms at Yale University and the University of California, Santa Barbara. He was the recipient of an ERC Advanced Research Grant in 2008 and became a member of the Accademia Nazionale dei Lincei in 2010 and the Istituto Veneto di Scienze Lettere ed Arti in 2018. He is also a member of Academia Europea and the European Academy of Sciences.

His research focuses on the synthesis and applications of new functional materials. He has worked with carbon nanostructures, including fullerenes, carbon nanotubes, and graphene, developing a series of reactions that make these species more biocompatible, less or even nontoxic, amenable to further functionalization, and easier to manipulate. He is interested in transferring the properties of these materials into applications, which include spinal cord repair, the splitting of water, and the reduction of carbon dioxide into useful chemicals.

Physical and Analytical Electrochemistry Division David C. Grahame Award

Tuesday 0830h
Trinity 3 (SHS)

Electroanalytical Techniques for Studying Nitrogenase Enzyme Mechanisms
by Shelley Minteer

Shelley Minteer is a Utah Science Technology and Research Initiative professor in both the Department of Chemistry and the Department of Materials Science and Engineering at the University of Utah.

She received her PhD in analytical chemistry at the University of Iowa in 2000, under the direction of Professor Johna Leddy. After receiving her PhD, she spent 11 years as a faculty member in the Department of Chemistry at Saint Louis University before moving to the University of Utah in 2011.

Minteer was the technical editor for the *Journal of The Electrochemical Society* from 2013 to 2016 and is presently an associate editor for the *Journal of the American Chemical Society*.

Minteer has won several awards, including the Luigi Galvani Prize of the Bioelectrochemical Society, the American Chemical Society Division of Analytical Chemistry Award in Electrochemistry, the International Society of Electrochemistry Tajima Prize, and the Society of Electroanalytical Chemists' Young Investigator Award. She has also been named Fellow of The Electrochemical Society.

Her research interests focus on electrocatalysis and bioanalytical electrochemistry. She has expertise in electrosynthesis, biosensors, biofuel cells, and bioelectronics.

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Location

The Exhibit Hall will be located on Level 2, Lonestar Ballroom in the Sheraton Dallas.

Exhibit Hours

Monday, May 27

1200-1700h ..... Exhibitor Move-In
1400-1700h ..... Poster Move-In
1800-2000h ..... Technical Exhibit, General Poster Session

Tuesday, May 28

1400-1700h ..... Poster Move-In
1400-2000h ..... Technical Exhibit
1530-1600h ..... Networking Break
1800-2000h ..... General and Student Poster

Wednesday, May 29

1400-1700h ..... Poster Move-In
1400-2000h ..... Technical Exhibit
1530-1600h ..... Networking Break
1800-2000h ..... General Poster Session
2000-2200h ..... Optional Technical Exhibit Tear Down

Thursday, May 30

0900-1200h ..... Technical Exhibit Tear Down

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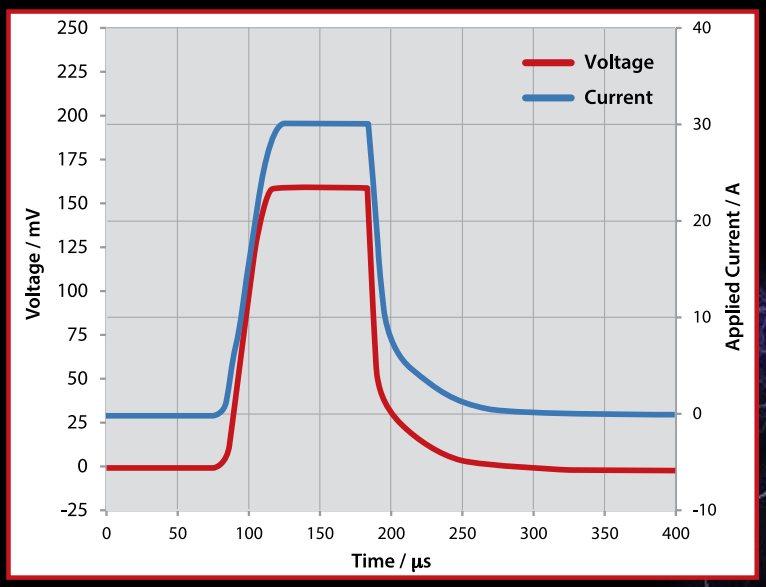
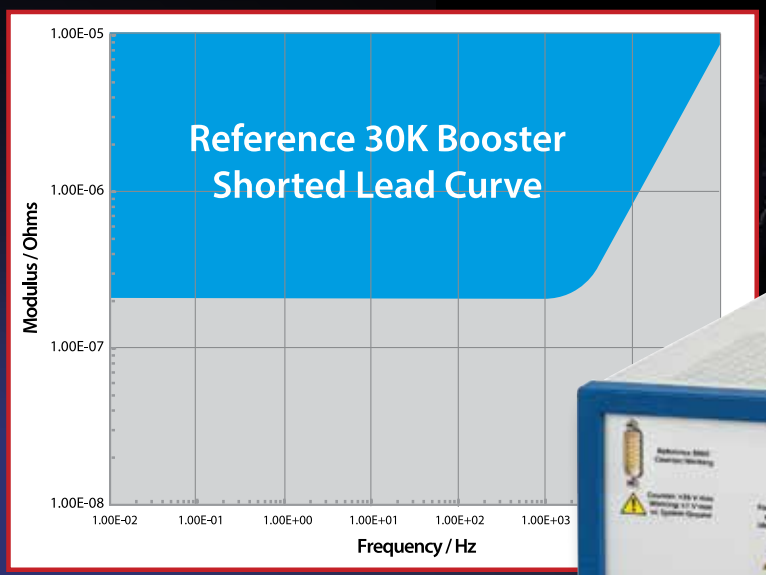


30 A Pulse on a 5 mOhm cell

Nobody goes lower

Up to 30A @ 20V, EIS to 300 kHz



200 nOhm Shorted Lead Curve

20 A rms, 0.9 m cell cable

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Chapter Name	Year Chartered	Faculty Advisor(s)
Aalborg University	2017	Dr. Daniel-Ioan Stroe Dr. Maciej Swierczynski
Ankara Yıldırım Beyazıt University	2018	Prof. Begum Unveroglu
Atlanta Student Chapter at Georgia Tech	2008	Prof. Peter J. Hesketh
Atlantic Canada Student Chapter (Dalhousie)	2018	Prof. Mark Obrovac Dr. Jeff Dahn Prof. Heather Andreas
Auburn University	2007	Prof. Majid Beidaghi
Belgium Student Chapter	2015	Dr. Philippe M. Vereecken Prof. Dr. Stefan De Gendt
Boston Student Chapter	2009	Dr. Eugene Smotkin
British Columbia University	2013	Dr. Dan Bizzotto
Brno University of Technology	2006	Prof. Jiri Vondrak
Calgary Student Chapter	2018	Dr. Viola Birss
California State University-Fullerton	2012	Dr. John L. Haan
Case Western Reserve University	2005	Dr. Robert F. Savinell
Central Illinois Student Chapter	2008	Prof. Dr. Andrzej Wieckowski
China Spallation Neutron Source	2018	Prof. Fongwei Wang Prof. Wang Hay (Jack) Kan Dr. Bao-Tian Wang Dr. Hua Yang
Clemson University	2014	Dr. Stephen E. Creager
Colorado School of Mines	2012	Prof. Andy M. Herring
Complutense University of Madrid	2018	Prof. Dr. Nazario Martin Leon Prof. Dr. Jose Manuel Pingarron
Drexel University	2012	Prof. Dr. Yury Gogotsi Dr. Ekaterina A. Pomerantseva
Florida International University	2018	Professor Chunlei Wang
Hong Kong University of Science and Technology	2016	Prof. Dr. Francesco Ciucci Dr. Minhua Shao
Illinois Institute of Technology	2015	Wei Chen Dr. Adam Hock
Imperial College London	2018	Gregory Offer Ifan Erfyl Lester Stephens
Indiana University	2012	Dennis Peters Dr. Lane A. Baker
Kerala, India at CUSAT Student Chapter	2008	Prof. Dr. Madambi K. Jayaraj
Lahore, Pakistan Student Chapter	2008	Inam Ul Haque
Lewis University	2015	Dr. Jason Keleher
Louisiana State University	2016	Mr. Christopher G. Arges
Mexico Capitulo Estudiantil CIDETEQ	2018	Dr. Rene Antano-Lopez Jorge Morales Hernández

Chapter Name	Year Chartered	Faculty Advisor(s)
Missouri University of Science and Technology	2017	Dr. Amitava Choudhury Dr. Jay A. Switzer Dr. Manashi Nath
Montana State University	2013	Prof. Ryan W. Anderson Dr. Paul E. Gannon
Montreal Student Chapter	2010	Prof. Steen B. Schougaard
Munich Student Chapter	2015	Prof. Dr. Hubert Gasteiger
New Mexico State University	2015	Dr. Vimal H. Chaitanya Prof. Hongmei Luo
North Florida Student Chapter	2014	Dr. Pedro Moss
Norwegian University of Science and Technology	2014	Dr. Ann Mari Svensson
Ohio State University	2006	Prof. Anne C. Co
Ohio University	2011	Dr. Gerardine Gabriela Botte
Oklahoma Student Chapter	2017	Dr. Sadagopan Krishnan Dr. Barry Lavine
Rensselaer Polytechnic Institute	2013	Dr. David J. Duquette Dr. Daniel J. Lewis
Research Triangle Student Chapter	2013	Dr. Jeffrey Glass
South Brazil Student Chapter	2010	Luís F. P. Dick
SRM University	2013	Ranjit Thapa Dr. Bhalchandra Anand Kakade
Tel Aviv University	2009	Eliezer Gileadi Prof. Yosi Shacham-Diamand
Texas A&M University	2016	Dr. Yue Kuo
Tyndall National Institute	2012	Dr. Alan O'Riordan
UK Northwest Student Chapter	2015	Dr. Laurence J. Hardwick
Ulm University	2018	Prof. Dr. Werner Tillmetz
University of Alabama	2016	Prof. Shanlin Pan
University of Arkansas	2018	Rick WiseDr
University of Calgary	2011	Dr. Viola Ingrid Birss
University of California–Berkeley	2014	Prof. Bryan D McCloskey
University of California-Los Angeles	2015	Prof. Dr. Sarah H Tolbert
University of California–Riverside	2011	Prof. Alexander A. Balandin
University of California–San Diego	2014	Dr. Shirley Meng
University of Cape Town	2018	Dr. Rhiyaad Mohamed
University of Central Florida	2000	Dr. Kalpathy B. Sundaram
University of Cincinnati	2007	Marc Cahay
University of Florida	2005	Erin Patrick
University of Guelph	2018	Dr. Aicheng Chen Dr. Abdelaziz Houman Dr. Jacek Lipkowski
University of Houston	2016	Prof. Yan Yao

Chapter Name	Year Chartered	Faculty Advisor(s)
University of Illinois at Chicago	2016	Sanjay Kumar Behura Prof. Brian P. Chaplin
University of Iowa	2014	Dr. Johna Leddy
University of Kansas	2016	Trung Van Nguyen
University of Kentucky	2014	Prof. Dr. Doo Young Kim
University of Maryland	2011	Prof. Dr. Eric D. Wachsman
University of Nevada-Reno	2014	Prof. Dev Chidambaram
University of New Mexico	2017	Dr. Fernando H. Garzon Dr. Plamen B. Atanassov
University of Oxford	2016	Dr.Charles W. Monroe Dr. Kyle A. Vincent Dr. Kylie A. Vincent
University of Pittsburgh	2014	Dr. Prashant N. Kumta Spandan Maiti
University of South Carolina	2010	Prof. William Mustain
University of St. Andrews	2015	Prof. John T. S. Irvine

Chapter Name	Year Chartered	Faculty Advisor(s)
University of Tartu	2013	Kaido Tammeveski
University of Texas at Austin	2006	Dr. Arumugam Manthiram
University of Texas at Dallas	2012	Prof. Moon J Kim
University of Toronto	2016	Dr. Donald W. Kirk
University of Utah	2015	Dr. Shelley D. Minteer
University of Virginia	2006	Dr. Giovanni Zangari
University of Washington	2016	Prof. Daniel T Schwartz Dr. Venkat R. Subramanian Dr. Stuart B. Adler
University of Western Ontario	2017	Prof. Jungsook Clara Wren Dr. Zhifeng Ding Dr. James J. Noel Dr. D.W. Shoesmith
Valley of the Sun (Central Arizona)	2013	Prof. Dr. Candace Kay Chan
Yamagata University	2018	Tsukasa Yoshida Hedemitsu Furukawa Ajit Khosla

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James Fenton	Member		Spring 2020
Gessie Brisard	Member		Spring 2022
Christopher Jannuzzi	Member	Executive Director	Term as ED

Board of Directors, Nonprofit Financial Professional			Term
Stuart Swirson	Member		Spring 2019

Audit Committee			Term
Johna Leddy	Chair	Immediate Past President	Spring 2019
Yue Kuo	Member	President	Spring 2019
Christina Bock	Member	Senior Vice President	Spring 2019
Gessie Brisard	Member	Treasurer	Spring 2022
Stuart Swirson	Member	Nonprofit Financial Professional	Spring 2019

Education Committee			Term
James Noël	Chair		Spring 2021
Anne Co	Member		Spring 2019
Enn Lust	Member		Spring 2019
Kalpathy Sundaram	Member		Spring 2020
Alice Suroviec	Member		Spring 2020
Keryn Lian	Member		Spring 2021
David Hall	Member		Spring 2021
Vimal Chaitanya	Member		Spring 2022
Takayuki Homma	Member		Spring 2022
Daniel Parr	Student Member		Spring 2019
Margaret Calhoun	Student Member		Spring 2020
James Fenton	Member	Secretary	Spring 2020
William Mustain	Member	Chair, Individual Membership Committee	Spring 2020

Ethical Standards Committee			Term
Johna Leddy	Chair	Immediate Past President	Spring 2019
Dennis Hess	Member	Past Officer	Spring 2019
D. Noel Buckley	Member	Past Officer	Spring 2020
James Fenton	Member	Secretary	Spring 2020
Gessie Brisard	Member	Treasurer	Spring 2022

Finance Committee			Term
Gessie Brisard	Chair	Treasurer	Spring 2022
Robert Mantz	Member		Spring 2019
Mark Verbrugge	Member		Spring 2019
Robert Kostecki	Member		Spring 2020
Boryann Liaw	Member		Spring 2020
James Fenton	Member	Secretary	Spring 2020
Tim Gamberzky	Member	Chief Operating Officer	Term as COO

Honors and Awards Committee			Term
Peter Fedkiw	Chair - ETD		Spring 2019
Joseph Stetter	Member - SENS		Spring 2019
Rohan Akolkar	Member - ELDP		Spring 2019
R. Bruce Weisman	Member - NANO		Spring 2019
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Thomas Moffat	Member - ELDP		Spring 2020
Jean St-Pierre	Member - ETD		Spring 2020
Viola Birss	Member - PAED		Spring 2021
Shelley Minteer	Member - PAED		Spring 2021
Scott Calabrese Barton	Member - ETD		Spring 2021
Junichi Murota	Member - EPD		Spring 2022
Dev Chidambaram	Member - CORR		Spring 2022
Wei Tong	Member - BATT		Spring 2022
Yue Kuo	Member - EPD	President	Spring 2019

Individual Membership Committee			Term
William Mustain	Chair		Spring 2020
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M. Neal Golovin	Member		Spring 2019
R. Bruce Weisman	Member		Spring 2020
Timothy Paschkewitz	Member		Spring 2020
Toshiyuki Nohira	Member		Spring 2021
Chi-Chang Hu	Member		Spring 2021
Beatriz Molero Sanchez	Student Member		Spring 2019
Jeffrey Henderson	Student Member		Spring 2020
Marion Jones	Member	Chair, Sponsorship Committee	Spring 2019
James Fenton	Member	Secretary	Spring 2020

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Hariklia Deligianni	Member		Spring 2019
Dennis Hess	Member		Spring 2019
Eric Wachsman	Member	Third Vice President	Spring 2019

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Peter Fedkiw	Member		Spring 2020
Xiaoping Jiang	Member		Spring 2020
Jie Xiao	Member		Spring 2021
Christopher Beasley	Member		Spring 2021
Mark Glick	Member		Spring 2021
William Mustain	Member	Chair, Individual Membership Committee	Spring 2020
Gessie Brisard	Member	Treasurer	Spring 2022

Technical Affairs Committee			Term
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Yue Kuo	Member	President	Spring 2019
Johna Leddy	Member	Immediate Past President	Spring 2019
Krishnan Rajeshwar	Member	Second Immediate Past President	Spring 2019
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Stefan De Gendt	Member	Chair, Publications Subcommittee	Spring 2019
E. Jennings Taylor	Member	Chair, Interdis. Sci. & Tech. Subcom.	Spring 2019
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Publications Subcommittee of the Technical Affairs Committee			Term
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Christina Roth	Member		Spring 2021

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Diane Smith	Member - OBE	Spring 2021
Jessica Koehne	Member - SENS	Spring 2021
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Zoltan Nagy	Spring 2019

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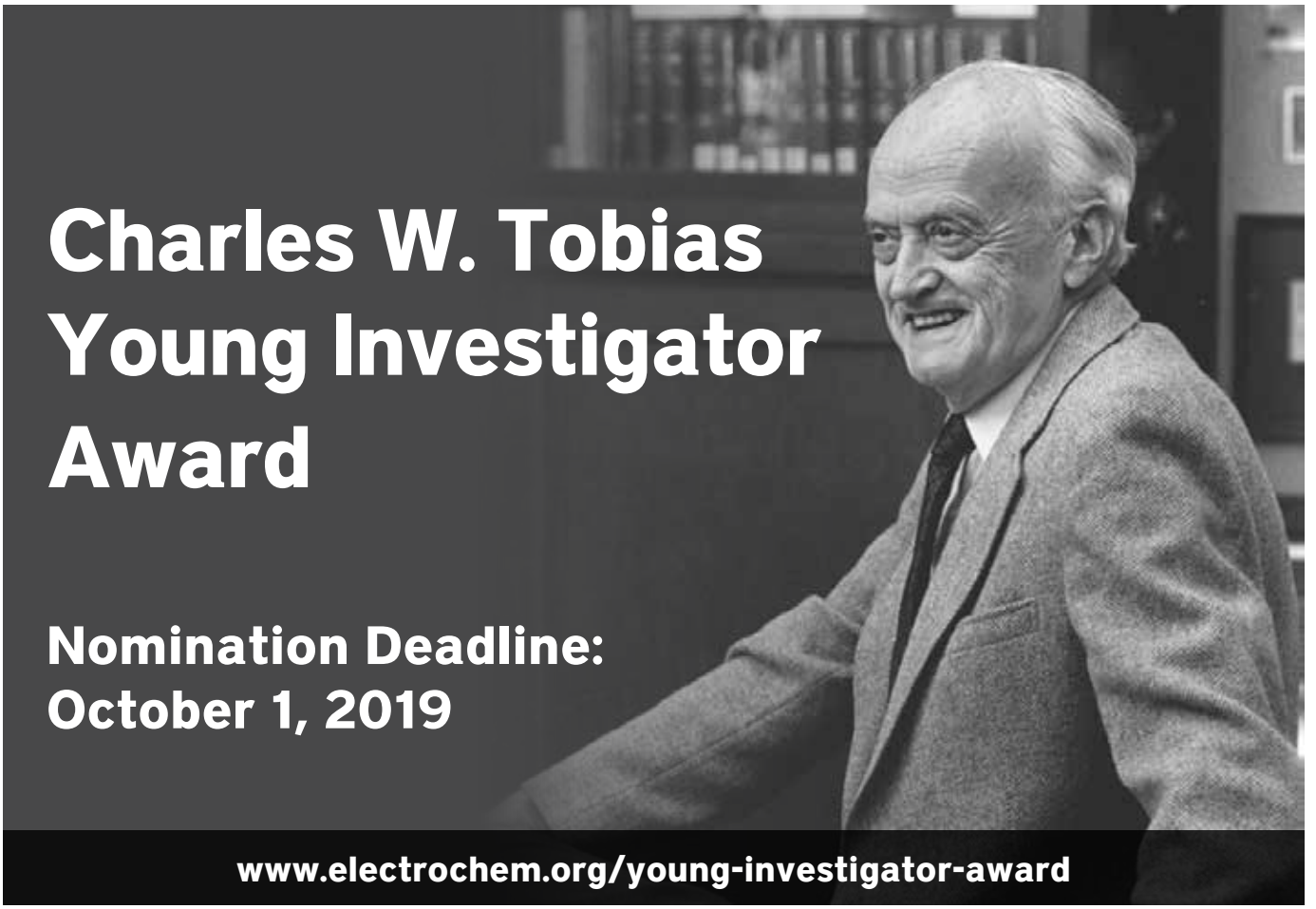

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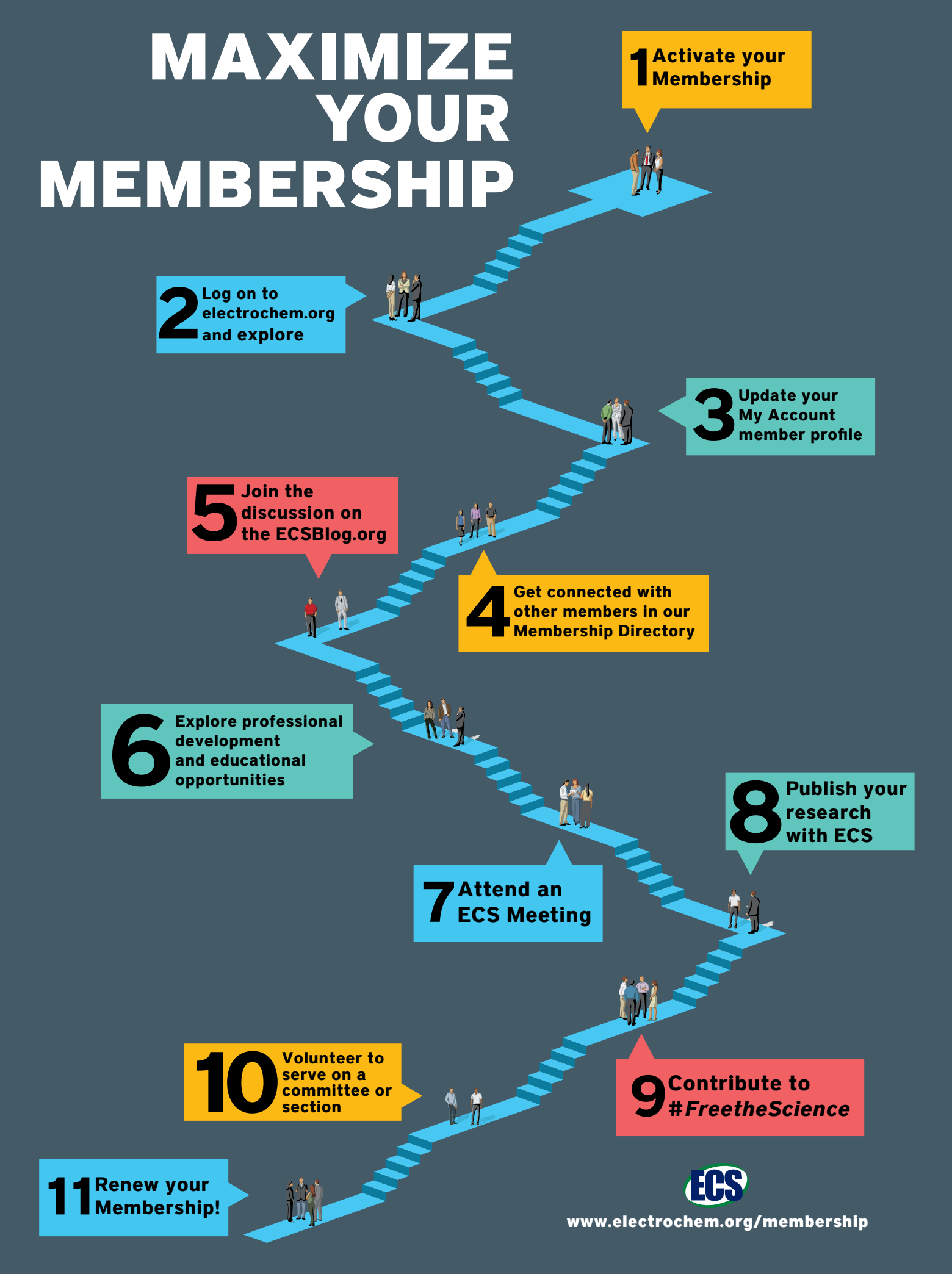

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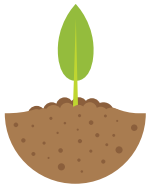

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Technical Symposia

A — Batteries and Energy Storage

A01 — **Battery and Energy Technology Joint General Session**
Mani Manivannan, Jie Xiao, Hui Xu, S. R. Narayan
Energy Technology, Battery

A02 — **Lithium Ion Batteries and Beyond**
Brett Lucht, Bryan McCloskey, Guoying Chen, Christopher Johnson, Pawel Kulesza
Battery, Physical and Analytical Electrochemistry

A03 — **Large Scale Energy Storage 10**
Trung Nguyen, Jagjit Nanda, Bin Li, Jing Xu, Wei Wang, Pawel Kulesza, Shelley Minteer
Energy Technology, Battery, Industrial Electrochemistry and Electrochemical Engineering, Physical and Analytical Electrochemistry
Battery, Physical and Analytical Electrochemistry

A04 — **Battery Student Slam 3**
Feng Lin, David Mitlin, Laurence Hardwick, Veronica Augustyn, Guoying Chen, Susan Odom
Battery Electrochemical Engineering

A05 — **Battery Characterization**
Gabriel Veith, Thomas Barrera, Roseanne Warren, Jun Lu, Gary Koenig, Anne Co
Battery, Physical and Analytical Electrochemistry

A06 — **Battery Safety and Failure Modes**
Thomas Barrera, Guangsheng Zhang, Boryann Liaw, Ankur Jain
Battery, Industrial Electrochemistry and Electrochemical Engineering

B — Carbon Nanostructures and Devices

B01 — **Carbon Nanostructures for Energy Conversion and Storage**
Jeffrey Blackburn, Michael Arnold, Stephen Doorn, David Cliffel, Christina Bock, Xiulei Ji, MinKyu Song, Vito Di Noto, Plamen Atanassov
Nanocarbons, Battery, Physical and Analytical Electrochemistry

B02 — **Carbon Nanostructures in Medicine and Biology**
Daniel Heller, Tatiana DaRos, Fotios Papadimitrakopoulos, Ardemis Boghossian, Mekki Bayachou, James Burgess, Larry Nagahara
Nanocarbons, Organic and Biological Electrochemistry, Sensor

B03 — **Carbon Nanotubes – From Fundamentals to Devices**
Stephen Doorn, Yury Gogotsi, Pawel Kulesza, Ming Zheng, Slava V. Rotkin, R. Bruce Weisman, Shigeo Maruyama, Benjamin Flavel, Yan Li
Nanocarbons, Physical and Analytical Electrochemistry

B04 — **Nano in Latin America**
Hiroshi Imahori, Mariana Martinez-Pacheco, Slava Rotkin, Juan Lale, Monica Cerro-Lopez, Giaan Álvarez-Romero
Nanocarbons, Dielectric Science and Technology, Electronics and Photonics

B05 — **Fullerenes – Endohedral Fullerenes and Molecular Carbon**
Shangfeng Yang, Alan Balch, Francis D'Souza, Luis Echegoyen, Dirk Guldi, Nazario Martin, Steven Stevenson
Nanocarbons

B06 — **2D Layered Materials from Fundamental Science to Applications**
Jessica Koehne, David Estrada, Ajit Khosla, Yaw Obeng, Stefan De Gendt, Zia Karim, Colm O'Dwyer, Slava V. Rotkin
Nanocarbons, Dielectric Science and Technology, Electronics and Photonics, Sensor, Interdisciplinary Science and Technology Subcommittee

B07 — **Light Energy Conversion with Metal Halide Perovskites, Semiconductor Nanostructures, and Inorganic/ Organic Hybrid Materials**
Hiroshi Imahori, Prashant Kamat, Kei Murakoshi, Tsukasa Torimoto, Vito Di Noto
Nanocarbons, Physical and Analytical Electrochemistry

B08 — **Porphyrins, Phthalocyanines, and Supramolecular Assemblies**
Karl Kadish, Roberto Paolesse, Tomas Torres, Nathalie Solladie, Diane Smith, Norbert Jux
Nanocarbons, Organic and Biological Electrochemistry

B09 — **Nano for Industry**
Slava V. Rotkin, Luke Haverhals, Francis D'Souza, E. Taylor, Oana Leonte
Nanocarbons, Industrial Electrochemistry and Electrochemical Engineering, Physical and Analytical Electrochemistry, Dielectric Science and Technology, Interdisciplinary Science and Technology Subcommittee

C — Corrosion Science and Technology

C01 — **Corrosion General Session**
Masayuki Itagaki, Jamie Noël
Corrosion

D — Dielectric Science and Materials

D01 — **Chemical Mechanical Polishing 15**
Gautam Banerjee, R. Rhoades, G. Bahar Basim, V. Chaitanya, Yaw Obeng
Dielectric Science and Technology

E — Electrochemical/Electroless Deposition

E01 — **Electrodeposition for Advanced Node Interconnect Metallization Beyond Copper**
Shafaat Ahmed, Jian Zhou, Qiang Huang, James Kelly
Electrodeposition

F — Electrochemical Engineering

F01 — **Industrial Electrochemistry and Electrochemical Engineering General Session**
Douglas Riemer, John Staser
Industrial Electrochemistry and Electrochemical Engineering

F02 — **Tutorial on Industrial Electrochemistry**
Gerardine Botte, John Harb, E. Taylor
Industrial Electrochemistry and Electrochemical Engineering

F03 — **Characterization of Porous Materials 8**
John Staser, Xiaolin Li, Christina Bock
Industrial Electrochemistry and Electrochemical Engineering, Battery, Energy Technology

F04 — **Multiscale Modeling, Simulation and Design 3: Enhancing Understanding, and Extracting Knowledge from Data**
Venkat Subramanian, Scott Calabrese Barton, John Harb, Luis Diaz, Gerardine Botte, Ankur Jain
Industrial Electrochemistry and Electrochemical Engineering, Energy Technology

G — Electronic Materials and Processing

G01 — **Silicon Compatible Materials, Processes, and Technologies for Advanced Integrated Circuits and Emerging Applications 8**
Fred Roozeboom, Paul Timans, Evgeni Gusev, Zia Karim, Stefan De Gendt, Hemanth Jagannathan, Kuniyuki Kakushima
Electronics and Photonics, Dielectric Science and Technology

G02 — **Processes at the Semiconductor Solution Interface 8**
Colm O'Dwyer, D. Buckley, Arnaud Etcheberry, Andrew Hillier, Robert Lynch, Philippe Vereecken, Heli Wang, Vidhya Chakrapani
Electronics and Photonics, Dielectric Science and Technology, Electrodeposition, Physical and Analytical Electrochemistry

G03 — **Organic Semiconductor Materials, Devices, and Processing 7**
M. Deen, David Gundlach, Benjamin Iniguez, Hagen Klauk
Electronics and Photonics

H — Electronic and Photonic Devices and Systems

H01 — **Wide Bandgap Semiconductor Materials and Devices 20**
Soohwan Jang, Travis Anderson, Jennifer Hite, Erica Douglas, Vidhya Chakrapani, John Zavada
Electronics and Photonics

H02 — **Solid-state Electronics and Photonics in Biology and Medicine 6**
Yu-Lin Wang, Wenzhuo Wu, Toshiya Sakata, Zong-Hong Lin, Andrew Hoff, Chih-Ting Lin, Lluis Marsal, M. Deen, Zoraida Aguilar
Electronics and Photonics, Sensor

H03 — **Wearable and Flexible Electronic and Photonic Technologies 2**
Colm O'Dwyer, Jessica Koehne, Ajit Khosla, Wei Gao, Durgamadhab Misra, Shelley Minteer, Lain-Jong Li, Yu-Lun Chueh, Sheng Xu, Jong-Hyun Ahn, Sang-Woo Kim
Electronics and Photonics, Dielectric Science and Technology, Physical and Analytical Electrochemistry, Sensor, Interdisciplinary Science and Technology Subcommittee

I — Fuel Cells, Electrolyzers, and Energy Conversion

I01 — **Hydrogen or Oxygen Evolution Catalysis for Water Electrolysis 5**
Hui Xu, Pawel Kulesza, Sanjeev Mukerjee, Nemanja Danilovic, John Weidner, Vivek Murthi
Energy Technology, Industrial Electrochemistry and Electrochemical Engineering, Physical and Analytical Electrochemistry

I02 — **Materials for Low Temperature Electrochemical Systems 5**
Minhua Shao, Prashant Kumta, Gang Wu, Svitlana Pylypenko, William Mustain
Energy Technology, Physical and Analytical Electrochemistry

I03 — **Renewable Fuels via Artificial Photosynthesis or Heterocatalysis 4**
Nianqiang Wu, Pawel Kulesza, Mani Manivannan, Frank Osterloh, Hui Xu, Eric Miller, Bunsho Ohtani, Vaidyanathan Subramanian, Jae Joon Lee, Jihui Yang, Krishnan Rajeshwar
Energy Technology, Sensor

I04 — **Energy Conversion Systems Based on Nitrogen 2**
Julie Renner, Gang Wu, Yuyan Shao, Hui Xu, Shelley Minteer, Lauren Greenlee
Energy Technology, Physical and Analytical Electrochemistry

I05 — **Heterogeneous Functional Materials for Energy Conversion and Storage 2**
Wilson Chiu, Fanglin Chen, Deryn Chu, Srikanth Gopalan, Torsten Markus, Patrick Masset, Robert Mantz, Steven DeCaluwe, Vito Di Noto, Nian Liu, Andrew Herring
High-Temperature Energy, Materials, & Processes, Battery, Energy Technology, Physical and Analytical Electrochemistry

I06 — **An Invited Symposium on Advances and Perspectives on Modern Polymer Electrolyte Fuel Cells – In Honor of Shimshon Gottesfeld**
Bryan Pivovar, Yushan Yan, Piotr Zelenay, Thomas Zawodzinski, Huyen Dinh, Gang Wu, Rod Borup, Adam Weber, Peter Pintauro, Hui Xu
Energy Technology, Industrial Electrochemistry and Electrochemical Engineering, Physical and Analytical Electrochemistry

K — Organic and Bioelectrochemistry

K01 — **Bioelectrochemistry: From Nature-Inspired Electrochemical Systems to Electrochemical Biosensors**
Graham Cheek, Mekki Bayachou
Organic and Biological Electrochemistry, Energy Technology, Physical and Analytical Electrochemistry, Sensor

K02 — **Electron-Transfer Activation in Organic and Biological Systems**
Graham Cheek, Shelley Minteer
Organic and Biological Electrochemistry, Energy Technology, Physical and Analytical Electrochemistry, Sensor

K03 — **Young Investigators in Organic and Biological Electrochemistry**
Graham Cheek, Sadagopan Krishnan, Alice Suroviec
Organic and Biological Electrochemistry, Physical and Analytical Electrochemistry

L — Physical and Analytical Electrochemistry, Electrocatalysis, and Photoelectrochemistry

L01 — **Physical and Analytical Electrochemistry, Electrocatalysis, and Photoelectrochemistry General Session and Grahame Award Symposium**
Alice Suroviec, Svitlana Pylypenko, Anne Co
Physical and Analytical Electrochemistry

L02 — **Impedance Technologies, Diagnostics, and Sensing Applications 5**
Petr Vanýsek, Andrew Hillier
Physical and Analytical Electrochemistry

L03 — **Computational Electrochemistry 5**
Stephen Paddison, Iryna Zenyuk, Scott Calabrese Barton
Physical and Analytical Electrochemistry, Energy Technology, Industrial Electrochemistry and Electrochemical Engineering

L04 — **Polyoxometallates and Nanostructured Metal Oxides in Efficient Electrocatalysis, Energy Conversion, and Charge Storage**
Pawel Kulesza, Andrew Herring, Vito Di Noto, Iwona Rutkowska
Physical and Analytical Electrochemistry, Energy Technology

L06 — **Nanoporous Materials**
Roseanne Warren, Anne Co, Bo Zhang, Kunal Karan
Physical and Analytical Electrochemistry, Energy Technology

M — Sensors

M01 — **Sensors, Actuators, and Microsystems General Session**
Larry Nagahara, Gary Hunter, Peter Hesketh, Aleksandr Simonian, Bryan Chin, Jessica Koehne, Mike Carter
Sensor

M02 — **Semiconductor Electrochemistry and Photoelectrochemistry in Honor of Krishnan Rajeshwar – An Invited Symposium**
Nianqiang Wu, Scott Calabrese Barton, Pawel Kulesza, Csaba Janáky, Heli Wang, Vaidyanathan Subramanian, Kohei Uosaki, Prashant Kamat, Mani Manivannan
Energy Technology, Physical and Analytical Electrochemistry, Sensor

M03 — **Sensors for Precision Medicine**
Praveen Sekhar, Nianqiang Wu, Yuehe Lin, Ajit Khosla, Pengyu Chen, Jessica Koehne, Leyla Soleymani
Sensor

Z — General Topics

Z01 — **General Student Poster Session**
Venkat Subramanian, Kalpathy Sundaram, Vimal Chaitanya, P. Pharkya, Alice Suroviec
All Divisions

Z02 — **Sustainable Materials and Manufacturing 3**
Gerardine Botte, Gautam Banerjee, John Harb, Nianqiang Wu, S. R. Narayan, E. Taylor, Arumugam Manthiram, John Stickney, Katherine Ayers, Gregory Jackson
All Divisions, Interdisciplinary Science and Technology Subcommittee

Z03 — **Nanoscale Electrochemical Imaging and Detection**
Petr Vanýsek, Tomokazu Matsue, Nongjian Tao, David Cliffel
All Divisions, International Society of Electrochemistry (ISE)

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		Sunday, May 26		Monday, May 27		
Code	**Symposium**	**AM**	**PM**	**AM**	**PM**	
A01	**Battery and Energy Technology Joint General Session** *Mani Manivannan, Jie Xiao, Hui Xu, S. R. Narayan* Energy Technology, Battery		**Abst 1-13** Houston Ballroom A, 3rd Floor (SCC)	**Abst 14-21** Houston Ballroom A, 3rd Floor (SCC)	**Abst 22-25** Houston Ballroom A, 3rd Floor (SCC) **Posters 26-46** Lone Star B/C, 2nd Floor (SCC)	
A02	**Lithium Ion Batteries and Beyond** *Brett Lucht, Bryan McCloskey, Guoying Chen, Christopher Johnson, Pawel Kulesza* Battery, Physical and Analytical Electrochemistry	**Abst 110-115** Lone Star A1, 2nd Floor (SCC) **Abst 116-121** Lone Star A2, 2nd Floor (SCC)	**Abst 122-133** Lone Star A1, 2nd Floor (SCC) **Abst 134-146** Lone Star A2, 2nd Floor (SCC)	**Abst 147-158** Lone Star A1, 2nd Floor (SCC) **Abst 159-170** Lone Star A2, 2nd Floor (SCC)	**Abst 171-176** Lone Star A1, 2nd Floor (SCC) **Abst 177-182** Lone Star A2, 2nd Floor (SCC) **Posters 183-245** Lone Star B/C, 2nd Floor (SCC)	
A03	**Large Scale Energy Storage 10** *Trung Nguyen, Jagjit Nanda, Bin Li, Jing Xu, Wei Wang, Pawel Kulesza, Shelley Minteer* Energy Technology, Battery, Industrial Electrochemistry and Electrochemical Engineering, Physical and Analytical Electrochemistry			**Abst 400-403** **Abst 404-408** San Antonio Ballroom B, 3rd Floor (SCC)	**Abst 409-409** **Abst 410-410** San Antonio Ballroom B, 3rd Floor (SCC) **Posters 411-416** Lone Star B/C, 2nd Floor (SCC)	
A04	**Battery Student Slam 3** *Feng Lin, David Mitlin, Laurence Hardwick, Veronica Augustyn, Guoying Chen, Susan Odom* Battery					
A05	**Battery Characterization** *Gabriel Veith, Thomas Barrera, Roseanne Warren, Jun Lu, Gary Koenig, Anne Co* Battery, Physical and Analytical Electrochemistry	**Abst 510-519** San Antonio Ballroom A, 3rd Floor (SCC)	**Abst 520-527** San Antonio Ballroom A, 3rd Floor (SCC)	**Abst 528-533** **Abst 534-536** San Antonio Ballroom A, 3rd Floor (SCC)	**Abst 537-545** San Antonio Ballroom A, 3rd Floor (SCC) **Posters 546-550** Lone Star B/C, 2nd Floor (SCC)	
A06	**Battery Safety and Failure Modes** *Thomas Barrera, Guangsheng Zhang, Boryann Liaw, Ankur Jain* Battery, Industrial Electrochemistry and Electrochemical Engineering			**Abst 564-569** State Room 1, 3rd Floor (SCC)	**Abst 570-575** State Room 1, 3rd Floor (SCC)	
B01	**Carbon Nanostructures for Energy Conversion and Storage** *Jeffrey Blackburn, Michael Arnold, Stephen Doorn, David Cliffel, Christina Bock, Xiulei Ji, Min-Kyu Song, Vito Di Noto, Plamen Atanassov* Nanocarbons, Battery, Physical and Analytical Electrochemistry					

	Tuesday, May 28		Wednesday, May 29		Thursday, May 30	
	AM	**PM**	**AM**	**PM**	**AM**	**PM**
	Abst 47-57 Houston Ballroom A, 3rd Floor (SCC)	**Abst 58-68** Houston Ballroom A, 3rd Floor (SCC)	**Abst 69-74** **Abst 75-81** Houston Ballroom A, 3rd Floor (SCC)	**Abst 82-91** Houston Ballroom A, 3rd Floor (SCC)	**Abst 92-102** Houston Ballroom A, 3rd Floor (SCC)	**Abst 103-109** Houston Ballroom A, 3rd Floor (SCC)
	Abst 246-256 Lone Star A2, 2nd Floor (SCC) **Abst 257-268** Lone Star A1, 2nd Floor (SCC)	**Abst 269-282** Lone Star A1, 2nd Floor (SCC) **Abst 283-294** Lone Star A2, 2nd Floor (SCC)	**Abst 295-305** Lone Star A2, 2nd Floor (SCC) **Abst 306-317** Lone Star A1, 2nd Floor (SCC)	**Abst 318-330** Lone Star A2, 2nd Floor (SCC) **Abst 331-343** Lone Star A1, 2nd Floor (SCC)	**Abst 344-354** Lone Star A2, 2nd Floor (SCC) **Abst 355-366** Lone Star A1, 2nd Floor (SCC) **Abst 367-378** Lone Star A3, 2nd Floor (SCC)	**Abst 379-389** Lone Star A2, 2nd Floor (SCC) **Abst 390-399** Lone Star A1, 2nd Floor (SCC)
	Abst 417-422 **Abst 423-427** San Antonio Ballroom B, 3rd Floor (SCC)	**Abst 428-431** **Abst 432-437** San Antonio Ballroom B, 3rd Floor (SCC)	**Abst 438-444** **Abst 445-449** San Antonio Ballroom B, 3rd Floor (SCC)	**Abst 450-454** **Abst 455-459** San Antonio Ballroom B, 3rd Floor (SCC)		
			Abst 460-475 San Antonio Ballroom A, 3rd Floor (SCC)	**Abst 476-492** San Antonio Ballroom A, 3rd Floor (SCC)	**Abst 493-509** San Antonio Ballroom A, 3rd Floor (SCC)	
	Abst 551-559 San Antonio Ballroom A, 3rd Floor (SCC)	**Abst 560-563** San Antonio Ballroom A, 3rd Floor (SCC)				
	Abst 576-581 State Room 1, 3rd Floor (SCC)	**Abst 582-591** State Room 1, 3rd Floor (SCC) **Posters 592-594** Lone Star B/C, 2nd Floor (SCC)	**Abst 595-600** State Room 1, 3rd Floor (SCC)	**Abst 601-607** State Room 1, 3rd Floor (SCC)		
		Posters 608-620 Lone Star B/C, 2nd Floor (SCC)	**Abst 621-629** **Abst 630-632** City View 8, 4th Floor (SH)	**Abst 633-640** City View 8, 4th Floor (SH)	**Abst 641-650** City View 8, 4th Floor (SH)	**Award 651** **Abst 652-659** City View 8, 4th Floor (SH)

		Sunday, May 26		Monday, May 27		
Code	**Symposium**	**AM**	**PM**	**AM**	**PM**	
B02	**Carbon Nanostructures in Medicine and Biology** *Daniel Heller, Tatiana DaRos, Fotios Papadimitrakopoulos, Ardemis Boghossian, Mekki Bayachou, James Burgess, Larry Nagahara* Nanocarbons, Organic and Biological Electrochemistry, Sensor					
B03	**Carbon Nanotubes - From Fundamentals to Devices** *Stephen Doorn, Yury Gogotsi, Pawel Kulesza, Ming Zheng, Slava V. Rotkin, R. Bruce Weisman, Shigeo Maruyama, Benjamin Flavel, Yan Li* Nanocarbons, Physical and Analytical Electrochemistry			**Award 692** **Abst 693-695** **Abst 696-702** City View 6, 4th Floor (SH)	**Abst 703-706** **Abst 707-710** City View 6, 4th Floor (SH)	
B04	**Nano in Latin America** *Hiroshi Imahori, Mariana Martinez-Pacheco, Slava Rotkin, Juan Lale, Monica Cerro-Lopez, Giaan Álvarez-Romero* Nanocarbons, Dielectric Science and Technology, Electronics and Photonics					
B05	**Fullerenes - Endohedral Fullerenes and Molecular Carbon** *Shangfeng Yang, Alan Balch, Francis D'Souza, Luis Echegoyen, Dirk Guldi, Nazario Martin, Steven Stevenson* Nanocarbons			**Abst 768-770** **Abst 771-779** City View 7, 4th Floor (SH)	**Abst 780-787** City View 7, 4th Floor (SH)	
B06	**2D Layered Materials from Fundamental Science to Applications** *Jessica Koehne, David Estrada, Ajit Khosla, Yaw Obeng, Stefan De Gendt, Zia Karim, Colm O'Dwyer, Slava V. Rotkin* Nanocarbons, Dielectric Science and Technology, Electronics and Photonics, Sensor, Interdisciplinary Science and Technology Subcommittee		**Abst 802-812** City View 5, 4th Floor (SH)	**Abst 813-822** City View 5, 4th Floor (SH)	**Abst 823-830** City View 5, 4th Floor (SH)	
B07	**Light Energy Conversion with Metal Halide Perovskites, Semiconductor Nanostructures, and Inorganic/Organic Hybrid Materials** *Hiroshi Imahori, Prashant Kamat, Kei Murakoshi, Tsukasa Torimoto, Vito Di Noto* Nanocarbons, Physical and Analytical Electrochemistry		**Abst 853-858** **Abst 859-862** City View 8, 4th Floor (SH)	**Abst 863-865** **Abst 866-872** City View 8, 4th Floor (SH)	**Abst 873-880** City View 8, 4th Floor (SH)	

	Tuesday, May 28		Wednesday, May 29		Thursday, May 30	
	AM	PM	AM	PM	AM	PM
		Posters 660-663 Lone Star B/C, 2nd Floor (SCC)		**Abst 664-666** **Abst 667-672** City View 6, 4th Floor (SH)	**Abst 673-677** **Abst 678-684** City View 6, 4th Floor (SH)	**Abst 685-691** City View 6, 4th Floor (SH)
	Abst 711-715 **Abst 716-722** City View 6, 4th Floor (SH)	**Abst 723-727** City View 6, 4th Floor (SH) **Posters 728-735** Lone Star B/C, 2nd Floor (SCC)	**Abst 736-740** **Abst 741-747** City View 6, 4th Floor (SH)	**Abst 748-749** City View 6, 4th Floor (SH)		
		Posters 750-754 Lone Star B/C, 2nd Floor (SCC)			**Abst 755-756** **Abst 757-763** City View 5, 4th Floor (SH)	**Abst 764-767** City View 5, 4th Floor (SH)
	Abst 788-792 **Abst 793-796** City View 7, 4th Floor (SH) **Posters 797-801** Lone Star B/C, 2nd Floor (SCC)					
	Abst 831-842 City View 5, 4th Floor (SH)	**Abst 843-847** City View 5, 4th Floor (SH) **Posters 848-852** Lone Star B/C, 2nd Floor (SCC)				
	Abst 881-885 **Abst 886-892** City View 8, 4th Floor (SH)	**Abst 893-897** City View 8, 4th Floor (SH)				

		Sunday, May 26		Monday, May 27		
Code	**Symposium**	**AM**	**PM**	**AM**	**PM**	
B08	**Porphyrins, Phthalocyanines, and Supramolecular Assemblies** *Karl Kadish, Roberto Paolesse, Tomas Torres, Nathalie Solladie, Diane Smith, Norbert Jux* Nanocarbons, Organic and Biological Electrochemistry					
B09	**Nano for Industry** *Slava V. Rotkin, Luke Haverhals, Francis D'Souza, E. Taylor, Oana Leonte* Nanocarbons, Industrial Electrochemistry and Electrochemical Engineering, Physical and Analytical Electrochemistry, Dielectric Science and Technology, Interdisciplinary Science and Technology Subcommittee					
B01-09	**Nano Poster Kick-off** Nanocarbons					
C01	**Corrosion General Session** *Masayuki Itagaki, Jamie Noel* Corrosion			**Abst 974-983** City View 1, 4th Floor (SH)	**Abst 984-992** City View 1, 4th Floor (SH)	
D01	**Chemical Mechanical Polishing 15** *Gautam Banerjee, R. Rhoades, G. Bahar Basim, V. Chaitanya, Yaw Obeng* Dielectric Science and Technology					
E01	**Electrodeposition for Advanced Node Interconnect Metallization Beyond Copper** *Shafaat Ahmed, Jian Zhou, Qiang Huang, James Kelly* Electrodeposition					
F01	**Industrial Electrochemistry and Electrochemical Engineering General Session** *Douglas Riemer, John Staser* Industrial Electrochemistry and Electrochemical Engineering					

	Tuesday, May 28		Wednesday, May 29		Thursday, May 30	
	AM	PM	AM	PM	AM	PM
	Abst 898-900 City View 7, 4th Floor (SH)	**Abst 901-905** City View 7, 4th Floor (SH) **Posters 906-915** Lone Star B/C, 2nd Floor (SCC)	**Abst 916-920** **Abst 921-927** City View 7, 4th Floor (SH)	**Abst 928-932** **Abst 933-938** City View 7, 4th Floor (SH)	**Abst 939-943** **Abst 944-950** City View 7, 4th Floor (SH)	**Abst 951-954** City View 7, 4th Floor (SH)
		Posters 955-956 Lone Star B/C, 2nd Floor (SCC)	**Abst 957-961** **Abst 962-966** **Abst 967** City View 5, 4th Floor (SH)	**Abst 968-970** City View 5, 4th Floor (SH)	**Abst 971-973** City View 5, 4th Floor (SH)	
		Abst 608-735 City View 6, 4th Floor (SH) **Abst 750-956** City View 7, 4th Floor (SH)				
	Abst 993-1001 City View 1, 4th Floor (SH)	**Abst 1002-1010** City View 1, 4th Floor (SH) **Posters 1011-1019** Lone Star B/C, 2nd Floor (SCC)	**Abst 1020-1029** City View 1, 4th Floor (SH)			
	Abst 1031-1035 Pearl 2, 2nd Floor (SH)	**Abst 1036-1041** Pearl 2, 2nd Floor (SH) **Poster 1030** Lone Star B/C, 2nd Floor (SCC)	**Abst 1042-1047** Pearl 2, 2nd Floor (SH)			
			Abst 1048-1054 Pearl 1, 2nd Floor (SH)	**Abst 1055-1063** Pearl 1, 2nd Floor (SH) **Posters 1064-1065** Lone Star B/C, 2nd Floor (SCC)		
			Abst 1066-1076 Pearl 5, 2nd Floor (SH)	**Award 1077** **Abst 1078-1082** Pearl 5, 2nd Floor (SH) **Posters 1083-1089** Lone Star B/C, 2nd Floor (SCC)	**Abst 1090-1097** Pearl 5, 2nd Floor (SH)	

		Sunday, May 26		Monday, May 27		
Code	**Symposium**	**AM**	**PM**	**AM**	**PM**	
F02	**Tutorial on Industrial Electrochemistry** *Gerardine Botte, John Harb, E. Taylor* Industrial Electrochemistry and Electrochemical Engineering				**Abst 1098-1102** Pearl 5, 2nd Floor (SH)	
F03	**Characterization of Porous Materials 8** *John Staser, Xiaolin Li, Christina Bock* Industrial Electrochemistry and Electrochemical Engineering, Battery, Energy Technology					
F04	**Multiscale Modeling, Simulation and Design 3: Enhancing Understanding, and Extracting Knowledge from Data** *Venkat Subramanian, Scott Calabrese Barton, John Harb, Luis Diaz, Gerardine Botte, Ankur Jain* Industrial Electrochemistry and Electrochemical Engineering, Energy Technology					
G01	**Silicon Compatible Emerging Materials, Processes, and Technologies for Advanced CMOS and Post-CMOS Applications 9** *Fred Roozeboom, Steve Kilgore, Hemanth Jagannathan, Kuniyuki Kakushima, Paul Timans, Evgeni Gusev, Zia Karim, Stefan De Gendt, Durgamadhab Misra, Yaw Obeng* Electronics and Photonics, Dielectric Science and Technology			**Abst 1164-1171** City View 2, 4th Floor (SH)	**Award 1172** **Abst 1173** City View 2, 4th Floor (SH) **Posters 1174-1179** Lone Star B/C, 2nd Floor (SCC)	
G02	**Processes at the Semiconductor Solution Interface 8** *Colm O'Dwyer, D. Buckley, Arnaud Etcheberry, Andrew Hillier, Robert Lynch, Philippe Vereecken, Heli Wang, Vidhya Chakrapani* Electronics and Photonics, Dielectric Science and Technology, Electrodeposition, Physical and Analytical Electrochemistry					
G03	**Organic Semiconductor Materials, Devices, and Processing 7** *M. Deen, David Gundlach, Benjamin Iniguez, Hagen Klauk* Electronics and Photonics					

	Tuesday, May 28		Wednesday, May 29		Thursday, May 30	
	AM	PM	AM	PM	AM	PM
	Award 1103 **Abst 1104-1109** Pearl 5, 2nd Floor (SH)	**Abst 1110-1119** Pearl 5, 2nd Floor (SH) **Posters 1120-1121** Lone Star B/C, 2nd Floor (SCC)				
	Abst 1122-1127 Pearl 4, 2nd Floor (SH)	**Abst 1128-1134** Pearl 4, 2nd Floor (SH)	**Abst 1135-1140** Pearl 4, 2nd Floor (SH)	**Abst 1141-1147** Pearl 4, 2nd Floor (SH) **Posters 1148-1151** Lone Star B/C, 2nd Floor (SCC)	**Abst 1152-1160** Pearl 4, 2nd Floor (SH)	**Abst 1161-1163** Pearl 4, 2nd Floor (SH)
	Abst 1180-1181 **Abst 1182-1184** City View 2, 4th Floor (SH)	**Award 1185** **Abst 1186-1189** City View 2, 4th Floor (SH)	**Abst 1190-1192** **Abst 1193-1196** City View 2, 4th Floor (SH)	**Abst 1197-1200** City View 2, 4th Floor (SH)		
	Abst 1201-1203 **Abst 1204-1209** City View 3, 4th Floor (SH)	**Abst 1210-1216** City View 3, 4th Floor (SH) **Posters 1217-1218** Lone Star B/C, 2nd Floor (SCC)	**Abst 1219-1221** **Abst 1222-1226** City View 3, 4th Floor (SH)	**Abst 1227-1231** City View 3, 4th Floor (SH)		
	Abst 1232-1235 **Abst 1236-1237** City View 4, 4th Floor (SH)	**Abst 1238-1244** City View 4, 4th Floor (SH)	**Abst 1245-1247** **Abst 1248-1250** City View 4, 4th Floor (SH)	**Abst 1251-1256** City View 4, 4th Floor (SH) **Posters 1257-1259** Lone Star B/C, 2nd Floor (SCC)		

		Sunday, May 26		Monday, May 27		
Code	**Symposium**	**AM**	**PM**	**AM**	**PM**	
H01	**Wide Bandgap Semiconductor Materials and Devices 20** *Soohwan Jang, Travis Anderson, Jennifer Hite, Erica Douglas, Vidhya Chakrapani, John Zavada* Electronics and Photonics			**Award 1260** **Abst 1261-1266** Austin Ballroom 1, 2nd Floor (SH)	**Abst 1267-1272** Austin Ballroom 1, 2nd Floor (SH)	
H02	**Solid-state Electronics and Photonics in Biology and Medicine 6** *Yu-Lin Wang, Wenzhuo Wu, Toshiya Sakata, Zong-Hong Lin, Andrew Hoff, Chih-Ting Lin, Lluis Marsal, M. Deen, Zoraida Aguilar* Electronics and Photonics, Sensor			**Abst 1296-1304** Austin Ballroom 2, 2nd Floor (SH)	**Abst 1305-1309** Austin Ballroom 2, 2nd Floor (SH) **Posters 1310-1317** Lone Star B/C, 2nd Floor (SCC)	
H03	**Wearable and Flexible Electronic and Photonic Technologies 2** *Colm O'Dwyer, Jessica Koehne, Ajit Khosla, Wei Gao, Durgamadhab Misra, Shelley Minteer, Lain-Jong Li, Yu-Lun Chueh, Sheng Xu, Jong-Hyun Ahn, Sang-Woo Kim* Electronics and Photonics, Dielectric Science and Technology, Physical and Analytical Electrochemistry, Sensor, Interdisciplinary Science and Technology Subcommittee					
I01	**Hydrogen or Oxygen Evolution Catalysis for Water Electrolysis 5** *Hui Xu, Pawel Kulesza, Sanjeev Mukerjee, Nemanja Danilovic, John Weidner, Vivek Murthi* Energy Technology, Industrial Electrochemistry and Electrochemical Engineering, Physical and Analytical Electrochemistry		**Abst 1379-1388** State Room 2, 3rd Floor (SCC)	**Abst 1389-1390** **Abst 1391-1397** State Room 2, 3rd Floor (SCC)	**Abst 1398-1405** State Room 2, 3rd Floor (SCC)	
I02	**Materials for Low Temperature Electrochemical Systems 5** *Minhua Shao, Prashant Kumta, Gang Wu, Svitlana Pylypenko, William Mustain* Energy Technology, Physical and Analytical Electrochemistry	**Abst 1473-1484** Houston Ballroom B, 3rd Floor (SCC)	**Abst 1485-1496** Houston Ballroom B, 3rd Floor (SCC)	**Abst 1497-1500** **Award 1501** **Abst 1502-1506** Houston Ballroom B, 3rd Floor (SCC)	**Abst 1507-1509** Houston Ballroom B, 3rd Floor (SCC)	
I03	**Renewable Fuels via Artificial Photosynthesis or Heterocatalysis 4** *Nianqiang Wu, Pawel Kulesza, Mani Manivannan, Frank Osterloh, Hui Xu, Eric Miller, Bunsho Ohtani, Vaidyanathan Subramanian, Jae Joon Lee, Jihui Yang, Krishnan Rajeshwar* Energy Technology, Sensor	**Abst 1579-1594** State Room 3, 3rd Floor (SCC)	**Abst 1595-1603** State Room 3, 3rd Floor (SCC)	**Abst 1604-1611** State Room 3, 3rd Floor (SCC)	**Abst 1612-1616** State Room 3, 3rd Floor (SCC)	

	Tuesday, May 28		Wednesday, May 29		Thursday, May 30	
	AM	PM	AM	PM	AM	PM
	Abst 1273-1278 Austin Ballroom 1, 2nd Floor (SH)	**Abst 1279-1285** Austin Ballroom 1, 2nd Floor (SH) **Posters 1286-1289** Lone Star B/C, 2nd Floor (SCC)	**Abst 1290-1295** Austin Ballroom 1, 2nd Floor (SH)			
	Abst 1318-1324 Austin Ballroom 2, 2nd Floor (SH)	**Abst 1325-1333** Austin Ballroom 2, 2nd Floor (SH)	**Abst 1334-1342** Austin Ballroom 2, 2nd Floor (SH)	**Abst 1343-1352** Austin Ballroom 2, 2nd Floor (SH)		
	Abst 1353-1354 **Abst 1355-1359** Austin Ballroom 3, 2nd Floor (SH)	**Abst 1360-1364** Austin Ballroom 3, 2nd Floor (SH) **Posters 1365-1366** Lone Star B/C, 2nd Floor (SCC)	**Abst 1367-1368** **Abst 1369-1373** Austin Ballroom 3, 2nd Floor (SH)	**Abst 1374-1378** Austin Ballroom 3, 2nd Floor (SH)		
	Abst 1406-1416 State Room 2, 3rd Floor (SCC)	**Abst 1417-1426** State Room 2, 3rd Floor (SCC)	**Abst 1427-1437** State Room 2, 3rd Floor (SCC)	**Abst 1438-1447** State Room 2, 3rd Floor (SCC) **Posters 1448-1459** Lone Star B/C, 2nd Floor (SCC)	**Abst 1460-1465** **Abst 1466-1472** State Room 2, 3rd Floor (SCC)	
	Abst 1510-1514 **Abst 1515-1519** Houston Ballroom B, 3rd Floor (SCC)	**Abst 1520-1531** Houston Ballroom B, 3rd Floor (SCC)	**Abst 1532-1543** Houston Ballroom B, 3rd Floor (SCC)	**Abst 1544-1554** Houston Ballroom B, 3rd Floor (SCC) **Posters 1555-1568** Lone Star B/C, 2nd Floor (SCC)	**Abst 1569-1578** Houston Ballroom B, 3rd Floor (SCC)	
	Abst 1617-1619 **Abst 1620-1625** State Room 3, 3rd Floor (SCC)	**Abst 1626-1631** **Abst 1632-1640** State Room 3, 3rd Floor (SCC)		**Posters 1641-1648** Lone Star B/C, 2nd Floor (SCC)	**Abst 1649-1657** State Room 3, 3rd Floor (SCC)	**Abst 1658-1668** State Room 3, 3rd Floor (SCC)

		Sunday, May 26		Monday, May 27		
Code	**Symposium**	**AM**	**PM**	**AM**	**PM**	
I04	**Energy Conversion Systems Based on Nitrogen 2** *Julie Renner, Gang Wu, Yuyan Shao, Hui Xu, Shelley Minteer, Lauren Greenlee* Energy Technology, Physical and Analytical Electrochemistry					
I05	**Heterogeneous Functional Materials for Energy Conversion and Storage 2** *Wilson Chiu, Fanglin Chen, Deryn Chu, Srikanth Gopalan, Torsten Markus, Patrick Masset, Robert Mantz, Steven DeCaluwe, Vito Di Noto, Nian Liu, Andrew Herring* High-Temperature Energy, Materials, & Processes, Battery, Energy Technology, Physical and Analytical Electrochemistry		**Abst 1693-1695** **Abst 1696-1698** State Room 4, 3rd Floor (SCC)	**Abst 1699-1701** **Abst 1702-1706** State Room 4, 3rd Floor (SCC)	**Abst 1707-1708** **Abst 1709-1711** State Room 4, 3rd Floor (SCC)	
I06	**An Invited Symposium on Advances and Perspectives on Modern Polymer Electrolyte Fuel Cells – In Honor of Shimshon Gottesfeld** *Bryan Pivovar, Yushan Yan, Piotr Zelenay, Thomas Zawodzinski, Huyen Dinh, Gang Wu, Rod Borup, Adam Weber, Peter Pintauro, Hui Xu* Energy Technology, Industrial Electrochemistry and Electrochemical Engineering, Physical and Analytical Electrochemistry			**Abst 1782-1790** Houston Ballroom C, 3rd Floor (SCC)	**Abst 1791-1795** Houston Ballroom C, 3rd Floor (SCC)	
K01	**Bioelectrochemistry: From Nature-Inspired Electrochemical Systems to Electrochemical Biosensors** *Graham Cheek, Mekki Bayachou* Organic and Biological Electrochemistry, Energy Technology, Physical and Analytical Electrochemistry, Sensor			**Abst 1834-1843** Pearl 3, 2nd Floor (SH)	**Abst 1844-1848** Pearl 3, 2nd Floor (SH) **Posters 1849-1856** Lone Star B/C, 2nd Floor (SCC)	
K02	**Electron-Transfer Activation in Organic and Biological Systems** *Graham Cheek, Shelley Minteer* Organic and Biological Electrochemistry, Energy Technology, Physical and Analytical Electrochemistry, Sensor					

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	AM	PM	AM	PM	AM	PM
	Abst 1669-1681 Pearl 1, 2nd Floor (SH)	**Abst 1682-1690** Pearl 1, 2nd Floor (SH) **Posters 1691-1692** Lone Star B/C, 2nd Floor (SCC)				
	Abst 1712-1716 **Abst 1717-1721** State Room 4, 3rd Floor (SCC)	**Abst 1722-1724** **Abst 1725-1727** **Abst 1728-1729** State Room 4, 3rd Floor (SCC)	**Abst 1730-1732** **Abst 1733-1737** State Room 4, 3rd Floor (SCC)	**Abst 1738-1742** **Abst 1743-1745** State Room 4, 3rd Floor (SCC) **Posters 1746-1765** Lone Star B/C, 2nd Floor (SCC)	**Abst 1766-1768** **Abst 1769-1772** State Room 4, 3rd Floor (SCC)	**Abst 1773-1774** **Abst 1775-1777** **Abst 1778-1781** State Room 4, 3rd Floor (SCC)
	Abst 1796-1804 Houston Ballroom C, 3rd Floor (SCC)	**Abst 1805-1813** **Award 1814** Houston Ballroom C, 3rd Floor (SCC)	**Abst 1815-1823** Houston Ballroom C, 3rd Floor (SCC)	**Abst 1824-1833** Houston Ballroom C, 3rd Floor (SCC)		
	Abst 1857-1866 Pearl 3, 2nd Floor (SH)	**Abst 1867-1869** Pearl 3, 2nd Floor (SH) **Posters 1870-1871** Lone Star B/C, 2nd Floor (SCC)				

		Sunday, May 26		Monday, May 27		
Code	**Symposium**	**AM**	**PM**	**AM**	**PM**	
K03	**Young Investigators in Organic and Biological Electrochemistry** *Graham Cheek, Sadagopan Krishnan, Alice Suroviec* Organic and Biological Electrochemistry, Physical and Analytical Electrochemistry					
L01	**Physical and Analytical Electrochemistry, Electrocatalysis, and Photoelectrochemistry General Session and Grahame Award Symposium** *Alice Suroviec, Svitlana Pylypenko, Anne Co* Physical and Analytical Electrochemistry			**Abst 1885-1894** Trinity 3, 3rd Floor (SHS)	**Abst 1895-1900** Trinity 3, 3rd Floor (SHS)	
L02	**Impedance Technologies, Diagnostics, and Sensing Applications 5** *Petr Vanysek, Andrew Hillier* Physical and Analytical Electrochemistry					
L03	**Computational Electrochemistry 5** *Stephen Paddison, Iryna Zenyuk, Scott Calabrese Barton* Physical and Analytical Electrochemistry, Energy Technology, Industrial Electrochemistry and Electrochemical Engineering			**Abst 1942-1945** **Abst 1946-1947** Trinity 1, 3rd Floor (SHS)	**Abst 1948-1949** Trinity 1, 3rd Floor (SHS) **Posters 1950-1953** Lone Star B/C, 2nd Floor (SCC)	
L04	**Polyoxometallates and Nanostructured Metal Oxides in Efficient Electrocatalysis, Energy Conversion, and Charge Storage** *Pawel Kulesza, Andrew Herring, Vito Di Noto, Iwona Rutkowska* Physical and Analytical Electrochemistry, Energy Technology			**Abst 1968-1970** Trinity 3, 3rd Floor (SHS)	**Abst 1971-1973** Trinity 3, 3rd Floor (SHS)	
M01	**Sensors, Actuators, and Microsystems General Session** *Larry Nagahara, Gary Hunter, Peter Hesketh, Aleksandr Simonian, Bryan Chin, Jessica Koehne, Mike Carter* Sensor				**Abst 1999-2003** Trinity 5, 3rd Floor (SHS)	

	Tuesday, May 28		Wednesday, May 29		Thursday, May 30	
	AM	PM	AM	PM	AM	PM
			Abst 1872-1879 Pearl 3, 2nd Floor (SH)	**Abst 1880-1882** Pearl 3, 2nd Floor (SH) **Posters 1883-1884** Lone Star B/C, 2nd Floor (SCC)		
	Award 1901 **Abst 1902-1908** Trinity 3, 3rd Floor (SHS)	**Posters 1909-1914** Lone Star B/C, 2nd Floor (SCC)	**Abst 1915-1923** Trinity 3, 3rd Floor (SHS)	**Abst 1924-1929** Trinity 3, 3rd Floor (SHS)		
		Abst 1930-1939 Trinity 3, 3rd Floor (SHS) **Posters 1940-1941** Lone Star B/C, 2nd Floor (SCC)				
	Abst 1954-1958 **Abst 1959-1963** Trinity 1, 3rd Floor (SHS)	**Abst 1964-1967** Trinity 1, 3rd Floor (SHS)				
	Abst 1974-1976 **Abst 1977-1979** Trinity 3, 3rd Floor (SHS)	**Abst 1980-1982** **Abst 1983-1985** Trinity 3, 3rd Floor (SHS) **Posters 1986-1988** Lone Star B/C, 2nd Floor (SCC)	**Abst 1989-1991** Trinity 3, 3rd Floor (SHS)	**Abst 1992-1994** **Abst 1995-1998** Trinity 3, 3rd Floor (SHS)		
	Abst 2004-2012 Trinity 5, 3rd Floor (SHS)	**Abst 2013-2020** Trinity 5, 3rd Floor (SHS)	**Abst 2021-2032** Trinity 5, 3rd Floor (SHS)	**Abst 2033-2038** Trinity 5, 3rd Floor (SHS) **Posters 2039-2051** Lone Star B/C, 2nd Floor (SCC)		

		Sunday, May 26		Monday, May 27		
Code	**Symposium**	**AM**	**PM**	**AM**	**PM**	
M02	**Semiconductor Electrochemistry and Photoelectrochemistry in Honor of Krishnan Rajeshwar - An Invited Symposium** *Nianqiang Wu, Scott Calabrese Barton, Pawel Kulesza, Csaba Janáky, Heli Wang, Vaidyanathan Subramanian, Kohei Uosaki, Prashant Kamat, Mani Manivannan* Energy Technology, Physical and Analytical Electrochemistry, Sensor					
M03	**Sensors for Precision Medicine** *Praveen Sekhar, Nianqiang Wu, Yuehe Lin, Ajit Khosla, Pengyu Chen, Jessica Koehne, Leyla Soleymani* Sensor					
Z01	**General Student Poster Session** *Venkat Subramanian, Kalpathy Sundaram, Vimal Chaitanya, P. Pharkya, Alice Suroviec* All Divisions					
Z02	**Sustainable Materials and Manufacturing 3** *Gerardine Botte, Gautam Banerjee, John Harb, Nianqiang Wu, S. R. Narayan, E. Taylor, Arumugam Manthiram, John Stickney, Katherine Ayers, Gregory Jackson* All Divisions, Interdisciplinary Science and Technology Subcommittee			**Abst 2239-2245** Pearl 2, 2nd Floor (SH)	**Abst 2246-2249** Pearl 2, 2nd Floor (SH) **Posters 2250-2255** Lone Star B/C, 2nd Floor (SCC)	
Z03	**Nanoscale Electrochemical Imaging and Detection** *Petr Vanýsek, Tomokazu Matsue, Nongjian Tao, David Cliffel* All Divisions, International Society of Electrochemistry (ISE)			**Abst 2256-2264** Pearl 1, 2nd Floor (SH)	**Abst 2265-2270** Pearl 1, 2nd Floor (SH)	

	Tuesday, May 28		Wednesday, May 29		Thursday, May 30	
	AM	PM	AM	PM	AM	PM
			Abst 2052-2054 **Abst 2055-2059** State Room 3, 3rd Floor (SCC)	**Abst 2060-2063** **Abst 2064-2067** State Room 3, 3rd Floor (SCC) **Poster 2068** Lone Star B/C, 2nd Floor (SCC)		
	Abst 2069-2076 Trinity 4, 3rd Floor (SHS)	**Abst 2077-2082** Trinity 4, 3rd Floor (SHS)	**Abst 2083-2090** Trinity 4, 3rd Floor (SHS)	**Abst 2091-2096** Trinity 4, 3rd Floor (SHS) **Posters 2097-2112** Lone Star B/C, 2nd Floor (SCC)	**Abst 2113-2119** Trinity 4, 3rd Floor (SHS)	**Abst 2120-2125** Trinity 4, 3rd Floor (SHS)
		Posters 2126-2238 Lone Star B/C, 2nd Floor (SCC)				

Technical Sessions

Sunday, May 26

Highlight

1900h..... Opening Reception – Lone Star A3/A4, *Sheraton Convention Center*

A01 Battery and Energy Technology Joint General Session

Energy Technology / Battery
Houston Ballroom A, Dallas Sheraton Convention Center

Air and Flow-Based Systems – 13:20 – 18:00
Chair(s): Rahul Singhal and S. R. Narayan

13:20	**1**	**Effect of H_2 Evolution in Aqueous Aluminum Air Battery** – C. Zhou, K. Bhonge, and K. T. Cho (Northern Illinois University)
13:40	**2**	**Analysis of Oxide Film on Aluminum Electrode in Ionic Liquid Based Aluminum-Air Battery** – A. Mohammad, J. Gong, N. S. Hosmane, T. Xu, and K. T. Cho (Northern Illinois University)
14:00	**3**	**Real-Time Imaging Analysis on Dendrite Formation of Aluminium Metal Anodes** – H. W. Liu, N. L. Wu (National Taiwan University), H. W. Huang, C. C. Chiang, and C. C. Yang (Industrial Technology Research Institute)
14:20	**4**	**Dual Electrolyte Aluminum-Air Flow Battery Using Methanol Anolyte** – P. Teabnamang and S. Kheawhom (Chulalongkorn University)
14:40	**5**	**The Role of DMSO As an Electrolyte Additive in Alkaline Zinc-Air Flow Battery** – S. Hosseini and S. Kheawhom (Chulalongkorn University)
15:00	**6**	**Advanced Reversible Long-Lasting Flexible Metal-Air Batteries Using Mn/Fe Hexaiminobenzene Metal-Organic Frameworks** – S. S. Shinde, N. Wagh, D. H. Kim, and J. H. Lee (Hanyang University)
15:20	**7**	**Use of Polarization Curves to Determine Kinetics Parameters in K–O_2 batteries** – G. Gourdin, N. Xiao, and Y. Wu (The Ohio State University)
15:40		**Break**
16:00	**8**	**Novel Metal Oxide Electrode Materials for Vanadium Redox Flow Battery Application** – A. W. Bayeh, Y. C. Chang, T. R. Liu, H. Y. Chen, H. C. Huang, D. M. Kabtamu, and C. H. Wang (National Taiwan University of Science and Technology)
16:20	**9**	**Redox-Mediated Bromate Based Electrochemical Energy System** – K. T. Cho and T. Razaulla (Northern Illinois University)
16:40	**10**	**Novel Organic Electrode Materialsfor Innovative Thick Electrode Based Aqueous Batteries** – S. Perticarari, E. Grange (IMN-CNRS), Y. Pellegrin (CNRS), D. Guyomard (IMN-CNRS, University of Nantes), F. Odobel (CNRS), P. Poizot (IMN, CNRS, University of Nantes), and J. Gaubicher (IMN)
17:00	**11**	**Proton-Conducting Ceramics for Metal-Supported Solid Oxide Fuel Cells and Electrolysis Cells** – R. Wang, C. Byrne, G. Lau, and M. C. Tucker (Lawrence Berkeley National Laboratory)
17:20	**13**	**Performance and Stability of Cathode Electrode Under Carbon Capture Operating Conditions** – A. Hilmi (FuelCell Energy, Inc.), T. C. Geary (FuelCell Energy, Inc), A. Franco, and C. Y. Yuh (FuelCell Energy, Inc.)
17:40	**12**	**Oxygen-Electrode-Supported Solid Oxide Cells with High Fuel and Steam Utilization** – H. Wang, N. R. Geisendorfer, S. Zhang, K. Yang, Y. Sun, K. H. Chiu, and S. A. Barnett (Northwestern University)

A02 Lithium Ion Batteries and Beyond

Battery / Physical and Analytical Electrochemistry
Lone Star A1, Dallas Sheraton Convention Center

Lithium Sulfur Batteries 1 – 10:00 – 12:00
Chair(s): Shuru Chen, Hsun-Yi Chen and Yan Yuan

10:00	**110**	**Simple but Highly-Efficient Polysulfide Trapping Strategy for Lithium-Sulfur Batteries** – Y. Yuan, D. Zheng, Z. Fang (Xi'an University of Architecture and Technology), and H. Lu (Xi'an University of Science and Technology)
10:20	**111**	**High Capacity, Solid State Lithium Sulfur Battery with Ceramic Electrolytes** – P. Choi, A. R. Svensen (CFD Research Corporation), and M. Sanghadasa (US Army AMRDEC)
10:40	**112**	**Low-Porosity Sulfur Cathodes for High-Energy-Density Lithium-Sulfur Batteries** – S. Chen (General Motors Global R&D Center), F. Dai (GM Global R&D Center), and M. Cai (General Motors, Global R&D Center)
11:00	**113**	**Modeling the Effect of Layer-on-Layer Cathodes in Lithium-Sulfur Batteries** – G. L. Shebert, R. Zhang, and Y. L. Joo (Cornell University)
11:20	**114**	**Freestanding CNF/Sulfur-Copolymer Cathodes for Li-S Batteries: Effect of Host Porosity on Battery Performance** – A. Rafie, A. Singh, and V. Kalra (Drexel University)
11:40	**115**	**Investigation of Lithium-Sulfur Battery Performance with Free-Standing Amide-MWCNT Protection Layer** – Y. H. Lai and H. Y. Chen (National Taiwan University)

Lone Star A2, Dallas Sheraton Convention Center

Sodium Batteries 1 – 10:00 – 12:00
Chair(s): Filipe Braga, Seung-Taek Myung and Shahul Hameed Abdulrahman

10:00 **116** ***In-Situ* Electrochemical Formation of $Na_{1+X}Cu^{3-X}O_2$ for Cathodes in Sodium Ion Batteries.** – C. Juarez-Yescas (Universidad Autónoma Metropolitana Iztapalapa), G. Ramos-Sánchez (CONACyT-UAM I), and I. González (Universidad Autónoma Metropolitana Iztapalapa)

10:20 **117** **Bifunctional Electrocatalytic Properties of Na_2MPO_4f (M: Fe, Mn, Co) for Na-Air Batteries** – L. Sharma (Indian Institute of Science, Bangalore) and P. Barpanda (Indian Institute of Science)

10:40 **118** **Exceptionally Highly Stable Cycling Performance and Facile Oxygen-Redox of Manganese-Based Cathode Materials for Rechargeable Sodium Batteries** – A. Konarov and S. T. Myung (Sejong University)

11:00 **119** **Binder Degradation in Sodium- and Potassium-Oxygen Batteries** – F. Braga and L. J. Hardwick (University of Liverpool)

11:20 **120** **$K_2[(VO)_2(HPO_4)_2(C_2O_4)]$ and K_xVOPO_4 as 4 V-Class Positive Electrode Materials for K-Ion Batteries** – S. H. Abdulrahman, A. Katogi (Tokyo University of Science), K. Kubota (Tokyo University of Science, ESICB-Kyoto University), and S. Komaba (Tokyo University of Science)

11:40 **121** **Temperature Dependent X-Ray Diffraction in $K_2FeP_2O_7$ Pyrophosphate: Polymorphism and Preliminary Electrochemistry Towards Li, Na, and K Ion Intercalation** – R. Gond (Indian Institute of Science), V. Pralong (Normandy Univ), and P. Barpanda (Indian Institute of Science)

Lone Star A1, Dallas Sheraton Convention Center

Lithium Sulfur Batteries 2 – 14:00 – 18:00
Chair(s): Arumugam Manthiram, Bing-Joe Hwang and Jie Xiao

14:00 **122** **Room-Temperature Nonaqueous Polyvalent Metal - Sulfur Batteries** – X. Yu and A. Manthiram (The University of Texas at Austin)

14:20 **123** **Flexible and Self-Supported Sulfur Cathode for High-Energy-Density Lithium-Sulfur Batteries** – J. Liu (South China University of Technology)

14:40 **124** **Polysulfide-Shuttle Control in Lithium-Sulfur and Sodium-Sulfur Batteries with Polymer-Coated Solid-State Electrolytes** – X. Yu and A. Manthiram (The University of Texas at Austin)

15:00 **125** **Mxenes As Sulfur Host Material for Magnesium-Sulfur Batteries** – H. Kaland, F. H. Fagerli, J. Hadler-Jacobsen, L. A. Boge, S. K. Schnell, and F. Vullum-Bruer (Norwegian University of Science and Technology)

15:20 **126** **Dynamics of Lithium Deposition in Li-S Batteries: An Elucidation with a Lithium Sulfide Cathode and a Bare Copper-Foil Current Collector without Any Free Lithium Metal** – S. Nanda (University of Texas at Austin), A. Gupta (The University of Texas at Austin), and A. Manthiram (University of Texas at Austin)

15:40 **127** **Lithium-Sulfur Batteries with a Vertical Co_9S_8 Hollow Nanowall Arrays-Modified Celgard Separator** – J. He and A. Manthiram (The University of Texas at Austin)

16:00 **128** **Fibrous Organosulfur Compounds As Cathode Materials for High-Performance Lithium-Sulfur Batteries** – M. A. Weret (National Taiwan University of Science and Technology), B. J. Hwang (NTUST, National Taiwan University of Science and Technology), C. F. Jeffrey Kuo, and W. N. Su (National Taiwan University of Science and Technology)

16:20 **129** **A Rational Balance Design of Ionic Liquid Based Electrolyte for Advanced Li-S Batteries** – H. Lu, Z. Chen, H. Du (Xi'an University of Science and Technology), and K. Zhang (Central South University)

16:40 **130** **Modeling of High Energy Density Li-S Cell Designs and Testing of Li-S Cells Based on Solid Polymer Electrolytes** – Z. Lu and J. Adams (Ford Motor Company)

17:00 **131** **Effects of N-Doped Graphene and Carbon Black As Conductive Additives on Sulfur Cathodes in Lithium-Sulfur Batteries** – X. Han, J. Cai, and X. Meng (University of Arkansas)

17:20 **132** **Understanding of Failure Mechanism of High Energy Lithium-Sulfur Pouch Cells** – L. Shi, D. Lu, C. Niu, X. Ren, J. Xiao, and J. Liu (Pacific Northwest National Laboratory)

17:40 **133** **Long-Life Lithium-Sulfur Batteries with a Bifunctional Cathode Substrate Configured with Boron Carbide Nanowires** – L. Luo and A. Manthiram (The University of Texas at Austin)

Lone Star A2, Dallas Sheraton Convention Center

Sodium Batteries 2 – 14:00 – 18:40
Chair(s): Zhiyuan Zeng, Fabian Linsenmann and Vidushi Sharma

14:00 **134** **Highly Conductive PEO-Based Polymer Electrolyte for Na Battery Applications** – X. Lu, X. He, H. Wang, D. Reed, and V. Sprenkle (Pacific Northwest National Laboratory)

14:20 **135** **Revealing of Solid Electrolyte Interphases during Electrochemical Deposition and Dissolution of Sodium** – Z. Zeng (City University of Hong Kong, MSE)

14:40 **136** **Cu_2s As a Superior Anode for Sodium-Ion Batteries** – J. Cai and X. Meng (University of Arkansas)

15:00 **137** **Red Phosphorus-Based Materials As Anode for Na-Ion Batteries K-Ion Batteries** – Y. Yu (University of Science and Technology of China)

15:20 **138** **Investigation of Na Ion Dynamics in P2-Type $Na_{2/3}[Ni_{1/3}Ti_{2/3}]O_2$: A Combination of Quasi-Elastic Neutron Scattering and First-Principles Molecular Dynamics Study** – Q. Chen and W. Lai (Michigan State University)

15:40 **139** **Multi-Site Redox Activities in Chemically Complex Sodium Layered Oxide Cathode Materials** – M. M. Rahman and F. Lin (Department of Chemistry, Virginia Tech)

16:00 **Break**

16:20 **140** **Stress Evolution in Na-Ion Battery Anode during Electrochemical Cycling** – S. Rakshit (New Jersey Institute of Technology), O. Ruiz (University of Pennsylvania), E. Detsi (School of Engineering, University of Pennsylvania), and S. Nadimpalli (New Jersey Institute of Technology)

16:40 **141** **Understanding Sodium Ion Storage and Diffusivity into CNT-TiO_2 Hybrid Electrodes** – S. K. Martha, S. Ghosh, V. Kiran Kumar (Indian Institute of Technology Hyderabad, India), and S. Biswas (Research Center Imarat (DRDO), Hyderabad, India)

17:00 **142** **Nitrate Combustion Synthesis of NVP-Type Cathode Material for Na-Ion Batteries** – R. Väli, A. Jänes, and E. Lust (Institute of Chemistry, University of Tartu)

17:20 **143** **2 V-Class Aqueous Multi-Ion Batteries Realized By Superconcentrated Na/K Electrolytes** – T. Hosaka, A. Noda, K. Kubota (Tokyo University of Science), Y. Matsuda, K. Ida, S. Denzumi (Technova Inc.), and S. Komaba (Tokyo University of Science)

17:40 **144** **Current Collector Interface for Phase Changing Tin Anode in Sodium Ion Batteries: Insight from First Principles Calculations** – V. Sharma (New Jersey Institute of Technology), K. Ghatak (New Jersey Institue of Technology), and D. Datta (Brown University)

18:00 **145** **Current-Dependent Growth Mechanisms of Sodium Metal Anode in Diglyme-Based Electrolytes** – B. Ma and P. Bai (Washington University in St. Louis)

18:20 **146** **A Novel Reference Electrode for EIS Measurements in Sodium-Ion Batteries** – F. Linsenmann, D. Pritzl, T. P. Fellinger (Technical University of Munich), and H. A. Gasteiger (Technical University of Munich, Chemistry department)

A05 Battery Characterization

Battery / Physical and Analytical Electrochemistry

San Antonio Ballroom A, Dallas Sheraton Convention Center

Science of Fabrication – 08:00 – 12:20
Chair(s): Gabriel M. Veith and Jianlin Li

08:00 **510** **Formation Strategies for Over-Lithiated NCMs Suitable for Large-Scale Cells** – T. Zünd, B. Strehle (Technical University of Munich), and H. A. Gasteiger (Technical University of Munich, Chemistry department)

08:20 **511** **New Analytical Method to Reveal the Adhesion Properties in the Composite Electrodes for Lithium-Ion Batteries** – Y. M. Lee, S. Byun, Y. Roh, D. Jin (DGIST), and M. H. Ryou (Hanbat National University)

08:40 **512** **Rapid 3D Imaging for Quality Assurance of Li-Ion Materials Using Lab-Based X-Ray Computed Tomography** – T. M. M. Heenan, A. Leach, C. Tan, R. Jervis, D. J. L. Brett (University College London), and P. R. Shearing (Electrochemical Innovation Lab, UCL, London)

09:00 **513** ***(Invited)* From Precursors to Devices: Using Neutron Scattering to Study Synthesis, Processing, and Material Properties** – R. L. Sacci (Oak Ridge National Laboratory)

09:30 **Break**

10:00 **514** ***(Invited)* Colloidal and Processing Science Characterization for Battery Systems** – B. Armstrong (Oak Ridge National Laboratory)

10:40 **515** **Pitt Modelling of Concurrent Ion-Insertive and Capacitive Storage Using Laplace Domain Representations of Impedance** – C. A. Hall, Y. Jiang, S. Lim, P. Burr, A. Ignjatovic, and A. Lennon (University of New South Wales)

11:00 **516** **Characterizing the Surface Free Energy of Composite Electrodes for Li-Ion Batteries** – J. Li (Oak Ridge National Laboratory), A. Davoodabadi, C. Jin (Binghamton University), and D. L. Wood III (University of Tennessee)

11:20 **517** **Investigation of Capacity and Homogeneity Recovery of Commercial Cells after Cycle Life Tests** – M. Lewerenz (Technische Hochschule Ingolstadt), P. Dechent (RWTH Aachen University - ISEA), C. Endisch (Technische Hochschule Ingolstadt), and D. U. Sauer (Juelich Aachen Research Alliance, JARA-Energy, Germany, RWTH Aachen University - ISEA)

11:40 **518** **Advanced Technique Development for Li-Ion Electrode Characterisation Using X-Ray Computed Tomography** – S. Randjbar Daemi, C. Tan, X. Lu (University College London), J. Cookson (Johnson Matthey), E. A. Petrucco (Johnson Matthey Battery Materials), A. Palacios-Padros (Johnson Matthey), D. J. L. Brett (University College London), and P. R. Shearing (Electrochemical Innovation Lab, UCL, London)

12:00 **519** **Fabrication and Characterization of Thick Sintered Lithium-Ion Battery Full Cells** – Z. Nie, P. McCormack (University of Virginia), H. Bilheux, J. Bilheux (Oak Ridge National Laboratory), P. Robinson, and G. Koenig (University of Virginia)

In Situ Spectroscopy (Interfaces) – 13:00 – 16:30
Chair(s): Gabriel M. Veith and Robert L Sacci

13:00 **520** **Battery Characterization Using Operando Optical Diagnostics** – J. M. Porter (Colorado School of Mines) and N. Saqib (University of Indianapolis)

13:20 **521** **Surface Characterization of Battery Electrode/Electrolyte Materials Using XPS and Tof-SIMS** – E. T. Harrison, S. L. Peczonczyk, A. Sharafi (Ford Motor Company), K. H. Wujcik (Blue Current), A. Drews, and S. Simko (Ford Motor Company)

13:40 **522** ***(Invited)* Solid-Electrolyte Interface and Interphase Depicted By Plasmon-Enhanced Raman Spectroscopy** – J. Nanda, G. Yang, G. M. Veith (Oak Ridge National Laboratory), D. T. Hallinan Jr. (Florida A&M University – Florida State University), and A. P. Sokolov (University of Tennessee)

14:10 **523** **On the Way to Elucidate Reaction Mechanisms that Involve Metallic Lithium and Atmospheric Gases Using *In Situ* Ambient Pressure X-Ray Photoelectron Spectroscopy** – A. Etxebarria (Advanced Ligth Source, LBNL, CIC Energigune), M. Blum (Advanced Ligth Source, LBNL), D. J. Yun (Advanced Light Source, LBNL), M. Á. Muñoz Márquez (CIC Energigune), and E. J. Crumlin (Joint Center for Energy Storage Research, LBNL)

14:30 **524** **Kerr Gated Raman Spectroscopy to Investigate Lithium-Ion Battery Interfaces** – L. J. Hardwick, L. Cabo-Fernandez (University of Liverpool), R. Kostecki (Lawrence Berkeley National Laboratory), and I. Sazanovich (Central Laser Facility, Research Complex at Harwell, STFC)

14:50 **525** ***(Invited)* X-Ray Reflectivity Studies of Interfaces in Lithium-Ion Batteries** – H. G. Steinrueck (SLAC National Accelerator Laboratory)

15:20 **Break**

15:50 **526** **Elucidating the SEI Formation and Composition As a Function of Binder on Si Anodes Using in Situ Neutron Reflectometry** – K. L. Browning (University of Tennessee, Oak Ridge National Laboratory), M. Doucet (Oak Ridge National Laboratory), J. F. Browning (Oak Ridge National Lab), R. L. Sacci, and G. M. Veith (Oak Ridge National Laboratory)

16:10 **527** **A Neutron Reflectometry Study of a Metal Oxide/Li-Ion Battery Electrolyte Interface** – E. D. Rus and J. A. Dura (NIST Center for Neutron Research)

B06 2D Layered Materials from Fundamental Science to Applications

Nanocarbons / Dielectric Science and Technology / Electronics and Photonics / Interdisciplinary Science and Technology Subcommittee / Sensor

City View 5, Dallas Sheraton Hotel

2D Layered Materials from Fundamental Science to Applications - Session 1 – 14:00 – 18:00
Chair(s): Elisa M. Miller

14:00 **802** **Controlled Electrochemical Synthesis of the Partially Unzipped Multi-Wall Carbon Nanotubes** – M. O. Danilov, I. A. Rusetskii (Institute of General and Inorganic Chemistry), G. I. Dovbeshko (Institute of Physics), G. Y. Kolbasov (Institute of General and Inorganic Chemistry), and J. Tang (National Center of Hybrid Materials)

14:20 **803** **Large-Scale Synthesis of MoS_2 Monolayer Using Na-Containing Facilitators for Electromechanical Energy Harvesting** – Y. S. Jung, H. J. Choi (Yonsei university), and Y. S. Cho (Yonsei University)

14:40 **804** **Substitutional Nitrogen Defects Enhance Thermal Transport across Graphene Interfaces** – D. Olson (University of Virginia), H. Zhu, T. Granzier-Nakajima, M. Terrones (Pennsylvania State University), and P. E. Hopkins (University of Virginia)

15:00 **805** **Fundamentals of the Local Anodic Oxidation of Graphene for Scalable Applications** – S. J. Quesada, A. L. Alvarez, F. Borrás, C. Coya (Universidad Rey Juan Carlos), E. Climent (Universidad Politécnica de Madrid), and A. de Andrés (Instituto de Ciencias de Materiales de Madrid)

15:20 **Break**

15:40 **806** **Characterizing the Morphology of the Different Grown Homo/Hetero TMD Structures By Controlling Parameters – a Multiscale Computational Approach** – J. Kashyap (New Jersey Institute of Technology), K. Ghatak, and D. Datta (New Jersey Institue of Technology)

16:00 **807** **Phosphorene Exfoliated from Black Phosphorous Via Bipolar Electrochemistry** – A. Rabiei Baboukani, I. Khakpour, and C. Wang (Florida International University)

16:20 **808** **Effect of Structural Properties on the Photoelectrochemical Performance of Transition Metal Dichalcogenides** – P. S. Tóth (University of Szeged, MTA Premium Post Doctorate Research Program), G. Szabó (University of Szeged), and C. Janáky (ELI-ALPS Research Institute, University of Szeged)

16:40 **809** **Transition Metal Dichalcogenides Clusters Immobilized on Defective Black Phosphorus As an Efficient Electrocatalyst for Hydrogen Evolution Reaction** – P. Ou and J. Song (McGill University)

17:00 **810** **Hybrid Nanostructures for Electrochemical Reduction of Carbon Dioxide** – S. Ozden (Los Alamos National Lab), T. Asset (University of New Mexico), and P. Atanassov (University of New Mexico,, The University of New Mexico)

17:20 **811** **Enhancing Electrical and Contact Properties of WSe_2 field-Effect Transistors *Via* Vacuum-Annealed Pt-W Alloy Contacts** – H. Kim, H. Park, and J. Kim (Korea University)

17:40 **812** **Improved Bending Fracture Behavior of Large-Scale Graphene Monolayer-Intervened Flexible Oxide Thin Films** – H. J. Choi (Yonsei university), D. B. Kim, and Y. S. Cho (Yonsei University)

B07 Light Energy Conversion with Metal Halide Perovskites, Semiconductor Nanostructures, and Inorganic/Organic Hybrid Materials

Nanocarbons / Physical and Analytical Electrochemistry

City View 8, Dallas Sheraton Hotel

Low Cost Photovoltaics – 14:00 – 16:00
Chair(s): Zhi David Chen and Takurou N Murakami

14:00 **853** ***(Invited)* Application of Impedance Spectroscopy for Perovskite Solar Cells** – T. N. Murakami (Advanced Industrial Science and Technology (AIST))

14:20 **854** ***(Invited)* Transient Electron Spin Polarization Imaging of Photoinduced Interfacial Charge Separation Geometries in Organic Photovoltaic Cell** – Y. Kobori, T. Ako, T. Tachikawa (Kobe University), and K. Marumoto (Tsukuba University)

14:40 **855** **Muli-Bath Electrodeposition of CTZS Increasing Sulfur Ratio Close to Back Contact** – M. A. Saeed (A'Sharqiyah University)

15:00 **856** **Electronic Structure and Phase Stability of Ag and Sn Doped Cu_2s: A DFT Study** – S. K. Barman (The University of Texas at Arlington) and M. N. Huda (University of Texas at Arlington)

15:20 **857** **Fabrication of Efficient Perovskite Solar Cells in Ambient Air Using a Humidity-Insensitive Method** – F. Wang, Z. Ye (University of Electronic Science and Technology of China), H. Sarvari, S. M. Park, A. Abtahi, K. Graham (University of Kentucky), Y. Zhao (University of Electronic Science and Technology of China), Z. Chen (University of Kentucky), S. Li, and Y. Wang (University of Electronic Science and Technology of China)

15:40 **858** **Scanning Photoelectron Spectroscopy of Tapered Cross Sections of Perovskite Solar Cells: Element Distribution, Band Alignment, Space Charge Layers and Photo-Voltage Distributions** – W. Jaegermann (Technische Universität Darmstadt) and T. Mayer (Darmstadt University of Technology, Germany, InnovationLab GmbH, Heidelberg, Germany)

Perovskite Photovoltaics 1 – 16:20 – 17:40
Chair(s): Qilin Dai, Yasuhiro Kobori and Stephan Link

16:20 **859** **Improved Efficiency and Stability of Perovskite Solar Cells By Structure Engineering** – Q. Dai (Jackson State University)

16:40 **860** **First-Principles Understanding of Strong Auger Recombination in Hybrid Perovskites** – J. Shen (UC Berkeley), X. Zhang, and C. G. Van de Walle (UC Santa Barbara)

17:00 **861** **Thermodynamic Approach to Develop Lead-Free Halide Perovskites: Theoretical Study** – J. G. Park, C. H. Chung (Hanbat National University), and K. H. Hong (Hanbat Naitional University)

17:20 **862** **Electron/Hole-Selective Interfaces in Perovskite Photovoltaics: Electrochemical Studies** – L. Kavan (J. Heyrovsky Institute of Physical Chemistry)

I01 Hydrogen or Oxygen Evolution Catalysis for Water Electrolysis 5

Energy Technology / Industrial Electrochemistry and Electrochemical Engineering / Physical and Analytical Electrochemistry

State Room 2, Dallas Sheraton Convention Center

Alkaline Electrolysis-HER 1 – 14:00 – 17:30
Chair(s): Hui Xu

14:00 **Welcoming Remarks**

14:10 **1379** **Alkaline Water Electrolysis at 20 a cm^{-2} with a Microfibrous, Flow-through Electrolyzer** – F. Yang, M. J. Kim, and B. J. Wiley (Duke University)

14:30 **1380** **Boosting the Hydrogen Evolution Performance of Transition Metal Phosphide Catalysts on 3D Electrode Supports** – J. Sanchez (Stanford University, Department of Chemical Engineering), T. Hellstern (Stanford University Department of Chemical Engineering), L. King (Stanford University), and T. F. Jaramillo (Stanford University, Department of Chemical Engineering)

14:50 **1381** **Low Temperature Synthesis of WS_2 Using PECVD for Hydrogen Evolution Catalysis** – V. K. Kanade, H. U. Kim, C. K. Kanade (SAINT, Sungkyunkwan University), D. Shin (Mechanical Engineering, Sungkyunkwan University), J. H. Lee (DESR,DME, Ajou University), and T. Kim (SAINT, Sungkyunkwan University, Mechanical Engineering, Sungkyunkwan University)

15:10 **1382** **New Avenues Towards Designing Transition Metal Phosphides for Efficient Electrocatalysis** – D. Das and K. K. Nanda (Indian Institute of Science)

15:30 **1383** **Electrochemical Activation of $MoTe_2$ for the Hydrogen Evolution Reaction** – J. C. McGlynn and A. Y. Ganin (University of Glasgow)

15:50 **1384** **The Catalytic Roles of Surface Transition Metals on the Hydrogen Evolution/Oxidation Reactions of Pt-Surfaces in Base** – E. Liu (Chemistry and Chemical Biology, Northeastern University), L. Jiao, S. Mukerjee, and Q. Jia (Northeastern University)

16:10 **1385** **Electrodeposited Iron Phosphide Film As an Efficient Electrocatalyst for Hydrogen Evolution Reaction** – Z. Lu and L. Sepunaru (University of California, Santa Barbara)

16:30 **1386** **Tuning and Mechanistic Insights of Metal Chalcogenide Molecular Catalysts for the Hydrogen-Evolution Reaction** – J. McAllister, H. Miras (University of Glasgow), N. Bandeira, C. Bo (The Barcelona Institute of Science and Technology), J. C. McGlynn, A. Y. Ganin (University of Glasgow), and Y. F. Song (Beijing University of Chemical Technology)

16:50 **1387** **Electrodeposition of Co-W Coatings from Acidic-Citrate Solutions for Hydrogen Evolution** – A. M. Kwiecińska, K. Kolczyk, K. Skibinska, D. Kutyla, P. Zabinski, and R. Kowalik (AGH University of Science and Technology)

17:10 **1388** **The Mechanism of Proton Diffusion in ABO_3 Perovskite Structure** – N. R. Aluru (University of Illinois at Urbana Champaign) and Y. Jing (Harbin Institute of Technology)

I02 Materials for Low Temperature Electrochemical Systems 5

Energy Technology / Physical and Analytical Electrochemistry

Houston Ballroom B, Dallas Sheraton Convention Center

Fuel Cell Performance and Characterization 1 – 08:20 – 12:20
Chair(s): Jacob S Spendelow and Feng-Yuan Zhang

08:20 **1473** **Lock-in Thermography As a Diagnostic Tool for Water Detection and Quantification in Polymer Electrolyte Fuel Cells (PEFCs)** – L. Rasha (University College London), D. J. L. Brett, P. R. Shearing (Electrochemical Innovation Lab, UCL, London), and J. I. S. Cho (University College London)

08:40 **1474** **Lung-Inspired PEM Fuel Cells Built from Layered Printed Circuit Boards** – V. S. Bethapudi (EPSRC Centre for Nature Inspired Engineering,UCL,London, Electrochemical Innovation Lab, UCL, London), J. I. S. Cho (EPSRC Centre for Nature Inspired Engineering,UCL,London), J. Hack, P. R. Shearing, D. J. L. Brett (Electrochemical Innovation Lab, UCL, London), and M. O. Coppens (EPSRC Centre for Nature Inspired Engineering,UCL,London)

09:00 **1475** **Intermetallic PtCo Catalysts for Fuel Cell Applications** – C. Wang, D. Li, Y. S. Kim (Los Alamos National Laboratory), D. A. Cullen, K. L. More (Oak Ridge National Laboratory), and J. S. Spendelow (Los Alamos National Laboratory)

09:20 **1476** **Pt-Based Chalcogenide As Cathodic Electrocatalysts for Proton Exchange Membrane FUEL CELL (PEMFC)** – G. I. Moreno-Grijalva (Instituto Tecnológico de Tijuana), G. Alonso (Centro de Nanociencias y Nanotecnología de la UNAM, CNyN), M. T. Oropeza-Guzman (InstitutoTecnológico de Tijuana), and Y. Gochi-Ponce (Instituto Tecnologico de Tijuana)

09:40 **1477** **Electrospinning and MEA Conditioning As a Tool for Designing Optimized Electrode Structures for Fuel Cell Applications** – S. Kabir (National Renewable Energy Laboratory), L. Anderson (UC Merced), S. Medina, S. Pylypenko (Colorado School of Mines), and K. C. Neyerlin (National Renewable Energy Laboratory)

10:00 **1478** **Effect of Surfactant for PTFE Binder Dispersion of Electrodes Prepared By Bar Coating Method in High Temperature Polymer Electrolyte Membrane Fuel Cell** – M. J. Lee (Korea Institute of Science and Technology (KIST), Korea University), J. S. Lee, S. Y. Lee, H. J. Kim (Korea Institute of Science and Technology (KIST)), and K. H. Song (Korea University)

10:20 **1479** **Modelling of a Light-Weight, Flexible, Air-Breathing PEMFC** – A. Kiessling, M. Mayer, and R. S. Besser (Stevens Institute of Technology)

10:40 **1480** **Pore Morphology Effects of Liquid/Gas Diffusion Layers in Proton Exchange Membrane Electrolyzer Cells** – S. Yu (UT, University of Tennessee Space Institute), G. Yang, Y. Li, B. Canfield (University of Tennessee Space Institute), A. Terekhov (UT Space Institute, University of Tennessee, Knoxville), L. Davis (University of Tennessee Space Institute), and F. Y. Zhang (UT Space Institute, University of Tennessee, Knoxville)

11:00 **1481** **Necessity to Avoid Titanium Oxide As Catalyst Support in PEM Fuel Cells** – J. Zhang, F. D. Coms, and S. Kumaraguru (General Motors Company)

11:20 **1482** **Ni/Ni-Cr-P and Ni/Ni-Mo-Cr-P Electrodeposited Coatings As Bipolar Plate in Polymer Electrolyte Membrane Fuel Cell Environment** – U. K. Chanda and S. Pati (Indian Institute of Technology Bhubaneswar)

11:40 **1483** **Development of Large-Scale Proton-Conducting Fuel Cells for Next Generation SOFC** – S. Wee, S. Lee, S. Park, and D. Shin (Hanyang University)

12:00 **1484** **Evaluation of Carbon Support Corrosion Using Accelerated Stress Protocol and Impedance Spectroscopy** – J. A. Prithi (Department of Chemistry, IIT-Madras), R. Vedarajan (Centre for Fuel Cell Technology - ARCI), G. Ranga Rao (Department of Chemistry, IIT-Madras), and N. Rajalakshmi (Centre for Fuel Cell Technology - ARCI)

General Electrocatalysis 1 – 14:00 – 18:20
Chair(s): Qingying Jia and Edward F. Holby

14:00 **1485** ***(Invited)* Revisiting the Nature of Active Sites in Pyrolyzed Fe-N-C Electrocatalysts: In Situ Monitoring the Structure Evolution of Active Sites in Fe-N-C Catalysts during Pyrolysis** – Q. Jia, J. Li (Northeastern University), D. J. Myers, A. J. Kropf (Argonne National Laboratory), and S. Mukerjee (Chemistry and Chemical Biology, Northeastern University)

14:40 **1486** **Electron Microscopy Study of Degradation Mechanisms in Platinum Group Metal-Free Catalysts** – D. A. Cullen, K. L. More (Oak Ridge National Laboratory), L. Osmieri, and K. C. Neyerlin (National Renewable Energy Laboratory)

15:00 **1487** **PGM-Free Oxygen Reduction Reaction Electrocatalyst: From the Design to Manufacturing** – A. Serov (Pajarito Powder, LLC), G. McCool (Pajarito Powder LLC), H. Romero, S. McKinney, A. Lubers (Pajarito Powder, LLC), M. Odgaard (IRD Fuel Cells), T. V. Reshetenko (University of Hawaii - Manoa), and B. Zulevi (Pajarito Powder LLC)

15:20 **1488** **Manganese Oxide Electrocatalysts: Degradation in Alkaline Energy Conversion Devices** – F. D. Speck (Forschungszentrum Juelich GmbH, Friedrich-Alexander-Universität Erlangen-Nürnberg), P. G. Santori, F. Jaouen (CNRS - Université De Montpellier), and S. Cherevko (Forschungszentrum Jülich GmbH)

15:40 **1489** **Structure-Function Relationships of PGM-Free ORR Electrocatalysts from Density Functional Theory** – E. F. Holby, U. Martinez, S. Komini Babu, X. Yin, H. T. Chung, and P. Zelenay (Los Alamos National Laboratory)

16:00 **1490** **Microstructure Characterization of PGM-Free Catalyst Ink Using in-Situ Ultra Small Angle X-Ray Scattering** – J. Park, N. N. Kariuki, D. J. Myers (Argonne National Laboratory), H. Zhang, and G. Wu (University at Buffalo, the State University of New York)

16:20 **1491** **High-Throughput Synthesis and Characterization of PGM-Free PEFC Cathode Catalysts** – J. Park, M. Ferrandon, E. Coleman, N. N. Kariuki, V. Stamenkovic, and D. J. Myers (Argonne National Laboratory)

16:40 **1492** **High Performance Fuel Cell Catalysts Synthesized By Fe Metalation of Nitrogen Doped Carbons Derived from Metal Organic Framework ZIF-8** – A. J. Roy, M. T. Sougrati, P. Y. Blanchard (CNRS - Université De Montpellier), D. Jones (CNRS, Université de Montpellier), F. Jaouen (CNRS - Université De Montpellier), M. Primbs, P. Strasser (Technical University Berlin), A. Mehmood, A. R. J. Kucernak (Imperial College London), T. Kosmala, G. Daniel, and C. Durante (Università Degli Studi Di Padova)

17:00 **1493** **Influence of the Dopant Atom and the Oxygen Vacancy Site for the Oxygen Reduction Reaction on the Titanium Oxide** – T. Saida, T. Suzuki, E. Niwa, and T. Maruyama (Meijo University)

17:20 **1494** **First-Principles Prediction of Activated Carbon Nanostructures for Catalyzing Oxygen Reduction** – G. P. Hartmann and G. S. Hwang (University of Texas at Austin)

17:40 **1495** **Nickel and Molybdenum Nitrides As Oxygen Reduction Reaction Catalysts: Probing the Structure-Activity Relationship** – M. Kreider, M. B. Stevens, Y. Liu (Stanford University), A. Gallo (Stanford University, SLAC National Accelerator Laboratory), A. Mehta (SLAC National Accelerator Laboratory), L. A. King (Stanford University), and T. F. Jaramillo (SLAC National Accelerator Laboratory, Stanford University)

18:00 **1496** **Carbon Nanofiber-Supported Fe_3O_4 nanoestructures As Efficient Electrocatalyst for the Oxygen Reduction Reaction** – R. Fernández-Cori and A. M. Baena Moncada (Universidad Nacional de Ingeniería)

I03 Renewable Fuels via Artificial Photosynthesis or Heterocatalysis 4

Energy Technology / Sensor

State Room 3, Dallas Sheraton Convention Center

Carbon Dioxide Conversion 1 – 07:55 – 12:20
Chair(s): Scott Kevin Cushing and Shu Hu

07:55 **Welcoming Remarks**

08:00 **1579** **A Gold-Polyaniline Nanocomposites Catalyst with a Posy Bouquet Structure for Efficient Electrocatalytic Reduction of CO_2.** – A. Vijayakumar, Y. Zhao, C. Wang, and G. Wallace (University of Wollongong)

08:15 **1580** **Efficient Electroreduction of CO_2 in an Ultra-Slim Pressurized Electrolyzer** – J. P. Edwards, Y. Xu, C. M. Gabardo, C. T. Dinh, J. Li, Z. Qi, E. H. Sargent, and D. Sinton (University of Toronto)

08:30 **1581** **A Microfluidic Artificial Photosynthesis Cell for CO_2 Reduction on TiO_2-CuO Photoelectrodes** – E. Kalamaras, M. Belekoukia (Heriot-Watt University), J. Xuan (Loughborough University), J. Andresen (Heriot-Watt University Edinburgh, UK), and M. Maroto-Valer (Heriot-Watt University)

08:45 **1582** **Effect of the Electrode Shape on CO_2 Electroreduction Product Selectivity over Ag and Cu Catalysts** – S. Sharifi Golru (The Graduate Center of the City University of New York), A. N. Karaiskakis (The City College of New York, CUNY), and E. J. Biddinger (City College of New York, The Graduate Center of the City University of New York)

09:00 **1583** **Understanding the Influence of Porosity on Product Selectivity for Copper CO_2 Reduction Electrocatalysts** – K. E. Fritz, U. Wiesner, and J. Suntivich (Cornell University)

09:15 **1584** **The Role of Mesostructure for CO_2 Reduction on Dendritic Copper Electrocatalysts** – H. Mehrabi and R. Coridan (University of Arkansas)

09:30 **1585** **Stable, High-Rate CO_2 Electroreduction to Multi-Carbon Products in a Membrane Electrode Assembly System** – C. M. Gabardo, C. P. O'Brien, J. P. Edwards, C. T. Dinh, Y. Xu, E. H. Sargent, and D. Sinton (University of Toronto)

09:45 **Break**

10:05 **1586** **Mechanistic Insights of Coupled Proton-Hydride Transfers on Pyridine Immobilized Metal Catalysts for Selective CO_2-Electroreduction to Methanol** – P. Kolla (Chemistry and Chemical Biology, Northeastern University), W. Wang (Department of Chemistry, Wuhan University), Q. Sun (Chemistry and chemical biology, Northeastern University), and S. Mukerjee (Chemistry and Chemical Biology, Northeastern University)

10:20 **1587** **Co-Electrolysis As an Approach for Efficient Electroreduction of CO_2 to Fuels or Chemicals** – P. J. A. Kenis (Int Inst for Carbon-Neutral Energy Research (WPI-I2CNER))

10:35 **1588** **Switching between CO_2 Electroreduction Pathways** – A. Seifitokaldani (Department of Chemical Engineering, McGill University)

10:50 **1589** **CO2 Reduction to CO on Au: Facet Dependent Activity and Selectivity** – B. Seger (Technical University of Denmark), S. Mezavilla (Imperial College London), and I. Chorkendorff (Technical University of Denmark)

11:05 **1590** **Modelling Anion-Exchange Membrane-Electrode Assembly Systems for CO_2 Reduction** – L. C. Weng (Joint Center for Artificial Photosynthesis, LBNL), A. T. Bell (University of California, Berkeley), and A. Z. Weber (Lawrence Berkeley National Laboratory)

11:20 **1591** **Nitrogen and Sulfur Co-Doped Carbon Nano-Onions for Efficient Electrochemical Conversion of Carbon Dioxide** – N. Wanninayake (University of Kentucky), A. Qianxiang (University of Kentucky, Center for Applied Energy Research), M. Thomas (University of Kentucky, Oak Ridge National Laboratory), U. S. Kodithuwakku, A. Hoque, M. I. Guzman (University of Kentucky), B. Guiton (University of Kentucky, Oak Ridge National Laboratory), C. Risko (University of Kentucky, Center for Applied Energy Research), and D. Y. Kim (University of Kentucky)

11:35 **1592** **High-Throughput Electrochemical Conversion of Gaseous CO_2 to C≥2 Products By Fine-Tuning Structure of $La_{2-X}Sr_xCuO_{4\pm\delta}$ electrocatalyst** – P. Kolla (Chemistry and Chemical Biology), Q. Sun (Chemistry and chemical biology), W. Wang (Department of Chemistry, Wuhan University), and S. Mukerjee (Chemistry and Chemical Biology, Northeastern University)

11:50 **1593** **H Sorption Based Materials for the Hydrogenation of CO2 to Added Value Fuel Products** – M. Leclerc (Université de Sherbrooke), A. Etxebarria, D. J. Yun, Y. Ye, E. J. Crumlin (Advanced Light Source, LBNL), and G. M. Brisard (Université de Sherbrooke)

12:05 **1594** **Mesoporous Semiconductors: A New Model to Assess Accessible Surface Area and Increased Photocatalytic Activity** – R. Marschall (University of Bayreuth)

Metal Oxide Photocatalysts and Photoelectrodes 2 – 13:50 – 17:55
Chair(s): Dongling Ma and Jaejoon Lee

13:50 **1595** ***(Invited)*** **Photocatalytic Water-Splitting Composites Working Under UV to Near-Infrared Lights** – J. Zhang (Beihang University)

14:20 **1596** ***(Invited)*** **Electronic Properties of ABO_4 Photo-Catalysts Under Nb-Substitution and Phase/Pressure-Related Distortions** – M. N. Huda (University of Texas at Arlington,), E. Bainglass (University of Texas at Arlington), H. P. Sarker (University of Texas at Arlington, TX), and P. Rao (Worcester Polytechnic Institute, MA)

14:50 **1597** ***(Invited)*** **Multiple Heterojunction in Single Titanium Dioxide Nanomaterials for Photocatalysis and Photoelectrochemical Cells** – J. H. Park (Yonsei University)

15:20 **1598** ***(Invited)*** **Electronic Tuning of Photo-Electro-Catalytic Processes By Intermediate-Band Oxides** – S. Hu (Yale University)

15:50 **1599** ***(Invited)*** **Layered Double Hydroxide Based Nanostructured Photocatalysts for Efficient Solar Fuels** – T. Zhang (Technical Institute of Physics and Chemistry, CAS)

16:20 **Break**

16:40 **1600** ***(Invited)*** **Bioinspired Water Oxidation Electrocatalysts Based on Manganese Oxide** – K. T. Nam (Seoul National University)

17:10 **1601** **Electrodeposition of Silver Metavanadate ($AgVO_3$) As a Visible Light-Active *P*-Type Semiconductor** – A. Vali, F. Firouzan (The University of Texas), and K. Rajeshwar (University of Texas)

17:25 **1602** **Developing and Understanding $BiFeO_3$ Photoelectrodes for Solar Water Splitting** – A. Radmilovic and K. S. Choi (University of Wisconsin-Madison)

17:40 **1603** **Visible-Light-Driven Water Splitting Using Perovskite-Type Oxynitride Photoanodes** – J. Seo, T. Hisatomi (Shinshu University), and K. Domen (The University of Tokyo, Shinshu University)

I05 Heterogeneous Functional Materials for Energy Conversion and Storage 2

High-Temperature Energy, Materials, & Processes / Battery / Energy Technology / Physical and Analytical Electrochemistry
State Room 4, Dallas Sheraton Convention Center

Advanced Imaging and Simulation 1 – 13:50 – 15:40
Chair(s): Wilson K. S. Chiu and Fanglin Chen

13:50 **Welcoming Remarks**

14:00 **1693** ***(Keynote)*** **Emergent Effects of Global Surfaces on Local Microstructure Designs for Functionality in Heterogeneous Functional Materials** – K. L. Reifsnider and Y. Cao (University of Texas Arlington)

14:40 **1694** ***(Invited)*** **X-Ray Microscopy of Operating Electrochemical Energy Storage Systems** – J. N. Weker (SLAC National Accelerator Laboratory, USA)

15:20 **1695** **The Analytical Transport Network Model for Energy Materials Design and Characterization: Extensions for the Modeling of Coupled Flows and Structural Mechanics** – A. P. Cocco and K. N. Grew (U.S. Army Research Laboratory)

Advanced Imaging and Simulation 2 - X-Ray Microscopy – 16:00 – 18:00
Chair(s): Kenneth L Reifsnider and Johanna Nelson Weker

16:00 **1696** ***(Invited)*** **A New Transmission X-Ray Microscope Beamline at the NSLS-II** – W. K. Lee, M. Ge, X. Xiao, S. Coburn, E. Nazaretski, W. Xu, H. Xu, K. Gofron, and Z. Yin (Brookhaven National Laboratory)

16:40 **1697** ***(Invited)*** **Understanding Heterogeneous Functional Materials Via Scale-Bridging between Nano and Micro Transmission x-Ray Microscopy and Absorption Near Edge Structure** – I. V. Zenyuk (University of California Irvine)

17:20 **1698** ***(Invited)*** **Multi-Modal and *Operando* Synchrotron Investigation of Energy-Storage Materials** – Y. C. K. Chen-Wiegart (Stony Brook University / Brookhaven National Laboratory)

Monday, May 27

Highlights

0700h..... Session Chair and Symposium Organizer Orientation Breakfast – *Austin Ballroom 3, Sheraton Hotel*
0800h..... Nanocarbons Division Richard E. Smalley Research Award Address– *City View 6, Sheraton Hotel*
1000h..... Allen J. Bard Award Address in Electrochemical Science – *Houston Ballroom B, Sheraton Convention Center*
1000h..... Industrial Electrochemistry and Electrochemical Engineering Division New Electrochemical Technology (NET) Award Address – *San Antonio Ballroom B, Sheraton Convention Center*
1410h..... Gordon E. Moore Medal for Outstanding Achievement in Solid State Science and Technology Award Address – *City View 2, Sheraton Hotel*
1440h..... Energy Technology Division Supramaniam Srinivasan Young Investigator Award Address – *San Antonio Ballroom B, Sheraton Convention Center*
1700h..... Plenary Session and the ECS Lecture – Lone Star A3/A4, *Sheraton Convention Center*
1800h..... Technical Exhibit, General Poster Session, and ECS Career Expo – *Lone Star B/C, Sheraton Convention Center*
2000h..... Student Mixer – *Chaparral Main Room, Sheraton Hotel*

A01 Battery and Energy Technology Joint General Session

Energy Technology / Battery
Houston Ballroom A, Dallas Sheraton Convention Center

Advances in Batteries - Invited Talks 1 – 08:00 – 12:05
Chair(s): Mani Manivannan and S. R. Narayan

08:00 **14** ***(Invited)*** **The P2 Sodium Layered Oxides in Na Ion-Batteries** – C. Delmas Sr. (ICMCB - CNRS), D. Carlier (ICMCB-CNRS, Univ. Bordeaux, Bordeaux INP, Pessac, France), M. Guignard (CNRS, Université de Bordeaux, ICMCB), and J. Yoshida (TOYOTA MOTOR EUROPE)

08:30 **15** ***(Invited)*** **On the $NaMeO_2$ (Me = 3d metal) for Na-Ion Batteries** – S. Komaba (Tokyo University of Science, ESICB-Kyoto University) and K. Kubota (Tokyo University of Science, ESICB-Kyoto Univeristy)

09:00 **16** ***(Invited)*** **Surface Modified Polypropylene Membrane for High Performance Lithium Metal Coin and Pouch Cell Batteries** – V. G. Pol, P. Kim, and P. Manikandan (Purdue University)

09:30 **Break**

09:45 **17** ***(Invited)*** **Strategies for Achieving High-Energy Density Storage Systems** – P. N. Kumta (University of Pittsburgh)

10:15 **18** ***(Invited)*** **Si Materials for Li-ion Battery Negative Electrode Applications** – G. Liu (Lawrence Berkeley National Laboratory)

10:45 **19** ***(Invited)*** **Self-Assembly Synthesis and Interfacial Control of Electrode Architectures** – S. Dai (Oak Ridge National Laboratory)

11:15 **20** ***(Invited)*** **In-Operando Neutron Scattering Studies of Interfacial Electrolyte Chemistry** – C. A. Bridges, C. J. Jafta, X. G. Sun, G. M. Veith (Oak Ridge National Laboratory), G. V. Jensen (NIST), W. Heller, M. J. Cuneo, S. Mahurin, M. P. Paranthaman, and S. Dai (Oak Ridge National Laboratory)

11:45 **21** **Design of Reversible Electroplating Cells for Energy-Saving Windows** – A. L. Yeang (University of Colorado, Boulder), T. S. Hernandez, M. T. Strand (Stanford University), C. J. Barile (University of Nevada, Reno), and M. D. McGehee (University of Colorado, Boulder)

Advances in Batteries - Invited Talks 2 – 14:00 – 16:00
Chair(s): Mani Manivannan

14:00 **22** ***(Invited)*** **Novel Design & Synthesis of Carbon for Lithium-Ion Batteries and Beyond** – M. P. Paranthaman (Oak Ridge National Laboratory)

14:30 **23** ***(Invited)*** **Mechanisms and Material Impacts of Overcharge in Lithium Ion Batteries** – L. Torres-Castro, J. Lamb, and M. Karulkar (Sandia National Laboratories)

15:00 **24** ***(Invited)*** **Suitable Materials and Electrolytes for Li-Ion Battery Fast Charging Applications** – I. Belharouak, Z. Du, J. Li (Oak Ridge National Laboratory), D. L. Wood III (University of Tennessee), and J. Nanda (Oak Ridge National Laboratory)

15:30 **25** ***(Invited)*** **Working Towards a Cost-effective Lithium-ion Battery Recycling Process** – B. J. Polzin, J. Spangenberger, and L. Gaines (Argonne National Laboratory)

Lone Star B/C, Dallas Sheraton Convention Center

A01 Poster Session – 18:00 – 20:00
Chair(s): S. R. Narayan and Mani Manivannan

- **26** **High Performance Lithium Sulfur Batteries Via MoS_2-Protected Lithium Metal Anode** – E. Cha, J. Park, and W. Choi (University of North Texas)
- **27** **Simulation of the Charge Process Incorporating Vanadium Crossover in Vanadium Redox Flow Battery** – Y. S. Chou and S. C. Yen (Chemical Engineering Dept., National Taiwan University)
- **28** **Effect of the Morphology of Active Nanomaterials and the Printed Structure for Flexible/Stretchable Batteries** – J. Lee (Sungkyunkwan University), H. Lee (Sungkyunkwan University, University of South Carolina), S. Hwang, and D. Byun (Sungkyunkwan University)
- **29** **Atomistic Simulations of Lithiation Induced Structural Changes in Layered-Spinel Nano-Architectured Li-Mn-O** – B. Shibiri, R. S. Ledwaba, and P. E. Ngoepe (University of Limpopo)
- **30** **Preparation of N,F,B-Doped Carbon Materials for High-Performance Electric Double Layer Capacitors** – D. K. Kim and Y. Piao (Seoul National University)
- **31** **A Microporous Gel Polymer Electrolyte for Sodium Batteries** – S. Kalami, H. Khani, and J. B. Goodenough (The University of Texas at Austin)
- **32** **All Coconut Sprout Sodium Ion Hybrid Capacitor** – V. Surendran (IISER Thiruvananthapuram), A. R. Suviresh (CENTRAL UNIVERSITY OF TAMILNADU THIRUVARUR), T. V. Vineesh, B. Babu, and M. M. Shaijumon (IISER Thiruvananthapuram)
- **33** **Study on a Novel Double-Layer Anode for Solid Oxide Fuel Cells Based on CO_2 Dry Reforming of Methane** – T. Wei, L. Jia, B. Chen, R. Li, B. Chi, J. Pu, and J. Li (Huazhong University of Science and Technology)
- **34** **Electrochemical Performance Enhancement of $Na_{0.7}MnO_2$ for Sodium-Ion Batteries By Doping and Conformal Surface Coating** – H. Yu and X. Liang (Missouri University of Science and Technology)
- **35** **Free Standing Nitrogen Deficient Carbon Nitride Oxygen Electrodes for Metal-Air Batteries** – N. Wagh, S. S. Shinde, D. H. Kim, and J. H. Lee (Hanyang University)
- **36** **Nanocomposites of Copper Sulphide and Graphene Oxide for High-Performance Supercapacitors** – R. Singhal, D. Thorne, P. Lemaire (Central Connecticut State University), X. Martinez, C. Zequine, R. Gupta (Pittsburg State University), D. Uhl, E. Scanley, and C. Broadbridge (Southern Connecticut State University)
- **37** **Modeling the Electrical and Thermal Behaviors of a Lithium-Ion Battery Under External Short Circuit Conditions** – J. Cho, B. Koo, C. B. Shin (Department of Energy Systems Research, Ajou University), and Y. C. Ha (Korea Electrotechnology Research Institute)
- **38** **Modeling the Effect of the Operating Temperature on the Performance of a Zinc/Bromine Flow Battery** – D. Lee, B. Koo, J. Lee, and C. B. Shin (Department of Energy Systems Research, Ajou University)
- **39** **Development of MWCNT/α-MnO_2/MoS_2 Ternary Composite for High-Performance Supercapacitor Application** – R. Rajagopal and K. S. Ryu (Department of Chemistry, University of Ulsan)

- **40** **Application of the Maximum Power Point Tracking (MPPT) Algorithm on Lithium-Ion Batteries** – S. Shrestha, M. Dion, and M. Sholin (Admiral Instruments)
- **41** **Highly Concentrated Aqueous Electrolyte with a Large Stable Potential Window for Electrochemical Double-Layer Capacitors** – G. Zhang, B. Jin, and S. Kong (Yangtze Normal University)
- **42** **Electrochemical Method for Graphene Preparation from Multi-Walled Carbon Nanotubes** – M. O. Danilov, I. A. Rusetskii (Institute of General and Inorganic Chemistry), G. I. Dovbeshko (Institute of Physics), O. Y. Khyzhun (Institute for Problems of Materials Science), V. Strelchuk (Institute of Semiconductor Physics), and G. Y. Kolbasov (Institute of General and Inorganic Chemistry)
- **43** **Exploration of New Electrolyte Additive for Solid Electrolyte Interphase (SEI) Modification** – J. Li, B. Wu, J. A. Lochala (University of Arkansas), and J. Xiao (University of Arkansas, Pacific Northwest National Laboratory)
- **44** **Microstructured Electrodes Supported on Serpentine Interconnects for Stretchable Electronics** – M. Nasreldin (centre microelectronics of provence)
- **45** **Random Heterogeneous Microstructure Construction of Composites By Fractal Geometry** – Z. Guo and S. Wang (shanghai university)
- **46** **Models of Electrochemical Transport in Electrolytes** – M. Zyskin (University of Oxford)

A02 Lithium Ion Batteries and Beyond

Battery / Physical and Analytical Electrochemistry

Lone Star A1, Dallas Sheraton Convention Center

Solid State Batteries 1 – 08:00 – 12:20
Chair(s): Maria Martinez-Ibañez, Andrew Keith Kercher and Jorge M. Seminario

08:00 **147** **Lipon-like Electrolyte Powders Made By Scalable Alternative Processing** – A. K. Kercher, A. S. Westover (Oak Ridge National Laboratory), M. Naguib (Tulane University), M. Kornbluth (Robert Bosch Research & Technology Center), G. M. Veith, and N. J. Dudney (Oak Ridge National Laboratory)

08:20 **148** **Solid-State Lithium and Li-Ion Batteries with Silica-Gel Solid Nanocomposite Electrolytes** – M. J. Mees (imec), A. Sagara (Technology Innovation Division, Panasonic Corporation), M. Debucquoy, X. Chen, K. B. Gandrud, B. Put (imec), H. Arase, Y. Kaneko (Technology Innovation Division, Panasonic Corporation), and P. M. Vereecken (imec, Belgium and COK, KU-Leuven, Belgium)

08:40 **149** **Long-Range Origins of Electrodeposition Instability in Solid Electrolytes** – A. N. Mistry and P. P. Mukherjee (Purdue University)

09:00 **150** **Porous PEO-Silica Hybrid Solid Electrolyte for All-Solid-State Lithium Ion Batteries** – E. T. Weldekidan, V. Hornebecq, and C. Lebouin (Aix-Marseille University)

09:20 **151** **From Ionic Liquid Fragments Towards Hybrid Nanoparticles for Solid-State Lithium Ion Technology** – J. Bidal, B. Fleutot (Laboratoire de Réactivité et Chimie des Solides, Réseau sur le Stockage Electrochimique de l'Energie), C. Hadad (Laboratoire Glycochimie Antimicrobiens Agroressources), M. Becuwe (Laboratoire de Réactivité et Chimie des Solides, Réseau sur le Stockage Electrochimique de l'Energie), and A. Nguyen Van Nhien (Laboratoire Glycochimie Antimicrobiens Agroressources)

09:40 **Break**

10:00 **152** **Interface Engineering on Solid-State Ceramic Electrolyte By Graphene-like Coating for Electrochemically Stable Sodium Metal Batteries** – E. Matios, H. Wang, and W. Li (Dartmouth College)

10:20 **153** **New Polymer Electrolytes for Safe All Solid-State Lithium Metal Batteries** – M. Martinez-Ibañez, I. Aldalur, E. Sánchez-Diez, U. Oteo (CIC EnergiGUNE), M. Piszcz (Warsaw Technical University, Faculty of Chemistry), H. Zhang (CIC EnergiGUNE), and M. Armand (CIC energiGUNE)

10:40 **154** **Improving the Performance of All-Solid-State Microbatteries By Conformal Electrodeposition of Polymer Electrolyte into Self-Organized TiO_2 Nanotubes** – V. A. Sugiawati (Aix-Marseille University), F. Vacandio (MADIREL), and T. Djenizian (Ecole Nationale Superieure des Mines de Saint-Etienne)

11:00 **155** **Atomic-Scale Rational Designs of Superionic Sulfide-Based Solid-State Electrolytes By Atomic Layer Deposition** – X. Meng (University of Arkansas) and J. W. Elam (Joint Center for Energy Storage Research)

11:20 **156** **Analysis of Solid-State Electrolytes for Li-Ion Batteries Using a Multiscale Molecular Dynamics Approach** – J. M. Seminario, D. E. Galvez-Aranda, V. Ponce, L. Selis, C. Vicharra, F. Franco-Gallo, and M. Gamero T (Texas A&M University)

11:40 **157** **Room Temperature Solid-State Lithium Polymer Battery with Polyionic Liquid Pentablock Terpolymer Electrolyte** – T. L. Chen, R. Sun (Texas A&M University), C. Willis (Kraton Performance Polymers, Inc.), B. Morgan, F. Beyer (Army Research Laboratory), and Y. A. Elabd (Texas A&M University)

12:00 **158** **Improving Cell Resistance and Cycle Life with Solvate/Thiophosphate Hybrid Electrolytes in Lithium Batteries** – A. A. Gewirth (Intl. Institute of Carbon Neutral Energy Research) and M. Philip (University of Illinois)

Lone Star A2, Dallas Sheraton Convention Center

Lithium Metal Anodes – 08:00 – 12:30
Chair(s): Jie Xiao, David Mitlin and Brett L. Lucht

08:00 **159** ***(Invited)* Electrochemical Fundamentals of Employing Li Metal Anode in the Next-Generation Battery Technologies** – J. Xiao (Pacific Northwest National Laboratory)

08:30 **160** **Engineering Lithium Metal Surface to Enable Long-Term Cycling with Carbonate-Based Electrolytes** – J. Huang, C. Peebles, G. Cheng, D. Strand, and Y. Zhu (Wildcat Discovery Technologies)

08:50 **161** **Mechanical Properties of Lithium Metal for Next Generation Batteries** – A. Masias (University of Michigan, Ford Motor Company), N. Felten, and J. Sakamoto (University of Michigan)

09:10 **162** **A Dual Functional Artificial Solid Electrolyte Interphase for Dendrite-Free Lithium-Metal Batteries** – P. Chiochan, N. Phattharasupakun, S. Duangdangchote, and M. Sawangphruk (Vidyasirimedhi Institute of Science and Technology)

09:30 **Break**

09:50 **163** **Li Electroplating/Stripping on the Metal Substrate Coated with Carbon Black** – N. Suzuki, N. Yashiro, and Y. Aihara (Samsung R&D Institute Japan)

10:10 **164** **Iron Controllable Lithium into Lithiotropic Carbon Fiber Fabric: A Novel Li Metal Anode with Improved Cyclability and Dendrite Suppression** – J. Niu, X. Chen, Y. Lv, and M. Shang (University of Wisconsin-Milwaukee)

10:30 **165** **Effect of Thickness and Surface Decoration of Lithium-Metal Electrodes for Lithium-Metal Batteries** – M. C. Stan, M. Kolek, M. Börner, D. Liebenau, F. Schappacher, P. Bieker (MEET Battery Research Center, University of Münster), and M. Winter (MEET Battery Research Center, University of Münster, Helmholtz Institute Münster, Forschungszentrum Jülich)

10:50 **166** **Investigation on Solvent and Surface Modification Effects for Li Metal Anodes** – H. W. Liu (Industrial Technology Research Institute), Y. T. Weng, and N. L. Wu (National Taiwan University)

11:10 **167** **The Fundamental Mechanism behind the Stability of Li Metal Anodes in Non-Aqueous Electrolytes** – J. G. Zhang, X. Cao, X. Ren, and W. Xu (Pacific Northwest National Laboratory)

11:30 **168** **Pristine or Highly Defective? Understanding the Role of Graphene Structure for Stable Lithium Metal Plating** – D. Mitlin (Clarkson University)

11:50 **169** **Atomic Layer 2D MoS_2 Coated Li-Metal for Advanced Li-Metal Rechargeable Batteries** – W. Choi (University of North Texas)

12:10 **170** **A Lithiophilic Scaffold of Three-Dimensional Free-Standing Silver Nanowire Aerogels for Stable Lithium Metal Batteries: *In Operando* xrd Investigation** – N. Phattharasupakun, J. Wutthiprom, S. Duangdangchote, P. Bunyanidhi, and M. Sawangphruk (Vidyasirimedhi Institute of Science and Technology)

Lone Star A1, Dallas Sheraton Convention Center

Solid State Batteries 2 – 14:00 – 16:00
Chair(s): Wu Xu, Jin Dai and Nick Wu

14:00 **171** **Hybrid Polymer Electrolytes for Lithium Metal Batteries** – H. Wu, B. Liu, Q. Li (Pacific Northwest National Laboratory), L. Zhang (Pacific Northwest National Laboratory, Inst. of Solid State Physics, Chinese Academy of Sciences), J. G. Zhang, and W. Xu (Pacific Northwest National Laboratory)

14:20 **172** **Effects of Lithium-Ion Conducting Solid Particles in Hybrid Electrolytes on Lithium-Ion Cell Performance** – T. H. Kusama, K. Yoshima, T. Sugizaki, K. Hoshina, T. Sasakawa, Y. Harada, and N. Takami (Corporate Research & Development Center, Toshiba Corp.)

14:40 **173** **Metrics of Hybrid Polymer/Ceramic Electrolyte for 21700 Cylindrical Solid-State Batteries Powering Electric Vehicles** – C. Mao, S. W. Kim, and Y. Liu (SF Motors Inc)

15:00 **174** **Investigation of Li Ion Dynamics in Garnet Oxide $Li_{6.5}La_3Zr_{1.5}Ta_{0.5}O_{12}$ Using Molecular Dynamics Simulation** – J. Dai (Michigan State University)

15:20 **175** **Understanding the Effect of Interlayer on the Performance of All-Solid-State Li_2S Batteries** – M. Shin and A. A. Gewirth (University of Illinois at Urbana-Champaign)

15:40 **176** **Ceramic-Polymer Interaction in Solid-State Composite Electrolytes of Lithium Ion Batteries** – H. Yang and N. Wu (West Virginia University)

Lone Star A2, Dallas Sheraton Convention Center

Diagnostics 1 – 14:00 – 16:00
Chair(s): Marshall C. Smart and William Yourey

14:00 **177** **The Impact of Radiation Exposure upon Lithium-Ion Batteries for Future Planned NASA Missions to Europa** – M. C. Smart, F. C. Krause, B. V. Ratnakumar, A. Ulloa-Severino, A. Mnatsakanian (Jet Propulsion Lab., California Institute of Technology), L. Bienvenu, J. Dembec, and T. Mault (Enersys Advanced Systems, ABSL Space Products, Inc.)

14:20 **178** **Low-Cost Self-Assembled Oxide Separator for Rechargeable Batteries** – N. S. Grundish, C. D. Amos, H. Khani, A. Agrawal, and J. B. Goodenough (The University of Texas at Austin)

14:40 **179** **Revealing the Atomic Origin of Heterogeneous Li-Ion Diffusion By Probing Na** – B. Xiao (Pacific Northwest National Laboratory), K. Wang (Beijing University of Technology), G. L. Xu (Argonne National Laboratory), J. Song (Pacific Northwest National Laboratory), Z. Chen (Argonne National Laboratory), K. Amine (Stanford University), D. Reed (Pacific Northwest National Laboratory), M. Sui (Beijing University of Technology), V. Sprenkle (Pacific Northwest National Laboratory), Y. Ren (Argonne National Lab), P. Yan (Beijing University of Technology), and X. Li (Pacific Northwest National Laboratory)

15:00 **180** **In-Situ Analysis of Nucleation and Growth of Transition Metal Oxalate Particles As Precursors for Battery Active Materials Via Time Evolution of Solution Composition and Particle Size Distribution** – H. Dong, A. Wang (University of Virginia), G. Smart (Mettler Toledo Autochem), D. Johnson (Advanced TechniSales), and G. Koenig (University of Virginia)

15:20 **181** **Key Features in the Manufacturing Process of Ultra-Thick Electrodes for High Energy Lithium Ion Batteries** – E. Heider, A. Hoffmann, L. Kremer, C. Dreer, C. Pfeifer (ZSW - Center for Solar Energy and Hydrogen Research), R. Diehm, J. Kumberg, W. Schabel (Karlsruhe Institute of Technology (KIT), Germany), and M. Wohlfahrt-Mehrens (ZSW - Center for Solar Energy and Hydrogen Research)

15:40 **182** **Lithium Ion Accelerated Charge Procedure Developed from Half Cell Characterization** – W. Yourey (Penn State University, Hazleton, Lawrence Berkeley National Labratory), Y. Fu, N. Li, V. Battaglia, and W. Tong (Lawrence Berkeley National Laboratory)

Lone Star B/C, Dallas Sheraton Convention Center

A02 Poster Session – 18:00 – 20:00
Chair(s): Brett L. Lucht and Jie Xiao

- **183** **Novel Tin (IV) Oxide-Carbon Composite Anode Material for High-Capacity Li-ion Batteries** – J. A. Weeks (The University of Texas at Austin), C. B. Mullins (University of Texas at Austin), and A. Heller (The University of Texas at Austin)
- **184** **The Effect of Metal-Oxide Coating on the Electrochemical Performance of Carbon-Nanofibers Anodes in Lithium-ion Batteries** – J. Ayala, J. Lopez, G. Gonzalez, and M. Alcoutlabi (University of Texas, Rio Grande Valley)
- **185** **Centrifugally Spun α-Fe_2O_3/TiO_2/Carbon Composite Fibers as Binder-free Anodes for Lithium Ion Batteries** – G. Gonzalez, A. Elizondo, J. Ayala, J. Lopez, and M. Alcoutlabi (University of Texas, Rio Grande Valley)
- **186** **Centrifugally Spun Carbon Composite Fibers and Their use as Anode Materials in Lithium-ion Batteries** – A. Elizondo, R. Gonzalez, J. Lopez, and M. Alcoutlabi (University of Texas, Rio Grande Valley)
- **187** **Interfacial Stabilization for Improved Cycling Performance of Polymer-Based All-Solid-State Batteries Using Additive Combination** – M. Yee (Chungnam National University, Republic of Korea), J. Suk (Korea Research Institute of Chemical Technology), and S. W. Song (Chungnam National University, Republic of Korea)
- **188** **Lithium-Sulfur Batteries with a 1T MoS_2/Graphene As a Highly Efficient Electrocatalyst** – J. He and A. Manthiram (The University of Texas at Austin)
- **189** **Novel Alkyl Aluminum Coating Method for Lithium Ion Batteries Cathode Materials** – M. Aoki, Y. Takemoto (Tosoh-finechem corporation), T. Futagoishi (Tosoh-finechem Corporation), K. Inaba, N. Nakajima (Tosoh-finechem corporation), T. Haraguti, and K. Sakai (University of Miyazaki)
- **190** **Polypropylene Carbonate Based Solid Polymer Electrolytes for Lithium Ion Batteries** – J. LaCoste, N. Campo (University of Louisiana Lafayette), S. Ardoin, Z. He (University of Louisiana at Lafayette), H. Guo (Central South University), and L. Fei (University of Louisiana at Lafayette)
- **191** **All-Solid-State Lithium Batteries Assembled with Surface-Modified Lithium Electrode** – J. Y. Min, H. Son (Hanyang University), H. S. Woo (Department of Chemical Engineering, Hanyang University), and D. W. Kim (Hanyang University)
- **192** **Enhancement of the Cycling Performance of Sodium-Metal Cells By Use of a Conductive Polymer Additive** – J. Y. Choi, M. S. Park, G. K. Veerasubramani, and D. W. Kim (Hanyang University)
- **193** **Lithium-Ion Polymer Cells Fabricated Using in-Situ Cross-Linked Quasi-Solid-State Polymer Electrolyte** – S. G. Park (Hanyang University), Y. C. Jung, Y. Seo (Department of Chemical Engineering, Hanyang University), and D. W. Kim (Hanyang University)
- **194** **A Single Secondary Particle Model for $LIFePO_4$ Electrochemical Performance Evaluation.** – J. Song, J. Park, and Y. M. Lee (DGIST)
- **195** **Electrochemical Properties of Assbs with High Energy Density Using Thin Solid Electrolyte Sheet** – H. M. Ryu (Korea Institute of Industrial Technology (KITECH)), D. H. Kim (KITECH), M. Y. Kim (Korea Institute of Indsutrial Technology), H. Y. Jung (KITECH), H. J. Ban (Korea Institute of Industrial Technology(KITECH)), Y. W. Song, S. H. Jeon, and H. S. Kim (Korea Institute of Industrial Technology (KITECH))
- **196** **Fabrication and Electrochemical Studies of Ncm Cathode Active Material with Nano-Grade Materials for All-Solid State Batteries** – S. J. Park (Korea Institute of Industrial Technology (KITECH)), S. H. Yang (Korea Institute of Industrial Technology(KITECH)), M. Y. Kim (Korea Institute of Indsutrial Technology), H. Y. Jung (KITECH), H. J. Ban (Korea Institute of Industrial Technology(KITECH)), Y. W. Song, S. H. Jeon (Korea Institute of Industrial Technology (KITECH)), S. J. Nam (KITECH), H. S. Kim (Korea Institute of Industrial Technology (KITECH)), J. H. Han, and Y. A. Kim (Chonnam National University)

- **197** **Carbon Nanotubes/Graphene Composites Treated By Nitrogen-Plasma and Covered By Porous Cobalt Oxide through Galvanostatic Electrodeposition As Well As Annealing for Anode Materials of Lithium-Ion Batteries** – C. C. Lin (National Yunlin University of Science and Technology), A. N. Wu, and S. H. Jiang (National Yunlin University of Science and Technology)
- **198** **Electrochemical Properties of Zr^{4+} Doped $LiFePO_4$ cathode Material for Li-Ion Battery** – C. Ellinwood, C. Zavala, O. Carson, and H. Fang (Sam Houston State University)
- **199** **Effect of Titanium Disulfide Cathode Additive in the Performance of Li-S Batteries** – G. P. Pandey, J. I. Adams, J. Callaway, and L. Meda (Xavier University of Louisiana)
- **200** **Structure Engineering and Structure-Property Study of $TiNb_2O_7$ Nanofibers As Anode for Safer Lithium Ion Batteries** – S. Ardoin (University of Louisiana at Lafayette), J. LaCoste (University of Louisiana Lafayette), H. Guo, Z. He, and L. Fei (University of Louisiana at Lafayette)
- **201** **Facile Improvement of Dual-Functional Catalytic Activity of Perovskite $La_{0.6}Sr_{0.4}CoO_{3-\Delta}$ Oxide Decorated with Nanostructured Palladium for Oxygen Electrochemical Reactions in Lithium-Air Battery** – K. S. Nahm, M. Y. Oh, and J. J. Lee (Chonbuk National University)
- **202** **Characterization of Limiting Factors in All-Solid-State Lithium Batteries Using an Embedded Reference Electrode** – H. T. Lim, G. H. Chang, H. U. Choi (Changwon National University), and S. Kang (Research Institute of Industrial Science and Technology)
- **203** **Investigation of the Effects of Crystallinity of Iron Oxyhydroxides on Na-Ion Charge Storage** – S. Niu and C. P. Rhodes (Texas State University)
- **204** **Challenge and Perspective of Interface between Li Metal and Llzo in Solid State Battery** – K. Guo (Ford Motor Company)
- **205** **Surface Modification of Graphite Anode Material By Coating WO_{3-X} for Fast Chargeable Lithium Ion Battery** – S. Kim, D. J. Chung, D. Youn, and H. Kim (Hanyang University)
- **206** **Lithium Ion Intercalation into Graphite in so_2-Based Inorganic Electrolyte Towards High-Rate Capable and Safe Lithium Ion Batteries** – J. Lee, A. Kim, H. Jung (Hanyang University), G. Jeong (Korea Electronics Technology Institute), and H. Kim (Hanyang University)
- **207** **Two Dimensional SiO_x Materials As High Capacity Anode Materials for Lithium Ion Battery** – D. Youn, S. Kim, H. Yoo, and H. Kim (Hanyang University)
- **208** **Dual-Crosslinked Polyacrylamide Binders with Various Polysaccharides and Their Application to High Capacity Anodes** – B. Gendensuren, J. Kim, and E. S. Oh (University of Ulsan)
- **209** **Capacity Limiting Factors in Ambient Pressure Li-Air Battery** – A. Dutta, K. Ito, and Y. Kubo (National Institute for Materials Science)
- **210** **Effects of a Novel Fluorinated Linear Carbonate Additive on the High Voltage Performance of Lithium Ion Batteries** – C. B. Dzakpasu, Y. Roh, S. Byun (DGIST), J. Y. Kim, K. M. Kim (Electronics and Telecommunications Research Institute), M. H. Ryou (Hanbat National University), and Y. M. Lee (DGIST)
- **211** **Synthesis of $LiNi_{0.8}Mn_{0.1}Co_{0.1}O_2$ by an Oxalate Precipitation** – H. N. Pollen (Norwegian University of Science and Technology), N. P. Wagner (SINTEF Industry), and F. Vullum-Bruer (Norwegian University of Science and Technology)
- **212** **Evaluation of High-Rate Pulsed Vs. Continuous Charging in Lithium-Ion Batteries** – A. N. Mansour, J. K. Ko, and G. H. Waller (Naval Surface Warfare Center, Carderock Division)
- **213** **Single-Step Preparation of Li2S-C Composite Electrode for Sulfide Based All-Solid-State Battery** – G. H. Chang and H. T. Lim (Changwon National University)
- **214** **Size-Effects of Micropattern on Lithium Metal Surface on the Electrochemical Performance of Lithium Metal Secondary Batteries** – D. Kim, J. Park (DGIST), D. Jin, M. H. Ryou (Hanbat National University), and Y. M. Lee (DGIST)
- **215** **Mitigating Storage-Induced Degradation of $LiNi_{0.8}Co_{0.1}Mn_{0.1}O_2$ for Lithium-Ion Batteries Via Surface Tuning with Phosphate** – W. G. Ryu, H. S. Shin (Korea Institute of Energy Research), M. S. Park (Kyunghee University), K. N. Jung (Korea Institute of Energy Research), and J. W. Lee (Chosun University)
- **216** **One-Step Synergy of Coating and Doping By TiN Atomic Layer Deposition for Significant Improvement on Li-Ion Battery** – Y. Gao, J. Park, and X. Liang (Missouri University of Science and Technology)
- **217** **Improving Rate Capability and Coulombic Efficiency Via Crosslinking Sulfonated Chitosan Protective Coating on Natural Graphite Anode in Lithium Ion Batteries** – C. Y. Lu, C. Y. Chao, and N. L. Wu (National Taiwan University)
- **218** **Honeycomb-like Nitrogen-Doped Carbon 3D Nanoweb@Li_2s Cathode Material for Use in Lithium Sulfur Batteries** – Y. Kim (Department of Chemical Engineering, POSTECH), Y. Noh, S. Lee, J. Bae, Y. Kim, H. Ahn (Pohang University of Science and Technology), and W. B. Kim (Department of Chemical Engineering, POSTECH)
- **219** **Bipolar All-Solid-State Battery Enabled By a Perovskite-Based Hybrid Solid Electrolyte** – H. S. Shin (Korea Institute of Energy Research), M. S. Park (Kyunghee University), K. N. Jung (Korea Institute of Energy Research), and J. W. Lee (Chosun University)

- **220** **Double-Doped Porous Perovskite $La_{0.6}Ca_{0.4}Fe_{0.8}Ni_{0.2}O_3$ Nanofibers As a High Efficient Bifunctional Catalyst for Rechargeable Lithium-Oxygen Batteries** – Z. Wang (Huazhong University of Science and Technology), L. Zou (Huazhong University of Science &Technology), R. Li (Huazhong University of Science and Technology), J. Li (Hubei University), B. Chi, J. Pu, and J. Li (Huazhong University of Science and Technology)
- **221** **Comparative Analysis on Deactivation of Redox Mediators in Li-O_2 Battery** – H. Kim, T. T. Nguyen, and Y. K. Sun (Department of Energy Engineering, Hanyang University)
- **222** **Opportunity for High Performance Lithium-Metal Batteries Enabled By in Situ Formation of Highly Stable Solid Electrolyte Interphase Layer** – S. J. Park (Hanyang university), S. H. Lee, and Y. K. Sun (Department of Energy Engineering, Hanyang University)
- **223** **Study on Degradation of Microstructure in Ni-Rich $Li[Ni_xCo_yMn_{1-x-Y}]O_2$ (x = 0.8, 0.9) Cathodes from Accelerated Calendar Aging** – H. H. Ryu, K. J. Park, U. H. Kim, J. H. Kim, and Y. K. Sun (Department of Energy Engineering, Hanyang University)
- **224** **Simultaneous MgO Coating and Mg Doping of Co-Free Cathode Material for High-Voltage Sodium-Ion Batteries** – T. Y. Yu and Y. K. Sun (Department of Energy Engineering, Hanyang University)
- **225** **Sulfurized Polyacrylonitrile Cathode and Polyacrylic Acid Binder for Advanced Potassium–Sulfur Batteries** – J. Y. Hwang, H. M. Kim, S. Shin, and Y. K. Sun (Department of Energy Engineering, Hanyang University)
- **226** **Studying the Influence of Carbon Sources Added on a Cost Effective Route to Synthesize $LiFePO_4$/C in a Quasi-Open Environment** – F. Gu, K. Jung (University of California, Riverside), and A. A. Martinez-Morales (Materials Science and Engineering, UC Riverside)
- **227** **Phase Inversion Strategy to Flexible Freestanding Electrodes: Critical Coupling of Binders and Electrolytes for High Performance Li-S Battery** – W. Wahyudi, Z. Chao, P. Kumar, M. Li, Y. Wu, M. N. Hedhili, L. Cavallo, L. J. Li, J. Ming, and T. D. Anthopoulos (King Abdullah University of Science and Technology)
- **228** **In-Depth Analysis of Binder Distribution within Lithium-Ion Battery Electrode Using SAICAS** – S. Byun (DGIST), K. Kim (Hanbat National University), J. Choi (University of Wollongong), M. H. Ryou (Hanbat National University), and Y. Lee (DGIST)
- **229** **Electrolyte Effects on the Intercalation of PF_6^- into Graphite Positive Electrode for Dual-Ion Batteries** – D. Yu and Y. Wang (City University of Hong Kong)
- **230** **Interconnected Porous Sb-C Nanocomposite As an Anode Material with High Capacity for K-Ion Batteries** – H. S. Ki, R. Verma, and C. J. Park (Chonnam National University)
- **231** **Carbon Coated Tin Selenide Nanocomposite Anode Materials for Advanced Potassium-Ion Batteries** – R. Verma and C. J. Park (Chonnam National University)
- **232** **Solid-State Li-O_2 Battery Using a Perovskite Type Solid Electrolyte with an Improved Interfacial Property** – T. T. Khan and C. J. Park (Chonnam National University)
- **233** **Polycarbonate and Poly(ethylene oxide) Blending As a Solid Polymer Electrolyte for All Solid State Li-Ion Batteries** – B. J. Sung, P. N. Didwal, and C. J. Park (Chonnam National University)
- **234** **In-Situ Growth of Conductive Copper Metal Organic Framework on Silicon Nanoparticles for High Performance Lithium Ion Batteries** – A. Nazir and C. J. Park (Chonnam National University)
- **235** **KPF_6-KFSA Binary Salt Electrolytes for 4 V-Class Potassium Batteries** – T. Hosaka, T. Matsuyama (Tokyo University of Science), K. Kubota, and S. Komaba (Tokyo University of Science, ESICB-Kyoto University)
- **236** **Electrochemical Properties of Petroleum Coke As Active Material of Negative Electrode in Lithium Batteries** – E. Kuzmina (Ufa Institute of Chemistry of Russian Academy of Sciences), N. Chudova (Ufa Institute of Chemistry the Russian Academy of Sciences, Ufa State Petroleum Technological University), T. Prosochkina (Ufa State Petroleum Technological University), E. Karaseva (Ufa Institute of Chemistry of Russian Academy of Sciences), and V. Kolosnitsyn (Ufa Institute of Chemistry of Russian Academy of Sciences, Ufa State Petroleum Technological University)
- **237** **Fabrication of a Spinose Structure $LiFePO_4$ Cathode Via Surface Etching to Improve the Rate Capability and Cycling Stability of Li-Ion Batteries** – J. Kim (Chemical and Environmental Engineering, UC Riverside, CE-CERT, UC Riverside), T. Lim (CE-CERT, UC Riverside), and A. A. Martinez-Morales (Materials Science and Engineering, UC Riverside, CE-CERT, UC Riverside)
- **238** **The Effect of Support Salt on Penetration Depth of Reaction of Electrochemical Reduction of Sulfur into Volume of Positive Electrode of Lithium-Sulfur Batteries** – E. Karaseva, E. Kuzmina, D. Kolosnitsyn, A. Melnikova, N. Shakirova, and V. Kolosnitsyn (Ufa Institute of Chemistry of Russian Academy of Sciences)
- **239** **Fabrication and Characterization of Highly Ordered Graphite Nanofiber Network Structure for Lithium-Sulfur Batteries** – D. K. Lee, H. J. Jeon, and C. W. Ahn (KAIST)
- **240** **Carbon Quantum Dots Deposed on TiO_2 Hollow Spheres for Lithium-Ion Battery Anodes** – A. Martinez-Morales and S. Lee (UC,Riverside)
- **241** **Experiment and Modeling of Electrochemical Performance of Lithium-Sulfur Batteries with Varying Carbon to Sulfur Ratios** – G. Koenig, C. Michaelis (University of Virginia), N. Erisen, and D. Eroglu (Middle East Technical University)

- **242** **Electrochemical Performance of Artificial Graphite Coated By Petroleum Pitch for Anode Material in Li-Ion Battery** – J. D. Lee and Y. J. Jo (Chungbuk National University)
- **243** **Superior Lithium/Potassium Storage Capability of Nitrogen-Rich Porous Carbon Nanosheets Derived from Petroleum Coke** – P. Li and Y. K. Sun (Department of Energy Engineering, Hanyang University)
- **244** **Electrochemical Investigations of High Voltage $Na_4Ni_3(PO_4)_2P_2O_7$ Cathode for Sodium Ion Batteries** – R. K. Petla (QEERI), R. Amin (Qatar Environment and Energy Research Institute), I. Belharouak (Qatar Environment & Energy Research Institute, HBKU), M. T. Sougrati (RS2E FR 3459 CNRS, France), H. Ben Yahia (Qatar Environment & Energy Research Institute, HBKU), and R. Essehli (Qatar Environment and Energy Research Institute)
- **245** **Increasing Surface Charge Density By Intrinsic Charge Layer Inclusion for High Performance Efficient Triboelectric Nanogenerators** – A. Ravichandran, M. Ramuz, and S. Blayac (EMSE-CMP)

A03 Large Scale Energy Storage 10

Energy Technology / Battery / Industrial Electrochemistry and Electrochemical Engineering / Physical and Analytical Electrochemistry

San Antonio Ballroom B, Dallas Sheraton Convention Center

Aqueous Systems - Systems/Demonstrations – 08:00 – 10:05
Chair(s): Trung Van Nguyen and Wei Wang

08:00 **Introduction**

08:05 **400** ***(Invited)*** **Development and Practical Verification of the Redox Flow Battery in SEI** – T. Shigematsu (Power Systems R&D Center, Sumitomo Electric Industries, Ltd.)

08:45 **401** **A 10kW Class Ti/Mn Redox Flow Battery** – H. Kaku, H. Yamaguchi, Y. R. Dong, R. Tatsumi, K. Miyatake, K. Moriuchi, Y. Tsutsui, and T. Shigematsu (Power Systems R&D Center, Sumitomo Electric Industries, Ltd.)

09:05 **402** ***(Invited)*** **Status and Future Perspectives of Redox Flow Batteries** – Z. G. Yang (UniEnergy Technologies)

09:35 **403** ***(Invited)*** **100MW-class vanadium flow battery projects in different applications in China** – M. Huang (VRB Energy Operations (Beijing) Co. Ltd.)

Aqueous Systems - Electrolytes/Electrode Materials 1 – 10:20 – 12:30
Chair(s): Wei Wang and Trung Van Nguyen

10:20 **404** ***(Invited)*** **Performance Improvements and Cost Considerations of the Vanadium Redox Flow Battery** – M. Skyllas-Kazacos (UNSW Sydney)

11:00 **405** ***(Invited)*** **Zinc Based Flow Battery for Stationary Energy Storage** – X. Li (Dalian Institute of Chemical Physics)

11:30 **406** **Low Cost Zinc-Iron Rechargeable Flow Battery with High Energy Density** – A. Accogli, M. Gianellini, G. Panzeri, E. Gibertini, and L. Magagnin (Politecnico di Milano)

11:50 **407** **A Quinone-Based Redox Flow Battery at Near-Neutral pH with Record Capacity Retention Rate** – Y. Ji (Harvard Department of Chemistry and Chemical Biology), M. A. Goulet (Harvard School of Engineering and Applied Sciences), D. Pollack (Harvard Department of Physics), D. G. Kwabi, S. Jin, D. De Porcellinis (Harvard School of Engineering and Applied Sciences), E. Kerr, R. G. Gordon (Harvard Department of Chemistry and Chemical Biology), and M. J. Aziz (Harvard School of Engineering and Applied Sciences)

12:10 **408** **A Low-Cost and Robust Aqueous Organic Redox Flow Battery** – B. Yang, A. Murali, A. Nirmalchandar, B. S. Jayathilake (University of Southern California), G. K. Surya Prakash (Loker Hydrocarbon Research Institute, Dept of Chemistry, University of Southern California), and S. R. Narayanan (University of Southern California)

Industrial Electrochemistry and Electrochemical Engineering Division New Electrochemical Technology (NET) Award Address – 14:00 – 14:40
Chair(s): John A. Staser and Trung Van Nguyen

14:00 **409** ***(Industrial Electrochemistry and Electrochemical Engineering Division New Electrochemical Technology (NET) Award Address)*** **Development and Commercialization of Large Scale PEM Water Electrolysis** – R. Abouatallah, N. I. Joos, R. Y. Wang, and A. Sinanan (Hydrogenics Corporation)

Energy Technology Division Supramaniam Srinivasan Young Investigator Award Address – 14:40 – 15:20
Chair(s): Andrew M. Herring and Trung Van Nguyen

14:40 **410** ***(Energy Technology Division Supramaniam Srinivasan Young Investigator Award Address)*** **Towards Deterministic Electrode Design: Elucidating the Role of Surface Chemistry and Microstructure on Flow Battery Performance** – F. R. Brushett (Joint Center for Energy Storage Research, MIT, Department of Chemical Engineering,MIT)

Lone Star B/C, Dallas Sheraton Convention Center

A03 Poster Session – 18:00 – 20:00

- **411** **Microwave Synthesis of TiP_2O_7 assisted By Carbon-Coating As Anode Material for Aqueous Rechargeable Lithium Ion Batteries** – H. Song (Carnegie Mellon University), J. Chang (West Virginia University), J. Wu, W. Wu, and J. Whitacre (Carnegie Mellon University)

- **412** **Linked Donor-Acceptor Systems for Symmetric Nonaqueous Redox Flow Batteries** – A. Rajewski, S. C. Mann, N. J. Mortimer, A. Dumitrascu (Michigan State University Bioeconomy Institute), J. G. Gillmore (Hope College, Michigan State University Bioeconomy Institute), and T. F. Guarr (Michigan State University Bioeconomy Institute, Jolt Energy Storage Technologies, LLC)
- **413** **Building Blocks for Symmetric Multielectron Nonaqueous Redox Flow Batteries** – A. Porath, S. C. Mann, A. Dumitrascu, D. R. Henton (Michigan State University Bioeconomy Institute), J. G. Gillmore (Hope College, Michigan State University Bioeconomy Institute), and T. F. Guarr (Jolt Energy Storage Technologies, LLC, Michigan State University Bioeconomy Institute)
- **414** **Enhancing Cell Performances of High Ni-Content NCM cathode By Surface Modification with SiO_2** – H. S. Kim, S. H. Lee, G. Park, and B. S. Jin (KERI)
- **415** **Polysulfone-Based Membranes for Vanadium Redox-Flow Batteries** – E. A. Karpushkin, A. I. Komayko, V. A. Timoshenko, and V. G. Sergeyev (Lomonosov Moscow State University)
- **416** **Strategies for Hydraulic Recharge of Zinc-Air Flow Batteries** – F. Mahlendorf, D. Fuchs, C. Müller, and A. Heinzel (University of Duisburg-Essen, LET)

A05 Battery Characterization

Battery / Physical and Analytical Electrochemistry

San Antonio Ballroom A, Dallas Sheraton Convention Center

Stress and Strain – 08:00 – 11:00
Chair(s): Matt Pharr and Erik G. Herbert

08:00 **528** ***(Invited)*** **Mechanisms of Stress Relaxation and Intensification at the Lithium/Solid Electrolyte Interface** – E. G. Herbert, S. A. Hackney (Michigan Technological University), and N. J. Dudney (Oak Ridge National Laboratory)

08:40 **529** **Cross Sectional Mapping of Nano-Mechanical Properties of Composite Electrodes for Lithium Ion Batteries Using Bimodal Mode Atomic Force Microscopy** – T. Masuda, H. Sakai (National Institute for Materials Science), Y. Taniguchi (Asylum Research, Oxford Instruments KK), and K. Uosaki (National Institute for Materials Science)

09:00 **530** **A Modified Phenomenological Force Model for Charge Process of Lithium-Ion Battery** – R. Li (Tsinghua Univerisity), D. Ren (Tsinghua University), C. Xu (China Agricultural University), Z. Hou, X. Han (Tsinghua Univerisity), L. Lu (Collaborative Innovation Center of Electric Vehicles), and M. Ouyang (Tsinghua University)

09:20 **531** **Pressure Evolution in Constrained Li Metal Pouch Cells** – A. Raj (Princeton University), C. C. Dickerson (Idaho National Laboratory), C. Niu, J. Xiao (Pacific Northwest National Laboratory), D. A. Steingart (MAE/ACEE Princeton University), E. J. Dufek, and B. Liaw (Idaho National Laboratory)

09:40 **Break**

10:00 **532** **Electrochemical Bridging-Impact Method for Characterizing the NCA@Carbon Core–Shell Cathode** – A. Krittayavathananon, S. Duangdangchote, and M. Sawangphruk (Vidyasirimedhi Institute of Science and Technology)

10:20 **533** ***(Invited)*** **In-Situ Measurements of Stress Evolution in Composite Sulfur Cathodes** – M. Pharr, Y. Zhang, Y. Luo, C. Fincher, and S. Banerjee (Texas A&M University)

In Situ Spectroscopy 1 (Bulk) – 11:00 – 12:00
Chair(s): Feng Lin, Gabriel M. Veith and Robert J. Messinger

11:00 **534** **Ex Situ and Operando Characterization of Energy Storage Materials By Benchtop XAFS and XES** – E. Jahrman, A. Ditter, W. Holden, L. Pellerin, G. T. Seidler, L. Bradshaw (University of Washington), B. J. Polzin, and T. T. Fister (Argonne National Laboratory)

11:20 **535** **Discharge Reactions of γ-MnO_2 and Mo_6S_8 Tracked in the Electrode Bulk of Sealed Devices By Energy Dispersive X-Ray Diffraction (EDXRD)** – J. W. Gallaway, M. A. Kim (Northeastern University), A. Jadhav, R. J. Messinger (The City College of New York), and J. Okasinski (Argonne National Laboratory)

11:40 **536** ***Operando*** **study of Chemical and Structural Evolutions of TiS_2 in Li-Ion and Na-Ion Batteries** – C. H. Lin (Stony Brook University), K. Sun (Brookhaven Nation Laboratory, Stony Brook University), K. Attenkofer, M. Topsakal, J. Bai (Brookhaven National Laboratory), C. Zhao (Stony Brook University), D. Lu, E. Dooryhee, E. Stavitski (Brookhaven National Laboratory), P. Northrup (Stony Brook University), H. Gan (Brookhaven National Laboratory), and Y. C. K. Chen-Wiegart (Stony Brook University, Brookhaven National Laboratory)

In Situ Spectroscopy 2 (Bulk) – 13:30 – 17:30
Chair(s): Feng Lin, Jennifer L. Schaefer and Gabriel M. Veith

13:30 **537** **Self-Diffusion of Electrolyte Species in Composite Battery Electrodes Using PFG-SE MAS NMR for Better Understanding of Their Electrochemical Performance** – S. J. Tambio (Institut des Materiaux Jean Rouxel Nantes), M. Deschamps (Orleans University), M. Deschamps (Centre National de la Recherche Scientifique (CNRS)), V. Sarou-Kanian (CNRS), T. Douillard (Laboratoire MATEIS, INSA-Lyon), F. Cadiou (Univ Lyon, INSA Lyon, CNRS, MATEIS), E. Maire (Laboratoire MATEIS, INSA-Lyon), N. Besnard (Renault Research Department), and B. Lestriez (IMN, CNRS/University of Nantes)

13:50 **538** ***(Invited)*** **Synchrotron X-Ray Spectroscopy and Imaging for Studying Intercalation Battery Chemistries** – F. Lin (Department of Chemistry, Virginia Tech)

14:30 **539** ***In Situ* Characterization of Lithium Deposition and Microstructure Evolution of Silicon Anodes By Synchrotron X-Ray Imaging** – K. Dong (Technische Universität Berlin, Helmholtz-Zentrum Berlin), H. Markötter, M. Osenberg, F. Sun (Helmholtz-Zentrum Berlin), T. Arlt (Technische Universität Berlin), A. Hilger, and I. Manke (Helmholtz-Zentrum Berlin)

14:50 **540** **Accessing the Lithiation/Delithiation Mechanism of a Li-Ion Battery $FeSi_2$/Si/Graphite Composite Negative Electrode and Differentiating the Si/Graphite Contributions By Simultaneous Operando Synchrotron SAXS/Waxs** – C. L. Berhaut (UGA, CEA, CNRS, INAC-SyMMES, 38000 Grenoble, France), D. Zapata Dominguez, S. Tardif, S. Pouget (UGA, CEA, CNRS, INAC-MEM, 38000 Grenoble, France), and S. Lyonnard (CEA Grenoble, DSM/INAC/SPrAM/PCI, UMR 5819)

15:10 **541** **Operando SANS and Synchrotron Radiography Characterization of the Carbon Cathode from Lithium Sulfur Batteries** – C. J. Jafta (Oak Ridge National Laboratory), S. Risse (Helmholtz-Zentrum Berlin), S. Prévost (Institut Max von Laue - Paul Langevin), M. Trapp (Helmholtz-Zentrun Berlin), S. Dai (Oak Ridge National Laboratory), and M. Ballauff (Helmholtz Zentrum Berlin)

15:30 **Break**

16:00 **542** ***(Invited)* Speciation and Electrochemical Properties of Magnesium-Ion Electrolytes** – L. C. Merrill, B. Park, and J. L. Schaefer (University of Notre Dame)

16:30 **543** **Electrochemical Environments for *Operando* Three-Dimensional Studies of Rechargeable Batteries** – C. Tan, S. Randjbar Daemi, T. M. M. Heenan, D. J. L. Brett (University College London), and P. R. Shearing (Electrochemical Innovation Lab, UCL, London)

16:50 **544** **^{23} Na and ^{31} P Solid-State NMR: A Key Tool to Study Local Environments in $Na_3V_2(PO_4)_2F_{3-y}O_y$ ($0 \leq y \leq 2$) Materials** – H. B. L. Nguyen (LRCS, Université de Picardie Jules Verne, Amiens, France), P. Sanz Camacho (ICMCB), C. Masquelier (LRCS, Université de Picardie Jules Verne, Amiens, France), L. Croguennec, and D. Carlier (ICMCB-CNRS, Univ. Bordeaux, Bordeaux INP, Pessac, France)

17:10 **545** ***(Invited)* Molecular-Level Understanding of Ion Intercalation Mechanisms in Aluminum and Zinc Battery Electrodes Revealed By Solid-State NMR Spectroscopy** – R. J. Messinger, A. Jadhav, B. E. Hawkins, and J. Xu (Dept. of Chemical Engineering, The City College of New York)

Lone Star B/C, Dallas Sheraton Convention Center

A05 Poster Session – 18:00 – 20:00

- **546** **Study of Sulfur-Based Electrodes By *Operando* Acoustic Emission** – Q. Lemarie (INRS-EMT Varennes, INSA LYON), H. Idrissi (INSA-Lyon), P. X. Thivel (Univ. Grenoble Alpes, LEPMI, F-38000 Grenoble, France), F. Alloin (Université Grenoble Alpes -CNRS), and L. Roué (INRS-EMT)
- **547** **Depth-Dependent Surface Analyses of 15% Vanadium Modified Lithium Iron Silicate** – Y. Zhang, X. Wei, X. Luo, and X. Cheng (Xiamen University)
- **548** **Synthesis and Electrochemical Performance of ZnO Nanorods and its Application in Silver - Zinc Secondary Battery** – V. T. Nguyen, C. D. Bui, H. T. Nguyen, H. T. Nguyen, B. H. Khuat, P. V. Mai (Institute of Chemistry and Materials), H. T. Do, and N. H. Tran (Faculty of Chemistry, Thai Nguyen University of Education)
- **549** **Investigation of the Influence of Compression of the Cell on Capacity Fade and Homogeneity of Lithium Distribution** – M. Lewerenz (Technische Hochschule Ingolstadt), C. Rahe (HI MS, IEK-12, Forschungszentrum Jülich), C. Endisch (Technische Hochschule Ingolstadt), and D. U. Sauer (Juelich Aachen Research Alliance, JARA-Energy, Germany)
- **550** **Four-Electrode Setup for Electrochemical Impedance Spectroscopy Study of Lithium–Sulfur Batteries** – J. Fang, S. Ghashghaie, H. K. Shahzad, and C. Y. Chung (City University of Hong Kong)

A06 Battery Safety and Failure Modes

Battery / Industrial Electrochemistry and Electrochemical Engineering

State Room 1, Dallas Sheraton Convention Center

Characterizing Battery Safety with Advanced Calorimetry Techniques 1 – 08:00 – 12:00
Chair(s): Thomas Paul Barrera and Guangsheng Zhang

08:00 **Welcoming Remarks**

08:20 **564** ***(Invited)* Gaining Insight into Decomposition Reactions within Energy Storage Systems: Use of Operando Isothermal Microcalorimetry** – E. S. Takeuchi (Brookhaven National Lab, Stony Brook University), A. C. Marschilok (Stony Brook University, Brookhaven National Laboratory), and K. J. Takeuchi (Stony Brook University)

09:00 **565** ***(Invited)* Risk Mitigation Strategies for Combustion / Explosion from Lithium-Ion Cell Failure** – R. Spray, M. Barry, and J. Vickery (Exponent, Inc.)

09:40 **Break**

10:00 **566** ***(Invited)* Changes in Thermal Stability of Cyclic Aged Commercial Lithium-Ion Cells** – T. Lian (Norwegian Defence Research Establishment,), P. J. S. Vie (Institute for Energy Technology), M. Gilljam, and S. Forseth (Norwegian Defence Research Establishment,)

10:40 **567** ***(Invited)*** **Correlation of Degradation Effects and the Thermal Stability of Different Active Materials in Lithium Ion Batteries** – F. Schappacher (MEET Battery Research Center, University of Münster), M. Börner (MEET Battery Research Center, University of Muenster), and M. Winter (Helmholtz Institute Münster, Forschungszentrum Jülich)

11:20 **568** **Thermal Runaway of Large Format Pouch Lithium Ion Cell with Internal Temperature Detection Using Extended Volume Accelerating Rate Calorimetry** – C. Xu (China Agricultural University, Tsinghua University), X. Feng (Tsinghua University), L. Lu (Collaborative Innovation Center of Electric Vehicles), M. Ouyang (Tsinghua University), and F. Jiang (China Agricultural University)

11:40 **569** **Thermal Stability Study of Commercial Lithium-Ion Batteries As a Function of Cathode Chemistry and State-of-Charge** – H. Barkholtz, Y. Preger, J. Langendorf, J. Lamb, B. R. Chalamala, S. Ferreira, and S. Ivanov (Sandia National Laboratories)

Characterizing Cell Faults and Failure Modes – 13:30 – 16:00
Chair(s): Jason Morgan Porter and Ankur Jain

13:30 **Introductory Remarks**

13:40 **570** ***(Invited)*** **The Role of Advanced Characterisation in Understanding the Initiation and Propagation of Failure in Li-Ion Batteries** – P. R. Shearing (Electrochemical Innovation Lab, UCL, London)

14:20 **571** **Design Considerations for Lithium-Ion Battery Safety Used in Unique/Military Platforms** – E. Andrukaitis (Defence Research and Development Canada (DRDC))

14:40 **572** **Safety Assessment of Solid State Batteries** – A. Masias (University of Michigan, Ford Motor Company), S. Tawfik, and J. Sakamoto (University of Michigan)

15:00 **573** **Single-Layer Nail Penetration for Lithium-Ion Battery Safety Characterization** – S. Huang, X. Du, M. Richter, G. M. Cavalheiro, T. Iriyama, and G. Zhang (The University of Alabama in Huntsville)

15:20 **574** **Unlocking the Safety Issues Caused By Internal Short Circuits in Lithium-Ion Batteries** – B. Liu and J. Xu (Beihang University)

15:40 **575** **Multi-Physics Computational Model for Lithium-Ion Batteries Under Mechanical Abusive Loading** – J. Xu and B. Liu (Beihang University)

B03 Carbon Nanotubes - From Fundamentals to Devices

Nanocarbons / Physical and Analytical Electrochemistry
City View 6, Dallas Sheraton Hotel

Nanocarbons Division Richard E. Smalley Research Award Address – 08:00 – 08:40
Chair(s): Slava V. Rotkin

08:00 **692** ***(Nanocarbons Division Richard E. Smalley Research Award Address)*** **Multifunctional Hybrid Carbon Interfaces** – M. Prato (University of TRIESTE, CIC biomaGUNE)

Chemistry 1 – 08:40 – 09:40
Chair(s): Slava V. Rotkin

08:40 **693** ***(Invited)*** **Learning to Predict Single-Wall Carbon Nanotube-Recognition DNA Sequences** – Y. Yang (Lehigh University), M. Zheng (National Institute of Standards and Technology), and A. Jagota (Lehigh University)

09:00 **694** **Effect of DNA on Fundamental Characteristics of Single-Walled Carbon Nanotubes; Length Distribution and Thermal Stability** – M. M. Safaee, M. Gravely, and D. Roxbury (University of Rhode Island)

09:20 **695** ***(Invited)*** **Strategies for Alignment and Spatial Localization of Semiconducting Single-Walled Carbon Nanotubes** – P. Gopalan (University of Wisconsin), J. Dwyer (UW-Madison), K. R. Jinkins, and M. S. Arnold (University of Wisconsin-Madison)

Chemistry 2 – 10:00 – 12:20
Chair(s): Benjamin S. Flavel

10:00 **696** **Tailoring the Properties of Single-Wall Carbon Nanotube Samples through Structure-Selective Photochemistry** – Y. Zheng, S. M. Bachilo, and R. B. Weisman (Rice University)

10:20 **697** ***(Invited)*** **Microenvironment Effects on Photoluminescent Doped Sites of Locally Functionalized Single-Walled Carbon Nanotubes** – T. Shiraki (Department of Applied Chemistry, Kyushu University, WPI-I2CNER, Kyushu University), Y. Niidome, F. Toshimitsu (Department of Applied Chemistry, Kyushu University), and T. Fujigaya (Department of Applied Chemistry, Kyushu University, WPI-I2CNER, Kyushu University)

10:40 **698** **Brightening of Long, Polymer-Wrapped Carbon Nanotubes By Large Scale sp^3 Functionalization** – F. J. Berger, J. M. Lüttgens, and J. Zaumseil (Heidelberg University, Physical Chemistry, Heidelberg University, Centre for Advanced Materials)

11:00 **699** ***(Invited)*** **Controlling the Inner Dielectric Environment of Carbon Nanotubes to Tune Their Optical Properties** – S. Cambre (University of Antwerp), J. Campo (National Institute of Standards and Technology, University of Antwerp), B. Botka, W. van Werveke (University of Antwerp), J. Obrzut (NIST), W. Wenseleers (University of Antwerp), and J. A. Fagan (National Institute of Standards and Technology)

11:20 **700** ***(Invited)*** **Tailoring Optical and Chemical Properties of Nanotube-Based Nanohybrids** – R. Martel (Département de chimie, Université de Montréal)

11:40 **701** **Fast Photo-Chemical Synthesis of Fluorescent Defects on Carbon Nanotubes** – C. W. Lin (Massachusetts Institute of Technology), S. M. Bachilo, Y. Zheng (Rice University), U. Tsedev, S. Huang (Massachusetts Institute of Technology), R. B. Weisman (Rice University), and A. M. Belcher (Massachusetts Institute of Technology)

12:00 **702** ***(Invited)*** **Perylene-Based Functionalization of Carbon Nanotubes** – A. Setaro (Freie Universitaet Berlin)

Separations – 14:00 – 15:20
Chair(s): Sofie Cambré

14:00 **703** ***(Invited)*** **Facile Isolation of Semiconducting Single-Walled Carbon Nanotubes By Flavin-Based Supramolecular Chemistry** – W. Hashimoto (Kyushu University), F. Toshimitsu (WPI-I2CNER, Kyushu University), J. Nishida, A. Staykov (Kyushu University), and N. Nakashima (WPI-I2CNER, Kyushu University)

14:20 **704** ***(Invited)*** **Separation of Small Diameter Swcnts in 1 – 3 Steps with Aqueous Two-Phase Extraction** – H. Li (Karlsruhe Institute of Technology), G. Gordeev, O. Garrity, S. Reich (Freie Universität Berlin), and B. S. Flavel (Karlsruhe Institute of Technology)

14:40 **705** ***(Invited)*** **Purification Using Atpe to Single (n,m) Species in the Large Diameter Single-Wall Carbon Nanotube Limit** – H. Li (Karlsruhe Institute of Technology), M. Zheng (National Institute of Standards and Technology), B. S. Flavel (Karlsruhe Institute of Technology), and J. A. Fagan (National Institute of Standards and Technology)

15:00 **706** ***(Invited)*** **Methylene Blue Helps to Reveal Selectivity of Carbon Nanotube Affinity to Dispersing Agents** – S. M. Bachilo, Y. Zheng, and R. B. Weisman (Rice University)

Synthesis – 15:20 – 16:40
Chair(s): Antonio Setaro

15:20 **707** ***(Invited) In Situ*** **Study of Cobalt-Tungsten and Cobalt Nanocrystals Under Reactive Environment** – Y. Li and F. Yang (Peking University)

15:40 **708** **Synthesis and Metrology for Large-Area Applications of Single-Wall Carbon Nanotube Forests** – E. Meshot, S. J. Park, S. Buchsbaum, K. J. Wu, and F. Fornasiero (Lawrence Livermore National Laboratory)

16:00 **709** **One Dimensional Van Der Waals Heterostructures Wrapped Around Single-Walled Carbon Nanotubes** – R. Xiang, T. Inoue (The University of Tokyo), and S. Maruyama (The University of Tokyo, AIST)

16:20 **710** **Controlled Growth of Metal Nanoparticles on Multi-Walled Carbon Nanotubes for Chemical Sensing Applications** – C. J. Smart, S. Belli, S. Afreen, R. Muresan, and C. Waltz-Chesnaye (Vassar College)

B05 Fullerenes - Endohedral Fullerenes and Molecular Carbon

Nanocarbons
City View 7, Dallas Sheraton Hotel

Endohedral Fullerene - Structures and Properties – 08:40 – 09:40
Chair(s): Shangfeng Yang and Luis Echegoyen

08:40 **768** ***(Invited)*** **Are There Still New Structural Elements in Fullerenes That Cause Violations of the IPR?** – A. L. Balch (University of California-Davis) and M. M. Olmstead (University of California, Davis)

09:00 **769** ***(Invited)*** **What Determines the Composition of Fullerene Porphyrin Cocrystals?** – M. Roy, M. M. Olmstead (University of California, Davis), and A. L. Balch (University of California-Davis)

09:20 **770** ***(Invited)*** **New Advances in Magnetic Properties of Endohedral Metallofullerenes** – A. A. Popov (IFW Dresden)

Exohedral Fullerenes – 10:00 – 13:00
Chair(s): Francis D'Souza and Dirk M. Guldi

10:00 **771** ***(Invited)*** **Prato Addition to C_{70}: A New Adduct and Water-Soluble Derivatives** – K. Liosi and Y. Yamakoshi (ETH Zürich)

10:20 **772** ***(Invited)*** **Electrochemical Reduction of [60] Fullerene-Fused Lactones to [60]Fullerene-Fused Ketones** – C. Niu (University of Science and Technology of China) and G. W. Wang (University or Science and Technology of China)

10:40 **773** ***(Invited)*** **Open-Cage Fullerene C60 Derivatives Encapsulating a Paramagnetic Molecule** – Y. Murata (Institute for Chemical Research, Kyoto University)

11:00 **774** ***(Invited)*** **Synthesis of Benzothieno[60] Fullerenes through Fullerenyl Cation Intermediates** – Y. Matsuo, Y. Yu, and X. Y. Yang (University of Science and Technology of China)

11:20 **775** ***(Invited)*** **Photoinduced Charge Separation in Several Dyads Involving Fullerenes** – M. Solà, A. J. Stasyuk, O. A. Stasyuk, and A. A. Voityuk (Universitat de Girona)

11:40 **776** ***(Invited)*** **Reactivity of Endohedral Metallofullerene Anions** – F. F. Li (Huazhong University of Science and Technology)

12:00 **777** ***(Invited)*** **Prato Addition to $M_3n@C_{80}$(M = Y, Gd): Mono, Bis, and Higher Adducts** – O. Semivrazhskaya, A. Safwan, and Y. Yamakoshi (ETH Zürich)

12:20 **778** ***(Invited)*** **Self-Assemble of Supramolecular Polymers of Porphyrin-Bisfulleropyrazoline Tweezers** – R. Caballero (University of Castilla-la Mancha), F. Langa, and P. de la Cruz (Universidad de Castilla-La Mancha)

12:40 **779** ***(Invited)*** **A Pophyrin-centered Fullerene Tetramer Containing N@C_{60}** – K. Porfyrakis (University of Oxford)

Properties and Mechanisms – 14:00 – 16:40
Chair(s): Alan L. Balch and Steven Stevenson

14:00 **780** ***(Invited)*** **Metallofullerenes – Enabling Long-Lived Radical Ion Pair States** – D. M. Guldi (Universität Erlangen-Nürnberg)

14:20 **781** ***(Invited)*** **Triplet Sensitizer Derived, Nanocarbon Bearing Donor-Acceptor Conjugates for High Potential, Long-Lived Charge Separation** – F. D'Souza (University of North Texas)

14:40 **782** ***(Invited)*** **Excited State Dynamics and Ultrafast Electron Transfer in β-Iodo Substituted Bdp and ADP Donor-Acceptor Systems Featuring Fullerene.** – H. B. Gobeze, S. Shao, and F. D'Souza (University of North Texas)

15:00 **783** ***(Invited)*** **Pristine Carbon Nanowires: Are They Five-Fold Symmetry C_{90}, C_{100} and C_{120} Fullerenes or [5,5] End-Capped Carbon Nanotubes?** – S. Stevenson, T. L. Seeler, R. M. Koenig, K. R. Tepper, H. M. Franklin (Purdue University - Fort Wayne), X. Liu (Virginia Tech Chemistry), X. Wang (University of California, Santa Barbara), and H. C. Dorn (Virginia Tech Chemistry)

15:20 **784** ***(Invited)*** **Chemical Purification of Nanotubular Fullerenes: Separating Buckyballs from Buckytubes** – R. M. Koenig, K. R. Tepper, H. M. Franklin, T. L. Seeler, and S. Stevenson (Purdue University - Fort Wayne)

15:40 **785** ***(Invited)*** **Synthesis of the Elusive Dimetallofullerenes** – F. Liu (IFW Dresden), L. Spree (IFW-Dresden), and A. A. Popov (IFW Dresden)

16:00 **786** ***(Invited)*** **Intramolecular Reactions for Gas-Phase Formation of Carbon-Entrapped Clusterfullerenes** – P. W. Dunk, M. Mulet-Gas, C. L. Hendrickson (National High Magnetic Field Laboratory/FSU), M. R. Cerón (University of Texas at El Paso), L. Echegoyen (The University of Texas at El Paso), A. Moreno-Vicente, A. Rodriguez-Fortea (Universitat Rovira i Virgili), and J. M. Poblet (univ. rovira i virgili)

16:20 **787** ***(Invited)*** **The Growth of Endohedral Metallofullerenes** – L. Abella, A. Rodriguez-Fortea (Universitat Rovira i Virgili), and J. M. Poblet (univ. rovira i virgili)

B06 2D Layered Materials from Fundamental Science to Applications

Nanocarbons / Dielectric Science and Technology / Electronics and Photonics / Interdisciplinary Science and Technology Subcommittee / Sensor
City View 5, Dallas Sheraton Hotel

2D Layered Materials from Fundamental Science to Applications - Session 2 – 08:40 – 12:20
Chair(s): David Estrada

08:40 **813** **Protons Are Transmitted across Single-Layer Graphene in Proton-Exchange-Membrane (PEM) Sandwich Structures More Than 100 Times Faster Than Other Cations** – S. Bukola (Clemson University), C. Korzeniewski (Texas Tech University), J. M. Harris (University of Utah), and S. E. Creager (Clemson University)

09:00 **814** **Potential Applications of Layered Double Hydroxides in Membrane-Based Separation and Anti-Corrosion** – Y. Liu (Dalian University of Technology)

09:20 **815** ***(Invited)*** **MXenes: From Fundamental Science to Emerging Applications** – N. Kurra and Y. Gogotsi (Drexel University)

09:40 **Break**

10:00 **816** **Synthesis and Surface Modification of Two-Dimensional Mxenes As Potential Magnesium Battery Cathodes** – F. H. Fagerli, H. Kaland, J. Hadler-Jacobsen, L. A. Boge, S. M. Selbach (Norwegian University of Science and Technology), Z. Wang (Norwegian University of Science and Technology, SINTEF Industri), and F. Vullum-Bruer (Norwegian University of Science and Technology)

10:20 **817** **Aerosol Jet Printing of Ti_3C_2 Mxene Aqueous Ink** – N. E. Mansoor, F. Muramutsa (Boise State University), C. E. Shuck (Drexel University), H. Subbaraman, T. Pandhi (Boise State University), Y. Gogotsi (Drexel University), and D. Estrada (Boise State University)

10:40 **818** **Emergence of Broadband Plasmon Absorption in Gold nanoparticle-decorated Molybdenum Diselenide Nanosheets** – J. R. Dunklin (National Renewable Energy Laboratory), A. H. Rose (Boston College), H. Zhang, J. Liu (National Renewable Energy Laboratory), and J. van de Lagemaat (National Renwable Energy Laboratory)

11:00 **819** ***(Invited)*** **Light Scattering and Emission from Hetero-Structures** – A. C. Ferrari (University of Cambridge)

11:20 **820** **Charge Generation in Monolayer Transition Metal Dichalcogenides** – J. L. Blackburn, D. Sulas (National Renewable Energy Laboratory), S. J. Yun, Y. H. Lee (Sungkyunkwan University), D. Vigil-Fowler (National Renewable Energy Laboratory), O. Reid (University of Colorado at Boulder), and E. M. Miller (National Renewable Energy Laboratory)

11:40 **821** ***(Invited)*** **Plasmon−Plasmon Interactions and Radiative Damping of Plasmons in Graphene Nanoribbon Arrays** – V. Perebeinos (University at Buffalo)

12:00 **822** ***(Invited)* (sSNOM) Imaging of 2D Encapsulated Ga Layered Metal** – S. V. Rotkin (ESM Department, MRI, The Pennsylvania State University)

2D Layered Materials from Fundamental Science to Applications - Session 3 – 14:00 – 16:40
Chair(s): Vasili Perebeinos

14:00 **823** **Fabrication of Top-Gate MoS_2 FET with Transferred Al_2O_3 Gate Dielectric** – T. Kawanago, T. Oba, and S. Oda (Tokyo Institute of Technology)

14:20 **824** ***(Invited)* 2D Materials for Cryptography** – S. Das (Pennsylvania State University)

14:40 **825** ***(Invited)* Atomic Level Investigation of Resistance Switching in 2D Memory Devices** – S. Hus, R. Ge, X. Wu, Y. Gu, J. C. Lee (The University of Texas at Austin), A. P. Li (Oak Ridge National Laboratory), and D. Akinwande (The University of Texas at Austin)

15:00 **826** ***(Invited)* From Field-Effect Transistors to Tunneling Devices and Resistive Random Access Memories in Two-Dimensional Van Der Waals Structures** – J. Appenzeller (Electrical and Computer Engineering, Purdue University)

15:20 **827** ***(Invited)* Efficient Photodetection in 2D Materials and 2D/3D Heterostructures** – M. C. Lemme (AMO GmbH, RWTH Aachen University)

15:40 **828** ***(Invited)* Electrochemically-Tunable and Low-Power 2D Synapses for Neuromorphic Computing** – F. Xiong (University of Pittsburgh)

16:00 **829** ***(Invited)* Graphene-Based Brain Interfaces for Probing Neural Activity** – D. Kuzum (University of California, San Diego)

16:20 **830** **Tackling Electrons in Two-Dimensional Materials for Electronic and Energy Applications** – Y. Liu (The University of Texas at Austin)

B07 Light Energy Conversion with Metal Halide Perovskites, Semiconductor Nanostructures, and Inorganic/Organic Hybrid Materials

Nanocarbons / Physical and Analytical Electrochemistry
City View 8, Dallas Sheraton Hotel

Perovskite Photovoltaics 2 – 08:40 – 09:40
Chair(s): Lance M. Wheeler, Takashi Sagawa and Brian A. Korgel

08:40 **863** ***(Invited)* Dynamic Chromism in Metal Halide Perovskites** – L. M. Wheeler (National Renewable Energy Laboratory)

09:00 **864** ***(Invited)* Metal Halide Perovskites at the Nanoscale: High Quality Optoelectronic Materials with Unique Phase Properties** – J. M. Luther (National Renewable Energy Laboratory)

09:20 **865** ***(Invited)* $(AgIn)_xZn_{2(1-x)}S_2$ Quantum Dots with ZnO or TiO_2 for Inorganic/Organic Hybrid or Metal Halide Perovskite Solar Cells** – T. Sagawa (Kyoto University)

Perovskite Photovoltaics 3 – 10:00 – 12:20
Chair(s): Eric Wei-Guang Diau and Brian A. Korgel

10:00 **866** ***(Invited)* Designing Novel Organic Small Molecular As Electron Transport Layers for Planar Perovskite Solar Cells** – Q. Zhang (Nanyang Technological University)

10:20 **867** ***(Invited)* Perovskite Single Crystals with Free-Hole Trapping Centers for Photodetector and Solar Cell Applications** – O. Mohammed (KAUST)

10:40 **868** ***(Invited)* Lead-Free Perovskite Solar Cells** – E. W. G. Diau (National Chiao Tung University)

11:00 **869** ***(Invited)* Elucidating Proton Migration in Hybrid Organic Inorganic Perovskites and the Effect of Surface Passivation** – D. M. Bassani, S. Sadhu (University of Bordeaux), T. Buffeteau (university of Bordeaux), and L. Hirsch (University of Bordeaux)

11:20 **870** ***(Invited)* Optical Investigation of Hybrid Perovskite Photophysics** – M. Kuno (university of notre dame)

11:40 **871** ***(Invited)* Temperature-Dependent Photoluminescence and Stability of Methylammonium Lead Iodide ($CH_3NH_3PbI_3$) and $CsPbX_3$ (X=Cl, Br, I) Perovskite Nanocrystal Superlattices** – Y. Zhang, C. Thomas, M. Abney (The University of Texas at Austin), and B. A. Korgel (University of Texas at Austin)

12:00 **872** ***(Invited)* Triplet Energy Transfer at Interfaces between Molecules and Perovskite or Metal Chalcogenide Nanostructures** – J. C. Johnson, H. Lu, D. Sulas (National Renewable Energy Laboratory), J. Anthony (University of Kentucky), E. M. Miller, M. C. Beard, and J. L. Blackburn (National Renewable Energy Laboratory)

Metal/Plasmonics – 14:00 – 16:40
Chair(s): Kei Murakoshi and Stephan Link

14:00 **873** **Resonance Energy Transfer in Hybrid Plasmonic-Polymetallophthalocyanine Nanoantennas Fabricated By Electropolymerization** – S. S. E. Collins, C. Flatebo, Y. Cai, S. Link, and C. F. Landes (Rice University)

14:20 **874** ***(Invited)* High Optical Absorbance Multilayer Film of Au and TiO_2: Charge Generation Dynamics Under Plasmon Excitation** – A. Furube (Tokushima Univ.), T. Takahata (Tokushima University), and S. Yanagiya (Tokushima Univ.)

14:40 **875** ***(Invited)* Single Nanoelectrode Photodissolution Mechanisms** – C. F. Landes (Rice University)

15:00 **876** ***(Invited)* Novel Plasmonic Nanomaterials for Near Infrared Light Energy Conversion** – T. Teranishi (Kyoto University)

15:20 **877** ***(Invited)* Multi-Electron Harvesting and Catalysis Using Plasmonic Nanoparticles: A Mechanistic Understanding** – P. K. Jain (UIUC)

15:40 **878** ***(Invited)* Enhanced Water Splitting Under Modal Strong Coupling Conditions** – H. Misawa (Hokkaido University, National Chiao Tung University)

16:00 **879** ***(Invited)* Single Particle Spectro-Electrochemistry** – S. Link (Rice University)

16:20 **880** **Electrochemical Investigation of Graphene Composited Plasmonic Photo Conversion Electrode** – S. Suzuki, K. Yasuda, H. Minamimoto, and K. Murakoshi (Hokkaido University)

C02 Corrosion General Session

Corrosion

City View 1, Dallas Sheraton Hotel

Corrosion in Various Environments 1 – 08:10 – 12:00
Chair(s): Eiji Tada and Jamie Noel

08:10 **Welcoming Remarks**

08:15 **974** **Effect of Gap Size on Galvanic Corrosion between AA5052 Aluminum-Magnesium Alloy and SS400 Carbon Steel in Aqueous NaCl Solutions** – K. Ota, E. Tada, A. Ooi, and A. Nishikata (Tokyo Institute of Technology)

08:35 **975** **Influence of Cations on Atmospheric Corrosion of Hot-Dipped Galvanized Steel** – Y. Liu, A. Ooi, E. Tada, and A. Nishikata (Tokyo Institute of Technology)

08:55 **976** **Electrochemical Test Configurations to Study Atmospheric Corrosion** – C. Hangarter (U.S. Naval Research Laboratory), B. Gong (California State University, Fresno), R. M. Anderson, and S. A. Policastro (U.S. Naval Research Laboratory)

09:15 **977** **Galvanic Aluminum Bond Pad Corrosion in Copper Wire Bonded Device Assembly – Mechanism and Prevention** – O. Chyan, M. Asokan, Z. Thompson, A. Lambert, and N. Ross (University of North Texas)

09:35 **Break**

10:00 **978** **Comparative Study of Chloride and Fluoride Induced Al Pad Corrosion in Wire Bonded Packaging Assembly** – G. Issac, A. Lambert, M. Asokan, W. Yi, and O. Chyan (University of North Texas)

10:20 **979** **A Study on Corrosion Resistance of Electroplated Gold over Nanocrystalline Ni-W for Contact Applications** – V. Budhraja, J. Stirn, E. Hallstrom, B. Lutz, M. Brennan, and K. Deford (Smiths Interconnect)

10:40 **980** **Comparative Evaluation of Corrosion Effects between Nanocrystalline Silver Alloy and Tradition Gold Stacks Using Spring Probe Contacts** – V. Budhraja, J. Stirn, E. Hallstrom, B. Lutz, M. Brennan, and K. Deford (Smiths Interconnect)

11:00 **981** **Corrosion Behavior of AZ31B Magnesium Alloy in Potassium Nitrate and Sulfate Solutions** – C. K. Chang, C. H. Tu (National Taiwan University), and C. S. Lin (Department of Materials Science and Engineering, NTU)

11:20 **982** **Chemical Mechanical Polishing Implementation for Corrosion Prevention of Titanium Bio-Implants** – G. B. Basim (178 Rhines Hall) and R. Yagan (Koc University)

11:40 **983** **Biodegradable Mg: Controlling the Corrosion Behavior By Biocompatible Coatings** – S. Virtanen (FAU, Institute of Surface Science and Corrosion)

Electrochemical Methods and Corrosion Mechanisms – 13:00 – 16:00
Chair(s): Masayuki Itagaki and Dev Chidambaram

13:00 **984** **Dissolution Mechanisms of Mg Investigated By Various Electrochemical Methods** – M. Itagaki, I. Shitanda, and Y. Hoshi (Tokyo University of Science)

13:20 **985** **Electrochemical Noise Analysis of Aluminum Alloy 6061-T6 in Laminar Flow of Seawater** – L. Veleva and G. Acosta (CINVESTAV-IPN, Merida, Applied Physics Department)

13:40 **986** **Electrode Scratching Technique As a Robust Way to Decouple Erosion-Corrosion Components** – A. Omirkhan (Imperial College London), T. Bos (Shell Technology Center Bangalore), G. Yang (Shell Technology Center Houston), C. Stitt, D. J. Riley, and M. P. Ryan (Imperial College London)

14:00 **987** **Passivation Layer Tailoring Using Laser Powder-Bed Fusion Additive Manufacturing: A Tribocorrosion Study** – T. M. Chiu and H. Castaneda (Texas A&M University)

14:20 **988** **Microstructure, Chemical Composition and Local Corrosion Behavior of Friction Stud Welding Joint** – Y. Gu, S. Wang, H. Gao (Beijing Institute of Petrochemical Technology), and Q. Zeng Sr. (Xi'an Jiaotong University)

14:40 **989** **Dynamical Measurements of Surface Transformations By Galvanic Replacement Reactions on Metal Electrode Interfaces** – Z. Schichtl, H. Mehrabi, and R. Coridan (University of Arkansas)

15:00 **990** **Electrochemistry Behavior and Surface Film Characterization of $Fe_{50}Mn_{30}Co_{10}Cr_{10}$ medium Entropy Alloy in Sulfuric Acid Solution** – Y. S. Lu, C. Y. Huang, H. W. Yen, and Y. L. Lee (National Taiwan University)

15:20 **991** **The Corrosion Behavior of 50-Kg As-Cast Fecrnicomnx Alloys** – K. M. Hsu (National Taiwan University, Department of Materials Science and Engineering) and C. S. Lin (National Taiwan University)

15:40 **992** **Multi-Phase Field Model of Localized Corrosion Kinetics with Corrosion Products Formation** – T. Q. Ansari (The Hong Kong Polytechnic University, Hong KOng) and S. Q. Shi (The Hong Kong Polytechnic University)

F02 Tutorial on Industrial Electrochemistry

Industrial Electrochemistry and Electrochemical Engineering

Pearl 5, Dallas Sheraton Hotel

Tutorial on Industrial Electrochemistry – 14:00 – 16:35
Chair(s): Gerardine G. Botte and E. J. Taylor

14:00 **Introductory Remarks by Gerardine G. Botte and John Harb**

14:05 **1098** ***(Invited)* Aqueous Amination of Carbon Fiber Surfaces for Improved Composite Properties** – M. A. Lowe, P. Vlasak, D. Bank, and R. Baumer (The Dow Chemical Company)

14:35 **1099** ***(Invited)*** **Transition from Coupon Observation to Part Processing and the Challenges in Between** – T. D. Hall, H. Garich, S. H. Vijapur (Faraday Technology, Inc.), R. Radhakrishnan (Faraday Technology), J. Xu, B. Skinn, S. Snyder, E. J. Taylor, and M. Inman (Faraday Technology, Inc.)

15:05 **1100** ***(Invited)*** **Estimation of the Onset of Mass Transfer Limitations in Pulsed Electrochemical Processes** – B. Skinn (Faraday Technology, Inc.)

15:35 **1101** **Effect of H_2 Plasma Modification on the Electrocatalytic Hydrogen Evolution Performance of MoS_2** – J. Hu and C. Zhang (Kunming University of Science and Technology)

16:05 **1102** **Novel Approach for the Electrosynthesis of Copper Nanoparticles** – K. Rudman (Indiana University), S. Hosseini (indiana university), and D. G. Peters (Indiana University)

G01 Silicon Compatible Emerging Materials, Processes, and Technologies for Advanced CMOS and Post-CMOS Applications 9

Electronics and Photonics / Dielectric Science and Technology

City View 2, Dallas Sheraton Hotel

Materials and Devices for Novel Non-volatile Memory Elements and Neuromorphic Computing – 08:30 – 12:00
Chair(s): Hemanth Jagannathan and Paul J. Timans

08:30 **Welcoming Remarks**

08:40 **1164** ***(Invited)*** **Ferroelectric Devices for Alternative, Non-Von Neumann Computing** – A. Khan (Georgia Institute of Technology)

09:20 **1165** **Copper-Based 3-Terminal Synaptic Cell with Multiple Resistance Levels** – T. Todorov (IBM T.J. Watson Research Center), T. Ando, F. M. Ross, J. A. Ott, J. Tang, D. Bishop (IBM T. J. Watson Research Center), J. Collins (IBM T.J. Watson Research Center), V. Narayanan (IBM T. J. Watson Research Center), and J. Rozen (IBM T. J. Watson Research Center)

09:40 **Break**

10:00 **1166** **Study on Forming-Free Characteristic of Amorphous Carbon Oxide Reram By Controlling Cu-Filament Shape** – S. M. Jin, K. H. Kwon (Hanyang University), D. W. Kim (hanyang universtiy), H. J. Kim, H. M. Yang, J. Y. Kim, and J. G. Park (Hanyang University)

10:20 **1167** **Multilevel Resistive Switching in Hf-Based Rram** – B. Jain (NJIT), C. S. Huang, D. Misra (New Jersey Institute of Technology), K. Tapily (TEL Technology Centre, America, LLC), R. D. Clark (TEL Technology Center, America, LLC), S. Consiglio (TEL Technology Center), C. S. Wajda, and G. J. Leusink (TEL Technology Center, America, LLC)

10:40 **1168** **Non-Uniform Dielectric Selectorless Resistive Switching Memory and Reliability Determination for Low Power Array Applications** – Y. C. Chen (The University of Texas at Austin), C. C. Lin (National Nano Device Laboratories, NAR Labs, Taiwan), S. Kim (Chungbuk National University, Republic of Korea), Y. F. Chang (Intel Corporation, USA), and J. C. Lee (The University of Texas at Austin)

11:00 **1169** **Artificial Neuron Based on TiO_2 Cbram for Neuromorphic Computing** – D. W. Kim, K. H. Kwon, H. J. Kim, S. M. Jin, H. M. Yang, J. Y. Kim, and J. G. Park (Hanyang University)

11:20 **1170** **Perpendicular Spin-Transfer-Torque Magnetic Tunnel Junction Multi-Level Cell with Dual Free Layers and MgO Tunnel Barriers** – J. U. Baek, H. S. Jun, J. Y. Choi (Hanyang University), K. Kondo (SUMCO CORPORATION), and J. G. Park (Hanyang University)

11:40 **1171** **Thermal Properties of Non-Volatile Phase Change Memories at Device Length Scale** – K. Aryana, J. Gaskins (University of Virginia), J. Nag, M. Grobis (Western Digital), D. Olson, and P. Hopkins (University of Virginia)

Gordon E. Moore Medal for Outstanding Achievement in Solid State Science and Technology Award Address – 14:00 – 14:50
Chair(s): Christina Bock

14:00 **Introductory Remarks**

14:10 **1172** ***(Gordon E. Moore Medal for Outstanding Achievement in Solid State Science and Technology Award Address)*** **Silicon-Based Photonic Integrated Circuits: The Quest for Compatible Light Sources** – D. J. Lockwood (National Research Council Canada)

Silicon Compatible Emerging Materials, Processes, and Technologies for Advanced CMOS and Post-CMOS Applications 9 – Plenary Session – 14:50 – 15:30
Chair(s): Fred Roozeboom and Hemanth Jagannathan

14:50 **1173** ***(Plenary)*** **Emerging Memory Materials and Electrochemical Synaptic Devices for Scalable Deep Learning Acceleration** – J. Rozen (IDM Research)

Lone Star B/C, Dallas Sheraton Convention Center

G01 Poster Session – 18:00 – 20:00

- **1174** **Novel Exploration of Flat-Band Voltage Manipulation by NPT for Advanced High-k/Metal-Gate CMOS Technology** – J. Yao (IMECAS, University of Chinese Academy of Sciences), Z. Hou (University of Chinese Academy of Sciences), Z. Wu, and H. Yin (IMECAS)
- **1175** **Enhanced Operation Characteristics for Charge Trapping Memory with $Al_2O_3/HfO_2/Al_2O_3$ High-κ Dielectrics and Sige Substrate** – Z. Hou (IMECAS, China, University of Chinese Academy of Sciences), J. Yao, Z. Wu, and H. Yin (IMECAS)

- **1176** **Analysis of OLED Fine Metal Mask Cleaning Process Using a Microstructure** – S. H. Lee, Y. C. Jeong, J. H. Yu, K. Y. Shin (Korea Institute of Industrial Technology), and C. R. Yoon (Deviceeng)
- **1177** **Effects of Ti Electrode on the Electrical Properties of Filament within Al_2O_3 Based Antifuse** – M. Tian (IMECAS, China, University of Chinese Academy of Sciences) and H. Zhong (IMECAS)
- **1178** **Ferroelectric Characteristics of $Hf_{0.5}Zr_{0.5}O_2$-Based Mfis and Mfmis Capacitors for Steep-Slope Ferroelectric Field Effect Transistor Applications** – J. Roh, H. W. Park, Y. B. Lee, S. D. Hyun, K. D. Kim, T. Moon, Y. H. Lee, B. S. Kim, B. Y. Kim, H. H. Kim, and C. S. Hwang (Seoul National University)
- **1179** **Study on Interface Engineering of TiN/SiO2 Layers to Reduce the Parasitic Capacitance in CMOS Circuits** – S. Kim, J. Y. Bae, M. Park, Y. I. Kwon, D. H. Han, U. H. Lee, and Y. Koo (Samsung Electronics Co. Ltd)

HO1 Wide Bandgap Semiconductor Materials and Devices 20

Electronics and Photonics

Austin Ballroom 1, Dallas Sheraton Hotel

Electronics and Photonics Division Award Address – 08:00 – 08:40
Chair(s): Soohwan Jang

08:00 **1260** ***(Electronics and Photonics Division Award)*** **New Directions in GaN Electronic and Photonic Devices Enabled By Electrochemical Processes** – J. Han (Department of Electrical Engineering, Yale University)

Gallium Oxide Materials and Deivces – 08:40 – 12:00
Chair(s): Marko J Tadjer and Soohwan Jang

08:40 **1261** ***(Keynote)*** **Exploration of Process Techniques for Ga_2O_3 Based Diodes** – F. Ren, J. Yang, P. H. Carey IV, S. J. Pearton (University of Florida), M. J. Tadjer (U.S. Naval Research Laboratory), and A. Kuramata (Tamura Corporation and Novel Crystal Technology)

09:20 **1262** ***(Invited)*** **Vertical Ga_2O_3 Transistors Fabricated By Ion Implantation Doping** – M. Higashiwaki, M. H. Wong (Nat. Inst. of Info. and Comm. Tech.), K. Goto, H. Murakami, and Y. Kumagai (Tokyo University of Agriculture and Technology)

09:50 **Break**

10:20 **1263** ***(Invited)*** **B-Ga_2O_3 Traps: Materials to Devices** – A. R. Arehart, E. Farzana, J. McGlone, C. M. Jackson, and S. A. Ringel (The Ohio State University)

10:50 **1264** **Switching Performance up to 150°C of β-Ga_2O_3 Field-Plated Vertical Schottky Diodes for 0.3-1 a Forward Current and 300-900 V Reverse Voltage** – J. Yang, P. H. Carey IV, F. Ren (University of Florida), Y. T. Chen, Y. T. Liao (National Chiao Tung University), C. W. Chang, J. Lin (University of Florida), M. J. Tadjer (Naval Research Laboratory), S. J. Pearton (University of Florida), and A. Kuramata (Tamura Corporation and Novel Crystal Technology)

11:10 **1265** ***(Invited)*** **Halide Vapor Phase Epitaxy for b- and a-Ga_2O_3 Power Electronics Devices** – J. Leach, K. Udwary, J. Rumsey, G. Dodson, H. Splawn, and K. Evans (Kyma Technologies)

11:40 **1266** **High Three-Terminal Breakdown Voltage Exfoliated β-Ga_2O_3 Nanolayer Field-Effect Transistors with Dual Field Modulating Plates** – J. Bae (Korea University), H. W. Kim, I. H. Kang (Korea Electrotechnology Research Institute), and J. Kim (Korea University)

Ultra-Wide Bandgap Materials and Devices – 13:00 – 16:10
Chair(s): Travis J. Anderson and Soohwan Jang

13:00 **1267** ***(Invited)*** **High-Voltage β-Ga_2O_3 vertical Power Diodes and Transistors with Fin Channels** – W. Li, Z. Hu, K. Nomoto (Cornell University), R. Jinno (Kyoto University, Cornell University), T. Nakamura (Dept. of Electrical Engineering, Hosei University), D. Jena, and H. G. Xing (Cornell University)

13:30 **1268** **Temperature-Dependent Electrical Characteristics of β-Ga_2O_3 Diodes with W Schottky Contacts up to 500°C** – C. Fares, F. Ren, and S. J. Pearton (University of Florida)

13:50 **1269** **Thermoreflectance Temperature Mapping of Ga_2O_3 Schottky Barrier Diodes** – P. E. Raad (Southern Methodist University), P. L. Komarov (TMX Scientific, Inc.), M. J. Tadjer (U.S. Naval Research Laboratory), J. Yang, F. Ren, S. J. Pearton (University of Florida), and A. Kuramata (Tamura Corporation and Novel Crystal Technology)

14:20 **Break**

14:40 **1270** ***(Invited)*** **Raman Thermography of β-Ga_2O_3 Nanomembrane FETs on Diamond** – M. J. Tadjer (U.S. Naval Research Laboratory), J. Noh (Purdue University), J. C. Culbertson (U.S. Naval Research Laboratory), S. Alajlouni, M. Si, H. Zhou, A. Shakouri, and P. D. Ye (Purdue University)

15:10 **1271** ***(Invited)*** **Hexagonal Boron Nitride Epilayers** – H. Jiang and J. Lin (Texas Tech University)

15:40 **1272** ***(Invited)*** **Thermal Characterization of Ultra-Wide Bandgap Gallium Oxide Electronics** – S. Choi (The Pennsylvania State University)

H02 Solid-state Electronics and Photonics in Biology and Medicine 6

Electronics and Photonics / Sensor

Austin Ballroom 2, Dallas Sheraton Hotel

FET-Based Sensors – 08:00 – 12:00
Chair(s): Yu-Lin Wang and Chao-Min Cheng

08:00 **Welcoming Remarks**

08:10 **1296** ***(Invited)*** **Graphene Based Devices for in Vitro and In Vivo Electrophysiology** – A. Offenhäusser and D. Kireev (Forschungszentrum Jülich)

08:40 **1297** ***(Invited)*** **Detection of Heart Failure-Related Biomarker in Whole Blood with Graphene Field Effect Transistor Biosensor** – G. Zhang (Hubei University of Chinese Medicine)

09:10 **1298** ***(Invited)*** **Electron Transport and Spin Selectivity in Nucleic Acids and Peptides** – D. H. Waldeck, E. Beall (University of PIttsburgh), and C. Clever (University of Pittsburgh)

09:40 **Break**

10:00 **1299** **Investigation of Electrical Stability and Sensitivity of High Field Modulated Extended Gate FET Biosensors for miRNA Detection** – W. C. Kuo (NTHU) and Y. L. Wang (National Tsing Hua University)

10:20 **1300** **Resonance-Frequency Modulation for Rapid, Point-of-Care Ebola-Glycoprotein Diagnosis with a Graphene-Based Field-Effect Biotransistor** – A. Maity, X. Sui, B. Jin, H. Pu, K. J. Bottum, X. Huang, J. Chang, G. Zhou, G. Lu, and J. Chen (University of Wisconsin-Milwaukee)

10:40 **1301** **Detection and Analysis of Extracellular Vesicles in Physiological Salt Environment Using AlGaN/GaN High Electron Mobility Transistor Biosensors** – A. K. Pulikkathodi, I. Sarangadharan, C. Y. Lo, P. H. Chen, C. C. Chen, and Y. L. Wang (National Tsing Hua University)

11:00 **1302** **Effect of Electrochemically Grafted Aryl-Based Monolayer on Nonspecific Electrical Signal of Field-Effect-Transistor-Based Biosensor** – S. Himori, S. Nishitani, and T. Sakata (The University of Tokyo)

11:20 **1303** **FET Based Heavy Metal Ion Selective Sensors for Lead Ion Detection in Whole Blood** – S. L. Wang, C. Y. Hsieh, and Y. L. Wang (National Tsing Hua University)

11:40 **1304** **A pH/Light Dual-Modal Sensing Isfet Assisted By Artificial Neural Networks** – W. E. Hsu, Y. H. Chang (National Taiwan University), Y. J. Huang, J. C. Huang (Taiwan Semiconductor Manufacturing Company), and C. T. Lin (National Taiwan University)

Wearable and Healthcare Sensors – 13:30 – 16:00
Chair(s): Zong-Hong Lin and Dong Sung Kim

13:30 **1305** ***(Invited)*** **Nanostructured Materials Based Sensors for Smart and Wearable Electronics** – N. E. Lee (Department of Advanced Materials Sci. & Eng., Sungkyunkwan University)

14:00 **1306** ***(Invited)*** **Interactive Skin Display with Epidermal Stimuli Electrode** – C. Park (Dept of Materials Science Engineering, Yonsei University)

14:30 **1307** ***(Invited)*** **Wearable Thermoelectric Generator and Refrigerator Integrated with Flexible Heat Sink** – W. Kim (Yonsei University)

15:00 **Break**

15:10 **1308** ***(Invited)*** **Translating Paper-Based Diagnostic Devices into Clinically Relevant Applications** – C. M. Cheng (National Tsing Hua University)

15:40 **1309** **Design Considerations of Liquid Gated High Field Modulated FET Biosensor for Enhanced Sensing Characteristics** – I. Sarangadharan, A. K. Pulikkathodi, P. H. Chen, S. L. Wang (National Tsing Hua University), W. C. Kuo (NTHU), and Y. L. Wang (National Tsing Hua University)

Lone Star B/C, Dallas Sheraton Convention Center

H02 Poster Session – 18:00 – 20:00
Chair(s): Zong-Hong Lin, Wenzhuo Wu and Yu-Lin Wang

- **1310** **Shark Skin Inspired Riblet Microstructures As a Novel Solid-Liquid Triboelectric Nanogenerator for Energy Harvesting** – C. Yeh, C. C. Liu (Tsinghua University), and Z. H. Lin (National Tsing Hua University)
- **1311** **An Ionic Polymer Actuator Capable of Simultaneously Improving Bandwidth and Blocking Force for Efficient Haptic Feedback** – H. Choi, S. Y. Kim (Dept. of Chemical Engineering, Hanyang Univ.), Y. Kim (School of Electronic Engineering, Soongsil Univ.), C. Cho (Dept. of ICMC Convergence Technology, Soongsil Univ.), H. Lee (School of Electronic Engineering, Soongsil Univ., Dept. of ICMC Convergence Technology, Soongsil Univ.), and D. H. Kim (Dept. of Chemical Engineering, Hanyang Univ.)
- **1312** **High Field Modulated Field Effect Transistors Coated By Ion Selective Membrane for Cadmium Ion Detection in Water** – C. Y. Hsieh, S. L. Wang (National Tsing Hua University), Y. T. Chen (Institute of NanoEngineering and MicroSystems), and Y. L. Wang (National Tsing Hua University)
- **1313** **Biodegradable Self-Powered Electronics and Application in Biomedical Engineering** – Z. Li (Beijing Institute of Nanoenergy and Nanosystems,CAS), Q. Zheng·, H. Li, Z. Liu, W. Jiang (Beijing Institute of Nanoenergy and Nanosystems), Z. Li (Beijing Institute of Nanoenergy and Nanosystem), and H. Feng (Beijing Institute of Nanoenergy and Nanosystems)
- **1314** **Study of Stability and Reproducibility of Cardiac Troponin I Based on FET Sensor** – S. W. Huang (National Tsing Hua University)
- **1315** **A Smart Glove with Integrated Triboelectric Nanogenerator for Self-Powered Gesture Recognition and Language Expression** – Y. P. Pao, C. M. Chiu, and Z. H. Lin (National Tsing Hua University)

- **1316** **A Multicellular Structured Ionic Hybrid Pump for Ultrasensitive Mechanotransducer Skin** – Y. S. Chung, V. Amoli, J. S. Kim, S. Y. Kim, and D. H. Kim (Dept. of Chemical Engineering, Hanyang Univ.)
- **1317** **Development of the Drying Process of Antibody-Immobilized FET Sensors for Long Term Storage** – C. R. Wu, P. H. Chen, and Y. L. Wang (National Tsing Hua University)

I01 Hydrogen or Oxygen Evolution Catalysis for Water Electrolysis 5

Energy Technology / Industrial Electrochemistry and Electrochemical Engineering / Physical and Analytical Electrochemistry

State Room 2, Dallas Sheraton Convention Center

Keynote Lectures – 08:25 – 09:50
Chair(s): Hui Xu and Nemanja Danilovic

08:25 **1389** ***(Invited)*** **Hydrogen Overview and AWSM Project Updates** – H. N. Dinh (National Renewable Energy Laboratory), D. Peterson, K. Randolph (U.S. Department of Energy), A. Z. Weber (Lawrence Berkeley National Laboratory), A. H. McDaniel (Sandia National Labs), R. Boardman (Idaho National Laboratory), T. Ogitsu (Lawrence Livermore National Laboratory), D. L. Anton (Savannah River National Laboratory), J. Vickers, and E. L. Miller (U.S. Department of Energy)

09:00 **1390** ***(Invited)*** **Development of Standards and Best Practices for Materials Testing in Low Temperature Electrolysis** – K. E. Ayers, C. B. Capuano, A. R. Motz, and P. Mani (Nel Hydrogen)

09:35 **Introductory Remarks**

Alkaline Electrolysis-HER 2 – 09:50 – 12:20
Chair(s): Sanjeev Mukerjee and Nemanja Danilovic

09:50 **1391** **"Inverse Strain Effect in Atomic Scale" - Enhanced Hydrogen Evolution Activity and Durability in Cu Substituted Binary Chalcogenide** – S. C. Sarma, V. Mishra, K. A. A. Mary, S. Roy, and S. C. Peter (Jawaharlal Nehru Centre for Advanced Scientific Research)

10:10 **1392** **Interfacial Design of Metallic 1T-MoS_2/ Carbon Nanotubes for High-Electrocatalytic Hydrogen Evolution Performance** – D. Geng and S. Jayabal (University of Science and Technology Beijing)

10:30 **1393** **Graphene-Dot-Armored Metallic Nanosponge Catalysts for High-Performance Hydrogen Evolution Reaction** – V. T. Nguyen, N. A. Nguyen, H. Ha, H. Y. Kim, and H. S. Choi (Chungnam National University)

10:50 **1394** ***(Invited)*** **The Cation Effects on the Alkaline HER/HOR Kinetics** – Q. Jia (Northeastern University), E. Liu (Chemistry and Chemical Biology, Northeastern University), L. Jiao, and S. Mukerjee (Northeastern University)

11:20 **1395** **Enhancing the Hydrogen Evolution Reaction with Alloy-TiO_2 Composites** – C. Wang, Y. Zhang, and E. J. Podlaha (Clarkson University)

11:40 **1396** **Effect of Ni/NiO Heterostructure on Hydrogen Evolution Performance in AEM Water Electrolysis: In-Operando Raman Study** – A. Y. Faid (Norwegian University of Science and Technology), A. O. Barnett (SINTEF), F. Seland, and S. Sunde (Norwegian University of Science and Technology)

12:00 **1397** **Nirh Nanosponges As Electrocatalysts for High-Performance Hydrogen Evolution Reaction** – N. A. Nguyen, V. T. Nguyen, Y. Ali, and H. S. Choi (Chungnam National University)

Modeling/Mechanism/Characterization – 13:25 – 16:30
Chair(s): Zhenxing Feng, Pietro Papa Lopes and Pawel J. Kulesza

13:25 **Introductory Remarks**

13:30 **1398** ***(Invited)*** **Activity-Stability Relationships for Water Electrolysis Electrocatalysis** – P. P. Lopes (Argonne National Laboratroy), D. Strmcnik, V. Stamenkovic, and N. M. Markovic (Argonne National Laboratory)

14:00 **1399** **Unraveling Oxygen Electrocatalysis Mechanisms and Investigating the Role of Vulcan Carbon on a Thin Film Oxygen Deficient Perovskite $La_{0.6}Sr_{0.4}CoO_{3-\delta}$** – V. F. Mattick, X. Jin, R. E. White, and K. Huang (University of South Carolina)

14:20 **1400** **Universal Mechanism and Rate Equation for Hydrogen Oxidation Reaction** – T. S. Zeleke (National Taiwan University of Science and Technology), M. C. Tsai (National Taiwan university of science and technology), W. N. Su (National Taiwan University of Science and Technology), and B. J. Hwang (NTUST)

14:40 **1401** **Theoretical and Experimental Investigations in Metal−N−C Composites for Oxygen Reduction Reaction and Hydrogen Evolution Reaction at Universal Phs** – X. Qin, L. Zhang, and M. Shao (The Hong Kong University of Science and Technology)

15:00 **1402** **Justifying the ECSA of the Pt Surface in Alkaline Solutions by Elucidating its Lower HUPD Area in Alkaline than in Acid** – L. Jiao (Chemical Engineering, Northeastern University), E. Liu, S. Mukerjee, and Q. Jia (Chemistry and Chemical Biology, Northeastern University)

15:20 **1403** ***(Invited) In Situ*** **x-Ray Absorption Spectroscopy Studies of Catalysts for Water Spitting** – Z. Feng (Oregon State University)

15:50 **1404** **Isotope-Labeling Studies in Water Oxidation Electrocatalysis** – S. B. Scott, J. E. Sørensen, J. Kibsgaard, and I. Chorkendorff (Technical University of Denmark)

16:10 **1405** **A Combined a-SAXS and XAS Study of the *Operando* Compositional and Morphological Changes Undergone By High Surface Area IrO_2 Oxygen Evolution Electrocatalysts** – M. Povia (Paul Scherrer Institut, Electrochemistry Laboratory, Paul Scherrer Institut), J. Herranz (Electrochemistry Laboratory, Paul Scherrer Institut), D. F. Abbott (Paul Scherrer Institute), D. Lebedev (ETH Zürich), E. Fabbri (Paul Scherrer Institut), M. Nachtegaal (In situ X-Ray Spectroscopy, Paul Scherrer Institut), C. Coperet, and T. J. Schmidt (ETH Zürich)

I02 Materials for Low Temperature Electrochemical Systems 5

Energy Technology / Physical and Analytical Electrochemistry
Houston Ballroom B, Dallas Sheraton Convention Center

General Electrocatalysis 2 – 08:00 – 09:40
Chair(s): Minhua Shao and Gang Wu

08:00 **1497** ***(Invited)* Advanced Atomically Dispersed Metal Cathode Catalysts for Hydrogen Fuel Cells** – G. Wu (University at Buffalo, the State University of New York)

08:40 **1498** **High Active Ultra-Low Pt Content Oxygen Reduction Reaction Catalyst Derived from Metal Organic Framework for PEMFC** – L. Chong (Argonne National Lab), J. Wen (Argonne National Laboratory), J. J. Kubal (Purdue University), M. K. Y. Chan (Center for Nanoscale Materials), J. Zou (Shanghai Jiao Tong University), J. Greeley (Purdue University), W. Ding (Shanghai Jiao Tong University), and D. J. Liu (Argonne National Laboratory)

09:00 **1499** **Nuclear Resonance Vibrational Spectroscopy and Mössbauer Spectroscopy Studies of Atomically Dispersed (AD)^{57}fe-N-C Oxygen Reduction Reaction Catalysts for Polymer Electrolyte Fuel Cells** – H. T. Chung, E. F. Holby (Los Alamos National Laboratory), S. Komini Babu (Carnegie Mellon University), J. Park, N. N. Kariuki, A. A. Farghaly (Argonne National Laboratory), J. Zhao (Advanced Photon Source, Argonne National Laboratory), W. Bi (Argonne National Laboratory, X-ray Science Division), D. A. Cullen, H. M. Meyer III (Oak Ridge National Laboratory), E. E. Alp (Argonne National Laboratory, X-ray Science Division), K. L. More (Oak Ridge National Laboratory), D. J. Myers (Argonne National Laboratory), and P. Zelenay (Los Alamos National Laboratory)

09:20 **1500** ***In Situ* Mössbauer and X-Ray Absorption Spectroscopy Studies of Atomically-Dispersed Fe-N-C Oxygen Reduction Reaction Catalysts** – D. J. Myers (Argonne National Laboratory), E. E. Alp (Argonne National Laboratory, X-ray Science Division), H. T. Chung, P. Zelenay (Los Alamos National Laboratory), D. E. Brown (Northern Illinois University, Department of Physics), W. Bi (Argonne National Laboratory, X-ray Science Division), H. Mistry, A. J. Kropf, J. Park, N. N. Kariuki (Argonne National Laboratory), K. L. More, and D. A. Cullen (Oak Ridge National Laboratory)

Allen J. Bard Award Address in Electrochemical Science – 10:00 – 10:40
Chair(s): Minhua Shao

10:00 **1501** ***(Allen J. Bard Award Address in Electrochemical Science)* Energy Conversion and Storage: Novel Materials and Operando Methodsbard** – H. D. Abruña (Cornell University)

Fuel Cell Performance and Characterization 2 – 10:40 – 12:20
Chair(s): K. C. Neyerlin

10:40 **1502** **Elucidating the Electrode/Electrolyte Interface of Anionic Exchange Membrane Electrolyzers** – I. Kendrick (Northeastern University), S. Mukerjee (Chemistry and Chemical Biology, Northeastern University), A. Z. Weber, and M. R. Gerhardt (Lawrence Berkeley National Laboratory)

11:00 **1503** **Application of Nano-Dispersed Ionomer to Prolong Lifetime of Polymer Electrolyte Membrane Fuel Cells** – C. Y. Ahn (Center for Nanoparticle Research, IBS, Seoul National University (SNU)), S. Kim, W. Hwang (Seoul National University (SNU)), Y. H. Cho (Kangwon National University), and Y. E. Sung (Institute for Basic Science (IBS), Seoul National University (SNU))

11:20 **1504** **Effect of Varying Co Content in PtCo Nanoparticles on the Performance of PEM Fuel Cells** – V. Yarlagadda (General Motors, Fuel Cell Activities, University of Michigan), E. Padgett (Cornell University), T. E. Moylan (General Motors), W. Gu (Global Fuel Cell Business, General Motors), R. Kukreja (General Motors), Y. Cai (Global Fuel Cell Business, General Motors), L. T. Thompson (Joint Center for Energy Storage Research (JCESR)), D. A. Muller (Cornell University), and A. Kongkanand (Global Fuel Cell Business, General Motors)

11:40 **1505** **Green Hydrogen and Polymer Electrolyte Fuel Cells for Our Future Sustainable Growth** – K. Ota, T. Nagai, K. Matsuzawa, Y. Kuroda, S. Mitsushima, and A. Ishihara (Yokohama National University)

12:00 **1506** **Electrode Layer Development and *in Situ* Diagnostic Characterization in Low Temperature Fuel Cells** – K. C. Neyerlin (National Renewable Energy Laboratory), T. Van Cleve (National Renewable Energy Lab), G. Wang, A. G. Star, S. Kabir, L. Osmieri (National Renewable Energy Laboratory), S. Khandavalli (National Renewable Energy Lab), M. Wang, M. Ulsh, S. A. Mauger (National Renewable Energy Laboratory), S. Medina, and S. Pylypenko (Colorado School of Mines)

General Electrocatalysis 3 – 14:00 – 16:00
Chair(s): Minhua Shao and Chao Wang

14:00 **1507** ***(Invited)* Tailoring Metal Nanostructures for Energy-Efficient Electroreduction of CO_2 and O_2** – C. Wang (Johns Hopkins University)

14:40 **1508** ***(Invited)* In Situ Stimulated Raman Spectroscopy of Amorphous Cobalt Oxide Catalyst during Oxygen Evolution Electrocatalysis** – C. Eom and J. Suntivich (Cornell University)

15:20 **1509** ***(Invited)* Earth-Abundant Transition Metal Single Atom Electrocatalysts for Selective CO_2 Reduction in Water** – H. Wang (Rice University)

I03 Renewable Fuels via Artificial Photosynthesis or Heterocatalysis 4

Energy Technology / Sensor
State Room 3, Dallas Sheraton Convention Center

Plasmonics along with Solar Energy Conversion – 07:55 – 12:20
Chair(s): Nianqiang (Nick) Wu and Heli Wang

07:55 **Introductory Remarks**

08:00 **1604** ***(Invited)*** **Plasmon Resonant Amplification of Hot Electron-Driven Photocatalysis** – S. B. Cronin (University of Southern California)

08:30 **1605** ***(Invited)*** **Plasmonic Nanocrystal Composites for Photocatalytic Production of Solar Fuels** – M. Zamkov (Bowling Green State University)

09:00 **1606** ***(Invited)*** **Rational Design of Plasmonic Photocatalysts** – N. Wu (West Virginia University)

09:30 **Break**

09:50 **1607** ***(Invited)*** **Tuning Thermal– and Hot Electron–Driven H_2 Generation with Plasmonic TiN/Pt Antenna–Reactor Nanohybrids** – S. Rej, Š. Kment, R. Zbořil, and A. Naldoni (RCPTM, Palacký University)

10:20 **1608** ***(Invited)*** **Plasmon Excitation-Driven Reduction and Coupling of Carbon Dioxide Molecules** – P. K. Jain (UIUC)

10:50 **1609** ***(Invited)*** **Efficient Charge Ggeneration Dynamics in Hematite Photoanodes Decorated with Gold Nanostructures** – A. Furube (Tokushima Univ.), M. Okazaki (Tokushima University), and L. Y. Chen (National Taiwan University of Science and technology)

11:20 **1610** ***(Invited)*** **Exotic Electronic Excitation of a Single-Layer Graphene By Surface Localized Plasmons Under Electrochemical Potential Control** – J. Zhang, R. Zhou, H. Minamimoto, and K. Murakoshi (Hokkaido University)

11:50 **1611** ***(Invited)*** **Plasmon-Driven Chemical Reactions** – J. Wang (The Chinese University of Hong Kong)

Solar Fuel Generation 1 – 13:45 – 16:00
Chair(s): Eric L. Miller

13:45 **1612** **Hydrogenation of Carbonyl Compounds over Pd in Aqueous Phase Under Charged Conditions: Role of Organic Molecular Structure** – L. C. Meyer, U. Sanyal, D. M. Camaioni (Pacific Northwest National Laboratory), K. A. Stoerzinger (Oregon State University), O. Y. Gutiérrez Tinoco (Pacific Northwest National Laboratory), and J. A. Lercher (Technische Universität München, Pacific Northwest National Laboratory)

14:00 **1613** ***(Invited)*** **Bottom-up Engineering of Hematite Nanowire Heterostructures for Photoelectrochemical Water Splitting** – P. Tang (ICN2, CSIC & BIST) and J. Arbiol (ICREA, ICN2, CSIC & BIST)

14:30 **1614** ***(Invited)*** **Understanding Photoelectrode/Catalyst Interface for Solar Water Splitting** – D. Wang (Boston College)

15:00 **1615** ***(Invited)*** **Nanohybrids for Manipulating Solar Energy** – A. Yurtsever and D. Ma (Institut national de la recherche scientifique (INRS))

15:30 **1616** ***(Invited) Single-Source*** **Precursors for Gas Phase Deposition of Catalytic Coatings for Water Splitting Applications** – S. Mathur, L. Jürgensen, T. Fischer, J. Leduc, and A. Möllmann (University of Cologne)

I05 Heterogeneous Functional Materials for Energy Conversion and Storage 2

High-Temperature Energy, Materials, & Processes / Battery / Energy Technology / Physical and Analytical Electrochemistry
State Room 4, Dallas Sheraton Convention Center

Advanced Imaging and Simulation 3 - Electron and X-Ray Microscopy – 08:00 – 10:00
Chair(s): Steven McIntosh and Wilson K. S. Chiu

08:00 **1699** ***(Invited)*** **Understanding Reactions between Li or Na and MoS_2 or WS_2 By Combining TEM and Computer Modeling** – C. B. Carter, S. Tripathi, M. T. Janish, J. Wang, C. B. Carter, S. Parida, H. Patel, C. Ghosh (University of Connecticut), P. G. Kotula, K. L. Jungjohann (Sandia National Laboratories), A. Dobley, C. Cook (Eagle Picher LLC), and A. M. Dongare (University of Connecticut)

08:40 **1700** ***(Invited)*** **Probing the Structure and Dynamic Behaviors of Heterogeneous Functional Materials with the Atomic Resolution in Real-Time** – X. Pan (University of California - Irvine)

09:20 **1701** ***(Invited)*** **Ex-Situ Tracking of Microstructural Evolution in Solid Oxide Cell Electrodes with Ptychographic Nanotomography** – J. R. Bowen (Technical University of Denmark), S. De Angelis (Technical University of Denmark, Paul Scherrer Institut), P. S. Jørgensen (Technical University of Denmark), E. H. R. Tsai (Brookhaven National Laboratory), M. Holler (Paul Scherrer Institut), E. Abdellahi, K. Kreka, and G. Fevola (Technical University of Denmark)

Photoelectrochemistry 1 – 10:20 – 12:20
Chair(s): Anne C. Co and Deryn Chu

10:20 **1702** ***(Invited)*** **Plasmon Resonant Photocatalysis Via Hot Electron Injection** – S. B. Cronin (University of Southern California)

11:00 **1703** **Hierarchically Structured Photoelectrodes Utilizing a Protected Transparent Conducting Oxide Grown Via Atomic Layer Deposition** – P. J. Reed, M. Norman, and R. Coridan (University of Arkansas)

11:20 **1704** **Mechanistic Control of the Galvanic Replacement Reaction of Gold on Cuprous Oxide** – J. M. Lowe and R. Coridan (University of Arkansas)

11:40 **1705** **Bimetallic Nanoparticles Supported on Cr_2O_3 Microspheres As Heterogeneous Photocatalysts for Light-Induced Alcohol Oxidation** – M. Belekoukia, J. Z. Y. Tan (Heriot-Watt University), J. Xuan (Loughborough University), F. Vilela, S. Garcia, and M. Maroto-Valer (Heriot-Watt University)

12:00 **1706** **Top-Down Fabrication of III-V Semiconductor Nanopillars for Photoelectrochemical Water Splitting Applications** – S. K. Karuturi, P. R. Narangari, J. Butson, H. Tan, and C. Jagadish (The Australian National University)

Photoelectrochemistry 2 - Catalysts – 13:20 – 14:40
Chair(s): Boon Siang Yeo and Jacob Ross Bowen

13:20 **1707** ***(Invited)*** **How Ti Modifies Oxygen Electro-Adsorption and Oxygen Evolution Reaction on IrO_2(110) and RuO_2(110) Surfaces** – D. Y. Kuo, J. N. Nelson, H. Paik, K. M. Shen, D. G. Schlom, and J. Suntivich (Cornell University)

14:00 **1708** ***(Invited)*** **Precise Structure Control Enabling Efficient Water Splitting for Hydrogen Generation** – J. Li (Army Research Laboratory) and D. Chu (U.S. Army Research Laboratory)

Photoelectrochemistry 3 - CO_2 Reduction – 14:40 – 16:20
Chair(s): Jin Suntivich and Boon Siang Yeo

14:40 **1709** ***(Invited)*** **Electrochemical Reduction of Carbon Dioxide: Controlling Selectivity to Formic Acid and Methanol** – B. S. Yeo (National University of Singapore)

15:20 **1710** ***(Invited)*** **A Rapid Method for Detecting CO_2 Reduction Products and Local pH** – A. C. Co and F. Zhang (The Ohio State University)

16:00 **1711** **Biomineralization of Quantum Confined Nanocrystals and Heterostructures for Electrochemical Applications** – L. Spangler, A. Sadeghnejad, J. Sakizadeh, J. Cline, C. Kiely, and S. McIntosh (Lehigh University)

I06 An Invited Symposium on Advances and Perspectives on Modern Polymer Electrolyte Fuel Cells – In Honor of Shimshon Gottesfeld

Energy Technology / Industrial Electrochemistry and Electrochemical Engineering / Physical and Analytical Electrochemistry
Houston Ballroom C, Dallas Sheraton Convention Center

Historical Interactions 1 – 08:00 – 12:00
Chair(s): Fernando H Garzon and Bryan S. Pivovar

08:00 **Introductory Remarks**

08:10 **1782** ***(Invited)*** **Shimshon Gottesfeld, the Right Person at the Right Time (Hydrogen: how we got here)** – B. McCormick (Pajarito Powder)

08:40 **1783** ***(Invited)*** **The Legacy of Shimshon Gottesfeld: Early Work on Conducting Polymers at Los Alamos** – T. Redondo (Los Alamos National Lab)

09:00 **1784** ***(Invited)*** **Development of an Innovative Flat-Metal Separator Integrating the Gdl Formed Gas-Flow Channels and the Analysis As Components of PEFCs** – M. Watanabe (Fuel Cell Nanomaterials Center, University of Yamanashi), H. Yanai, and M. Nasu (Enomoto Co., Ltd.)

09:20 **1785** ***(Invited)*** **Electrocatalysis of Direct Methanol Fuel Cells with a Special Reference to the Work of Shimshon Gottesfeld** – R. R. Adzic (Chemistry Department, Brookhaven National Laboratory, Senior Scientist Emeritus)

09:40 **1786** **Shimshon Gottesfeld - a Pioneer of Fuel Cell Science and Catalyst of the Fuel Cell Community** – R. F. Savinell (Case Western Reserve University, Cleveland, Ohio, USA)

10:00 **Break**

10:20 **1787** ***(Invited)*** **Good Food, Paper Napkins, and New Ideas: A PEM-Fuel Cell Community at Its Best** – K. D. Kreuer (Max-Planck-Institute)

10:50 **1788** ***(Invited)*** **Perspective on Modeling in Proton Exchange Membrane Fuel Cells** – T. F. Fuller (School of Chemical & Biomolecular Engineering)

11:10 **1789** ***(Invited)*** **The Impact of Work By Dr. Gottesfeld and Coworkers on the Commercial Introduction of the Fuel Cell Vehicle -- Calling the Shots in Polymer Electrolyte Fuel Cells** – M. F. Mathias (University of Rochester)

11:30 **1790** ***(Invited)*** **Electro-Osmosis in Polymer Electrolytes** – T. A. Zawodzinski Jr. (University of Tennessee-Knoxville)

Historical Interactions 2 – 13:40 – 16:00
Chair(s): Thomas A. Zawodzinski Jr.

13:40 **1791** ***(Invited)*** **Hydrogen and Fuel Cells Enabled through the U.S. Department of Energy** – S. Satyapal (U.S. Department of Energy)

14:00 **1792** ***(Invited)*** **What's Killing My Fuel Cell? a Retrospective on Polymer Fuel Cell Poisoning and Degradation Research** – F. H. Garzon (University of New Mexico), R. Mukundan, and R. L. Borup (Los Alamos National Laboratory)

14:20 **1793** ***(Invited)*** **Materials and MEA Design Impact on the High-Current Density Performance of PEMFCs** – A. Orfanidi, G. S. Harzer, P. Madkikar (Technical University of Munich), N. Schulte (Technical University of Munich, Munich University of Applied Sciences), P. J. Rheinländer, H. A. El-Sayed (Technical University of Munich), and H. A. Gasteiger (Technical University of Munich, Chemistry department)

14:50 **1794** ***(Invited)*** **Hydroxide Exchange Membrane Fuel Cells** – Y. Yan (University of Delaware)

15:20 **1795** ***(Invited)*** **My First 35 Years in R&D of Polymer Electrolyte Fuel Cells** – S. Gottesfeld (Fuel Cell Consulting, inc.)

K01 Bioelectrochemistry: From Nature-Inspired Electrochemical Systems to Electrochemical Biosensors

Organic and Biological Electrochemistry / Energy Technology / Physical and Analytical Electrochemistry / Sensor

Pearl 3, Dallas Sheraton Hotel

Bioelectrochemistry: From Nature-Inspired Electrochemical Systems to Electrochemical Biosensors - Session 1 – 08:00 – 11:40
Chair(s): James Y. Becker and Janine Mauzeroll

08:00 **1834** **The Effect of Length of Spacer on the Anodic Oxidation of Bisamides** – J. Y. Becker (ben-Gurion University of the Negev, Ben-Gurion University of the Negev) and T. Golub (Ben-Gurion University of the Negev)

08:20 **1835** **Effect of Plasmon Stimulation on the Extraction of Photosynthetic Electrons from Thylakoid Membranes** – Y. J. Kim, H. Hong, J. Yun, S. I. Kim, and W. Ryu (Yonsei University)

08:40 **1836** **Side-Selective Modification of Photosystem I Protein and Preparation of Oriented Photo-Electrochemical Films** – K. Wolfe (Vanderbilt University)

09:00 **1837** **The Use of a Protein Scaffold to Control the Structure of Electrodes and Ionomer in Proton Exchange Membrane Electrolyzers** – N. Pramounmat, C. Kim, and J. Renner (Case Western Reserve University)

09:20 **1838** **Scale up of Biofilm Electrodes** – A. Mohamed, S. Tutar, P. T. Ha, and H. Beyenal (Washington State University)

09:40 **Break**

10:00 **1839** **Immunosensor for Early Diabetes Markers** – S. Krishnan, G. Premaratne, and J. Niroula (Oklahoma State University)

10:20 **1840** **Development of the 2.5th Generation Biosensor for HbA1c Using Engineered Fructosyl Peptide Oxidase** – M. Hatada (Tokyo University of Agriculture and Technology, The University of North Carolina at Chapel Hill), S. Saito, W. Tsugawa (Tokyo University of Agriculture and Technology), N. Loew (The University of North Carolina at Chapel Hill, North Carolina State University), K. Ikebukuro (Tokyo University of Agriculture and Technology), and K. Sode (The University of North Carolina at Chapel Hill, North Carolina State University)

10:40 **1841** **Development and Application of D-Serine Enzymatic Biosensors in Neuroscience Research** – J. Mauzeroll (McGill University)

11:00 **1842** **A Protonic Biotransducer for Controlling ATP Synthesis in Mitochondria** – T. Miyake, C. Li (Waseda University), and T. Ohta (Tokyo University of Agriculture and Technology)

11:20 **1843** **Electrochemistry of Antibiotic Hybrids: Towards the Detection and Quantification of Antibiotic Resistance** – S. Kuss, R. M. Islam (University of Manitoba), M. Sahihi (University of Isfahan), and F. Schweizer (University of Manitoba)

Bioelectrochemistry: From Nature-Inspired Electrochemical Systems to Electrochemical Biosensors- Session 2 – 14:00 – 15:40
Chair(s): Sadagopan Krishnan and Graham T. Cheek

14:00 **1844** **Biochemical Oxygen Demand Microelectrode for Quantifying Concentration Gradients in Anaerobic Biofilms** – M. A. Elharati, A. Mohamed, and H. Beyenal (Washington State University)

14:20 **1845** **Evaluation of Respiratory Activity IMAGE in Normal Human Epidermal Keratinocyte SHEET Using BIO-LSI** – S. Kasai (Graduate School of Eng.,Tohoku institute of technology), T. Sato (Tohoku Institute of Technology), A. Prasad (Palacky University, Olomouc, Czech Republic), K. Y. Inoue, K. Ino (Grad. School of Environmental Studies, Tohoku University), H. Shiku, and T. Matsue (Tohoku University)

14:40 **1846** **Evaluation of Respiration Activity for Diagnosis of Mastitis Using SECM** – S. Kasai (Graduate School of Eng.,Tohoku institute of technology), R. Kumagai (Thohoku Institute of Technology), A. Prasad (Palacky University, Olomouc, Czech Republic), T. Honmo (Tohoku Institute of technology), and M. Kumagai (Morinokuma veterinary clinic)

15:00 **1847** **Ultra Micro Neural Stimulation and Recording Electrodes** – A. Ghazavi, C. R. Leon (University of Texas at Dallas), and S. F. Cogan (The University of Texas at Dallas)

15:20 **1848** **Charge Density and Charge Delivery Characteristics of Sputtered Transition Metal Oxide Films Used As Neural Stimulation and Recording Electrodes** – B. Chakraborty (University Of Texas at Dallas), A. Joshi-Imre (The University of Texas at Dallas), J. Maeng (University Of Texas at Dallas), and S. F. Cogan (The University of Texas at Dallas)

Lone Star B/C, Dallas Sheraton Convention Center

K01 Poster Session – 18:00 – 20:00

- **1849** **Bio-Inspired Nanowire Arrays As Artificial Photoreceptors for Retinal Prosthesis** – J. Tang (Stanford University)
- **1850** **Interconnection of Open Circuit Potential in Blood Plasma with Oxidative Stress Parameters in Patients with Acute Poisoning** – A. K. Evseev, M. M. Potskhveriya, I. V. Goroncharovskaya, A. Y. Simonova, E. V. Klychnikova, A. K. Shabanov (N. Sklifosovsky Research Institute of Emergency Medicine), M. M. Goldin (Glen Oaks Community College), and S. S. Petrikov (N. Sklifosovsky Research Institute of Emergency Medicine)
- **1851** **Anodic Behavior of Erythrocytes and Erythrocytes Ghosts on the Carbon Paste Electrode** – I. V. Goroncharovskaya, A. K. Evseev, A. K. Shabanov (N. Sklifosovsky Research Institute of Emergency Medicine), M. M. Goldin (Glen Oaks Community College), and S. S. Petrikov (N. Sklifosovsky Research Institute of Emergency Medicine)
- **1852** **Highly Specific Detection of Oxytocin in Saliva** – M. Rana, A. Weber, M. Manoukian, B. Dweik, and A. Argun (GINER, INC.)

- **1853** **Characterization of Ages Produced from CELLS Using SECM-ELISA** – S. Kasai (Graduate School of Eng.,Tohoku institute of technology), Y. Takahashi, T. Sato (Tohoku Institute of Technology), and H. Hosshi (Research Institute for theFunctional Peptide)
- **1854** **Characterization of Respiratory Burst By 3D CELL Chip with a through-Hole Type Electrochemical Sensing Device** – S. Kasai, Y. Sato (Tohoku Institute of Technology), A. Prasad (Palacky University, Olomouc, Czech Republic), and T. Sato (Tohoku Institute of Technology)
- **1855** **Charge Fluence As a Predictor for the Atmospheric Plasma Inactivation of E. coli Cultures** – A. Otten, M. Jaroszeski, R. Gilbert, R. Vangapattu, and A. Hoff (University of South Florida)
- **1856** **Understanding Amyloid-Beta Plaque Formation By Monitoring the Redox Activity of Copper at the Active Site** – A. L. Tabaka, E. Sanchez, D. Nashed (Lewis University), M. A. Havens (Lewis University, Department of Biology), J. J. Keleher, and D. S. Kissel (Lewis University, Department of Chemistry)

L01 Physical and Analytical Electrochemistry, Electrocatalysis, and Photoelectrochemistry General Session and Grahame Award Symposium

Physical and Analytical Electrochemistry

Trinity 3, Dallas Sheraton Hotel

Physical and Analytical Electrochemistry, Electrocatalysis, and Photoelectrochemistry General Session 1 – 08:20 – 12:00
Chair(s): Prantik Saha and Michael John Counihan

08:20 **1885** **Holey Bismuth for Selective Electrochmical CO_2 Reduction** – C. W. Yang (KAUST), K. W. Huang (King Abdullah University of Science and Technology), V. Tung (University of California, Merced), S. Zhong, and X. Yang (KAUST)

08:40 **1886** **High-Yield Urea Electrochemistry Synthesis Derived from Direct CO_2 Activation in Ionic Liquid** – P. Ling, Z. Huang, W. Winchester, K. Riley, and Z. Wang (Xavier University of Louisiana)

09:00 **1887** **X-Ray Study of Electrochemical Stern Layer: Ordering and Layering** – Y. Liu, T. Kawaguchi (Argonne National Laboratory), M. S. Pierce (Rochester Institute of Technology), V. Komanicky (Safarik University), and H. You (Argonne National Laboratory)

09:20 **1888** **Potential-Induced Acid-Base Chemistry of Adsorbed Species** – H. Mantelli (Case Western Reserve University), R. A. Martinez-Hincapie, J. Feliu (Instituto de Electroquímica, Universidad de Alicante), and D. Scherson (Case Western Reserve University)

09:40 **Break**

10:00 **1889** **Combined Electrokinetic and Electrochemical Measurements to Study the Electric Double Layer at Electrode-Electrolyte Interface** – P. Saha, A. Truong (University of California, Irvine), C. Nam, M. Hickner (The Pennsylvania State University), and I. V. Zenyuk (University of California Irvine)

10:20 **1890** **Development of a Simple Analysis Method for Determining Ion Transport Properties in Electrolytes** – J. Okagaki, H. Matsuda (AIST), H. Daiguji, and T. Kudo (The University of Tokyo)

10:40 **1891** **Monolayer Effects on Surface Plasmon Resonance of Au Thin Films** – C. Artur, M. Yarali, K. Ahmadi, X. Shan, and S. Brankovic (University of Houston)

11:00 **1892** **Nonlinear Time Series Analysis of Nickel in Sulfuric Acid** – D. Q. Clark and D. O. Wipf (Mississippi State University)

11:20 **1893** **Piezoelectric Electric Supports Modulate the Reactivity of Platinum Thin Films** – M. J. Counihan (University of Illinois at Urbana-Champaign), B. H. Simpson (California Institute of Technology, University of Illinois at Urbana-Champaign), and J. Rodriguez-Lopez (University of Illinois at Urbana-Champaign)

11:40 **1894** **The Mechanism of Electrochemical Oxidation of Sulphite on Gold Nanoparticles** – X. Cai, J. S. Foord, and R. G. Compton (University of Oxford)

Physical and Analytical Electrochemistry, Electrocatalysis, and Photoelectrochemistry General Session 2 – 14:00 – 16:00
Chair(s): Andrew Campion Hillier

14:00 **1895** **Fabrication of Metamaterial Building Blocks with Selective Photoreduction of Metal Ions Followed By Electroless Plating Onto DNA Origami Templates** – M. M. Hossen, L. Bendickson, P. E Palo, M. Nilsen-Hamilton, and A. C. Hillier (Ames Laboratory, Iowa State University)

14:20 **1896** **Strain Effect on Electrolytic Hydrogen Isotope Separation** – M. Hasanzadehshirazi, W. Dongjun, C. Artur, L. Grabow, and S. Brankovic (University of Houston)

14:40 **1897** **Effect of Capping-Agents on Performance of Copper Nickel Tin Sulfide (CNTS) Nanocrystals Based Solar Cells** – S. K. Haram (University of Mumbai, Pune University) and Y. Jadhav (Pune University)

15:00 **1898** **Understanding Charge-Transfer and Kinetic Processes in Particulate Photoelectrode Morphologies for Solar Water Splitting** – R. Bala Chandran (University of Michigan)

15:20 **1899** **Optimal Regioselectivity Control in Electrocatalytic Oxidation of Terminal Olefins** – S. Ghobadi (Virginia Commonwealth University, Center for Rational Catalyst Synthesis), T. D. Roper (Virginia Commonwealth University), B. F. Gupton (Virginia Commonwealth University, Center for Rational Catalyst Synthesis), and C. E. Castano (Virginia Commonwealth University)

15:40 **1900** **Development of PANI/Chitosan/Ionic Liquid/Gce Based Sensor for the Simultaneous Electrochemical Quantification of Pharmaceuticals** – N. Jadon (Jiwaji University)

L03 Computational Electrochemistry 5

Physical and Analytical Electrochemistry / Energy Technology / Industrial Electrochemistry and Electrochemical Engineering
Trinity 1, Dallas Sheraton Hotel

Multiscale Modeling – 08:00 – 10:00
Chair(s): Stephen J. Paddison

08:00 **1942** ***(Invited)* Multiscale Molecular Modeling for Polymer Electrolyte Membrane for Fuel Cell** – W. Shinoda (Nagoya University)

08:40 **1943** ***(Invited)* Molecular Dynamics Simulations of the Ionic Conductivity: From Aqueous Electrolytes to Polymer Electrolytes** – C. Zhang, Y. Shao, H. Gudla, A. Yllö, and D. Brandell (Uppsala University)

09:20 **1944** **A FE² Framework for Ionic Transport Modeling in the Electrolyte of a Battery Cell** – M. Zhuo, D. Grazioli (Delft University of Technology), and A. Simone (University of Padova, Delft University of Technology)

09:40 **1945** **Modeling and Simulation of Fiber-Based Electrodes for Li-Ion Batteries** – D. Grazioli, M. Zhuo, M. Goudarzi (Delft University of Technology), and A. Simone (University of Padova, Delft University of Technology)

Classical Molecular Dynamics – 10:40 – 11:40
Chair(s): Niels Gronbech-Jensen and Stephen J. Paddison

10:40 **1946** ***(Invited)* Structure and Dynamics in Ion-Conducting Polymers from MD Simulations** – A. L. Frischknecht (Sandia National Labs)

11:20 **1947** **Molecular Modeling of Reaction and Diffusion Processes at Electrochemical Interfaces in Lithium Ion Batteries** – M. J. Boyer and G. S. Hwang (University of Texas at Austin)

Simulation Methods – 13:40 – 15:40
Chair(s): Stephen J. Paddison and Mark E. Tuckerman

13:40 **1948** ***(Keynote)* Nuclear and Electronic Quantum Effects in the Chemical Dynamics of Proton Defects in Hydrogen-Bonded Liquids** – T. E. Markland (Stanford University)

14:40 **1949** ***(Keynote)* Accurate Configurational and Kinetic Measures in Discrete-Time Langevin Dynamics** – L. F. G. Jensen (The Technical University of Denmark, University of California, Santa Barbara) and N. Gronbech-Jensen (University of California, Davis)

Lone Star B/C, Dallas Sheraton Convention Center

L03 Poster Session – 18:00 – 20:00

- **1950** **On Sulfur Reduction Mechanism in Li-S Cells. Formation of Li_2S_8** – E. Khamitov, E. Kuzmina, and V. Kolosnitsyn (Ufa Institute of Chemistry of Russian Academy of Sciences)
- **1951** **Evaluation of Changes in Bond Parameters in Sulfolane Under the Influence of Electron-Withdrawing Substituents** – A. Yasko, E. Khamitov, E. Kuzmina, and V. Kolosnitsyn (Ufa Institute of Chemistry of Russian Academy of Sciences)
- **1952** **Molecular Dynamics Simulations of Lithium Ion Battery Anode Interface in Battery Charging Process** – K. Aoyagi (TOYOTA Motor Corporation) and M. Otani (AIST)
- **1953** **Influences of Terminal Donor Unit in Dyes with D–D–π–a Architecture on the Regeneration Mechanism in DSSCs: A Computational Study** – Y. M. Hailu and J. C. Jiang (National Taiwan University of Science and Technology)

L04 Polyoxometallates and Nanostructured Metal Oxides in Efficient Electrocatalysis, Energy Conversion, and Charge Storage

Physical and Analytical Electrochemistry / Energy Technology
Trinity 2, Dallas Sheraton Hotel

Polyoxometallates and Nanostructured Metal Oxides in Efficient Electrocatalysis, Energy Conversion, and Charge Storage 1 – 10:00 – 11:50
Chair(s): Pawel J. Kulesza, Vito Di Noto, Andrew M. Herring and Iwona Agnieszka Rutkowska

10:00 **1968** ***(Keynote)* Water-Oxidation By Polyoxometalate-Complexed Manganese-Oxide Nanocrystals: Visible-Light Driven Photoelectrocatalysis through Hierarchical Assembly** – I. A. Weinstock (Ben-Gurion University of the Negev)

10:40 **1969** ***(Keynote)* Cathodic Electrocatalysis Mediated By Polyoxometalates: Reduction of Carbon Dioxide and Reductive Activation of Molecular Oxygen for Hydrocarbon Oxidation** – R. Neumann (Weizmann Institute of Science)

11:20 **1970** ***(Invited)* Hybrid Polyxometallate and Metal Oxide Based Materials of Defined Structure, Electrocatalytic Activity and Charge Storage Properties** – P. J. Kulesza and I. A. Rutkowska (University of Warsaw)

Polyoxometallates and Nanostructured Metal Oxides in Efficient Electrocatalysis, Energy Conversion, and Charge Storage 2 – 14:00 – 15:50
Chair(s): Pawel J. Kulesza and Ira A. Weinstock

14:00 **1971** ***(Keynote)* Electrocatalysis on Nanostructured Metal Oxides** – D. Y. Chung (Argonne National Labroatory), P. P. Lopes (Argonne National Laboratroy), D. Strmcnik, N. M. Markovic, and V. Stamenkovic (Argonne National Laboratory)

14:40 **1972** ***(Keynote)* Benefits and Limitations of Metal-Oxide Supports in Proton-Exchange Membrane Fuel Cells and Water Electrolyzers** – G. Cognard, F. Claudel, L. Dubau (CNRS, LEPMI, F-38000 Grenoble, France), M. Chatenet (Grenoble INP, LEPMI, F-38000 Grenoble, France), L. Sola-Hernandez, G. Ozouf, C. Beauger (MINES ParisTech, F-06904 Sophia Antipolis, France), and F. Maillard (CNRS, LEPMI, F-38000 Grenoble, France)

15:20 **1973** ***(Invited)* Nanostructured-Metal-Oxide Functionalized-Supports for Noble Metal Catalytic Nanoparticles: Enhancement of Electrooxidation of Simple Organic Fuels** – I. A. Rutkowska and P. J. Kulesza (University of Warsaw)

M01 Sensors, Actuators, and Microsystems General Session

Sensor
Trinity 5, Dallas Sheraton Hotel

Biosensors – 14:00 – 16:00
Chair(s): Aleksandr Simonian and Larry A. Nagahara

14:00 **1999** ***(Invited)* Nanomaterial-Based Electrochemical Sensors for Environmental, Food Quality, and Medical Applications** – A. Chen, V. Manikandan, and Z. Liu (University of Guelph)

14:40 **2000** **Rapid and Low-Cost Field Detection of Marine Toxins** – A. Argun, A. Weber, M. Manoukian, M. Rana (GINER, INC.), R. Pierce, V. Lovko, and M. Henry (Mote Marine Laboratory)

15:00 **2001** **A Novel Microbiosensor Microarray for Continuous *Ex Vivo* Monitoring of Gamma-Aminobutyric Acid in Real-Time** – M. I. Hossain (Institute for Micro-manufacturing, Louisiana Tech University), C. Tan (Institute for Micromanufacuring), P. Doughty (Louisiana Tech University), G. Dutta (Institute for Micromanufacturing), T. Murray, S. Siddiqui, L. Iasemidis, and P. U. Arumugam (Louisiana Tech University)

15:20 **2002** **Thin Hematite Film Based Flavin Microsensor** – G. Tibbits, N. A. Wall, and H. Beyenal (Washington State University)

15:40 **2003** **Biomedical Applications of Carbon Nanomaterial Modified Sensors: A Promising Future** – S. Chatterjee (Institute of Chemical Technology)

Z02 Sustainable Materials and Manufacturing 3

All Divisions / Interdisciplinary Science and Technology Subcommittee
Pearl 2, Dallas Sheraton Hotel

Sustainable Materials and Manufacturing 3 - Session 1 – 08:30 – 11:30
Chair(s): Gerardine G. Botte, E. J. Taylor, Gregory S. Jackson and S. R. Narayan

08:30 **2239** ***(Invited)* Diamond Electrodes for Electro-Chemical Synthesis** – T. Mollart and H. Zarrin (Element Six)

09:10 **2240** **Bismuth Conversion Electrodes in Water De-Ionization: Potentials, Limitations and the Case of Nitrate Removal** – S. Shanbhag, J. Whitacre, and M. Mauter (Carnegie Mellon University)

09:30 **Break**

09:50 **2241** **Thermodynamically Controlled Microstructure of Binary Alloy for Efficient Electrochemical Conversion of CO_2 to C_2H_4** – J. E. Kim, K. D. Yang, J. H. Jang, S. W. Im, J. B. Yeo, and K. T. Nam (Seoul National University)

10:10 **2242** **Electrochemical Precipitation of Struvite in Acidic Environment** – A. Teymouri (Colorado School of Mines), L. Kékedy-Nagy, L. F. Greenlee (University of Arkansas), and A. M. Herring (Colorado School of Mines)

10:30 **2243** **Research on Potentiostatic Accelerated Test Method for Fuel Cell Metal Bipolar Plate** – R. Zhang, H. Zhu, D. Yang, and C. Zhang (Tongji University)

10:50 **2244** **Quantitative Analysis Effect of the Cathode Catalyst Layer in PEMFC with Various Ionomer By Protonic Resistance** – D. J. Yang (Tongji University)

11:10 **2245** **Fluoride Electroadsorption on Activated Carbon Electrodes Modified with La(III)** – D. R. Martínez-Vargas, J. R. Rangel-Mendez, and L. F. Cházaro-Ruiz (IPICyT, A.C.)

Sustainable Materials and Manufacturing 3 - Session 2 – 14:00 – 15:20
Chair(s): John N. Harb, Katherine E. Ayers, Nianqiang (Nick) Wu and Gautam Banerjee

- **2246** **Perspectives on the Development and Evaluation of Electrode Materials for Electrochemical Deionization Processes** – S. Shanbhag, X. Liu, J. Whitacre, and M. Mauter (Carnegie Mellon University)
- **2247** **Electrodeposition of Silicon with a Liquid Gallium Cathode in Molten Salts** – G. M. Haarberg (Norwegian University of Science and Technology), T. Kato (Kyoto University), Y. Norikawa, and T. Nohira (Institute of Advanced Energy, Kyoto Univ.)
- **2248** **Exploration of Flash Sintering Mechanisms and Increase Mechanical Strength of YSZ for Dental Application** – H. W. Chan and H. Y. Chen (National Taiwan University)
- **2249** **Design Integrated Microfluidic Chips for Clinical Applications** – B. R. Li (National Chiao Tung University)

Lone Star B/C, Dallas Sheraton Convention Center

Z02 Poster Session – 18:00 – 20:00

- **2250** **Facile Synthesis of Nb_2O_5 as a Visible Light-Sensitive Photocatalyst** – R. R. Maciel Silva (Federal University of Sao Carlos), R. V. Goncalves (University of São Paulo), L. A. M. Ruotolo, and F. G. E. Nogueira (Federal University of Sao Carlos)
- **2251** **Modelling of Direct Laser Patterning of Self Assembled Monolayers (SAMs) on Cobalt-Chromium Alloy** – C. Powell and A. Mahapatro (Wichita State University, Biomedical Engineering)
- **2252** **Synthesis and Characterization of Self-Organized Oxide Layer Grown on Ti-Cu Alloys System for CO_2 Reduction** – J. de Almeida (Federal University of São Paulo, University of Texas at Arlington), S. H. Câmara (Federal University of São Paulo), R. Bertazzoli (State University of Campinas), R. G. da Silva, and C. A. Rodrigues (Federal University of São Paulo)
- **2253** **Preparation and Characterization of Electroless Deposited Fe-Ni Alloy Films** – T. Yamamoto, T. Nagayama, Y. Konno, K. Okura, and T. Nakamura (Kyoto Municipal Institute of Industrial Tech. and Culture)
- **2254** **Electroplating and Characterization of Invar Fe–Ni Alloy Films from Plating Baths Containing Organic Acids** – T. Nagayama, T. Yamamoto, and T. Nakamura (Kyoto Municipal Institute of Industrial Tech. and Culture)
- **2255** **Synthesis of CIS (Cu-In-S_2) Solar Cell Nanoparticles By Controlling the Concentration of Metal Complexes in an Aqueous Solution** – H. Takahashi (Tohoku University)

Z03 Nanoscale Electrochemical Imaging and Detection

All Divisions / International Society of Electrochemistry (ISE)
Pearl 1, Dallas Sheraton Hotel

Nanoscale Electrochemical Imaging and Detection 1 – 08:25 – 12:00
Chair(s): Petr Vanýsek, Tomokazu Matsue and Hoydoo You

08:25 **Welcoming Remarks**

08:30 **2256** **Micropatterning of Metals by Tip Electrode Dissolution and Imaging of Oxygen Reduction Reaction Using Scanning Electrochemical Microscopy** – A. Jo (Korea Institute of Science and Technology), Y. Lee (Ewha Womans University), H. S. Park (Korea Institute of Science and Technology), and C. Lee (Ewha Womans University)

08:50 **2257** **Revealing the Dynamics of Single-Molecule Reactions in a Single-Molecule Nanoreactor** – K. Qiu, B. Yuan, W. W. Zhang, P. Y. Wang, and Y. T. Long (East China University of Science and Technology)

09:10 **2258** **In-Situ Imaging of Electrochemical Polymerization of Functionalized Thiophenes Using Transmission Electron Microscopy** – V. Subramanian (The University of Delaware), J. Liu (Dow AgroSciences LLC), B. Wei, and D. C. Martin (The University of Delaware)

09:30 **Break**

10:00 **2259** **Visualization of Inhomogeneuous Reactivity on Battery Material Using Scanning Electrochemical Cell Microscopy** – T. Yasufumi (Kanazawa University, JST PREST), I. Hirotaka (Tohoku university), D. Takamatsu (Hitachi, Ltd.), A. Kumatani (AIMR, Tohoku University), H. Shiku, and T. Matsue (Tohoku University)

10:20 **2260** **Simultaneous SECM-AFM-Ters Mapping of Electrocatalytic Reactions on a Nanometric Scale** – A. Schechter (Department of Chemical Sciences, Ariel University), P. Subramanian, and S. Kolagatla (Ariel University)

10:40 **2261** ***Operando* Atomic Force Microscopy Reveals Mechanics of Structural Water Driven Battery-to-Pseudocapacitor Transition** – R. Wang, J. B. Mitchell (North Carolina State University), Q. Gao, W. Y. Tsai (Oak Ridge National Laboratory), S. Boyd (North Carolina State University), M. Pharr (Texas A&M University), N. Balke (Oak Ridge National Laboratory), and V. Augustyn (North Carolina State University)

11:00 **2262** **Coherent-x-Ray Imaging of Nanoparticle Alloy Electrodes and Catalysts** – H. You, Y. Liu (Argonne National Laboratory), W. Cha (Argonne National Lab), and A. Ulvestad (Argonne National Laboratory Materials science division)

11:20 **2263** **Imaging Electrochemistry at the Nanoscale By Liquid Cell Transmission Electron Microscopy** – S. Hietzschold and L. Sepunaru (University of California, Santa Barbara)

11:40 **2264** **Bubble Nucleation-Based Electrochemical Sensor for Detection of per- and Polyfluoroalkyl Substances (PFAS) in Water** – L. Luo and R. Ranaweera (Wayne State University)

Nanoscale Electrochemical Imaging and Detection 2 – 14:00 – 16:00
Chair(s): David E. Cliffel and Nongjian Tao

14:00 **2265** **Electrode Stimulation: Heterogeneous Electron Transfer Reactions Induced By Modulation of Electrostatic Potentials in the Electrolyte** – Q. Han (Case Western Reserve University, Chemistry Department), N. S. Georgescu (Case Western Reserve University, Department of Chemistry), J. Gibbons, and D. Scherson (Case Western Reserve University)

14:20 **2266** **Investigation of Cell Microenvironment Effect on Cell Behaviors Using Electrochemical Scanning Probe Microscopy** – F. Li (Xi'an Jiaotong University)

14:40 **2267** **Scanning Electrochemical Cell Microscopy for Analysis of Solid Electrolyte Interface on Negative Electrodes in Lithium-Ion Batteries** – A. Kumatani (AIMR, Tohoku University, Tohoku University), Y. Sato (Tohoku University), Y. Takahashi (JST PREST, Kanazawa University), H. Shiku, and T. Matsue (Tohoku University)

15:00 **2268** **Potentiometric Tip Electrodes for Improved Visualization of Galvanic Corrosion Processes Using SECM** – D. Filotás (University of Pécs), B. M. Fernández-Pérez (Universidad de La Laguna), L. Nagy, G. Nagy (University of Pécs), and R. M. Souto (Universidad de La Laguna)

15:20 **2269** **Enhanced Electrochromic Properties of a Nickel Oxide-Alanine Film** – K. H. Wang, H. Ikeuchi, and T. Kawai (Tokyo University of Science)

15:40 **2270** **Photoelectrochemical Microscopy of Ultrathin Liquid Junction Solar Cells** – J. Sambur and L. Wang (Colorado State University)

Tuesday, May 28

Highlights

0830h..... Physical and Analytical Electrochemistry Division David C. Grahame Award Address – *Trinity 3, Sheraton Hotel*

0900h..... Industrial Electrochemistry and Electrochemical Engineering Division H. H. Dow Memorial Student Achievement Award Address – *Pearl 5, Sheraton Hotel*

1200h..... Annual Society Business Meeting and Luncheon – *Majestic 1, Sheraton Hotel*

1410h..... Dielectric Science and Technology Division Thomas D. Callinan Award Address – *City View 2, Sheraton Hotel*

1400h..... Technical Exhibit opens, ECS Career Expo and Resume Review – *Lone Star B/C, Sheraton Convention Center*

1530h..... Networking Break – Lone Star B/C, *Sheraton Convention Center*

1720h..... Energy Technology Division Research Award Address – *Houston Ballroom C, Sheraton Convention Center*

1800h..... Technical Exhibit, General and Student Poster Session – *Lone Star B/C, Sheraton Convention Center*

A01 Battery and Energy Technology Joint General Session

Energy Technology / Battery

Houston Ballroom A, Dallas Sheraton Convention Center

Advances in Batteries 1 – 08:00 – 12:00
Chair(s): Loraine Torres-Castro, Mohan Karulkar and Jie Xiao

08:00 **47** **High Precision Characterization of Li-Ion Batteries during Extreme Fast Charging** – M. Karulkar, L. Torres-Castro, and J. Lamb (Sandia National Laboratories)

08:20 **48** **Effect of Functional Groups on Polysulfide Trapping Properties of Complex Framework Materials (CFM) Serving As Effective Sulfur Hosts for Li – S Batteries** – P. Murugavel Shanthi (University of Pittsburgh), P. Jampani (Department of Bioengineering, University of Pittsburgh), B. Ramalinga, B. Gattu, M. K. Datta, O. I. Velikokhatnyi, and P. N. Kumta (University of Pittsburgh)

08:40 **49** **Lead-Carbon Nanofiber Based ANODE for High Performance LI-ION Battery** – H. Pham (Missouri University of Science and Technology), S. Sarkar (Missouri University of Science and Technology, Rolla), and J. Park (Missouri University of Science and Technology)

09:00 **50** **Effective Nucleation Host Alloys (ENHAs): A New Materials Solution for Stable and Effective Li Metal Anodes** – P. Thanapisitikul, B. Gattu, M. K. Datta, R. Bandi, and P. N. Kumta (University of Pittsburgh)

09:20 **51** **Optimization of Design Parameters and Operating Conditions of Electrochemical Capacitors for High Energy and Power Performances** – I. S. Ike (University of the Witwatersrand, Johannesburg), I. J. Sigalas (DST/NRF (COE-SM), University of the Witwatersrand,), and S. E. Iyuke (School of Chemical and Metallurgical Engineering,)

09:40 **Break**

10:00 **52** **TEMPO-Modified Linear Polyethylenimine (LPEI) As Organic Radical Battery Electrode** – D. Patel (University of the Utah), M. Yuan, D. P. Hickey, S. Minteer, and R. Warren (University of Utah)

10:20 **53** **Fluorination of Vanadium Oxy-Phosphate By Lif: Electrochemical Behavior in Li-Ion Battery** – S. Semsari Parapari (National Institute of Chemistry Slovenia, Sabanci University Turkey), J. M. Ateba Mba, E. Tchernychova (National Institute of Chemistry Slovenia), M. A. Gulgun (Sabanci University Turkey), and R. Dominko (National Institute of Chemistry Slovenia, ALISTORE – European Research Institute)

10:40 **54** **Linear and Non-Linear EIS Measurements on Li\SOCl2 Batteries** – M. A. Zabara, C. B. Uzundal, and B. Ulgut (Bilkent University)

11:00 **55** **Operando Study of Lithium Dendrite Growth on Graphite Andoe By EC-AFM** – C. Shen (Ningbo Instutute, Chinese Academy of Sciences)

11:20 **56** **Aging and Electrode Inhomogeneity in Commercial 18650 Lithium-Ion Cells during Long-Term Cycling** – H. Wang and J. Whitacre (Carnegie Mellon University)

11:40 **57** **A Desalination Battery Combining $Cu_3[Fe(CN)_6]_2$ As a Na-Storage Electrode and Bi As a Cl-Storage Electrode Enabling Membrane-Free Desalination** – D. H. Nam, M. A. Lumley, and K. S. Choi (University of Wisconsin-Madison)

Advances in Batteries 2 – 14:00 – 18:00
Chair(s): Mohan Karulkar, Loraine Torres-Castro and Jie Xiao

14:00 **58** **Silicon Encapsulated All Solid-State Li-ion Microbatteries** – J. Collins, A. Afzali-Ardakani, J. Papalia, J. De Souza, T. Todorov, A. Pacquette, M. Krishnan, J. Rozen, and D. K. Sadana (IBM T.J. Watson Research Center)

14:20 **59** **Electroless Synthesis Approach for Cu_2o-CuO Nanowires/Whiskers on C-Felt for Lithium Ion Battery Anode Materials** – V. G. Watson, Z. Haynes (Florida A&M University), Y. D. Yeboah (FAMU-FSU College of Engineering), M. H. Weatherspoon (Florida A&M University - Florida State University), J. P. Zheng (Florida State University), and E. E. Kalu (Florida A&M University - Florida State University COE)

14:40 **60** **Electrochemical Noise Measurements in Primary Lithium Batteries** – C. B. Uzundal, G. Karaoglu, and B. Ulgut (Bilkent University)

15:00 **61** **Electrochemically Produced Zinc Oxide Electrode in Rechargeable Alkaline Batteries** – S. Kolhekar (CUNY Energy Institute at the City College of New York), D. Turney (City University of New York), G. G. Yadav, M. Nyce, and S. Banerjee (CUNY Energy Institute at the City College of New York)

15:20 **62** **Ceramic Synthesis of Disordered Lithium Rich Oxyfluoride and the Impact of Their Defects in Electrochemical Performances** – J. M. Ateba Mba (National Institute of Chemistry Slovenia), I. Arcon (Institute Jozef Stefan, University of Nova Gorica Slovenia), G. Mali, E. Tchernychova (National Institute of Chemistry Slovenia), R. Witte (Karlsruhe Institute of Technology (KIT), Germany), R. Kruk (Karlsruhe Institute of Technology), and R. Dominko (ALISTORE – European Research Institute, National Institute of Chemistry Slovenia)

15:40 **Break**

16:00 **63** **Design of High Voltage All-Solid-State Batteries Based on Sulfide Electrolytes** – W. Fitzhugh and X. Li (Harvard University)

16:20 **64** **Application of Acoustic Emission to Study Electrochemical Energy Conversion and Storage Devices** – M. Maier, C. Tan (University College London), L. Castanheira, G. Hinds (National Physical Laboratory), P. R. Shearing (Electrochemical Innovation Lab, UCL, London), and D. J. L. Brett (University College London)

16:40 **65** **Conversion Reaction of Nanoporous ZnO Forstable Electrochemical Cycling of Binderless Simicroparticle Composite Anode** – D. Kim, M. Park (KAIST), S. M. Kim (KAIST, KIMM), H. C. Shim, S. Hyun (Korea Institute of Machinery and Materials (KIMM)), and S. M. Han (EEWS, KAIST)

17:00 **66** **Choline Chloride-Urea Deep Eutectic Solvent As Promising Electrolyte for Zinc Ion Batteries** – W. Kao-Ian and S. Kheawhom (Chulalongkorn University)

17:20 **67** **Anion-Dependent Perturbations in Ionic Liquid Structure Probed By High-Energy X-Ray Scattering** – R. Coulthard (Yale University), T. A. Pham (Lawrence Livermore National Laboratory), M. Zobel (University of Bayreuth), S. Buchsbaum (Lawrence Livermore National Laboratory), D. Plata (Massachusetts Institute of Technology), B. C. Wood, F. Fornasiero, and E. Meshot (Lawrence Livermore National Laboratory)

17:40 **68** **A Solvent-Free Approach to Lithium-Ion Battery Electrodes Using Melt-Processable Elastomeric Binders** – S. El Khakani, N. Verdier, O. Rynne, D. Ciszewski, D. Lepage (Université de Montréal), A. Prébé (Hutchinson SA), D. Ayme-Perrot (Total), A. Badia, M. Dollé, and D. Rochefort (Université de Montréal)

A02 Lithium Ion Batteries and Beyond

Battery / Physical and Analytical Electrochemistry

Lone Star A2, Dallas Sheraton Convention Center

Lithium Ion Anodes 1 – 08:00 – 12:00
Chair(s): Charl J Jafta, Mohammad Hossein Tahmasebi and Jagjit Nanda

08:00 **246** **Si/C Composite As an Anode Material with Ultrafast Charging Capability for Lithium Ion Batteries** – Q. He (Wanger Institute for Sustainable Energy Research (WISER), Illinois Institute of Technology), M. Ashuri (Wanger Institute for Sustainable Energy Research, Illinois Institute of Technology), Y. Liu (Center for Nanoscale Materials, Argonne National Laboratory), and L. Shaw (Illinois Institute of Technology, Wanger Institute for Sustainable Energy Research (WISER))

08:20 **247** **Heterostructured Nanoporous Silicon Anode for High Energy Density Lithium Ion Battery** – A. D. Pathak, S. Pati, K. Sahu, and A. Mandal (Indian Institute of Technology Bhubaneswar)

08:40 **248** **Fluorination of Mxene by Elemental F_2 as Electrode for Lithium-Ion Batteries** – C. J. Jafta (Oak Ridge National Laboratory), B. Thapaliya (University of Tennessee), H. Lyu, J. Xia, H. M. Meyer III, M. P. Paranthaman, X. G. Sun, C. A. Bridges, and S. Dai (Oak Ridge National Laboratory)

09:00 **249** **Interdigitated Eutectic Alloy Anodes with High-Volumetric Capacity for Lithium-Ion Batteries** – B. T. Heligman, K. J. Kreder III, K. P. Scanlan, R. Sun, and A. Manthiram (University of Texas at Austin)

09:20 **250** **Carbon Nanospheres-Encapsulated Silicon Anode from Solvent-Free Mechanofusion Process for Ultrahigh Stable Lithium Silicon Batteries** – J. Wutthiprom, N. Phattharasupakun, K. Srimanon, and M. Sawangphruk (Vidyasirimedhi Institute of Science and Technology)

09:40 **Break**

10:00 **251** **Porous Germanium Anode for Li-Ion Batteries** – A. Andreoli, S. Fugattini, P. Bernardoni, M. Boschetti, M. Gjestila, G. Mangherini, D. Vincenzi (University of Ferrara), U. Gulzar, T. Li, R. P. Zaccaria (Italian Institute of Technology), and D. Giubertoni (Bruno Kessler Foundation)

10:20 **252** **Lithiation of Oxidised Silicon** – M. Schnabel, E. Arca, G. Teeter, C. Ban, and P. Stradins (National Renewable Energy Laboratory)

10:40 **253** **Insights into the Phase Transformation and Degradation Mechanisms of Al and Al-Alloys for Lithium-Ion Battery Anodes** – M. H. Tahmasebi (The Hong Kong Polytechnic University), D. Kramer (Helmholtz Institute Ulm HIU), T. Zheng (The Hong Kong Polytechnic University), R. Mönig (KIT - Institute for Applied Materials), and S. T. Boles (The Hong Kong Polytechnic University)

11:00 **254** **Temperature Influence on Silicon-Based Anodes for Li-Ion Batteries** – M. J. Piernas-Muñoz (Argonne National Lab), S. E. Trask, A. R. Dunlop, and I. Bloom (Argonne National Laboratory)

11:20 **255** **In-Situ Dilation Observation of Si-Based Electrode Adopting the Thermally Treated Poly (amid-imide) As a Binder for Lithium Rechargeable Battery.** – H. I. Park, D. G. Lee, D. J. Chung, M. Sohn, D. Youn (Hanyang University), C. Park (Next Generation Technology Center ; ILJIN Electric), and H. Kim (Hanyang University)

11:40 **256** **New Si Nanofiber Mat Designs for Li-Ion Battery Anodes** – A. N. Mondal, R. Wycisk, P. N. Pintauro (Vanderbilt University), E. C. Self, and J. Nanda (Oak Ridge National Laboratory)

Lone Star A1, Dallas Sheraton Convention Center

Non Aqueous Electrolytes – 08:00 – 12:30
Chair(s): Wu Xu, Brett L. Lucht and Susan A. Odom

08:00 **257** ***(Invited)* Electrolytes for Wide-Temperature Application Range of Lithium Ion Batteries** – B. Liu, Q. Li, M. H. Engelhard, Y. He, C. Wang, and W. Xu (Pacific Northwest National Laboratory)

08:30 **258** **Ionic Liquid-Based Electrolytes for High-Voltage Li-Ion Batteries** – Q. Liu, W. Jiang, Y. Li, K. Z. Pupek, M. J. Piernas-Muñoz, I. Bloom, and Z. Zhang (Argonne National Laboratory)

08:50 **259** **Li Ion Hopping Conduction in Highly Concentrated Liquid Electrolytes** – K. Dokko, D. Watanabe, Y. Ugata, M. L. Thomas, K. Ueno, and M. Watanabe (Yokohama National University)

09:10 **260** **Generation and Evolution of Materials in the Anode Solid Electrolyte Interphase (SEI) of Lithium Ion Batteries** – B. L. Lucht (University of Rhode Island)

09:30 **Break**

09:50 **261** **$CuCl_2$-Based Cathode Material with Incombustible Inorganic Liquid Electrolyte Towards Room-Temperature Na Rechargeable Battery** – H. Jung, A. Kim, J. Lee (Hanyang University), G. Jeong (Korea Electronics Technology Institute), Y. J. Kim (SKKU Advanced Institute of Nanotechnology (SAINT)), and H. Kim (Hanyang University)

10:10 **262** ***In Situ* Controlled Syntheses of Electrolyte Additives for High Voltage Lithium Ion Batteries** – C. Liao (JCESR at Argonne National Laboratory), J. Yang (Argonne National Lab), I. A. Shkrob, Z. Zhang, A. Gutierrez, and J. R. Croy (Argonne National Laboratory)

10:30 **263** **Ethylene Carbonate-Free Electrolytes for High-Nickel Layered Oxide Cathodes** – W. Li, A. Dolocan, J. Li, Q. Xie, and A. Manthiram (The University of Texas at Austin)

10:50 **264** **New Electrolyte Additives for High Voltage Lithium Ion Batteries** – H. Lyu, Y. Li, C. J. Jafta, C. A. Bridges, H. M. Meyer III, A. Borisevich, M. P. Paranthaman, S. Dai, and X. G. Sun (Oak Ridge National Laboratory)

11:10 **265** **Evaluation of the Solid Electrolyte Interphase Formed in Lithium Bis(trifluoromethylsulfonyl)Amide-Tetraglyme Solvate Ionic Liquids with Different Compositions** – Y. Katayama, N. Tachikawa, and N. Serizawa (Keio University)

11:30 **266** **Evaluation of Tailored Phenothiazines for Overcharge Protection and Cathode Passivation in High Voltage Lithium-Ion Batteries** – S. A. Odom (University of Kentucky), C. S. Johnson, Y. Li (Argonne National Laboratory), Z. Liang (Departement of Chemistry, University of Kentucky), T. M. Suduwella (University of Kentucky), N. H. Attanayake (Department of Chemistry, University of Kentucky), and A. P. Kaur (University of Kentucky)

11:50 **267** **Electrolyte Development and Its Application for Fast Charging of Li-Ion Batteries** – Z. Du (Oak Ridge National Laboratory), X. Wu (Oak Ridge National Laboratory, Purdue University), D. L. Wood III (University of Tennessee), K. Zhao (Purdue University), and I. Belharouak (Oak Ridge National Laboratory)

12:10 **268** **Effect of Salt Concentration in Sulfolane-Based Electrolyte on Long-Term Li Plating/Stripping Behavior** – Y. Maeyoshi, M. Kubota, H. Abe (ABRI Co., Ltd.), K. Abe (Yamaguchi University), and K. Kanamura (ABRI Co., Ltd., Tokyo Metropolitan University)

Tuesday, May 28

Lithium Sulfur Batteries 3 – 13:40 – 18:20
Chair(s): S. R. Narayanan, Weibing Xing and Ying Ma

13:40 **269** **Sulfur Incorporated into Carbon Coated FeS_2 Nanotubes for High-Performance Lithium-Sulfur Batteries** – Z. Zeng (west virginia univerity) and X. Liu (West Virginia University)

14:00 **270** **Intercalating Solid State Electrolyte Based Composite Electrode for Lithium-Sulfur Batteries** – A. Irshad, R. Elizalde-Segovia, B. S. Jayathilake, D. Moy (University of Southern California), E. J. Plichta, M. A. Hendrickson (Army Power Division, RDER-CCA), and S. R. Narayanan (University of Southern California)

14:20 **271** **Enhancing the Performance of Li-S Batteries with $LaLiO_2$-Based Multifunctional Interlayer** – G. G. Bizuneh, J. Fan, C. Sun, Y. Xiangfei, F. Xue, D. Deng, J. Lei, X. Lin, Y. Jia, J. Yang, H. Yan, X. Wang, M. Zheng, and Q. Dong (Xiamen University)

14:40 **272** **The Reaction between Metal Disulfides Interlayer and Polysulfides in Lithium-Sulfur Batteries** – A. Paolella (Hydro-Quebec) and K. Zaghib (CETEES, HydroQuébec)

15:00 **273** **Elucidating Interfacial Phenomena between Solid-State Electrolytes and the Sulfur-Cathode of Lithium-Sulfur Batteries** – L. E. Camacho-Forero (Department of Chemical Engineering, Texas A&M University) and P. B. Balbuena (Texas A& M University)

15:20 **274** **The Role of Electrolyte Additives on the Stability and Electrochemical Performance of Lithium-Sulfur Batteries** – S. Duangdangchote, A. Krittayavathananon, N. Phattharasupakun, and M. Sawangphruk (Vidyasirimedhi Institute of Science and Technology)

15:40 **275** **Surface Modification of Carbon Fiber Interlayer Via Amide Coupling Reaction for High-Performance Lithium-Sulfur Batteries: Experimental and Theoretical Investigation** – S. Kosasang, N. Ma, P. Chiochan, S. Duangdangchote, H. Gatemala, N. Chanlek, and M. Sawangphruk (Vidyasirimedhi Institute of Science and Technology)

16:00 **276** **Computational Study of Electronic Current Effect on Sulfur Conversion Reactions Under Lean Electrolyte Conditions** – F. A. Soto, K. Hankins (Texas A&M University), and P. B. Balbuena (Texas A& M University)

16:20 **277** **Computational Studies of Organic Sulfides for Energy Storage** – Y. Ma (University of Wisconsin-Eau Claire)

16:40 **278** **Nanoengineered Separators for a High Energy Density, Long Cycle Life Li-S Battery** – W. Xing (ADA Technologies, Inc.)

17:00 **279** **Sulfurized Polyacrylonitrile (SPAN): Mechanical Properties and Reduction Mechanisms of Carbonate-Based Solvents on Its Surface** – S. Perez-Beltran (Texas A&M University) and P. B. Balbuena (Texas A& M University)

17:20 **280** **Investigating the Effect of Lewis Acid Base Interaction in Non-Stoichiometric Vanadium Oxide Based CNFs in Lithium – Sulfur Battery** – R. Pai, A. Singh, and V. Kalra (Drexel University)

17:40 **281** **Modeling the Effect of Electrolyte-to-Sulfur Ratio in the Cathode on the Systems-Level Performance of a Li-S Battery** – N. B. Emerce (Middle East Technical University) and D. Eroglu (Bogazici University)

18:00 **282** **A Fast-Charging Long-Life Li–S Battery Incorporating a MoO_3 nanobelt/Polypropylene Functional Separator** – C. W. Chu (Research Center for Applied Sciences, Academia Sinica), N. Kaisar (Department of Materials Science and Engineering, NTUST), S. Jou (National Taiwan University of Science and Technology), S. A. Abbas (Department of ESS, NTHU, TW), and J. Fang (Industrial Technology Research Institute)

Lone Star A2, Dallas Sheraton Convention Center

Lithium Ion Anodes 2 – 14:00 – 18:00

Chair(s): Denis Y.W. Yu, Christopher M. Lang and Derwin Lau

14:00 **283** **Impact of Dopant Density on n-Type Crystalline Silicon Lithium Ion Battery Anode Capacity and Cycle Life** – D. Lau, S. Lim, S. Hager, Z. Ouyang, and A. Lennon (University of New South Wales)

14:20 **284** **On the Potentialities of Lithiated Iron Hydroxisulfides for Lithium Ion Battery** – C. Mir, D. Giaume (Ecole Nationale Supérieure de Chimie de Paris), M. Chakir (Renault S.A.), and P. Barboux (Institut de Recherche de Chimie Paris- CNRS)

14:40 **285** **Solid Nano-Composite Electrolytes (nano-SCE) with Ion Conductivity Promotion at an Interfacial Ice Layer on the Mesoporous Silica Matrix** – X. Chen, K. B. Gandrud (imec), A. Sagara (Technology Innovation Division, Panasonic Corporation), B. Put (imec), M. Murata, H. Yabe, M. Tomiyama, H. Arase, Y. Kaneko, M. Shimada (Technology Innovation Division, Panasonic Corporation), J. Steele, M. Roeffaers (COK, KU-Leuven), M. Debucquoy, M. J. Mees (imec), and P. M. Vereecken (imec, Belgium and COK, KU-Leuven, Belgium)

15:00 **286** **Li-Ion Cell Development with Advanced Anodes** – C. M. Lang, J. T. Herb, and P. D. Moran (Physical Sciences Inc.)

15:20 **287** **Microstructural Analysis of Li-Ion Battery Graphite Anodes** – C. Norris, A. N. Mistry (Purdue University), S. A. Roberts (Sandia National Laboratories), and P. P. Mukherjee (Purdue University)

15:40 **288** **Onion-like Synergetic Multilayer Coating for High-Stability Silicon Monoxide Anode in Lithium-Ion Batteries** – T. Tan, P. K. Lee (City University of Hong Kong), and D. Y. W. Yu (City university of Hong Kong)

16:00 **289** **Versatile Utilizations of Cellulose Nanofibers for High-Performance Silicon Anode in Lithium-Ion Batteries** – J. M. Kim and Y. Piao (Seoul National University)

16:20 **290** **Understanding Criteria of Cross-Linking Polymer As Effective Binder for Si-Based Lithium-Ion Battery Anodes** – S. Wang (City University of Hong Kong), J. Lei (Xi'an Jiaotong University), Q. Duan, and D. Y. W. Yu (City University of Hong Kong)

16:40 **291** **Design of Multifunctional Binder for High-Capacity Silicon Based Anodes** – P. Cao, G. Yang, J. Nanda, and T. Saito (Oak Ridge National Laboratory)

17:00 **292** **Surface-Modified Si Nano-Particles as New Anode Materials** – S. Jiang, B. Hu (Argonne National Laboratory), N. Neale (National Renewable Energy Lab), B. Zhao (The University of Tennessee-Knoxville), and Z. Zhang (Chemical Sciences and Engineering Division)

17:20 **293** **The Effect of Volume Change on the Accessible Capacities of Porous Silicon-Graphite Composite Anodes** – D. J. Pereira (University of South Carolina), T. R. Garrick (General Motors), and J. W. Weidner (University of South Carolina)

17:40 **294** **Pre-Lithiatiated Carbon Composite Nanofibers Anodes and Their use in Rechargeable Lithium-ion Batteries** – M. Alcoutlabi, A. Elizondo, J. Lopez, and G. Gonzalez (University of Texas, Rio Grande Valley)

A04 Large Scale Energy Storage 10

Energy Technology / Battery / Industrial Electrochemistry and Electrochemical Engineering / Physical and Analytical Electrochemistry

San Antonio Ballroom B, Dallas Sheraton Convention Center

Aqueous Systems - Electrolytes/Electrode Materials 2 – 08:00 – 10:00
Chair(s): Wei Wang and Jagjit Nanda

08:00 **417** **Phenazine-Based Anolyte Materials and Their Application in Aqueous Redox Flow Batteries** – A. Hollas, N. Wellala, R. Feng (Pacific Northwest National Laboratory), V. Murugesan (Joint Center for Energy Storage Research), B. Li, Z. Nie, E. Thomsen, Y. Shao, D. Reed (Pacific Northwest National Laboratory), and W. Wang (Joint Center for Energy Storage Research (JCESR))

08:20 **418** **Promising Additives for the Stability of Vanadium Flow Battery Catholytes** – D. Oboroceanu, N. Quill (Physics Dept., Bernal Institute, University of Limerick), D. N. Buckley, and R. P. Lynch (Physics Dept., Bernal Institute, University of Limerick, Dept. of Chem. Eng., Case Western Reserve University)

08:40 **419** **Effect of Sodium Fluoride and Sodium Lignosulphonate Additives on Performance of the Soluble Lead Redox Flow Battery** – R. Suman, M. K. Ravikumar, N. Jaiswal, S. Patil (Indian Institute of Science - Bangalore), and A. K. Shukla (Indian Institute of Science)

09:00 **420** **Improving Cycle Life and Active Materials Utilization for Rechargeable Alkaline Zn–MnO2 Batteries** – M. B. Lim, M. Kelly, J. Duay, I. Kolesnichenko, and T. N. Lambert (Sandia National Laboratories)

09:20 **421** **Nature-Derived Organic Mesomeric Electrolyte for Low Cost and High Capacity Aqueous Flow Battery** – H. Zhu (Hongli Zhu)

09:40 **422** **Metal Complexing Agents for Low-Cost Flow Battery Electrolytes** – M. P. Marshak (University of Colorado Boulder)

Aqueous Systems - Electrolytes/Electrode Materials 3 – 10:10 – 12:20
Chair(s): Jagjit Nanda and Wei Wang

10:10 **423** ***(Invited)* Advanced Redox Flow Battery Technologies** – W. Wang (Pacific Northwest National Laboratory)

10:50 **424** ***(Invited)* High-Energy-Density Redox-Flow Batteries: Fundamental Redox Processes and Materials Design Strategies** – Y. C. Lu (The Chinese University of Hong Kong)

11:20 **425** **Scalable and Efficient Electrochemical Exfoliation of Graphite Felt As High-Performance Flow Battery Electrode** – H. Zhu (Hongli Zhu)

11:40 **426** **Coupled Thermal and Chemical Activation of Graphite Felt, to be Used As Positive Half-Cell Electrode in the Vanadium Redox Flow Batteries.** – A. Hassan (Laboratoire de Génie Chimique, University of Toulouse-III Paul Sabatier, France) and T. Tzedakis (Laboratoire de Génie Chimique, University of Toulouse-III Paul Sabatier, France)

12:00 **427** **Hierarchical Carbon Nanofiber/Birnessite-MnO_2 Nanosheets Cathode for High Performance and Low-Cost Aqueous Rechargeable Zinc Ion Battery** – X. Chen, W. Li, and X. Liu (West Virginia University)

Aqueous Systems - Electrolytes/Electrode Materials 4 – 14:00 – 15:30
Chair(s): Bin Li and Pawel J. Kulesza

14:00 **428** ***(Invited)* Development of Porous Structures for Electrochemical Energy Storage** – K. Y. Chan, B. Qin, M. Zhou, C. Y. V. Li, C. K. Ho, and A. A. Voskanyan (The University of Hong Kong)

14:30 **429** **Performance of a Hybrid Regenerative Hydrogen-Vanadium Fuel Cell with Carbon Nanotube Electrode (CNT) Materials** – T. V. Nguyen (The University of Kansas), Y. Li, and R. Hammar (University of Kansas)

14:50 **430** **Characterization of Carbon Felt Materials As Negative Electrode Material for Flow-Assisted Zn-Air Batteries** – R. M. Wittman (Oak Ridge National Laboratory) and T. A. Zawodzinski Jr. (University of Tennessee-Knoxville)

15:10 **431** **Nanoparticle Surface Charge Alters Membrane Ionic Permeability** – Y. Zhang, S. Sankarasubramanian (Washington University in St. Louis), X. Li, X. Xie (Tsinghua University), and V. Ramani (Washington University in St. Louis)

Aqueous Systems - Design/Diagnostics 1 – 15:40 – 17:50
Chair(s): Pawel J. Kulesza and Bin Li

15:40 **432** ***(Invited)* Capacity Fade and Cross-over in Redox Flow Batteries** – T. A. Zawodzinski Jr. (University of Tennessee-Knoxville), K. Lou (University of Tennessee, Knoxville, TN), R. M. Wittman (Oak Ridge National Laboratory), G. A. Goenaga (University of Tennessee-Knoxville), N. M. Cantillo (The University of Tennessee - Knoxville), and J. Peng (University of Tennessee-Knoxville)

16:10 **433** **Measurement of VO^{2+} Transference Number in Nafion with Varying Concentrations of Sulfuric Acid** – J. T. Vardner, J. J. S. Edziah, and A. C. West (Columbia University)

16:30 **434** **A NOVEL CELL Design of Alkaline-Based ZINC -Iodide FLOW Battery for Enhancing Energy and POWER Performance** – H. Pham, R. G. Landers, and J. Park (Missouri University of Science and Technology)

16:50 **435** ***In-Situ* Electrode Potential Measurements in Vanadium Redox Flow Batteries** – Z. Yang and M. L. Perry (United Technologies Research Center)

17:10 **436** **Optimally Engineered Flow-through Electrodes Using Automatic Design Algorithms and Additive Manufacturing** – V. A. Beck, T. H. Weisgraber, A. N. Ivanovskaya, S. Chandrasekaran, B. D. Moran, S. E. Watts (Lawrence Livermore National Laboratory), D. A. Tortorelli (University of Illinois, Lawrence Livermore National Laboratory), E. B. Duoss, J. Biener, M. Stadermann, and M. A. Worsley (Lawrence Livermore National Laboratory)

17:30 **437** **Isolation of Mass Transport and Current Distribution in Vanadium Flow Batteries Via Segmented Strip Cell** – T. Y. Ertugrul, J. T. Clement, Y. Ashraf Gandomi, D. Aaron, and M. M. Mench (University of Tennessee)

A05 Battery Characterization

Battery / Physical and Analytical Electrochemistry
San Antonio Ballroom A, Dallas Sheraton Convention Center

In situ Formation and Degradation 1 – 08:10 – 12:10
Chair(s): Nagore Ortiz Vitoriano, David Mitlin, Gabriel M. Veith and Jennifer L. Schaefer

08:10 **551** ***(Invited)* Microcalorimetry of Silicon Anodes for Lithium-Ion Batteries** – E. Allcorn, J. Langendorf, G. Nagasubramanian, and K. R. Fenton (Sandia National Laboratories)

08:40 **552** **Probing Signatures of Thermal Metastability in Lithium-Ion Batteries** – A. N. Mistry, S. Perumaram Rangarajan, and P. P. Mukherjee (Purdue University)

09:00 **553** ***(Invited)* Unravelling Solvation Phenomena in Glyme-Based Electrolytes for Na-O_2 Batteries** – N. Ortiz Vitoriano (Ikerbasque, CIC EnergiGUNE), R. L. Sacci, C. A. Bridges (Oak Ridge National Laboratory), O. Arcelus, M. Enterria, J. Carrasco (CIC EnergiGUNE), and G. M. Veith (Oak Ridge National Laboratory)

09:30 **Break**

10:00 **554** ***(Invited)* On-Line Inductively-Coupled Plasma Mass Spectrometry Characterization of Transition Metal Dissolution in Electrochemical Environments** – D. J. Myers and N. N. Kariuki (Argonne National Laboratory)

10:30 **555** **Atomic Resolution Imaging of the Cathode-Electrolyte Interface on a $LiMn_2O_4$ Electrode** – R. Scipioni, D. Isheim, and S. A. Barnett (Northwestern University)

10:50 **556** **Developing Plasmonic Imaging Technique to Understand Battery Solid Electrolyte Interface Formation and Li Nucleation in-Situ** – X. Shan (University of Houston, ECE) and C. Yang (University of Houston)

11:10 **557** **Study of Sulfur-Based Electrodes By *in Situ* Characterization Techniques** – Q. Lemarie (INSA LYON), H. Idrissi (INSA-Lyon), E. Maire (Laboratoire MATEIS, INSA-Lyon), F. Alloin (Université Grenoble Alpes -CNRS), P. X. Thivel (Univ. Grenoble Alpes, LEPMI, F-38000 Grenoble, France), and L. Roué (INRS-EMT)

11:30 **558** **^{7}li Chemical Shift Imaging to Detect Microstructural Growth in All Solid-State Batteries** – L. E. Marbella (Columbia University), S. Zekoll, J. Kasemchainan (University of Oxford), S. Emge (University of Cambridge), P. G. Bruce (Department of Materials, University of Oxford), and C. P. Grey (Department of Chemistry, University of Cambridge)

11:50 **559** **Investigation of Structural Changes during Long-Term Cycling of NCM-811 Used As Cathode Active Material in Li-Ion Batteries** – B. Strehle, F. Friedrich, A. T. S. Freiberg, M. Piana (Technical University of Munich), and H. A. Gasteiger (Technical University of Munich, Chemistry department)

In situ Formation and Degradation 2 – 14:00 – 15:40
Chair(s): Nagore Ortiz Vitoriano, David Mitlin, Gabriel M. Veith and Jennifer L. Schaefer

14:00 **560** ***(Invited)*** **B-SnSb for Sodium Ion Battery Anodes: Phase Transformations Responsible for Enhanced Cycling Stability Revealed By in Situ TEM** – D. Mitlin (Clarkson University)

14:40 **561** **Real-Time Operando SEM Investigation into Lithium Ion Battery Degradation** – A. N. Patel, F. M. Maddar, and M. J. Loveridge (University of Warwick)

15:00 **562** **Battery Charakterisation Using Optical Methods** – C. Rahe (HI MS, IEK-12, Forschungszentrum Jülich)

15:20 **563** **Unraveling the Underlying Redox Mechanism in $Na_2FeP_2O_7$ Pyrophosphate Cathode for Sodium-Ion Batteries** – R. Gond and P. Barpanda (Indian Institute of Science)

A06 Battery Safety and Failure Modes

Battery / Industrial Electrochemistry and Electrochemical Engineering
State Room 1, Dallas Sheraton Convention Center

Characterizing Battery Safety with Advanced Calorimetry Techniques 2 – 08:00 – 11:40
Chair(s): Judith A. Jeevarajan and Rengaswamy Srinivasan

08:00 **Welcoming Remarks**

08:10 **576** ***(Invited)*** **A Combined Calorimetry and Modeling Approach for Safety Analysis of Large-Size Cells** – C. Yang, D. Finegan, W. Mai, and M. Keyser (National Renewable Energy Laboratory)

08:50 **577** ***(Invited)*** **The Scalability of Accelerating Rate Calorimetry (ARC) with State of Charge and Capacity** – J. Lamb, L. Torres-Castro, M. Karulkar, and J. Stanley (Sandia National Laboratories)

09:30 **Break**

10:00 **578** ***(Invited)*** **Influence of Cell Design Features on Low Temperature Cycling Performance and Safety Assessed with Accelerated Rate Calorimetry and Micro X-Ray Computed Tomography** – C. T. Love (U.S. Naval Research Laboratory), R. E. Carter (NRC Postdoctoral Associate), and E. J. Klein (US Naval Research Laboratory)

10:40 **579** **The Comparison of Thermal Stability and Safety between Fresh and Aging Large Capacity Lithium Ion Battery with Silicon Carbon Anode** – H. Hsu (Tsinghua University), X. Liu (Tsinghua University, Argonne National Laboratory), X. Feng (Tsinghua University), L. Lu (Collaborative Innovation Center of Electric Vehicles, Tsinghua University), and M. Ouyang (Tsinghua University)

11:00 **580** **Infrared Spectroscopic Study of the Thermal Stability of Alkyl Carbonate Electrolytes** – J. M. Porter (Colorado School of Mines) and N. Saqib (University of Indianapolis)

11:20 **581** **Comparison of the Thermal Reaction Kinetic Parameters of Layered $Li[Ni_xCo_yMn_z]O_2$ Cathode Material with Different Nickel Content and Different Crystal Structure** – Y. Wang, D. Ren, H. Hsu, X. Feng (Tsinghua University), L. Lu (Collaborative Innovation Center of Electric Vehicles), and M. Ouyang (Tsinghua University)

Mechanisms of Thermal Runaway – 13:00 – 18:00
Chair(s): Summer Ferreira and Xiang Liu

13:00 **Introductory Remarks**

13:10 **582** ***(Invited)*** **The Role of Internal Short Circuit during the Thermal-Induced Thermal Runaway Process of Lithium-Ion Battery** – D. Ren, X. Feng, H. Hsu, L. Lu, X. He, and M. Ouyang (Tsinghua University)

13:50 **583** ***(Invited)*** **Thermal Runaway Propagation Testing of Lithium-Ion Cells Using the Transportation Standard Protocol** – J. A. Jeevarajan (Underwriter's Laboratories Inc.), S. Azam (Underwriters Laboratories Inc.), C. Lopez, and S. E. Kinyon (Stress Engineering Services Inc.)

14:30 **584** ***(Invited)*** **Thermal Runaway Propagation Resistance in Lithium-Ion Batteries** – R. Srinivasan, M. E. Thomas, M. B. Airola, B. G. Carkhuff, L. J. Frizzell-Makowski, H. Alkandry, J. G. Reuster, H. N. Oguz, P. W. Green, P. A. Demirev, and L. J. Currano (Johns Hopkins University Applied Physics Laboratory)

15:10 **585** **Varying Thermal Runaway Mechanism Caused By Fast Charging for High Energy Pouch Batteries** – Y. Li, X. Feng, D. Ren, M. Ouyang (Tsinghua University), and L. Lu (Collaborative Innovation Center of Electric Vehicles)

15:30 **Break**

16:00 **586** **Early Detection for Li-Ion Batteries Thermal Runaway Based on Gas Sensing** – T. Cai, A. G. Stefanopoulou, and J. B. Siegel (University of Michigan)

16:20 **587** **Effect of Mechanical Stress Factors on Large Format Li-Ion Cell Thermal Runaway Characteristics** – J. Graika (NASA Johnson Space Center), T. P. Barrera (LIB-X Consulting), and Y. Alobaidi (NASA Johnson Space Center)

16:40 **588** **Evaluating the Thermal Runaway Propagation within a Battery Pack: The Unsolved Problems That Hinders the Consensus on the Test Profile in Electric-Vehicle-Safety Global-Technical-Regulation** – X. Feng (Tsinghua University), C. Jin (Shanghai University of Technology), F. Wang (China Automotive Technology & Research Center), X. He, and M. Ouyang (Tsinghua University)

17:00 **589** **Inhibiting Thermal Runaway in Large Format Li-Ion Batteries** – G. Torres and S. S. Moganty (NOHMs Technologies)

17:20 **590** **Early Warning of Thermal Runaway for Lithium-Ion Battery Based on Multi-Sensor Detection** – Y. Pan, X. Feng (Tsinghua University), L. Lu (Collaborative Innovation Center of Electric Vehicles), and M. Ouyang (Tsinghua University)

17:40 **591** **Thermal Runaway Propagation within Lithium-Ion Battery Packs: Modes and Mechanisms** – Y. Jia and J. Xu (Beihang University)

Lone Star B/C, Dallas Sheraton Convention Center

A06 Poster Session – 18:00 – 20:00

- **592** **Investigation of Lithium-Ion Battery Interface Degradation Mechanism through EIS Analysis Under Various Cycling Conditions** – B. Dong, Y. Li, C. Ozkan, and M. Ozkan (University of California, Riverside)
- **593** **Thermal Runaway of Lithium-Ion Batteries: Mechanism, Modeling and Aging Effects** – D. Ren, X. Feng (Tsinghua University), X. Han (Tsinghua Univerisity), X. Liu (Tsinghua University, Argonne National Laboratory), L. Lu, X. He, and M. Ouyang (Tsinghua University)
- **594** **High-Performance Ionic Liquid Gel Polymer Electrolytes for Solid-State Lithium Metal Batteries** – X. Pan (Harbin Institute of technology, Virginia Tech), P. Yang (Harbin Institute of Technology), and F. Lin (Department of Chemistry, Virginia Tech)

B01 to B09 Nano Poster Kick-off

Nanocarbons

City View 6, Dallas Sheraton Hotel
Nano Poster Kick-off (B01, B02, B03) – 16:00 – 18:05

City View 7, Dallas Sheraton Hotel
Nano Poster Kick-off (B04, B05, B06, B08, B09) – 16:00 – 18:15

B01 Carbon Nanostructures for Energy Conversion and Storage

Nanocarbons / Battery / Physical and Analytical Electrochemistry
Lone Star B/C, Dallas Sheraton Convention Center

B01 Poster Session – 18:00 – 20:00

- **608** **Electrochemical Exfoliation of Graphite in the Presence of Metal Complexes** – S. El Khakani and D. Bélanger (Université du Québec à Montréal)
- **609** **Hard/Soft Template Synthesis of Mesoporous TiO_2/Carbon Supports for Fuel Cells** – A. Jones (University of Ontario Institute of Technology), G. Montiel (Instituto Nacional de Tecnología Industrial), F. Viva (Comisión Nacional de Energía Atómica (CNEA)), and L. Trevani (University of Ontario Institute of Technology)
- **610** **Electrical Resistance Response of Reduced Graphene Oxide - Aramid Nanofiber Films to Bending-Induced Strain** – D. Loufakis, J. G. Boyd, J. L. Lutkenhaus, and D. Lagoudas (Texas A&M University)
- **611** **High Capacitance Supercapacitors Based on Polypyrrole and Carbon Nitride Composites** – E. Pereira, R. Gonçalves, R. Paiva (Federal University of Sao Carlos), T. Lima (Federal University of Sao Carlos, Inorganic Chem. Dept., Federal Fluminense University), and M. Paixao (Federal University of Sao Carlos)
- **612** **Graphene and Carbon Supported Manganese(IV)-Cobalt(II/III) Oxides Nanoparticles As High-Performance Electrochemical Supercapacitors** – J. Jablonskiene, J. Vaičiūnienė, V. Pakštas, G. Stalnionis, A. Drabavičius, V. Jasulaitienė, L. Tamašauskaitė-Tamašiūnaitė, and E. Norkus (Center for Physical Sciences and Technology)
- **613** **Facile Synthesis of Carbon Supported Porous Metal Oxide Nanofibers for Prospective Supercapacitor Electrodes** – H. Guo, Z. He, J. LaCoste, S. Ardoin, R. Cook, and L. Fei (University of Louisiana at Lafayette)
- **614** **Examination of High Porosity Activated Carbon Obtained from Dehydration of White Sugar (ASC) for Electrochemical Capacitor Applications** – K. O. Oyedotun, F. Barzegar, A. Mirghni, A. A. Khaleed, T. M. Masikhwa (University of Pretoria), and N. Manyala (Physics Department, University of Pretoria)
- **615** **Insight into the Effect of Cationsin Ionic Liquidelectrolytes on Charge Storage Capacity of High-Performance Supercapacitors of N-Doped Graphene Aerogels** – P. Wuamprakhon, A. Krittayavathananon, and M. Sawangphruk (Vidyasirimedhi Institute of Science and Technology)
- **616** **The Effect of Embedded Dye Molecules with Conducting Polymer to Enhance the Photo-Generated Charges at the Working Electrode Toward the Performance of Solar-Capacitor Device** – B. Aljafari (University of South Florida)
- **617** **Optical Properties Alteration and Photo-Voltaic Applications of Nitrogen-Doped Graphene Quantum Dots** – M. T. Hasan (Texas Christian University), R. Gonzalez-Rodriguez (Texas Christian University Fort Worth), and A. V. Naumov (Texas Christian University)
- **618** **Electrochemically Engineered Graphite for Supercapacitor Application** – R. M. Tamgadge (Indian Institute of Technology, Delhi) and A. Shukla (Indian Institute of Technology Delhi)
- **619** **Synthesis of Rice Ball Shaped Rare Earth-Carbon Composite Electrode Material for Lithium-Ion Batteries** – S. Lee (Department of Chemistry, Sungkyunkwan Univsrsity), C. Y. Park (Department of Physics, Sungkyunkwan Univsrsity), and Y. Son (Department of Chemistry, Sungkyunkwan University)

• **620** **3D Porous Silver Nonwoven Mat Prepared with Cellulosic Templates and Spray Equipment for Supercapacitor Current Collectors** – Y. Jang, J. Jo, and S. H. Lee (Korea Institute of Machinery & Materials)

B02 Carbon Nanostructures in Medicine and Biology

Nanocarbons / Organic and Biological Electrochemistry / Sensor

B02 Poster Session – 18:00 – 20:00

• **660** **Xeno Nucleic Acid Nanosensors for Enhanced Stability** – A. J. Gillen (École Polytechnique Fédérale de Lausanne), J. Kupis-Rozmyslowicz (École polytechnique fédérale de Lausanne (EPFL)), C. Gigli (Université Denis Diderot), N. Schuergers, and A. A. Boghossian (École Polytechnique Fédérale de Lausanne)

• **661** **Near-Infrared Confocal Imaging of Single-Walled Carbon Nanotube Uptake in Bacterial Cells** – A. Antonucci, N. Schuergers, V. Zubkovs, and A. A. Boghossian (École Polytechnique Fédérale de Lausanne)

• **662** **Characterization of Double-Stranded DNA on Single-Walled Carbon Nanotubes (SWCNTs)** – S. J. Wu, N. Schuergers (École Polytechnique Fédérale de Lausanne), K. H. Lin (Ecole Polytechnique Federale de Lausanne (EPFL)), A. J. Gillen (École Polytechnique Fédérale de Lausanne), C. Corminboeuf (Ecole Polytechnique Federale de Lausanne (EPFL)), and A. A. Boghossian (École Polytechnique Fédérale de Lausanne)

• **663** **Graphene Quantum Dots As Effective Formulations for Drug Delivery, Imaging, and Sensing** – E. Campbell, M. T. Hasan (Texas Christian University), R. Gonzalez-Rodriguez (Texas Christian University Fort Worth), G. R. Akkaraju, and A. V. Naumov (Texas Christian University)

B03 Carbon Nanotubes - From Fundamentals to Devices

Nanocarbons / Physical and Analytical Electrochemistry

City View 6, Dallas Sheraton Hotel

Chemistry 3 – 08:00 – 09:40
Chair(s): Ardemis Anoush Boghossian

08:00 **711** **Photochemical Patterning of Fluorescent sp3 Quantum Defects on Carbon Nanotube Thin Films** – J. Fortner, X. Wu, Z. Huang, and Y. Wang (University of Maryland)

08:20 **712** ***(Invited)*** **Photoexcited Electron Transfer from Semiconducting Carbon Nanotubes to Non-Fullerene Acceptors** – M. S. Arnold (University of Wisconsin - Madison)

08:40 **713** ***(Invited)*** **The Mechanical Bond As a Tool to Control Surface and Electronic Properties of SWNTs** – E. M. Perez (IMDEA Nanociencia)

09:00 **714** ***(Invited)*** **Superacid-Surfactant Exchange** – P. Wang, M. Kim, and Y. Wang (University of Maryland)

09:20 **715** ***(Invited)*** **Distinct Coating Displacement Kinetics for Single-Wall Nanotube Enantiomers** – R. B. Weisman, Y. Zheng, and S. M. Bachilo (Rice University)

Optics 1 – 10:00 – 12:20
Chair(s): François Léonard

10:00 **716** ***(Invited)*** **Spectroscopy of Nanocarbon Structures Synthesized in the One-Dimensional Core of Carbon Nanotubes** – W. Wenseleers, M. Martinati, S. Cambré (University of Antwerp), H. Kuzmany, L. Shi, P. Rohringer, P. Ayala, and T. Pichler (University of Vienna)

10:20 **717** ***(Invited)*** **Modeling Insights into Optical Properties of Functionalized Carbon Nanotubes** – S. Tretiak (Los Alamos National Laboratory)

10:40 **718** ***(Invited)*** **Correlations in Photon Emission from Neutral and Charged Exciton States in Functionalized Carbon Nanotubes** – A. Högele (Fakultät für Physik, Munich Quantum Center, Center for NanoScience (CeNS), LMU München)

11:00 **719** ***(Invited)*** **Photophysics of Cabon Nanostructures** – S. Zhao (LAC), J. Lavie (CEA), L. Rondin (LAC), L. Orcin-Chaix (Aimé Cotton laboratory), G. Rebeyre (LAC), C. Diederichs (LPA, ENS), Y. Chassagneux (CNRS), C. Voisin (Ecole Normale Supérieure), A. Narita (MPI), S. Campidelli (CEA-Saclay), and J. S. Lauret (Laboratoire Aimé Cotton, ENS Paris Saclay)

11:20 **720** **The Impact of Exposed Surface Area on the Response of SWCNT Optical Sensors** – A. J. Gillen (École Polytechnique Fédérale de Lausanne), D. J. Siefman (Ecole Polytechnique Federale de Lausanne (EPFL)), S. J. Wu (École Polytechnique Fédérale de Lausanne), C. Bourmaud (Ecole Polytechnique Federale de Lausanne (EPFL)), B. P. Lambert, and A. A. Boghossian (École Polytechnique Fédérale de Lausanne)

11:40 **721** ***(Invited)*** **Carbon Nanotube Photoluminescence Solvatochromism in Biomedicine: Spectroscopy, Imaging, and Modulation** – D. A. Heller (Weill Cornell Medicine, Cornell University, Memorial Sloan Kettering Cancer Center), H. Baker, J. Budhathoki-Uprety, C. Cupo (Memorial Sloan Kettering Cancer Center), J. Harvey (Memorial Sloan Kettering), P. V. Jena (Memorial Sloan Kettering Cancer Center), R. E. Langenbacher (Weill Cornell Medical College, Cornell University), J. Mittal (Lehigh University), D. Roxbury (University of Rhode Island), J. Shah, R. M. Williams (Memorial Sloan Kettering Cancer Center), G. Zerze (Princeton University), and M. Zheng (National Institute of Standards and Technology)

12:00 **722** **Multifunctional NIR-Fluorescent Carbon Nanotubes for Imaging and Sensing By Using Defect Chemistry** – N. Herrmann, F. Mann, and S. Kruss (Göttingen University)

Devices 1 – 14:00 – 15:40
Chair(s): Delphine Bouilly

14:00 **723** ***(Invited)*** **Ultra-Low Power Light Emission Via Avalanche and Sub-Avalanche Breakdown in Suspended Carbon Nanotubes** – S. B. Cronin (University of Southern California)

14:20 **724** ***(Invited)*** **Organic/Inorganic Hybrid Interfaces with Swcnts for Energy Harvesting and Conversion** – J. L. Blackburn, D. Sulas, H. S. Kang, S. N. Habisreutinger, J. C. Johnson, A. J. Ferguson, and E. M. Miller (National Renewable Energy Laboratory)

14:40 **725** ***(Invited)*** **Emerging Neuromorphic Devices for Carbon Nanotubes and Related Low-Dimensional Materials** – M. C. Hersam (Northwestern University)

15:00 **726** ***(Invited)*** **Tuning Transport and Emission Properties of Sorted Carbon Nanotube Networks** – J. Zaumseil (Heidelberg University, Physical Chemistry)

15:20 **727** **Controlling Doping Profiles in Enriched Semiconducting Carbon Nanotube Networks for Novel Energy Harvesting Electronic Devices** – J. Hao, A. J. Ferguson, and J. L. Blackburn (National Renewable Energy Laboratory)

Lone Star B/C, Dallas Sheraton Convention Center

B03 Poster Session – 18:00 – 20:00
Chair(s): Anand Jagota

- **728** **Spinning-Disc Confocal Microscopy in the Second Near-Infrared Window (NIR-II)** – V. Zubkovs, A. Antonucci, N. Schuergers, B. P. Lambert (École Polytechnique Fédérale de Lausanne), A. Latini, R. Ceccarelli, A. Santinelli (CrestOptics S.p.A), A. Rogov, D. Ciepielewski (Nikon GmbH), and A. A. Boghossian (École Polytechnique Fédérale de Lausanne)
- **729** **Mediatorless, Reversible Optical Nanosensor Enabled through Enzymatic Pocket Doping** – V. Zubkovs, N. Schuergers, B. P. Lambert (École Polytechnique Fédérale de Lausanne), E. Ahunbay (Ecole Polytechnique Federale de Lausanne (EPFL)), and A. A. Boghossian (École Polytechnique Fédérale de Lausanne)
- **730** **Highly Flexible Agnw-CNT Sponge** – J. Kim (Kyungpook National University, Korea Institue of Industrial Technology (KITECH)), J. Lee (Kyungpook National University, Korea Institute of Industrial Technology (KITECH)), and D. Jung (Korea Institue of Industrial Technology (KITECH))
- **731** **The Effect of Catalyst Thickness and the Hydrogen Annealing Time on Spin Capability of Carbon Nanotube Forest with a Fast Temperature Ramping Rate CVD System** – Y. I. Choi, B. Dousti (University of Texas at Dallas), D. Jung (Korea Institute of Industrial Technology (KITECH)), and G. S. Lee (University of Texas at Dallas)
- **732** **Post-Chemical Modification of Doped Sites of Locally Functionalized Single-Walled Carbon Nanotubes for Multistep Photoluminescence Modulation** – T. Shiraki (Department of Applied Chemistry, Kyushu University, WPI-I2CNER, Kyushu University), T. Shiga (Department of Applied Chemistry, Kyushu University), N. Nakashima (WPI-I2CNER, Kyushu University), and T. Fujigaya (Department of Applied Chemistry, Kyushu University, WPI-I2CNER, Kyushu University)
- **733** **Fluorescent Ultrashort Nanotubes from Defect-Induced Chemical Cutting** – Y. Li, X. Wu, M. Kim (University of Maryland), H. Qu (University Of Maryland), J. Fortner, and Y. Wang (University of Maryland)
- **734** **Carbon Nanotube Compositie Based Sensor for Detecting Hydrogen Molecules** – J. Lee (Korea Institute of Industrial Technology (KITECH), Kyungpook National University), J. K. Kim (Korea Institue of Industrial Technology (KITECH), Kyungpook National University), S. Kim, and D. Jung (Korea Institute of Industrial Technology (KITECH))
- **735** **Improved Performance of Carbon Nanotube Based Strain Sensor** – J. K. Kim, J. Lee (Kyungpook National University), and D. Jung (Korea Institute of Industrial Technology (KITECH))

B04 Nano in Latin America

Nanocarbons / Dielectric Science and Technology / Electronics and Photonics

B04 Poster Session – 18:00 – 20:00

- **750** **Electrochemical Study of Tartrazine Using a Carbon Paste Electrode Modified with Nanostructured Materials** – S. I. Rivera-Hernández, N. Roque-de la O, G. Vázquez-Huerta (Universidad Autónoma Metropolitana-Azcapotzalco), S. Corona-Avendaño (Universidad Autónoma Metropolitana- Azcapotzalco), M. Palomar-Pardavé (Universidad Autónoma Metropolitana Azcapotzalco), and M. A. Romero-Romo (Universidad Autónoma Metropolitana-Azcapotzalco)
- **751** **Methanol Electro-Oxidation on Pt/C and Au @Pt/C Nanoparticles with Different Shapes.** – N. Roque-de la O, S. I. Rivera-Hernández (Universidad Autónoma Metropolitana-Azcapotzalco), S. Corona-Avendaño (Universidad Autónoma Metropolitana-Azcapotzalco), G. Vázquez-Huerta, and E. Refugio-García (Universidad Autónoma Metropolitana-Azcapotzalco)
- **752** **The Effect of Swelling on Charge's Transmission of Chitosan and Reduced Graphene Oxide Films Electrodes** – M. A. Nakagawa (Instituto Tecnológico da Aeronáutica), C. Brito de Souza (Instituto Tecnologico da Aeronáutica), and E. S. Gonçalves (Instituto Tecnológico da Aeronáutica, Instituto de Aeronáutica e Espaço)

- **753** **Electrodeposition of Co and Pd Onto Carbon Fiber and Platinum Ultramicroelectrodes** – J. A. Corona Castro and L. H. Mendoza Huizar (Universidad Autónoma del Estado de Hidalgo)
- **754** **Nanohydroxyapatite/Graphene Nanoribbons Nanocomposites for Bone Tissue Engineering Applications** – F. C. Oliveira (Universidade Brasil, UNINOVAFAPI), J. O. Carvalho (UNINOVAFAPI), B. C. Viana (Federal University of Piaui), F. R. Marciano (Universidade Brasil), and A. O. Lobo (Federal University of Piaui, Universidade Brasil)

B05 Fullerenes - Endohedral Fullerenes and Molecular Carbon

Nanocarbons

City View 7, Dallas Sheraton Hotel

Endohedral Fullerenes - New Structures – 08:00 – 09:40
Chair(s): Harry C Dorn and Josep M. Poblet

08:00 **788** ***(Invited)*** **Uranium-Based Endohedral Fullerenes: Completely Unexpected and Unusual Cage Structures Dictated By the Tetracationic Lanthanide Metal Ion** – L. Echegoyen, W. Cai (The University of Texas at El Paso), J. M. Poblet (univ. rovira i virgili), L. Feng (Soochow University), R. Morales-Martinez, A. Rodriguez-Fortea (Universitat Rovira i Virgili), and N. Chen (Soochow University)

08:20 **789** ***(Invited)*** **Actinide Endohedral Fullerenes: Unexpected Cages and Encapsulated Clusters** – N. Chen, J. Zhuang (Soochow University), Y. Wang (Soochow University, Suzhou, Jiangsu, (China)), W. Yang, and X. Li (Soochow University)

08:40 **790** ***(Invited)*** **Temperature Works Against Symmetry but "Fortunately" It Does Not Always Win: The Example of Formation of Actinide Endohedral Metallofullerenes** – J. M. Poblet, R. Morales-Martinez, L. Abella, A. Rodriguez-Fortea (Universitat Rovira i Virgili), J. Zhuang, N. Chen (Soochow University), W. Cai, and L. Echegoyen (The University of Texas at El Paso)

09:00 **791** ***(Invited)*** **New Approaches in Computational Modeling of Fullerene/Metallofullerenes** – X. Liu and H. C. Dorn (Virginia Tech Chemistry)

09:20 **792** ***(Invited)*** **Electronic Structure and Properties of Boron-Doped Endohedral Metalloheterofullerenes** – A. Rodriguez-Fortea, A. Moreno-Vicente, S. Schardt (Universitat Rovira i Virgili), P. W. Dunk (National High Magnetic Field Laboratory/ FSU), and J. M. Poblet (univ. rovira i virgili)

Applications of Fullerenes – 10:00 – 11:20
Chair(s): Alexey A. Popov and Hiroshi Imahori

10:00 **793** ***(Invited)*** **Isomer Effects of Nanocarbons in Organic Solar Cells** – H. Imahori (Kyoto University)

10:20 **794** ***(Invited)*** **Lithium-Ion Endohedral Fullerenes on Carbon Nanotube Electrode-Laminated Perovskite Solar Cells As Dopants and Anti-Oxidants** – I. Jeon, A. Shawky (The University of Tokyo), E. Kauppinen (Aalto University School of Science), S. Maruyama (The University of Tokyo), and Y. Matsuo (University of Science and Technology of China)

10:40 **795** ***(Invited)*** **Synthesis and Properties of Giant Molecular Carbon Nanorings and Nanocrowns Based on Nanographenes** – P. Du, Q. Huang, and H. Jia (University of Science and Technology of China (USTC))

11:00 **796** ***(Invited)*** **Hybridizing Fullerenes and Two-Dimensional Nanomaterials** – S. Yang (University of Science and Technology of China)

Lone Star B/C, Dallas Sheraton Convention Center

B05 Poster Session – 18:00 – 20:00
Chair(s): Shangfeng Yang

- **797** **High Regioselective Cycloaddtion of Sc3N@ C78 with Aryl Oxiranes** – M. Chen (Muqing Chen), R. Guan, F. Jin, and S. Yang (University of Science and Technology of China)
- **798** **Purification of Nanotubular Fullerenes: Manipulating Reactivity Differences of Carbon Tubes and Spheres** – T. L. Seeler, R. M. Koenig, K. R. Tepper, H. M. Franklin, and S. Stevenson (Purdue University - Fort Wayne)
- **799** **Chemical Purification of Lutetium Clusters Entrapped in Less-Common Fullerene Cages** – H. M. Franklin, S. Stevenson, and K. R. Tepper (Purdue University - Fort Wayne)
- **800** **Leveraging Reactivity Differences to Isolate the Less-Common Holmium Metallofullerenes** – K. R. Tepper and S. Stevenson (Purdue University - Fort Wayne)
- **801** **C_{60}-Fused Ketoamides Formation in Self-Sensitized Photo-Oxidation of 2-Fulleropyrrolines and Its Dynamic Study** – J. Bo, P. Rufang, and Z. Tian (Southwest University of Science and Technology)

B06 2D Layered Materials from Fundamental Science to Applications

Nanocarbons / Dielectric Science and Technology / Electronics and Photonics / Interdisciplinary Science and Technology Subcommittee / Sensor

City View 5, Dallas Sheraton Hotel

2D Layered Materials from Fundamental Science to Applications - Session 4 – 08:00 – 12:20
Chair(s): Richard Martel

08:00 **831** **Transition Metal Salts Additive as Antioxidant or Metal Oxide Decorator during Electrochemical Exfoliation of Graphite?** – A. Ejigu (School of Chemistry, The University of Manchester), K. Fujisawa (Pennsylvania State University), B. F. Spencer (University of Manchester, School of Materials), B. Wang (University of manchester, School of Chemistry), M. Terrones (Pennsylvania State University), I. A. Kinloch (School of Materials, University of Manchester), and R. A. Dryfe (School of Chemistry, University of Manchester)

08:20 **832** **Engineered [60]Fullerene-Graphene Macroassemblies: Synthesis, Characterization and Applications** – M. R. Cerón, C. Zhan, T. A. Pham, P. G. Campbell, J. Biener (Lawrence Livermore National Laboratory), L. Echegoyen (The University of Texas at El Paso), and M. M. Biener (Lawrence Livermore National Laboratory)

08:40 **833** **Modification of Conductive Electrodes with Two-Dimensional Materials** – M. Velický (Cornell University), R. A. Dryfe (School of Chemistry, University of Manchester), K. S. Novoselov (School of Physics and Astronomy, University of Manchester), and H. D. Abruña (Cornell University)

09:00 **834** ***(Invited)*** **Large Area Ion Sensitive Graphene Field Effect Transistors for Potassium, Sodium and Chlorine Sensing** – I. Fakih, F. Mahvash (McGill University), B. Ghaddab (Université du Quebec à Montreal), A. Centeno, A. Zurutuza (Graphenea), M. Siaj (Université du Quebec à Montreal), and T. Szkopek (McGill University)

09:20 **835** ***(Invited)*** **Covalent Functionalization of Graphene and MoS2: Chemical Versus Electrochemical Routes** – K. S. Mali (KU Leuven-University of Leuven) and S. De Feyter (KU Leuven)

09:40 **Break**

10:00 **836** ***(Invited)*** **The Role of Defects in Van Der Waals Epitaxy of Transition Metal Dichalcogenides** – X. Zhang, T. Choudhury, M. Chubarov, A. Bansal, and J. M. Redwing (The Pennsylvania State University)

10:20 **837** **Molybdenum Disulfides and Diselenides By Atomic Layer Deposition** – R. Zazpe (Brno University of Technology), J. Prikryl, M. Krbal (University of Pardubice), S. Ng (Brno University of Technology), F. Dvorak, F. Bures (University of Pardubice), and J. M. Macak (Brno University of Technogy)

10:40 **838** **Investigation on the Stability of $MoS_{2(1-x)}Te_{2x}$ Fabricated By Tellurization Using Organic Precursor $(i\text{-}C_3H_7)_2te$** – Y. Hibino, S. Ishihara (Meiji University, JSPS Research Fellow), K. Yamazaki, Y. Oyanagi, Y. Hashimoto, N. Sawamoto (Meiji University), H. Machida, M. Ishikawa, H. Sudoh (Gas-phase Growth Ltd.), H. Wakabayashi (Tokyo Institute of Technology), and A. Ogura (Meiji University)

11:00 **839** ***(Invited)*** **Tuning Optoelectronic Properties of Transition Metal Dichalcogenides for Hydrogen Generation** – E. M. Miller (National Renewable Energy Laboratory)

11:20 **840** ***(Invited)*** **Atomic-Scale Exploration of Synthetic Low Dimensional Materials** – N. P. Guisinger (Argonne National Laboratory)

11:40 **841** ***(Invited)*** **Controlling and Tailoring the Electronic Properties of Chemically Reactive 2D Materials** – M. C. Hersam (Northwestern University)

12:00 **842** ***(Invited)*** **2D-Metals: From Synthesis to Quantum Phenomena** – J. A. Robinson (Pennsylvania State University)

2D Layered Materials from Fundamental Science to Applications - Session 5 – 14:00 – 15:40
Chair(s): Nathan P Guisinger

14:00 **843** ***(Invited)*** **Towards High-Performance Field-Effect Transistors with Atomically Precise Graphene Nanoribbons** – J. P. Llinas (University of California, Berkeley)

14:20 **844** ***(Invited)*** **Atomically Precise Graphene Nanoribbons: From Synthesis to Applications** – A. Sinitskii (University of Nebraska - Lincoln)

14:40 **845** ***(Invited)*** **Electronic Structure and Raman Fingerprint of Atomically Precise Graphene Nanoribbons – a Key for Integration in Devices.** – B. V. Senkovskiy, K. Lindfors (University of Cologne), F. R. Fisher (University of California, Berkeley), and A. Grueneis (University of Cologne)

15:00 **846** **Tightly Pitched Sub-10 Nm Nanoribbons Grown Via Seeded Anisotropic Synthesis on Ge(001)** – A. J. Way, E. Murray, R. M. Jacobberger, F. Goeltl, V. Saraswat, M. Mavrikakis, and M. S. Arnold (University of Wisconsin - Madison)

15:20 **847** **Direct Synthesis of Armchair Graphene Nanoribbons on Ge(001)/Si(001) Using CVD** – V. Saraswat (University of Wisconsin - Madison), Y. Yamamoto (IHP), R. M. Jacobberger, A. J. Way, and M. S. Arnold (University of Wisconsin - Madison)

Lone Star B/C, Dallas Sheraton Convention Center

B06 Poster Session – 18:00 – 20:00
Chair(s): Michael S. Arnold

• **848** **Synthesis and Application of Molybdenum Disulphide Thin Layers Grown By Chemical Vapour Deposition** – R. Mula (IIT Kharapur), K. Biswas, K. Annapurna (CGCRI), and C. Jacob (IIT Kharagpur)

- **849** **Synthesis of Large-Scale Single-Layer $Mo_{1-x}W_xS_2$ Alloys with Highly Uniform and Tunable Photoluminescence** – J. Park and W. Choi (University of North Texas)
- **850** **Epitaxial and Atomically Thin Graphene–Metal Hybrid Catalyst Films—the Dual Role of Graphene As the Support and the Chemically-Transparent Protective Cap** – A. Abdelhafiz and F. M. Alamgir (Georgia Institute of Technology)
- **851** **Removal of Photoresist Residues and Healing of Defects on Graphene Using H_2 and CH_4 Plasma** – C. Y. Park (Department of Physics, Sungkyunkwan Univsrsity), Y. Son (Department of Chemistry, Sungkyunkwan University), and H. K. Jo (Sungkyunkwan University)
- **852** **Alkali Metal Doped Mono- and Bilayer Graphene: Band Structure, Raman Spectrum and Electronic Transport** – M. Hell, N. Ehlen, Y. Falke, B. V. Senkovskiy (University of Cologne), L. Petaccia (Elettra Sincrotrone Trieste), T. Szkopek (McGill University), and A. Grueneis (University of Cologne)

B07 Light Energy Conversion with Metal Halide Perovskites, Semiconductor Nanostructures, and Inorganic/Organic Hybrid Materials

Nanocarbons / Physical and Analytical Electrochemistry

City View 8, Dallas Sheraton Hotel

Semiconductors 1 – 08:00 – 09:40
Chair(s): Jea-Gun Park and Kentaro Teramura

08:00 **881** **Graphitic Carbon Nitride (g-C_3N_4) Modified N-Doped $LaTiO_3$ As an Organic–Inorganic Hybrid for Higher Visible Light Photocatalytic and Photo-Electrochemical Performance** – M. Rakibuddin, M. A. Shinde, and H. Kim (Yeungnam University)

08:20 **882** **High Resolution OLED Using Eco-Friendly Quantum-Dots Functional Color-Filter** – J. E. Lee (Hanyang University), S. J. Lee (Hanyang university), S. Y. Kim, J. H. Park, U. H. Jung, T. H. Sim, and J. G. Park (Hanyang University)

08:40 **883** ***(Invited)*** **Modification By an Ag–Cr Core–Shell Cocatalyst for Highly Selective Photocatalytic Conversion of CO_2 by H_2o** – K. Teramura (Department of Molecular Engineering, Kyoto University)

09:00 **884** ***(Invited) Beta*, *Beta*-Functionalized Push-Pull *Opp*-Dibenzoporphyrins As Sensitizers for Dye-Sensitized Solar Cells: The Role of the Phenylethynyl Bridge** – H. Wang (Univeristy of North Texas), Y. Hu, and F. D'Souza (University of North Texas)

09:20 **885** ***(Invited)*** **Electrochemical Oxygen Reduction Catalyzed at Pt–Ni Nanostructured Electrocatalysts Immobilized on Nitrogen-Doped Carbon Supports** – M. Kato, K. Ogura, S. Nakagawa, T. Li, R. Nakahoshiba, S. Tokuda, and I. Yagi (Hokkaido University)

Semiconductors 2 – 10:00 – 12:20
Chair(s): Tsukasa Torimoto, Frank E. Osterloh and Akihito Imanishi

10:00 **886** ***(Invited)*** **Effect of Particle Size on Photocatalytic Reaction Kinetics Including Multielectron-Transfer Processes** – B. Ohtani (Institute for Catalysis, Hokkaido University) and M. Takashima (Graduate School of Environmental Science, Hokkaido Univ.)

10:20 **887** ***(Invited)*** **Using Surface Photovoltage Spectroscopy to Observe Photovoltage Generation at the Interfaces of Cu_2o, $BiVO_4$, and Rh:$SrTiO_3$ Particles** – F. E. Osterloh, Z. Wu (University of California-Davis), and M. A. Melo (University of California - Davis)

10:40 **888** **Narrow Band-Edge Photoluminescence of Ga^{3+}-Doped $AgInS_2$ Quantum Dots** – T. Torimoto, T. Kameyama, M. Kishi, C. Miyamae (Nagoya University), T. Uematsu, and S. Kuwabata (Osaka University)

11:00 **889** ***(Invited)*** **Geometry and Dynamics of Quintet Multiexciton Studied By Time-Resolved EPR** – Y. Kobori (Kobe University), H. Nagashima (Kobe Univeristy), S. Kawaoka (Osaka Prefecture University), S. Akimoto (Kobe Univeristy), T. Tachikawa (Kobe University), Y. Matsui, and H. Ikeda (Osaka Prefecture University)

11:20 **890** ***(Invited)*** **Photoionization in Doped and Undoped Semiconductor Quantum Dots** – I. Robel (Los Alamos National Laboratory)

11:40 **891** ***(Invited)*** **Construction of Organic and Inorganic Hybrid Nanomaterials Utilizing Acene Derivatives for Efficient Singlet Fission** – T. Hasobe and H. Sakai (Faculty of Science and Technology, Keio University)

12:00 **892** **Nanowire-Based Energy Conversion Devices and Technologies for Waste Heat Scavenging and Water Disinfection** – S. Vaddiraju (Department of Chemical Engineering, Texas A&M University)

Semiconductors 3 – 14:00 – 15:40
Chair(s): Andrew A. Gewirth, Akihito Imanishi and Vito Di Noto

14:00 **893** ***(Invited)*** **Control of Diffusion Behavior of Metal Ions at Ionic Liquid/Electrode Interface and Its Effect on Electrodeposits** – A. Imanishi (Graduate School of Engineering Science, Osaka University)

14:20 **894** ***(Invited)*** **Catalytic Reaction Networks Mimicking Photosynthetic Electron Transport Chain** – S. Nakanishi (Osaka University)

14:40 **895** ***(Invited)*** **Ordered Nanoporous Semiconductors with Controlled Geometrical Structures By Anodization Processes** – T. Yanagishita, T. Kondo, and H. Masuda (Tokyo Metropoliatn University)

15:00 **896** ***(Invited)*** **Synthesis of Multimetallic Subnano Particles Using a Dendrimer Reactor** – K. Yamamoto (Tokyo Institute of Technology,)

15:20 **897** ***(Invited)* Nanostructured Copper and Copper Alloys for CO2 Reduction** – A. A. Gewirth (University of Illinois), T. T. H. Hoang (University of Illinois at Urbana-Champaign), X. S. Chen (University of Illinois Urbana-Champaign), and P. J. A. Kenis (University of Illinois at Urbana-Champaign)

B08 Porphyrins, Phthalocyanines, and Supramolecular Assemblies

Nanocarbons / Organic and Biological Electrochemistry

City View 7, Dallas Sheraton Hotel

Sensors – 11:20 – 12:20
Chair(s): Nathalie Solladie and Karl M. Kadish

11:20 **898** **Chiral Discrimination By Porphyrin Supramolecular Aggregates Based Chemical Sensors** – R. Paolesse, M. Stefanelli, D. Monti, G. Magna, and C. Di Natale (University of Rome Tor Vergata)

11:40 **899** **Synergistic Effects between Phthalocyanines and Nanoparticles in Nanostructured Voltammetric Sensors - Applications in the Food Industry** – C. Garcia-Hernandez, C. Salvo-Comino, C. Garcia-Cabezon, F. Martin-Pedrosa, and M. L. Rodriguez-Mendez (Group UvaSens, Universidad de Valladolid, Spain.)

12:00 **900** **Bis-Porphyrin Structural Motiff for Chirality and Molecular Sensing** – R. Du, Z. Zhou, and V. Borovkov (South-Central University for Nationalities)

Porphyrinoid Electrochemistry – 14:00 – 15:40
Chair(s): Karl M. Kadish and Nathalie Solladie

14:00 **901** **Electrochemical and Chemical Reactivity of Octahalogenated *Meso*-Tetrakis(3,5-di-tert-butyl-4-hydroxyphenyl)Porphyrins** – L. Cong (University of Houston), M. K. Chahal (Indian Institute of Technology Roorkee), R. Osterloh (University of Houston), M. Sankar (Indian Institute of Technology Roorkee, Roorkee), and K. M. Kadish (University of Houston)

14:20 **902** **Formation and Isolation of a Four-Electron-Reduced Porphyrin** – T. Kojima, W. Suzuki, H. Kotani, T. Ishizuka (University of Tsukuba), Y. Shiota, and K. Yoshizawa (Kyushu University)

14:40 **903** **Electrochemistry of Three-Dimensional Porphyrin Arrays and Related Compounds** – S. Hiroto (Kyoto University)

15:00 **904** **Synthesis, Structural, Spectral and Electrochemical Redox Properties of N-Fused Porphyrins and Their Photoinduced Electron Transfer Studies with C_{60} Derivatives** – M. Sankar, P. Rathi (Indian Institute of Technology Roorkee), S. Seetharaman, and F. D'Souza (University of North Texas)

15:20 **905** **Electrochemical and Chemical Reductions to Stable $[Co(NO)]^9$ N-Confused Porphyrin Complexes for NO to Nitrous Oxide Conversion** – C. H. Hung (Institute of Chemistry, Academia SInica)

Lone Star B/C, Dallas Sheraton Convention Center

B08 Poster Session – 18:00 – 20:00
Chair(s): Nathalie Solladie and Muniappan Sankar

- **906** **Synthesis, Structural, Spectral and Electrochemical Redox Properties of Monofused Porphyrins Derived from *Trans*-Chlorins** – N. Chaudhri, N. Grover, and M. Sankar (Indian Institute of Technology Roorkee)
- **907** **Extension of π Conjugation System By Functionalization of the Beta Position of Porphyrin** – R. Perera (University of North Texas) and H. Wang (Univeristy of North Texas)
- **908** **Synthesis, Spectral and Electrochemical Redox Properties of EAA-Appended Porphyrins** – I. Yadav and M. Sankar (Indian Institute of Technology Roorkee)
- **909** **Synthesis and Applications of Monobenzoporphyrins** – S. Kumar and M. Sankar (Indian Institute of Technology Roorkee)
- **910** **Synthesis, Photophysical and Electrochemical Redox Properties of *B*-Octa and Hepta Substituted Chlorins and Porphyrins** – R. K. Rohal and M. Sankar (Indian Institute of Technology Roorkee)
- **911** **Synthesis of Dithiophene-Monobenzo-Tetra(4-isopropylphenyl)Porphyrin** – C. Stewart (University of North Texas)
- **912** **Ultrafast Photoinduced Charge Separation in Wide-Band Capturing, Bis-Styryl Bodipy-Fullerene Donor – Acceptor Assemblies** – S. Shao, C. Obondi, H. Gobeze, G. N. Lim (University of North Texas), P. Karr (Wayne State College), and F. D'Souza (University of North Texas)
- **913** **Pentacene Fused Porphyrin Dimer Exhibiting High Stability and Solubility** – Y. Hu (University of North Texas) and H. Wang (Univeristy of North Texas)
- **914** **Rigid and Flexible Bis-Porphyrinic Tweezers: Efficient Molecular Recognition of Bidentate Bases.** – R. Rein and N. Solladie (Laboratoire de Chimie de Coordination - CNRS)
- **915** **Synthesis and Computational Study of Pentacenequinone-Fused Porphyrins with Triply-Split Soret Bands** – A. Moss, S. Washburn (University of North Texas), and H. Wang (Univeristy of North Texas)

B09 Nano for Industry

Nanocarbons / Industrial Electrochemistry and Electrochemical Engineering / Physical and Analytical Electrochemistry / Interdisciplinary Science and Technology Subcommittee / Dielectric Science and Technology

B09 Poster Session – 18:00 – 20:00

- **955** **High-Performance Flexible Supercapacitors Based on Hair Fiber-Shaped Electrode** – W. Liu, M. Zhang, and A. Yu (University of Waterloo)
- **956** **Superior Micro-Supercapacitors Based on Graphenequantum Dots** – M. Zhang, W. Liu, and A. Yu (University of Waterloo)

C01 Corrosion General Session

Corrosion

City View 1, Dallas Sheraton Hotel

Stainless Steel – 08:30 – 12:00
Chair(s): Hiroaki Tsuchiya and Zhanpeng Lu

08:30 **993** **Electrochemical Behavior of Stainless Steels in Highly Concentrated Electrolytes** – H. Tsuchiya, S. Tokuoka, and S. Fujimoto (Osaka University)

08:50 **994** **Effect of PBF-SLM Process Parameters on the Electrochemical Behavior of 316L Stainless Steel Parts in Acidic and Chloride Containing Environments** – P. Murkute, S. Pasebani, and O. B. Isgor (Oregon State University)

09:10 **995** **Electrochemical Changes with Thermal Aging of Duplex Stainless Steels** – P. Murkute, K. O. Sarfo (Oregon State University), Y. Zhang (Idaho National Laboratory), L. Árnadóttir, J. Tucker, and O. B. Isgor (Oregon State University)

09:30 **Break**

10:00 **996** **XPS Analysis of the Oxide Films Formed on Non-Charged and Hydrogen-Charged 316L SS in Deaerated High Temperature Water** – T. Cui (Shanghai University, School of Mater. Sci. & Eng.), J. Ma (Shanghai University), K. Zhang (Shanghai University, School of Mater. Sci.& Eng.), Y. Jia, F. Ning (Shanghai University,School of Mater. Sci.& Eng.), and Z. Lu (School of Mater. Sci. and Eng.,Shanghai University)

10:20 **997** **Structure of the Oxide Films Formed on Hydrogen-Charged and Uncharged 316L Stainless Steels in Oxygenated High Temperature Water** – T. Cui (Shanghai University, School of Mater. Sci. & Eng.), K. Zhang (Shanghai University, School of Mater. Sci.& Eng.), J. Ma (Shanghai University), Y. Jia, F. Ning (Shanghai University,School of Mater. Sci.& Eng.), and Z. Lu (School of Mater. Sci. and Eng.,Shanghai University)

10:40 **998** **Synthesis and Evaluation of Anionic Schiff Bases As Pitting Corrosion Inhibitor for Stainless Steel 304 in NaCl Solution** – M. Talebian, K. Raeissi, M. Atapour (Isfahan University of Technology), B. M. Fernández-Pérez, A. M. Betancor-Abreu (Universidad de La Laguna), I. Llorente (Centro Nacional de Investigaciones Metalúrgicas, CSIC), S. Fajardo (Centro Nacional de Investigaciones Metalúrgicas (CENIM)), M. Amirnasr, Z. Salarvand (Isfahan University of Technology), and R. M. Souto (Universidad de La Laguna)

11:00 **999** **3D Peridynamic Models for Pitting Corrosion and Stress Corrosion Cracking** – S. Jafarzadeh (University of Nebraska-Lincoln), Z. Chen (Huazhong University of Science and Technology), J. Zhao, and F. Bobaru (University of Nebraska-Lincoln)

11:20 **1000** **Corrosion Behaviors of Ferritic and Martensitic Stainless Steels in H_2o Containing CO_2 and O_2 at Elevated Pressures** – R. Repukaiti, L. Teeter, Ö. N. Doğan (National Energy Technology Laboratory), M. Ziomek-Moroz (DOE/NETL), R. P. Oleksak, R. B. Thomas, N. Huerta, J. P. Baltrus (National Energy Technology Laboratory), and J. Tucker (Oregon State University)

11:40 **1001** **Mechanistic Insights into the Initial Stages of Chloride Enhanced Depassivation of Chromium Oxide Film, a Density Functional Theory Study** – K. O. Sarfo, P. Murkute, O. B. Isgor, J. Tucker, L. Árnadóttir (Oregon State University), and Y. Zhang (Idaho National Laboratory)

Corrosion Protection – 14:00 – 17:20
Chair(s): Dev Chidambaram and Eiji Tada

14:00 **1002** **The Effects of Citric Acid on the Mechanical and Corrosion Resistant Properties of Ni-Y_2O_3 Coatings for Enhanced Corrosion Protection** – N. Ngo (Department of Chemistry, University of North Texas), G. Argade (Department of Material Science, University of North Texas), and T. Golden (Department of Chemistry, University of North Texas)

14:20 **1003** **Mechanistic Study of Environmentally-Friendly Zr-Based and Hybrid Nano-Coating Surface Conversion Treatment** – X. Liu (Stony Brook University), D. Vonk (Henkel Corporation), X. Tong (Brookhaven National Laboratory), B. Ravel (NIST), G. P. Halada (Stony Brook University), K. Foster, S. Petrash (Henkel Corporation), and Y. C. K. Chen-Wiegart (Stony Brook University, Brookhaven National Laboratory)

14:40 **1004** **Study on Corrosion and Cavitation Behaviors of NiTi Alloy Coated on Steel** – Q. Zeng Sr. (Xi'an Jiaotong University) and Y. Gu (Beijing Institute of Petrochemical Technology)

15:00 **1005** **Henna Extract As a Corrosion Inhibitor on Carbon Steel with TMSM-PMMA Hybrid Coating** – A. Rabiei Baboukani and M. Torkghashghaei (Florida International University)

15:20 **Break**

15:40 **1006** **Acridin-Based Thiosemicarbazones As Novel Corrosion Inhibitors in the Corrosion of Mild Steel in 1M HCl: Synthesis, Gravimetric, Electrochemical, and Quantum Chemical Studies** – E. D. Akpan (North West University), I. O. Isaac (Akwa Ibom State University), L. O. Olasunkanmi (North-West University, South Africa), and E. E. Ebenso (North-West University (Mafikeng Campus))

16:00 **1007** **Electrochemical, Surface Morphology and Computational Studies on Some Quinoxalin-6-Yl-4,5-Dihydropyrazolylpropanones As Inhibitors of Mild Steel Corrosion in 1 M HCl Solution** – L. O. Olasunkanmi (North-West University, South Africa, Obafemi Awolowo University, Ile-Ife, Nigeria) and E. E. Ebenso (North-West University (Mafikeng Campus))

16:20 **1008** **Super Slipery Coating By ZnO Based on Aluminum and Its Anti-Corrosion Performance** – J. Liu (Harbin Engineering University)

16:40 **1009** **Newly-Developed Molybdate-Based Protective Coatings for AZ31D Magnesium Alloys** – M. Farhat (Central Metallurgical R&D Institute)

17:00 **1010** **Prospects and Challenges of Supramolecular Approaches in Corrosion Prevention Strategies** – V. S. Saji (King Fahd University of Petroleum and Minerals (KFUPM))

Lone Star B/C, Dallas Sheraton Convention Center

C01 Poster Session – 18:00 – 20:00
Chair(s): Masayuki Itagaki and Jamie Noel

- **1011** **Effect of Hydrogen Embrittlement on the Mechanical and Electrochemical Properties of Carbon Steel API 5L X65 in a CO_2-Saturated 3.5 Wt.% NaCl Solution** – A. Rodriguez (ORISE/DOE/NETL), K. Rozman (AECOM/DOE/NETL), M. Ziomek-Moroz, and J. H. Tylczak (DOE/NETL)
- **1012** **Corrosion Protection Application of Liquid-Infused Surface with Regional Growth of LDH Films on Al Alloys** – J. Shuyue, Z. Haifeng, T. Yanjing, R. Wanting, and X. Liu (Harbin Institute of Technology)
- **1013** **The Effectiveness of Some Organic Polymers As Corrosion Inhibitors for Carbon Steel and Brass in Acidic Media** – F. Branzoi, L. Aricov, and A. Baran (Institute of Physical Chemistry)
- **1014** **Photocathodic Protection Performance of ZnS-CdS-Ag@TiO_2 for 403SS Under Visible Light** – Y. Zhu (Binzhou University)
- **1015** **Development of a New Copper Corrosion Screening Methodology for Application in Microelectronics** – J. Alptekin, A. S. Salunke, M. Asokan, G. Issac, J. Caperton, and O. Chyan (University of North Texas)
- **1016** **Aromatic Disulfide Based Compounds As Corrosion Inhibitors for Steel in Acidic Media** – D. Karunarathne and T. D. Golden (University of North Texas)
- **1017** **Corrosion Studies of 12-Aminododecanoate Modified Zn-Al LDH/Epoxy Coating** – A. Aminifazl and T. D. Golden (University of North Texas)
- **1018** **Enhancing Mechanical and Corrosion Properties of Electrodeposited Ni- Pr_6O_{11} Composite Coatings Via Stabilizing Agents** – J. England, N. Ngo, and T. Golden (Department of Chemistry, University of North Texas)
- **1019** **Effect of Soil Particle Size on Corrosion Behavior of Buried Carbon Steel** – S. Ohki, S. Mineta, M. Mizunuma, and M. Tsuda (NTT Device Technology Labs, NTT Corporation)

D01 Chemical Mechanical Polishing 15

Dielectric Science and Technology
Pearl 2, Dallas Sheraton Hotel

Chemical Mechanical Polishing 15 - Session 1 – 09:00 – 12:15
Chair(s): Yaw S. Obeng and Robert L. Rhoades

09:00 **Welcoming Remarks - Gautam Banerjee, Versum Materials**

09:20 **1031** ***(Invited)* A Review on the Role of Slurry Chemistry on Chemically Modified Thin Film Formation for CMP Applications** – G. B. Basim (178 Rhines Hall)

10:00 **1032** **Mechanistic Understanding of the Planarization Behavior of Low κ Organosilicate Glass Films with Beol Barrier Slurries** – A. Mallikarjunan (Versum Materials Technology LLC., Taiwan), J. Achtyl (Versum Materials, Tempe AZ , USA), R. J. Yang, C. Y. Huang, S. H. Chao (Versum Materials Technology LLC., Taiwan), L. Gan, R. Ridgeway, J. Schlueter (Versum Materials, Tempe AZ , USA), M. S. Tsai, C. Li (Versum Materials Technology LLC., Taiwan), and M. O'Neill (Versum Materials, Tempe AZ , USA)

10:30 **Break**

10:45 **1033** **Small Molecule Adsorption on Colloidal Alumina and Zirconia Abrasives Used in Chemical-Mechanical Planarization (CMP) Slurries** – K. A. Martinez, M. R. Stewart, D. J. Campbell, and E. E. Remsen (Dept. of Chemistry and Biochemistry, Bradley University)

11:15 **1034** **Holographic Characterization of Contaminants in CMP Slurries** – F. C. Cheong, J. Lumer, M. A. Odete, A. Winters, and L. A. Philips (Spheryx, Inc.)

11:45 **1035** **Initial Study on the Polishing Performance of Silica Abrasive Size in Copper Barrier Chemical Mechanical Planarization (CMP)** – G. Lee and H. Park (SK hynix)

Chemical Mechanical Polishing 15 - Session 2 – 13:30 – 17:00
Chair(s): Aniruddh J. Khanna and Edward E. Remsen

13:30 **1036** ***(Invited)* Unraveling Synergistic Interactions driving the Chemical Mechanical Planarization Process** – J. J. Keleher (Lewis University, Department of Chemistry)

14:10 **1037** **Effects of Amino Acids on Silicon Oxide for High Silicon Oxide Removal Rate Ceria Slurry** – T. Kim (SAINT, Sungkyunkwan University)

14:40 **Break**

15:00 **1038** **Table-Top Evaluation Approach to Design Post-CMP Clean Chemicals** – T. Kusano and K. Takeshita (Mitsubishi Chemical Corporation)

15:30 **1039** **Improvement of Post CMP Cleaning Efficiency through Surface Energy Optimization and Use of Viscoelastic Fluids** – S. Ozbek (South Dakota School of Mines and Technology, Ozyegin University), T. Walker (South Dakota School of Mines and Technology, Oregon State University), R. K. Cashen (Oregon State University), and G. B. Basim (178 Rhines Hall)

16:00 **1040** **In-Situ Electrochemical Characterization on Pcmp Cleaning Under Brushing Conditions** – J. Liu, M. White (Entegris, Inc.), C. Johnson, and D. Roy (Clarkson University)

16:30 **1041** **Comparison of Wear with Friction Data in Chemical Mechanical Planarization** – C. McGowan and J. Levert (University of New Haven)

Lone Star B/C, Dallas Sheraton Convention Center

D01 Poster Session – 18:00 – 20:00
Chair(s): Gautam Banerjee

• **1030** **Hydraulic Jump Dynamics for Water Jet Impingement on Vertically Oriented Rotating Surfaces** – P. Adiga (Oregon State University)

F03 Characterization of Porous Materials 8

Industrial Electrochemistry and Electrochemical Engineering / Battery / Energy Technology
Pearl 5, Dallas Sheraton Hotel

Industrial Electrochemistry and Electrochemical Engineering Division H. H. Dow Memorial Student Achievement Award Address – 09:00 – 09:40
Chair(s): John A. Staser and Christina Bock

09:00 **1103** ***(Industrial Electrochemistry and Electrochemical Engineering Division H. H. Dow Memorial Student Achievement Award)*** **Transport Study Inside Porous Layers of PEFC Using Direct Numerical Simulation** – P. Satjaritanun, S. Shimpalee, J. W. Weidner (University of South Carolina), I. V. Zenyuk (University of California Irvine), and S. Hirano (Ford Motor Company)

Characterization of Porous Materials 8 - Session 1 – 10:00 – 12:00
Chair(s): John A. Staser and Christina Bock

10:00 **1104** **Symmetric and Asymmetric Capacitive Deionization Cells Using Modified Porous Carbon Electrodes** – X. Gao, A. Omosebi (University of Kentucky), J. Landon (Center for Applied Energy Research University of Kentucky), Z. Ma (China University of Mining and Technology), M. Ghorbanian (LG&E and KU Energy LLC), N. Kern (Duke Energy), and K. Liu (University of Kentucky)

10:20 **1105** **Tracking Gas Diffusion Electrode Flooding in CO_2 Electrolyzers Via Electrochemical Double Layer Capacitance** – M. E. Leonard, A. Forner-Cuenca, S. M. Brown (Massachusetts Institute of Technology), and F. R. Brushett (Department of Chemical Engineering,MIT)

10:40 **1106** **Dielectric Characteristics Analysis of Aluminum Electrolytic Capacitors Based on Linear Response Function** – D. Mukaiyama and M. Yamamoto (Department Electrical Engineering, Nagoya University)

11:00 **1107** **Effect of Tunnel Pits Radius Variation on the Electric Characteristics of Aluminum Electrolytic Capacitor** – D. Mukaiyama and M. Yamamoto (Department Electrical Engineering, Nagoya University)

11:20 **1108** **Transport Properties of Flow-through Electrodes with Varying Composition and Particle Dimension for Electrochemical Desalination** – E. R. Reale (University of Illinois at Urbana-Champaign) and K. C. Smith (Mechanical Science and Engineering, University of Illinois at Urbana-Champaign)

11:40 **1109** **Metal Nanowire Felt As a Flow-through Electrode for High-Throughput Electrosynthesis** – B. J. Wiley and M. J. Kim (Duke University)

Characterization of Porous Materials 8 - Session 2 – 14:00 – 17:30
Chair(s): John A. Staser and Christina Bock

14:00 **1110** **Activated Carbon-Based Electrodes with Engineered Microstructure for Capacitive Deionization (CDI) of Aqueous Solutions** – Y. Salamat, C. Mueller, T. Stanczyk, R. Soheilian, R. Erb, and C. H. Hidrovo (Northeastern University)

14:20 **1111** **Tailoring Mesoporous Silica Nanoparticles and Thin Films: Synthesis, Characterization and Electrochemical Applications** – E. T. Weldekidan, V. Hornebecq, and C. Lebouin (Aix-Marseille University)

14:40 **1112** **Hierarchical Bulk Nanoporous Aluminum for on-Board Hydrogen and Heat Generation By Hydrolysis in Pure Water** – J. S. Corsi (School of Engineering, University of Pennsylvania, Vagelos Institute for Energy Science and Technology), J. Fu (School of Engineering, University of Pennsylvania), T. Lee (School of Engineering, University of Pennsylvania, Vagelos Institute for Energy Science and Technology), and E. Detsi (School of Engineering, University of Pennsylvania)

15:00 **1113** **Conformal Coating on Inverse Opaline Scaffolds for Enhanced Mechanical Properties and Thermal Stability** – P. S. Hung, S. C. Chou, G. R. Wang, C. J. Wang, W. A. Chung, and P. W. Wu (National Chiao Tung University)

15:20 **1114** **Luminescence and Magnetic Properties of Porous Silicon Investigated with Respect to Its Metal Filling** – P. Granitzer, K. Rumpf (Karl Franzens University Graz), P. Poelt (University of Technology Graz), and M. Reissner (Vienna University of Technology)

15:40 **Break**

15:50 **1115** **Assessment of Arrays of Permanent Nanomagnets Produced By Bi-Metal Deposits within Porous Silicon** – K. Rumpf, P. Granitzer (Karl Franzens University Graz), R. Gonzalez-Rodriguez (Texas Christian University Fort Worth), J. L. Coffer (Texas Christian University), P. Poelt (University of Technology Graz), and H. Michor (Vienna University of Technology)

16:10 **1116** **Microstructure Simulation and Virtual Material Design of Electrospun Gas Diffusion Layers for Polymer Electrolyte Membrane Fuel Cells** – M. Balakrishnan, K. F. Fahy (University of Toronto), V. P. Schulz (Baden-Wuerttemberg Cooperative State University, University of Toronto), and A. Bazylak (University of Toronto)

16:30 **1117** **Novel Electrospun Gas Diffusion Layers with Spatially Graded Pore Sizes for Polymer Electrolyte Membrane Fuel Cells** – M. Balakrishnan (University of Toronto), L. Eifert, R. Zeis (KIT, Helmholtz Institute Ulm), B. D. Hatton, and A. Bazylak (University of Toronto)

16:50 **1118** **Perforated Anode Gas Diffusion Layer for Direct Methanol Fuel Cells** – A. Alrashidi (University of Miami)

17:10 **1119** **Correlative Multiscale Tomography on Inert Supported Solid Oxide Fuel Cells** – F. Wankmüller, N. Russner, A. Weber (IAM-WET, Karlsruhe Institute of Technology (KIT)), M. Meffert, J. Schmieg (LEM, Karlsruhe Institute of Technology (KIT)), H. Störmer (LEM, Karlsruhe Institute of Technology, Germany), P. Lupetin (Robert Bosch GmbH), D. Gerthsen (LEM, Karlsruhe Institute of Technology (KIT)), and E. Ivers-Tiffée (IAM-WET, Karlsruhe Institute of Technology (KIT))

Lone Star B/C, Dallas Sheraton Convention Center

F03 Poster Session – 18:00 – 20:00

- **1120** **Transport Limitations of Sodium-Ions in Type-II Clathrates** – X. Li (National Renewable Energy laboratory), K. Steirer, L. Krishna (Colorado School of Mines), C. Xiao, K. Fink, and S. Santhanagopalan (National Renewable Energy Laboratory)
- **1121** **High Ionic Conductivity in 2D Molybdenum Disulfide (MoS_2) Membrane** – J. Park and W. Choi (University of North Texas)

F04 Multiscale Modeling, Simulation and Design 3: Enhancing Understanding, and Extracting Knowledge from Data

Industrial Electrochemistry and Electrochemical Engineering / Energy Technology
Pearl 4, Dallas Sheraton Hotel

Multiscale Modeling, Simulation and Design 3: Enhancing Understanding, and Extracting Knowledge from Data - Session 1 – 08:00 – 12:00
Chair(s): John N. Harb and Venkat R. Subramanian

08:00 **Introductory Remarks**

08:10 **Talk on Perspectives, by Dr. Richard Alkire**

08:20 **1122** ***(Invited)*** **Model Guided Design and Analysis of Experiment** – N. W. Brady, K. Mayilvahanan, and A. C. West (Columbia University)

09:00 **1123** ***(Invited)*** **Superconformal Electrodeposition** – T. P. Moffat, G. Liu (NIST), S. Zou (American University), L. Y. Ou Yang, T. Braun, M. Walker, D. Wheeler, L. Richter, and D. Josell (NIST)

09:40 **Break**

10:00 **1124** ***(Invited)*** **Effect of Gravitational Level on the Initial Stage of Cu Electrodeposition** – Y. Fukunaka (Nanotechnology Research Institute, Waseda)

10:20 **1125** **Die Level Model for Electroplated Copper Pillars** – G. Graham, L. P. Chua, B. Buckalew, T. Ponnnuswamy, and S. Mayer (Lam Research)

10:40 **1126** ***(Invited)*** **Perspectives on Computational Studies of Electrocatalysis: New Approaches to Theoretical Catalyst Design** – J. Greeley (Purdue University)

11:20 **1127** ***(Invited)*** **Molecular-Level Analysis of Electrodeposition Processes Using Theoretical Calculations and Surface Enhanced Raman Microscopy** – T. Homma (Department of Applied Chemistry, Waseda University, Res. Org. for Nano&Life Innovation, Waseda University), M. Kunimoto, Y. Onabuta (Department of Applied Chemistry, Waseda University), M. Bertz, and M. Yanagisawa (Res. Org. for Nano & Life Innovation, Waseda University)

Multiscale Modeling, Simulation and Design 3: Enhancing Understanding, and Extracting Knowledge from Data - Session 2 – 14:00 – 18:00
Chair(s): John N. Harb and Ankur Jain

14:00 **1128** ***(Invited)*** **Multiscale Stress-Transport-Kinetics Continuum Models for Lithium-Metal Batteries-Relevance of Richard Alkire's Electrodeposition Legacy for Next-Generation Batteries** – A. Subramaniam, T. Jang (University of Washington), E. J. Dufek (Idaho National Laboratory), and V. R. Subramanian (University of Washington)

14:20 **1129** ***(Invited)*** **Model-Based Battery Management System of Lithium-Ion Batteries** – M. Pathak (BattGenie Inc, Seattle), S. Kolluri (BattGenie Inc, Seattle, University of Washington, Seattle), T. Jang (University of Washington), C. Pathak (University of Washington, BattGenie Inc. Seattle), S. Santhanagopalan (National Renewable Energy Laboratory), and V. R. Subramanian (University of Washington, Pacific Northwest National Laboratory)

14:40 **1130** ***(Invited)*** **Modeling at Multiple Scales for Development of Future Energy Storage Technologies** – R. M. Stephens (Shell International E&P Inc.), J. Balachandran, I. Rudra, S. Maheshwari, F. Thakkar, S. Bonakala (Shell India Markets Pvt. Ltd.), G. Verbist (Shell Global Solutions International B.V.), and R. Ratnakar (Shell International E&P Inc.)

15:20 **1131** ***(Invited)*** **Atomically-Informed Phase-field Modeling of Li and Mg Electrodeposition Morphologies** – Z. Liu (The Pennsylvania State University), Y. Li (Michigan State University), Y. Yao (University of Houston), L. Q. Chen (The Pennsylvania State University), and Y. Qi (Michigan State University)

16:00 **1132** ***(Invited)*** **Elucidating Interfacial Phenomena in Li-Metal Based Batteries** – P. B. Balbuena (Texas A& M University)

16:40 **1133** ***(Invited)*** **Heat Generation in Batteries Under Extreme Fast Charge: A Multi-Scale Perspective** – S. Santhanagopalan, N. Sunderlin, K. Fink, A. Saxon, and C. Yang (National Renewable Energy Laboratory)

17:20 **1134** ***(Invited)*** **Equivalent Circuit Modeling for EIS on Structured Electrode in LIB** – T. Osaka and H. Nara (Research Organ. for Nano & Life Innovation, Waseda Univ.)

G01 Silicon Compatible Emerging Materials, Processes, and Technologies for Advanced CMOS and Post-CMOS Applications 9

Electronics and Photonics / Dielectric Science and Technology
City View 2, Dallas Sheraton Hotel

Ferroelectrics Materials and Devices – 08:30 – 09:30
Chair(s): Kuniyuki Kakushima and Zia Karim

08:30 **1180** ***(Invited)*** **A Ferroelectric Semiconductor Field-Effect Transistor** – M. Si and P. D. Ye (Purdue University)

09:10 **1181** **Ferroelectric Properties of Si Doped HfO_2 Thin Films with $NiSi_2$ As Bottom Electrode** – J. Molina-Reyes (Tokyo Institute of Technology, National Inst. of Astrophysics, Optics and Electronics), H. Iwatsuka, T. Hoshii, S. I. Ohmi, H. Funakubo, A. Hori, I. Fujiwara, H. Wakabayashi, K. Tsutsui, and K. Kakushima (Tokyo Institute of Technology)

Technologies for Advanced Integrated Circuits 1 – 10:00 – 12:00
Chair(s): Paul J. Timans and Zia Karim

10:00 **1182** ***(Invited)*** **Challenges and Opportunities in the Modeling of Novels Devices and Materials for Logic Applications** – M. Luisier, A. Szabo, C. Klinkert, C. Stieger, M. Rau, T. Agarwal, and Y. Lee (ETH Zurich)

10:40 **1183** ***(Invited)*** **Laser Thermal Annealing for Low Thermal Budget Applications: From Contact Formation to Material Modification** – K. Huet, T. Tabata, J. Aubin, B. Curvers, F. Mazzamuto (SCREEN-LASSE, Gennevilliers, France), and Y. Mori (SCREEN Semiconductor Solutions, Co., Ltd., Hikone, Japan)

11:20 **1184** ***(Invited)*** **Cluster-Preforming-Deposited Si-Rich W Silicide: A New Contact Material for Advanced CMOS** – N. Okada, N. Uchida, S. Ogawa, and T. Kanayama (AIST)

Dielectric Science and Technology Division Thomas D. Callinan Award Address – 14:00 – 14:50
Chair(s): Durgamadhab Misra

14:00 **Introductory Remarks**

14:10 **1185** ***(Dielectric Science and Technology Division Thomas D. Callinan Award Address)*** **Colorful Adventures in the Field of Dielectrics Science: Some Highs and Lows with a Touch of a Chilly Forecast** – S. W. King (Intel Corporation)

Processes for Advanced Integrated Circuits – 14:50 – 17:00
Chair(s): Stefan De Gendt and Yaw S. Obeng

14:50 **1186** ***(Invited)*** **Area Selective Atomic Layer Deposition As an Emerging Process for Advanced Nanofabrication** – D. Bobb-Semple, T. L. Liu, and S. F. Bent (Stanford University)

15:30 **Break**

16:00 **1187** **Thermal Resistance in ALD Grown Dielectric Thin Films** – E. A. Scott (University of Virginia), S. W. King (Intel Corporation), S. Smith (Sandia National Laboratories), J. Gaskins, J. Ihlefeld, and P. Hopkins (University of Virginia)

16:20 **1188** **Hollow Cathode Plasma (HCP) Enhanced Atomic Layer Deposition of Silicon Nitride (SiN_x) Thin Films Using Pentachlorodisilane (PCDS)** – S. M. Hwang, A. L. N. Kondusamy, Q. Zhiyang, H. S. Kim, J. Kim (The University of Texas at Dallas), B. K. Hwang, X. Zhou, M. Telgenhoff, and J. Young (The Dow Chemical Company)

16:40 **1189** **Co-Planar Nano-Resistor Devices** – Y. Kuo and S. Zhang (Texas A&M University)

G02 Processes at the Semiconductor Solution Interface 8

Electronics and Photonics / Dielectric Science and Technology / Electrodeposition / Physical and Analytical Electrochemistry
City View 3, Dallas Sheraton Hotel

Processes at the Semiconductor Solution Interface - Session 1 – 08:20 – 09:40
Chair(s): Colm O'Dwyer and Vidhya Chakrapani

08:20 **1201** ***(Invited)*** **Intermediates in PEC Water Oxidation — How They Come and How They Go** – A. Braun (Empa)

09:00 **1202** **Evaluating the Intrinsic Material Stability at the Semiconductor/Electrolyte Interface for Solar Fuel Production** – W. Yu and N. S. Lewis (California Institute of Technology)

09:20 **1203** **Controlling the Performance of Si(111) Photoelectrodes Via Molecular Modification** – D. G. Boucher and M. J. Rose (University of Texas at Austin)

Processes at the Semiconductor Solution Interface - Session 2 – 10:00 – 12:20
Chair(s): Philippe M. Vereecken and Andrew Campion Hillier

10:00 **1204** ***(Invited)*** **A New Perspective for Photoelectrochemical Water Splitting: Black TiO2 Nanotubes** – P. Schmuki (University of Erlangen-Nuremberg), N. Liu (University of Erlangen-Nuremberg (FAU)), and M. Altomare (University of Erlangen-Nuremberg)

10:40 **1205** **Oxides of Manganese As Efficient Bifunctional Electrocatalysts** – I. Roy, Q. Wang, and V. Chakrapani (Rensselaer Polytechnic Institute)

11:00 **1206** **Band Alignment of *N*- and *P*- Doped InP at Electrolyte and Ultra High Vacuum Junctions: Fundamental Correlation between the Open Circuit Potential Under Illumination and XPS Photopeak Energy** – P. C. Rakotoarimanana, M. Frégnaux, N. Simon, A. Etcheberry, and A. M. Gonçalves (Institut Lavoisier de Versailles UMR8180 CNRS-UVSQ)

11:20 **1207** **Characterization and (Electro)Chemical Studies of Halide-Passivated Ge (100) Surfaces in Acidic Solutions** – G. H. A. Abrenica (KU Leuven, IMEC), M. V. Lebedev (Ioffe Institute), H. Le (IMEC), A. Hajduk (TU Darmstadt), M. Fingerle (Darmstadt University of Technology), T. Mayer (Darmstadt University of Technology, Germany), S. De Gendt (KU Leuven, imec), and D. H. van Dorp (IMEC)

11:40 **1208** **Activation of Iridium Electrodes for Neural Stimulation** – R. A. Frederick, A. Joshi-Imre, Y. I. Meliane (The University of Texas at Dallas), P. Troyk (Sigenics, Inc, Illinois Institute of Technology), and S. F. Cogan (The University of Texas at Dallas)

12:00 **1209** **Morphological Evolution of Photoelectrodeposited Semiconductor Nanopatterns in Response to Dynamic Optical Inputs** – K. R. Hamann, A. I. Carim, M. C. Meier, and N. S. Lewis (California Institute of Technology)

Processes at the Semiconductor Solution Interface - Session 3 – 14:00 – 17:00
Chair(s): Colm O'Dwyer and Vidhya Chakrapani

14:00 **1210** ***(Invited)* Electrodeposition of Semiconductors: An Emerging and Hugely Popular Art** – K. Rajeshwar (University of Texas)

14:40 **1211** **Quantum-Enhanced Hydrogen Evolution Reactions in a Monolayer Crystal** – M. Yan (University of Washington), M. Brischetto (University of washington), C. McCune, and J. Yang (University of Washington)

15:00 **1212** **Semiconductor Nanostructure Tailoring Via Spontaneous Interface Shaping for Light-Collection Maximization** – A. I. Carim, N. A. Batara, A. Premkumar, H. A. Atwater, and N. S. Lewis (California Institute of Technology)

15:20 **1213** **Ionic Bombardment to Tune the Electrochemical Properties of a Semiconductor.** – D. Aureau, M. Frégnaux, M. Bouttemy, J. Vigneron, N. Simon, A. Etcheberry, and A. M. Gonçalves (Institut Lavoisier de Versailles UMR8180 CNRS-UVSQ)

15:40 **Break**

16:00 **1214** **Real-Time Detection and Diagnosis of Abnormalities in Electroplating Baths - Copper Damascene Process Case Study** – A. Jaworski, H. Wikiel, and K. Wikiel (Technic, Inc.)

16:20 **1215** **Cyclic Voltammetry of Ge and Te in Basic Conditions: An Investigation of Surface Coverages.** – P. W. Sisk and J. L. Stickney (University of Georgia)

16:40 **1216** **Metal-Assisted Chemical Etching for Simple, Cost-Effective, and Large-Scale III-V Semiconductor Nanofabrication** – T. S. Wilhelm (Rochester Institute of Technology, NanoPower Research Laboratories), A. P. Kolberg, Z. Wang, C. W. Soule (Rochester Institute of Technology), M. A. Baboli (Rochester Institute of Technology, NanoPower Research Laboratories), J. Yan (Matrix Opto Co., Ltd.), S. F. Preble (Rochester Institute of Technology), and P. K. Mohseni (Rochester Institute of Technology, NanoPower Research Laboratories)

Lone Star B/C, Dallas Sheraton Convention Center

G02 Poster Session – 18:00 – 20:00

- **1217** **Influence of Additives on Formation of through-Si Via in Si Substrate Using Metal Assisted Chemical Etching** – T. Shimizu, S. Hanatani, T. Yorioka, R. Niwa, T. Ito, and S. Shingubara (Kansai University)
- **1218** **Characterization of Silicon Nanowires Reflectance By Effective Index Due to Air-Silicon Ratio** – P. K. Koech, M. Ogini, S. Mohan, A. Alice Francis, M. Deo, S. Albin (Department of Engineering, Norfolk State University), and K. B. Sundaram (Univ. of Central Florida)

G03 Organic Semiconductor Materials, Devices, and Processing 7

Electronics and Photonics
City View 4, Dallas Sheraton Hotel

OLEDS and Photovoltaics – 08:30 – 10:55
Chair(s): Lluis F. Marsal

08:30 **Welcoming Remarks**

08:35 **1232** ***(Invited)* Simulation of CdSe Based Quantum Dot Hybrid Light Emitting Diodes Using Tcad Continuous Models** – R. Grassi (Silvaco Inc), I. Arroyo, B. Iniguez (Univ of Rovira I Virgili), T. Drevon, A. Plews (silvaco europe ltd), S. Chourou, M. Townsend (Silvaco Inc), and A. Nejim (silvaco europe ltd)

09:05 **1233** ***(Invited)* Roll Coated Organic Dye-Based Photovoltaics for Indoor Energy Harvesting Applications** – G. C. Welch (University of Calgary)

09:35 **Break**

10:05 **1234** ***(Invited)* Efficient Non-Fullerene Polymer Solar Cells** – J. G. Sanchez, J. Ferré-Borrull, J. Pallares, and L. F. Marsal (Universitat Rovira i Virgili)

10:35 **1252** **Surmofs and Ccncs As Novel Tuneable Metal-Organic Materials for Photonic, Electronic, Optoelectronic and Thermoelectric Applications** – E. Redel (IFG (institute of Functional Interfaces))

Sensors – 11:05 – 12:05
Chair(s): Hagen Klauk

11:05 **1236** ***(Invited)*** **Morphological Engineering for Polymer-Based Electrochemical Sensors** – C. H. Kim (Gachon University)

11:35 **1237** ***(Invited)*** **Emerging Designs for Polymer-Based Energy Storage Devices and Sensors** – K. Wang (University of California San Diego), Z. Wu (UC San Diego), J. Azoulay (University of Southern Mississippi), and T. N. Ng (University of California San Diego)

Modeling and Parameter Extraction – 14:00 – 17:30
Chair(s): Benjamin Iniguez

14:00 **1238** ***(Invited)*** **Physics-Based Compact Model for Organic Thin-Film Transistors with a Universal Charge Expression for Quasi-Static Operation** – A. Kloes, J. Pruefer, J. Leise, G. Darbandy (TH Mittelhessen - University of Applied Sciences), and H. Klauk (Max Planck Institute for Solid State Research)

14:30 **1239** ***(Invited)*** **Compact Modeling of I-V and C-V Characteristics in OTFTs from 125K to 350K** – B. Iniguez, H. Cortes-Ordonez (University Rovira i Virgili, DEEEiA), A. Cerdeira (CINVESTAV-IPN), M. Estrada (CINVESTAV-IPN, Mexico), S. Jacob (CEA Liten), C. Haddad (CEA-LITEN, Grenoble, France), G. Ghibaudo (IMEP-LAHC MINATEC/INPG, Grenoble 38000, France), and F. Mohamed (Silvaco France)

15:00 **1240** **Improved Electron Injection and Transport in Semiconducting Polymers By Doping with Guanidino-Functionalized Aromatic Compounds** – S. Schneider (Heidelberg University, Physical Chemistry, Heidelberg University, Centre f Advanced Materials), R. Lorenz, H. J. Himmel (Heidelberg University, Inorganic Chemistry), and J. Zaumseil (Heidelberg University, Physical Chemistry)

15:20 **Break**

15:40 **1241** ***(Invited)*** **Organic Molecular Electrets: Multifaceted Complexity of Dipole Effects on Charge Transfer** – V. I. Vullev (University of California, Riverside)

16:10 **1242** ***(Invited)*** **Seebeck Coefficient Model Based on Hopping Transport** – L. Li and N. Lu (Chinese academy of sciences)

16:40 **1243** ***(Invited)*** **Evolutionary Parameter Extraction for Organic TFT Compact Models Including Contact Effects** – A. Romero, J. González (Universidad de Granada), R. Picos (Universitat de les Illes Balears), M. J. Deen (McMaster University), and J. A. Jiménez-Tejada (Universidad de Granada)

17:10 **1244** **A Kinetic Study of Cationic Polymer Chemical Vapor Deposition** – D. J. Giambra and W. Tenhaeff (University of Rochester)

H01 Wide Bandgap Semiconductor Materials and Devices 20

Electronics and Photonics
Austin Ballroom 1, Dallas Sheraton Hotel

GaN based Materials and Devices 1 – 09:00 – 12:10
Chair(s): Jennifer K. Hite and Marko J Tadjer

09:00 **1273** ***(Invited)*** **Top-Down Etching of III-Nitride Nanostructures** – G. T. Wang, B. Leung (Sandia National Laboratories), M. C. Tsai (The University of New Mexico), B. A. Kazanowska, K. S. Jones (University of Florida), and K. R. Sapkota (Sandia National Laboratories)

09:30 **1274** **Lateral GaN Jfet Devices on Large Area Engineered Substrates for Robust Power Switching** – T. J. Anderson, J. C. Gallagher (NRL), G. M. Foster (U.S. Naval Research Laboratory), A. D. Koehler (Naval Research Laboratory), M. J. Tadjer (U.S. Naval Research Laboratory), K. D. Hobart (Naval Research Laboratory), O. Aktas (Qromis), V. Odnoblyudov (Qromis, Inc.), C. Basceri (QROMIS, Inc.), and F. J. Kub (U.S. Naval Research Laboratory)

09:50 **Break**

10:20 **1275** ***(Invited)*** **Coupled Experimental and Numerical Investigation of High-Voltage GaN Hemts** – Y. Cui, A. El Helou, and P. E. Raad (Southern Methodist University)

10:50 **1276** ***(Invited)*** **New Avenues for Exploration and Aplications of GaN** – I. Tiginyanu (Technical University of Moldova)

11:20 **1277** ***(Invited)*** **Growth and Characterization of GaN Based Multi-Channel FETs** – A. Xie, E. Beam (Qorvo), and Y. Cao (Qorvo Inc.)

11:50 **1278** **Magnetic III-N Semiconductors Based on Rare Earth Doping** – J. M. Zavada (New York University)

GaN based Materials and Devices 2 – 14:00 – 17:10
Chair(s): Travis J. Anderson and John M Zavada

14:00 **1279** ***(Invited)*** **Limits to Phonon Thermal Boundary Resistance across GaN Interfaces** – P. Hopkins (University of Virginia, Charlottesville)

14:30 **1280** **Improved Output Power and Electromigration Behavior of Ultraviolet GaN-Based Light-Emitting Diode By Using Agpdcu Reflector** – K. B. Sim, S. J. Yoon, and T. Y. Seong (Korea University)

14:50 **1281** **Size Effects on the Cross-Plane Thermal Conductivity of Transparent Conducting Indium Tin Oxide (ITO) and Fluorine Tin Oxide (FTO) Thin Films** – D. Olson, C. Rost, J. Gaskins, C. Szwejkowski, J. Braun, and P. E. Hopkins (University of Virginia)

15:10 **Break**

15:40 **1282** **Hydrogen Sensor for High Temperature and Humid Environment Applications** – S. Jang, M. Kim, H. Shin (Dankook University), and K. H. Baik (Hongik University)

16:00 **1283** **Advanced HEMT Characteristics of Epitaxial Quality-improved GaN by Using Patterned Sapphire Substract** – Y. C. Chien, C. C. Huang (GIEE National Taiwan University), C. K. Yi (GIEE, National Taiwan University), C. W. Yen (E-Beam Lab, GIEE, National Taiwan University), and C. H. Kuan (GIEE NTU)

16:20 **1284** **Effect of Hydrogen-Ion-Implantation on Self-Separation of Free-Standing Gallium Nitride Wafers Grown By Hvpe** – J. S. Park, J. H. Shim, J. E. Lee, T. H. Shim, and J. G. Park (Hanyang University)

16:40 **1285** ***(Invited)* Flexible Multifunctional III-N Semiconductor Materials and Devices for Energy Applications** – J. H. Ryou, S. Shervin, J. Chen, W. Wang, S. K. Oh, S. D. Singh, S. Pouladi, M. Moradnia (University of Houston), M. K. Kwon (Chosun University), J. Y. Kim (Korea Photonics Technology Institute), N. Nabulsi (University of Houston), and H. Johnson (Brigham Young University)

Lone Star B/C, Dallas Sheraton Convention Center

H01 Poster Session – 18:00 – 20:00
Chair(s): Soohwan Jang

- **1286** **GaN Schottky Contact on the Pattern Sapphire Substrate with Reducted Threading Dislocation** – C. C. Lee, C. Y. Chien, W. I. Cheng, C. W. Yen, P. Y. Hu, K. T. Huang (E-Beam Lab, GIEE, National Taiwan University), and C. H. Kuan (Graduate Institute of Electronics Engineering, NTU)
- **1287** **Catalyst-Free Synthesis and Properties of Oxygen-Vacancy-Rich Tungsten Oxide Nanowires** – C. W. Ting, S. M. Yang, and K. C. Lu (National Cheng Kung University)
- **1288** **Photoactive Basic Bismuth Nitrate/ Nb_2O_5 Nanocomposites** – J. A. Oliveira (Federal University of São Carlos), R. V. Goncalves (University), C. Ribeiro (Embrapa Instrumentation), F. G. E. Nogueira, and L. A. M. Ruotolo (Federal University of Sao Carlos)
- **1289** **Nanocomposites Based Self-Powered Electronic Systems: Investigating the Materials Properties for Energy Harvesters and Photodetectors** – R. Aepuru and R. V. Mangalaraja (University of Concepcion)

H02 Solid-state Electronics and Photonics in Biology and Medicine 6

Electronics and Photonics / Sensor
Austin Ballroom 2, Dallas Sheraton Hotel

Energy Harvesting, Storage, and Self-Powered Applications 1 – 08:00 – 12:10
Chair(s): Wenzhuo Wu and Pu-Xian Gao

08:00 **1318** ***(Invited)* Standardization of Triboelectric Nanogenerators: Progress and Perspectives** – Y. Zi (The Chinese University of Hong Kong)

08:30 **1319** ***(Invited)* scavenging of Mechanical Energy Using Piezoelectric and Triboelectric Materials** – M. Lee (Inha University)

09:00 **1320** ***(Invited)* Design and Energy Application of Piezoelectric Biomaterials** – R. Yang (Xidian University)

09:30 **1321** ***(Invited)* Self-Powered Wearable and Implantable Electrical> Stimulation Devices for Medical Treatments** – X. Wang (University of Wisconsin Madison)

10:00 **Break**

10:20 **1322** ***(Keynote) Nature Communications*: Overview and Research Highlights** – J. Brant (Springer Nature)

11:10 **1323** ***(Invited)* Electrochemical Tuning Sensing and Catalytic Performance of Catalytic Materials -from Nanoscale to Atomic Scale** – J. F. Huang (Department of Chemistry, National Chung Hsing University)

11:40 **1324** ***(Invited)* 3D Conformal Additive Printing of Semiconducting Nanocrystals for Energy Harvesting and Biosensing** – Y. Zhang (University of Notre Dame)

Energy Harvesting, Storage, and Self-Powered Applications 2 – 13:30 – 18:00
Chair(s): Rusen Yang and Xudong Wang

13:30 **1325** ***(Invited)* Controlled Homo-Epitaxial Growth of Hybrid Halide Perovskites** – S. Xu (University of California, San Diego)

14:00 **1326** ***(Invited)* heterostructured "Binary Materials" for Photodetection from Mid-Infrared, Visible, to X-Ray** – T. Wu (UNSW)

14:30 **1327** ***(Invited)* what Limits the Intrinsic Carrier Mobility of Two Dimensional Metal Dichalcogenides?** – Y. Liu (The University of Texas at Austin)

15:00 **1328** ***(Invited)* Scalably-Nanomanufactured 2-D Tellurene for Ubiquitous Electronics and Smart Sensors** – W. Wu (Purdue University)

15:30 **Break**

15:40 **1329** ***(Invited)* Single Nanoarray Sensor for Multi-Analyte Detection** – P. X. Gao (University of Connecticut)

16:10 **1330** ***(Invited)* Self-Powered Medical Electronics** – Z. Li (Beijing Institute of Nanoenergy and Nanosystems,CAS)

16:40 **1331** ***(Invited)* Biomimetic Approaches for the Practical Utilization of Discrete Liquid-Solid Contact Electrification** – D. S. Kim (POSTECH)

17:10 **1332** ***(Invited)* Nanowire-Enabled Low-Voltage Electroporation for Microbial Inactivation in Water** – X. Xie (Georgia Institute of Technology)

17:40 **1333** **Fully Bioabsorbable Capacitor As an Energy Storage Unit for Implantable Medical Electronics** – H. Li (Beihang University), Z. Li (Beijing Institute of Nanoenergy and Nanosystems,CAS), and Y. Fan (Beihang University)

H03 Wearable and Flexible Electronic and Photonic Technologies 2

Electronics and Photonics / Dielectric Science and Technology / Physical and Analytical Electrochemistry / Sensor / Interdisciplinary Science and Technology Subcommittee

Austin Ballroom 3, Dallas Sheraton Hotel

Wearable and Flexible Electronic and Photonic Technologies - Session 1 – 08:10 – 09:30
Chair(s): Sheng Xu and Wei Gao

08:10 **1353** ***(Invited)*** **Flexible Human-Machine Interfaces and Damage Robust Stretchable Optoelectronics** – B. C. Tee (National University of Singapore)

08:50 **1354** ***(Invited)*** **Electrically Conductive Silver Nanowire Coatings on Textiles for Personal Thermal Management** – P. A. D'Angelo, J. Orlando, J. S. Lum, and E. Hirst (US. Army Natick Soldier RDEC)

Wearable and Flexible Electronic and Photonic Technologies - Session 2 – 10:00 – 12:40
Chair(s): Sheng Xu and Wei Gao

10:00 **1355** ***(Invited)*** **Ferromagnetic, Folded, Soft Composite Material for Skin-Interfaced Electrodes** – K. I. Jang (DGIST)

10:40 **1356** ***(Invited)*** **Biomimetic Electronic Skins for Wearable Sensors** – H. Ko (Ulsan National Institute of Science and Technology)

11:20 **1357** ***(Invited)*** **Self-Powered Textiles for Healthcare Applications** – Z. H. Lin (National Tsing Hua University)

12:00 **1358** **Prestress-Driven Optical Modulations of Flexible Oxide Thin Films Processed in Stretching Mode** – H. J. Choi, Y. S. Jung, A. Soon (Yonsei university), and Y. S. Cho (Yonsei University)

12:20 **1359** **A Spectroelectrochemical Sweat Sensor for Improved Management of Diabetes Mellitus** – D. L. Parr IV and J. Leddy (University of Iowa)

Wearable and Flexible Electronic and Photonic Technologies - Session 3 – 14:00 – 17:00
Chair(s): Wei Gao and Sheng Xu

14:00 **1360** ***(Invited)*** **Wearable Sweat Sensors** – A. Javey (University of California, Berkeley)

14:40 **1361** ***(Invited)*** **Merging Humans and Machines with Hydrogel Bioelectronics** – X. Zhao (MIT)

15:20 **1362** ***(Invited)*** **Ultraflexible Organic Photonic Devices** – T. Yokota (University of Tokyo) and T. Someya (The University of Tokyo)

16:00 **1363** ***(Invited)*** **Gold Electronic Skins** – W. Cheng (Monash University, Melbourne Centre for Nanofabrication)

16:40 **1364** **Multi-Responsive Hydrogel Based Flexible Sensors for Plants/Animals Metabolic Stress Analytics** – S. Mugo, J. Alberkant, N. Yu, and W. Lu (MacEwan University)

Lone Star B/C, Dallas Sheraton Convention Center

H03 Poster Session – 18:00 – 20:00

- **1365** **Study of Fluorescent Dichroic Liquid Crystal Dyes for Wearable and Flexible Device** – X. Li and Z. Wang (Dalian University of Technology)
- **1366** **Evaluation of on-Body Performance of a Sweat-Based Lactate Sensor from Low Volumes of Passive Eccrine Sweat** – A. Bhide (University of Texas at Dallas), S. Prasad (The University of Texas at Dallas), and S. Muthukumar (Enlisense LLC)

I01 Hydrogen or Oxygen Evolution Catalysis for Water Electrolysis 5

Energy Technology / Industrial Electrochemistry and Electrochemical Engineering / Physical and Analytical Electrochemistry

State Room 2, Dallas Sheraton Convention Center

Alkaline Electrolysis-OER 1 – 08:00 – 12:20
Chair(s): Yu Seung Kim and Karl Mayrhofer

08:00 **Welcoming Remarks**

08:05 **1406** ***(Invited)*** **Electrolyte Oxidation Limits the Life of Alkaline Membrane Water Electrolyzer** – Y. S. Kim, D. Li (Los Alamos National Laboratory), I. Matanovic (Los Alamos National Laboratory, University of New Mexico), A. S. Lee (Los Alamos National Lab), and H. T. Chung (Los Alamos National Laboratory)

08:35 **1407** **3D Printed Electrodes: A New Platform for Studies of Water Oxidation** – P. L. dos Santos (University of Campinas), S. J. Rowley-Neale, C. E. Banks (Manchester Metropolitan University), and J. A. Bonacin (University of Campinas)

08:55 **1408** **Transition-Metal-Doped TiO_2 Decorated Nife Layered Double Hydroxide Catalyst in Alkaline Oxygen Evolution Reaction** – M. C. Tsai (National Taiwan University of Science and Technology), B. J. Hwang (NTUST), X. D. Lin, and W. N. Su (National Taiwan University of Science and Technology)

09:15 **1409** **Functionalized Phosphorene Quantum Dots As Efficient Electrocatalyst for Oxygen Evolution Reaction** – R. Prasannachandran (IISER- Thiruvanathapuram), T. V. Vineesh (IISER Thiruvananthapuram), A. Anil (IISER-Thiruvanathapuram), B. M. Krishna (CMS College, kottayam), and M. M. Shaijumon (IISER Thiruvanathapuram)

09:35 **Break**

09:50 **1410** ***(Invited)*** **Fundamental Insights into Catalyst Stability in Low-Temperature Electrolysis** – K. Mayrhofer (Helmholtz-Institute Erlangen-Nürnberg), S. Cherevko (Forschungszentrum Jülich GmbH), O. Kasian, S. Geiger, and M. Ledendecker (Max-Planck-Institut für Eisenforschung GmbH)

10:20 **1411** **Vanadium Based Full Water Splitting Electrocatalysts** – A. Saxena (Missouri University of Science & Technology), J. Masud (The University of Kansas), and M. Nath (Missouri University of Science & Technology)

10:40 **1412** **Oxygen Evolution Reaction in Alkaline Media: Electrical Double Layer and Interfacial Interactions** – G. Li and A. Chuang (University of California Merced)

11:00 **1413** **Synthesis of Co-Fe Alloy 1D Nanocone Array Electrodes with Aluminum Oxide Template for Water Spliting Reaction.** – K. Skibinska, D. Kutyla, K. Kolczyk, R. Kowalik, and P. Zabinski (AGH University of Science and Technology)

11:20 **1414** **Activity and Stability Relations on Oxygen Evolution Electrocatalysis** – D. Y. Chung (Argonne National Labroatory), P. P. Lopes (Argonne National Laboratroy), D. Strmcnik, V. Stamenkovic, and N. M. Markovic (Argonne National Laboratory)

11:40 **1415** **CuNCo3-Xvx Antiperovskite As a High Performance Catalyst for Oxygen Evolution Reaction** – J. Zhang, L. Du, and Z. Cui (South China University of Technology)

12:00 **1416** **Compositional and Microstructural Engineering of Transition Metal Phosphides for Improved Electrocatalytic Performance** – L. Liu (International Iberian Nanotechnology Laboratory (INL)) and J. Xu (International Iberian Nanotechnology Laboratory)

Alkaline Electrolysis-OER 2 – 13:45 – 17:40
Chair(s): Shaun M Alia and Shuo Chen

13:45 **Introductory Remarks**

13:50 **1417** ***(Invited)* Nickel Based Electrocatalysts for Water Electrolysis Under Large Current** – S. Chen (University of Houston)

14:20 **1418** **MOF Based Electrocatalysts for Electrolytic Water Splitting** – D. S. Raja, H. W. Lin, X. F. Chuah, and S. Y. Lu (National Tsing Hua University)

14:40 **1419** **Unique-Structure MoS_2 Grow on Nickel Foam As Highly Efficient Self-Supported Electrode for Oxygen Evolution Reaction** – Z. He, H. Guo, S. Ardoin, J. LaCoste, and L. Fei (University of Louisiana at Lafayette)

15:00 **1420** **Ni- and Co-Based Heterogeneous Nanosheet Array As Efficient Electrocatalysts for Oxygen Evolution Reaction from Water** – Y. Li (The Hong Kong Polytechnic University), W. Zhang (The Hong Kong Polytechnic Univeristy), M. Liu, and L. Y. S. Lee (The Hong Kong Polytechnic University)

15:20 **1421** **Catalytic Activities of Bismuth-Based Pyrochlore Oxides for Oxygen Evolution in Alkaline Solutions** – K. Kawaguchi, T. Hirai, C. Iketani, and M. Morimitsu (Doshisha University)

15:40 **Break**

15:50 **1422** ***(Invited)* ZIF 67 Based Electrocatalysts As Highly Active Oxygen Electrodes for Water Electrolysis** – S. Ghoshal (National Renewable Energy Laboratory), S. Zaccarine, G. C. Anderson (Colorado School of Mines), M. B. Martinez, K. E. Hurst (National Renewable Energy Laboratory), S. Pylypenko (Colorado School of Mines), B. S. Pivovar, and S. M. Alia (National Renewable Energy Laboratory)

16:20 **1423** **Oxygen Evolution Reaction of Oxide-Based Material with and without Doping in Alkaline Solution** – K. Matsuzawa, K. Sumi, R. Suzuki (Green Hydrogen Research Center, Yokohama Nat. Univ.), Y. Kuroda, S. Mitsushima (Yokohama National University), A. Ishihara (Institute of Advanced Sciences, Yokohama Nat. Univ.), and K. I. Ota (Green Hydrogen Research Center, Yokohama Nat. Univ.)

16:40 **1424** **Improved Components for High Temperature Alkaline Water Electrolysis** – K. Patil, A. Sweet, S. McCatty, W. Greene, and H. Xu (Giner, Inc.)

17:00 **1425** **Encapsulation of Metallic Electrocatalysts in Graphitic Shells** – H. Khani, N. S. Grundish (The University of Texas at Austin), D. O. Wipf (Mississippi State University), and J. B. Goodenough (The University of Texas at Austin)

17:20 **1426** **Ni-Fe-Based Nanostructures for Oxygen Evolution Reaction in Alkaline Media** – R. Manso (Univerisity of Arkansas), A. Prashant, L. F. Greenlee, and J. Chen (University of Arkansas)

I02 Materials for Low Temperature Electrochemical Systems 5

Energy Technology / Physical and Analytical Electrochemistry
Houston Ballroom B, Dallas Sheraton Convention Center

Fuel Cell Performance and Characterization 3 – 08:00 – 09:40
Chair(s): Luigi Osmieri and Yossef A Elabd

08:00 **1510** **Investigation of Ni/C and Pt/C Catalyst Stability in an Anion Exchange Membrane (AEM) Fuel Cell** – L. Xie and D. W. Kirk (University of Toronto)

08:20 **1511** **Probing the Nanoscale Morphology and Conductance of Anion Exchange Membrane Fuel Cells By Atomic Force Microscopy (AFM)** – A. Barnes (Univ of California - Santa Barbara), S. K. Buratto (University of California, Santa Barbara), Y. Du (University of Massachusetts, Amherst), and B. E. Coughlin (University of Massachusetts Amherst)

08:40 **1512** **Use of a Segmented Cell for the Development of PGM-Free Cathode Catalyst Layers for Polymer Electrolyte Fuel Cells** – L. Osmieri, S. A. Mauger, E. Klein, M. Ulsh, K. C. Neyerlin, and G. Bender (National Renewable Energy Laboratory)

09:00 **1513** **PGM-Free Electrode Development and Optimization Using H_2 Limiting Current** – G. Wang, A. G. Star, L. Osmieri, and K. C. Neyerlin (National Renewable Energy Laboratory)

09:20 **1514** **Alkaline Fuel Cell Performance of Saturated *N*-Heterocyclic Cationic Multiblock Polymers** – M. Hwang (Texas A&M University), C. Willis (Kraton Performance Polymers, Inc.), and Y. A. Elabd (Texas A&M University)

Batteries and Supercapacitors – 10:00 – 12:20
Chair(s): Megan B. Sassin and William E. Mustain

10:00 **1515** ***(Invited)* Enabling Conversion-Based Metal Oxide Anodes for Li Ion Batteries through Material Confinement** – B. Ng and W. E. Mustain (University of South Carolina)

10:40 **1516** ***(Invited)* New Insight of $NaLiFePO_4f$ As a High Voltage Cathode Material for Lithium-Ion Battery** – Z. W. Bai (The Hong Kong University of Science and Technology, The Hong Kong Polytechnic University), M. Shao (The Hong Kong University of Science and Technology), and G. Chen (The Hong Kong Polytechnic University)

11:20 **1517** **Na_2so_4-Polyacrylamide Neutral pH Polymer Electrolytes for Electrochemical Capacitors** – A. Virya, J. Abella, A. Grindal, and K. Lian (University of Toronto)

11:40 **1518** **Low Temperature Performance of MnO*x*@ Carbon Nanofoam-Based Ecs with Neutral pH-Based Aqueous Electrolytes** – M. B. Sassin (U.S. Naval Research Laboratory), K. Brant (Formerly of U.S. Naval Research Laboratory), C. L. Pitman (NRL/NRC Postodoctoral Associate), J. Wallace (Formerly of Nova Research Inc.), and J. W. Long (U.S. Naval Research Laboratory)

12:00 **1519** **Miniaturized Electrochemical Supercapacitor with Patterned Horizontally Aligned Carbon Nanotube Sheets** – B. Dousti, Y. I. Choi, and G. S. Lee (University of Texas at Dallas)

General Electrocatalysis 4 – 14:00 – 18:20
Chair(s): Lior Elbaz and Wataru Sugimoto

14:00 **1520** ***(Invited)* Materials Design for Microbial Bioelectrochemical Devices** – S. D. Minteer (University of Utah)

14:40 **1521** **Palladium-Ceria Nanocatalyst for Hydrogen Oxidation in Alkaline Media: Optimization of the Pd-CeO_2 Interface** – H. Yu (University of Connecticut), E. S. Davydova (Technion Israel Institute of Technology), U. Ash (Technion − Israel Institute of Technology), H. A. Miller (CNR-ICCOM), L. J. Bonville (University of Connecticut), D. R. Dekel (Technion Israel Institute of Technology), and R. Maric (Center for Clean Energy Engineering)

15:00 **1522** **Platinum-Iridium Modified Gold Nanoparticles Catalysts for Electrooxidation of Ethanol in Alkaline Media** – Z. Liang, L. Song (Chemistry Department, Brookhaven National Laboratory), S. Deng, Y. Zhu (Dep. Cond. Matter Phys. Mater. Sci., Brookhaven Nat. Lab.), E. Stavitski (Brookhaven National Laboratory), R. R. Adzic (Senior Scientist Emeritus), J. Chen (University of Arkansas), and J. X. Wang (Chemistry Department, Brookhaven National Laboratory)

15:20 **1523** **Direct Electro-Oxidation of Dimethyl Ether on Pt-Cu Nanoparticles** – L. Elbaz (Bar Ilan University)

15:40 **1524** **Graphene Oxide Modified Pt/C and Pt_2Ru_3/C for Enhanced Carbon Monoxide Tolerable Fuel Cell Anode Catalyst** – M. S. Islam, D. Takimoto (Shinshu University), D. Mochizuki (Tokyo Denki University), S. Hideshima, and W. Sugimoto (Shinshu University)

16:00 **1525** **Electrocatalysis of Ketjenblack-Supported Ru-Ir Cathode for the Electrohydrogenation of Toluene to Methylcyclohexane in the Organic Hydride System** – Y. Inami (Tokyo Institute of Technology), S. Nagamatsu, K. Asakura (Hokkaido University), S. Iguchi, and I. Yamanaka (Tokyo Institute of Technology)

16:20 **1526** **Cu-Pt Bi-Metallic Catalysts By Continuous Electroless Deposition for Methanol Oxidation Reaction** – B. A. Tavakoli Mehrabadi, W. Xiong, G. Caldwell, J. R. Regalbuto, J. W. Weidner, and J. R. Monnier (University of South Carolina)

16:40 **1527** **Electrochemical Partial Oxidation of Alkenes: Understanding Selectivity and Reaction Mechanisms** – B. Seger, A. Winiwarter, S. B. Scott, I. Chorkendorff (Technical University of Denmark), L. Silvioli, and J. Rossmeisl (University of Copenhagen)

17:00 **1528** **Enhanced Anodic Reaction of Dimethyl Ether (DME) on Ptpdsn Based Catalysts for High Power Low Temperature Fuel Cells** – A. Schechter, H. Teller, and D. Kashyap (Department of Chemical Sciences, Ariel University)

17:20 **1529** **Effect of Heat Treatment and Bath Compositions on the Performance of Co-Ni-Mo-P Electrocatalysts for Ethanol Electro-Oxidation** – E. E. Kalu (Florida A&M University - Florida State University COE) and W. Chaitree (Florida State University)

17:40 **1530** **CVD Graphene Modified with Au Nanoparticles As Electrocatalysts for Sodium Borohydride and Hydrazine Oxidation** – L. Tamašauskaitė-Tamašiūnaitė, A. Balčiūnaitė, A. Zabielaitė, J. Vaičiūnienė, and E. Norkus (Center for Physical Sciences and Technology)

18:00 **1531** **Nitrogen-Doped Carbon Catalysts Modified with Au-M (M = Co, Ni, Cu) Nanoparticles As the Anode Material for Direct Borohydride-Hydrogen Peroxide Fuel Cells** – A. Balčiūnaitė, J. Vaičiūnienė (Center for Physical Sciences and Technology), I. Kruusenberg, K. Kaare (National Institute of Chemical Physics and Biophysics), A. Volperts, G. Dobele, A. Zurins (Latvian State Institute of Wood Chemistry), L. Tamašauskaitė-Tamašiūnaitė, and E. Norkus (Center for Physical Sciences and Technology)

I03 Renewable Fuels via Artificial Photosynthesis or Heterocatalysis 4

Energy Technology / Sensor

State Room 3, Dallas Sheraton Convention Center

Solar Fuels and Plasmonics – 07:55 – 09:35
Chair(s): Heli Wang and Nianqiang (Nick) Wu

07:55 **1617** ***(Keynote)*** **Generation of Hot Electrons in Plasmonic and Hybrid Metastructures for Photochemical Applications** – A. O. Govorov (UESTC, Ohio University), L. V. Besteiro (UESTC, INRS), L. Chang, and Z. Wang (UESTC)

08:30 **1618** ***(Keynote)*** **Stable Mixed-Anion Photocatalysts for Visible-Light-Induced Water Splitting** – R. Abe (CREST)

09:05 **1619** ***(Invited)*** **Separations in Solar Fuels Systems** – F. A. Houle (Joint Center for Artificial Photosynthesis)

Solar Fuel Generation 2 – 09:55 – 12:10
Chair(s): Bunsho Ohtani

09:55 **1620** ***(Invited)*** **Red TiO_2 and Ferroelectric Photocatalysts** – G. Liu (Institute of Metal Research, Chinese Academy of Sciences)

10:25 **1621** ***(Invited)*** **Rational Design of Hybrid Photoelectrode Assemblies for Solar Fuel Generation** – C. Janáky (ELI-ALPS Research Institute)

10:55 **1622** ***(Invited)*** **Proton Pump for Solar Energy Transformation:from Nano- to Meso-Scale Architectures** – E. A. Rozhkova (ANL)

11:25 **1623** **Production of C4 Species from the Electrochemical Reduction of CO on Nanostructured Cu/CuO_x Catalyst** – J. M. Spurgeon (Conn Center for Renewable Energy Research) and J. Strain (Conn Center, University of Louisville)

11:40 **1624** **Chemical Consequences of Flow- CO_2 Reduction in a Microfluidic Flow Cell** – D. A. Henckel, S. Bhargava, A. A. Gewirth, and P. J. A. Kenis (Intl. Institute of Carbon Neutral Energy Research, University of Illinois Urbana-Champaign)

11:55 **1625** **Electrocatalytic Hydrogenation of Benzaldehyde: Unexpected Enhancing Effect By Co-Adsorbed Proton Donor** – U. Sanyal, K. Koh, L. C. Meyer, A. Karkamkar, J. Holladay, D. M. Camaioni, O. Y. Gutiérrez Tinoco (Pacific Northwest National Laboratory), and J. A. Lercher (Technische Universität München)

Fundamental Studies on Semiconductors 1 – 13:40 – 15:25
Chair(s): Frank E. Osterloh and Vaidyanathan Subramanian

13:40 **1626** **Surface Structural Evolution of Pd Nanosheets during Aging and Their Effect on (Electro-)Catalytic Activities** – Y. Zhang (Hong Kong University of Science and Technology, Georgia Institute of Technology), Y. Xia (Georgia Institute of Technology), and M. Shao (Hong Kong University of Science and Technology)

13:55 **1627** **First-Principles Simulations of Stability, Optical and Electronic Properties of Competing Phases in Chalcopyrite-Based Photoelectrodes** – J. B. Varley (Lawrence Livermore National Laboratory), A. Sharan (University of Delaware), T. Ogitsu (Lawrence Livermore National Laboratory), A. Janotti (University of Delaware), A. D. DeAngelis, and N. Gaillard (University of Hawaii)

14:10 **1628** **Design of Heterogeneous Photocatalysis Based on Energy-Resolved Distribution of Electron Traps** – B. Ohtani (Institute for Catalysis, Hokkaido University), A. Nitta (Graduate School of Environmental Science, Hokkaido Univ.), M. Takase (Graduate School of Engineering, Muroran Institute of Tech), and M. Takashima (Graduate School of Environmental Science, Hokkaido Univ.)

14:25 **1629** ***Operando*** **Spectroelectrochemistry Approaches for Aqueous CO2 Reduction** – K. Jiang (University of California, Berkeley, Lawrence Berkeley National Laboratory) and A. T. Bell (University of California, Berkeley)

14:40 **1630** **Crystal Phase Dependence on HER Water Splitting Performance of Earth-Abundant Electrocatalysts** – D. D. Rodene, E. H. Eladgham, I. Arachchige, and R. B. Gupta (Virginia Commonwealth University)

14:55 **1631** ***(Invited)*** **Element-Specific Measurement of Hole Transport and Kinetics in a Ni-TiO_2-Si Photolectrode Using Transient Extreme Ultraviolet Spectroscopy** – S. K. Cushing (California Institute of Technology)

Photoelectrochemical Assembly and Systems – 15:45 – 18:00
Chair(s): Frank E. Osterloh and Vaidyanathan Subramanian

15:45 **1632** **Photoelectrochemical Water Splitting Using Multiple Quantum Well Photovoltaic Devices** – J. L. Young, C. Aldridge, C. Barraugh (National Renewable Energy Laboratory), I. Barraza (National Renewable Energy Laboratory, University of Texas, El Paso), D. J. Friedman, T. G. Deutsch, and M. A. Steiner (National Renewable Energy Laboratory)

16:00 **1633** **Solar-to-Hydrogen Efficiency: Shining Light on Photoelectrochemical Device Performance** – J. L. Young (National Renewable Energy Laboratory), H. Döscher (Philipps-Universität Marburg), J. F. Geisz, J. A. Turner, and T. G. Deutsch (National Renewable Energy Laboratory)

16:15 **1634** **Surface-Modified Metal Sulfides As Stable H_2 Evolving Photocatalyst in Z-Scheme Water Splitting System with $[Fe(CN)_6]^{3-/4-}$ Redox Mediator Under Visible Light Irradiation** – M. Higashi, T. Shirakawa, H. Matsuoka, O. Tomita, A. Nakada (Kyoto University), and R. Abe (Kyoto University, CREST)

16:30 **1635** **Scaled Solar Fuel Production System Using Concentrated Integrated Photo-Electrochemical Device** – S. Tembhurne, I. Holmes-Gentle, L. Schwander, and S. Haussener (Lab. of Renewable Energy Science & Engg. (LRESE), EPFL)

16:45 **1636** **Sustainable Hydrogen Production Using Water By a Photovoltaic Integrated Electrolyser with Active Area Exceeding 100 cm^2** – S. Calnan, E. Kemppainen, S. Aschbrenner, F. Bao, and R. Schlatmann (Helmholtz Zentrum Berlin)

17:00 **1637** **Integrated Membrane-Electrode-Assembly Photoelectrochemical Cell Under Various Feed Conditions for Solar Water Splitting** – T. Kistler (Lawerence Berkeley National Laboratory), D. M. Larson (Lawrence Berkeley National Laboratory), P. Agbo (Lawerence Berkeley National Laboratory), K. Walczak (Sandia National Laboratory), I. D. Sharp (Technische Universität München), A. Z. Weber, and N. Danilovic (Lawrence Berkeley National Laboratory)

17:15 **1638** **The Interplay between Quantum Efficiency, Light Flux, and Turnover Frequency in Molecular-Modified Photocathodes** – G. F. Moore, B. L. Wadsworth, A. M. Beiler, D. Khusnutdinova, E. A. Reyes Cruz, and S. K. Nanyangwe (Arizona State University)

17:30 **1639** **Design of a Solar Device to Transform Wastewater Nitrates to Nitrogen-Species Coupled with Energy and Nutrient Recovery** – L. Barrera and R. Bala Chandran (University of Michigan)

17:45 **1640** **Conformal and Continuous Deposition of Bifunctional Cobalt Phosphide Layers on p-Silicon Photocathodes for Improved Solar Hydrogen Evolution** – L. Liu (International Iberian Nanotechnology Laboratory (INL)) and S. M. Thalluri (International Iberian Nanotechnology Laboratory)

I04 Energy Conversion Systems Based on Nitrogen 2

Energy Technology / Physical and Analytical Electrochemistry

Pearl 1, Dallas Sheraton Hotel

Catalysts for Ammonia Electrosynthesis – 08:00 – 12:40
Chair(s): Lauren F. Greenlee, Yuyan Shao and Gang Wu

08:00 **1669** ***(Invited)*** **Electrochemical Ammonia Synthesis As Potential Alternative to the Haber-Bosch Process** – G. L. Soloveichik (Advanced Research Projects Agency-Energy (ARPA-E))

08:20 **1670** ***(Invited)*** **Electrochemistry of the N-H Bond: Synthesis and Oxidation of Ammonia** – K. Manthiram (Massachusetts Institute of Technology)

08:40 **1671** ***(Invited)*** **Iron Catalyst Facilitated Synthesis of Ammonia from N_2 and Water at High Efficiency By Electrolysis** – X. Liu and S. Licht (George Washington University)

09:00 **1672** ***(Invited)*** **Atomically Dispersed Eletrocatalysts for High-Efficiency Ambient N2 Fixation** – L. Han (Center for Funct. Nanomater.,Brookhaven National Lab.), X. Liu (Tianjin University of Technology), R. Lin (CFN, Chemistry Division, Brookhaven National Laboratory), Z. Liang (Chemistry Department, Brookhaven National Laboratory), E. Stavitski (Brookhaven National Laboratory), J. Luo (Tianjin University of Technology), R. R. Adzic (Chemistry Department, Brookhaven National Laboratory), and H. L. Xin (University of California, Irvine)

09:20 **1673** ***(Invited)*** **Understanding Metal-Based Catalysts for Electrochemical Ammonia Synthesis** – X. Feng (University of Central Florida)

09:40 **1674** ***(Invited)*** **Electrochemical Nitrogen Fixation Under Ambient Conditions** – G. Chen, L. Ding, R. Luo, and H. Wang (South China University of Technology)

10:00 **1675** ***(Invited)*** **A Systematic Study of Ammonia Synthesis By Electrochemical Reduction of N_2 over Cu** – N. Balaji, A. Prajapati, and M. R. Singh (University of Illinois at Chicago)

10:20 **Break**

10:40 **1676** **Design of Materials for Electroreduction of Nitrogen to Ammonia: A Computational Perspective** – I. Matanovic (University of New Mexico, Center for Micro-Engineered Materials) and F. H. Garzon (University of New Mexico)

11:00 **1677** **A Bimetallic Electrocatalyst Platform for Understanding the Roles of Surface Chemistry and Functionalization on Nitrogen Reduction to Ammonia** – L. F. Greenlee, S. I. P. Bakovic (University of Arkansas), C. Loney, J. Renner (Case Western Reserve University), S. Maheshwari (Pennsylvania State University), and M. J. Janik (The Pennsylvania State University)

11:20 **1678** **Electrochemical Synthesis of Ammonia Using Origami-like Molybdenum Carbide Nanoflakes As Nitrogen Reduction Reaction Catalyst** – K. P. Ramaiyan (Los Alamos National Laboratory), S. Ozden (Los Alamos National Lab), S. Maurya (Los Alamos National Laboratory), S. Komini Babu (Carnegie Mellon University), A. D. Benavidez, F. H. Garzon (University of New Mexico), Y. S. Kim, R. Mukundan, and C. R. Kreller (Los Alamos National Laboratory)

11:40 **1679** **Ammonia Electrochemical Synthesis Using Platinum Ruthenium Alloy at Ambient Pressure and Low Temperature** – A. Schechter (Department of Chemical Sciences, Ariel University), R. Manjunatha, and A. Karajic (Ariel University)

12:00 **1680** **A Spectroscopic Study on the Electrochemical Nitrogen and Nitrate Reduction Reactions on Rhodium and Ruthenium Surfaces** – Y. Yao, H. Wang (Southern University of Science and Technology), H. Li (SUSTech), and M. Shao (Hong Kong University of Science and Technology)

12:20 **1681** **Metal-Organic Framework-Derived Carbon Electrocatalysts for Nitrogen Reduction** – S. Mukherjee (University at Buffalo) and G. Wu (University at Buffalo, the State University of New York)

Ammonia and Other Nitrogen Containing Compounds: Synthesis and Oxidation – 14:00 – 17:20
Chair(s): Julie N. Renner, Shelley D. Minteer and Hui Xu

14:00 **1682** ***(Invited)*** **Investigating the Photoelectrocatalytic Activity of Titania for Nitrogen Fixation Using Rotating Ring-Disk Electrode Voltammetry** – M. C. Hatzell (Georgia Institute of Techology) and Y. H. Liu (Georgia Institute of Technology)

14:20 **1683** ***(Invited)*** **Electrolytic Synthesis of Ammonia at Ambient Conditions from Nitrogen and Acidic Water By a Catalyst-Free, Plasma Process** – R. Hawtof, J. Toth, S. Ghosh, E. Guarr, C. Xu, J. N. Renner, and R. M. Sankaran (Case Western Reserve University)

14:40 **Break**

15:00 **1684** **Surface Modification of Pd Shape-Controlled Nanoparticles for Electrochemical Nitrate Reduction** – J. Lim, J. Park, S. W. Lee (Georgia Institute of Technology), and M. C. Hatzell (Georgia Institute of Techology)

15:20 **1685** **Thermochemical and Techno-Economic Evaluation of Ammonia Synthesis Via Lithium-Molten Salt Processes** – F. H. Garzon (University of New Mexico), I. Matanovic (Los Alamos National Laboratory, University of New Mexico), and J. Gomez (University of New Mexico)

15:40 **1686** **Removal of Nitrate and Ammonia from Wastewater** – M. Bagheri Hariri and G. G. Botte (Ohio University)

16:00 **1687** **Mass Transport Influence on Electrooxidation of Urea for Wastewater Remediation** – K. Carpenter and E. M. Stuve (University of Washington)

16:20 **1688** **Iridium-Based Catalysts for Electro-Oxidation of Ammonia in Alkaline Media** – L. Song, Z. Liang, and J. X. Wang (Chemistry Department, Brookhaven National Laboratory)

16:40 **1689** **Binary and Ternary Nanocubes As Electrocatalysts for Ammonia Electrooxidation Reaction** – K. Siddharth (Hong Kong University of Science and Technology), Y. Hong, S. I. Choi (Kyungpook National University), and M. Shao (The Hong Kong University of Science and Technology)

17:00 **1690** **Direct Ammonia-Fueled Solid Oxide Fuel Cells** – G. Tao (Chemtronergy)

Lone Star B/C, Dallas Sheraton Convention Center

I04 Poster Session – 18:00 – 20:00

• **1691** **Pt-Zn Nanocube for Enhanced Mass and Specific Activities in Ammonia Electro-Oxidation Reaction (AOR)** – M. Shao (The Hong Kong University of Science and Technology) and Y. T. Chan (the Hong Kong University of Science and Technology)

• **1692** **Effect of Short Current on the Open Circuit Voltage in a Solid Oxide Fuel Cell** – C. G. Lee, S. Koomson, and E. Arthur (Hanbat National University)

I05 Heterogeneous Functional Materials for Energy Conversion and Storage 2

High-Temperature Energy, Materials, & Processes / Battery / Energy Technology / Physical and Analytical Electrochemistry
State Room 4, Dallas Sheraton Convention Center

Solid Oxide Cells 1 – 08:00 – 10:00
Chair(s): Srikanth Gopalan and Wilson K. S. Chiu

08:00 **1712** ***(Keynote)*** **A High Performance Tubular Solid Oxide Fuel Cell for Unmanned Autonomous Systems** – D. Chu (U.S. Army Research Laboratory), K. Chu (US Army CERDEC), C. Cook (Army Power Division), and A. DeAnni (US Army CERDEC)

08:40 **1713** **High-Performance Oxygen Electrodes for Low Temperature Solid Oxide Cells** – Y. A. Chart, M. Y. Lu, and S. A. Barnett (Northwestern University)

09:00 **1714** **A Novel Strategy to Synthesize Cathode Heterostructures at the Nanoscale for Solid Oxide Fuel Cells (SOFCs) Using a Molten Salt Solvent** – B. Levitas, S. Gopalan (Boston University), and K. Kakinuma (Fuel Cell Nanomaterials Center, University of Yamanashi)

09:20 **1715** **Triple Conducting Perovskite Oxide Nanocomposites As Oxygen Electrodes for Intermediate-Temperature Protonic Ceramic Cells** – J. Tong, Z. Zhao, S. Mu, and M. Zou (Clemson University)

09:40 **1716** **Freeze Casting of Tubular Anode Supports for High-Performance Solid Oxide Fuel Cells** – D. Panthi (Kent State University at Tuscarawas), T. Woodson, and Y. Du (Kent State University)

Solid Oxide Cells 2 - Degradation – 10:20 – 12:20
Chair(s): Steven McIntosh and Deryn Chu

10:20 **1717** ***(Keynote)*** **Electrochemical and Microstructural Studies of Degradation Mechanisms in Solid Oxide Cells** – S. A. Barnett (Northwestern University)

11:00 **1718** **Interface and Grain Boundary Degradation of Cathode from Commercial Cells Induced By Electrochemical Operation in Humidified Air** – Y. Chen (National Energy Technology Laboratory, West Virginia University), Y. Fan (National Energy Technology Laboratory), S. Lee (U.S. DOE, National Energy Technology Laboratory), G. A. Hackett, H. Abernathy, K. Gerdes (U.S. DOE National Energy Technology Laboratory), and X. Song (DOE National Energy Technology Laboratory, West Virginia University)

11:20 **1719** **Degradation of High-Performance Oxygen Electrodes for Solid Oxide Cells** – M. Y. Lu (Northwestern University), S. L. Zhang (Northwestern University, Xi'an Jiaotong University), B. K. Park, Y. A. Chart, and S. A. Barnett (Northwestern University)

11:40 **1720** **Mitigating Carbon Formation in SOFCs with Aluminum Titanate Doped NiO-YSZ Anodes** – M. Welander and R. A. Walker (Montana State University)

12:00 **1721** **Life Testing of Ni-YSZ Fuel Electrode Under Electrolysis and Fuel Cell Operation in High Reducing Environment** – Q. Liu, Q. Zhang, P. W. Voorhees, and S. A. Barnett (Northwestern University)

Solid Oxide Cells 3 - Nanoparticles and Secondary Phases – 14:00 – 15:40
Chair(s): Scott A Barnett and Wilson K. S. Chiu

14:00 **1722** ***(Invited)* Heterogeneous Doping, a Novel in-Situ Synthesis of Supported Metal Nanocatalysts** – W. Jung (KAIST)

14:40 **1723** ***(Invited)* Enhancing High Temperature Electrode Performance with Secondary Phases** – M. Welander, J. B. Sinrud, B. D. Gold, D. R. Driscoll, M. D. McIntyre, M. S. Zachariasen, S. Sofie, and R. A. Walker (Montana State University)

15:20 **1724** **Effect of Nanoparticle Impregnation on Ni-YSZ Cermet Electrode Polarization Using YSZ-Supported Cells** – B. Mo, P. J. Gasper, Y. Lu, S. N. Basu, U. B. Pal, and S. Gopalan (Boston University)

Solid Oxide Cells 4 - Atomic Layer Deposition – 16:00 – 17:20
Chair(s): Robert A Walker and Deryn Chu

16:00 **1725** ***(Invited)* Enhancing SOFC Anode Stability through Atomic Layer Deposition** – S. McIntosh (Lehigh University), R. J. Gorte, J. M. Vohs (University of Pennsylvania), and C. Curran (Lehigh University)

16:40 **1726** **Effects of Atomic Layer Deposition of ZrO_2 on Infiltrated Mixed Ionic and Electronic Conducting Solid Oxide Cell Electrodes** – T. A. Schmauss and S. A. Barnett (Northwestern University)

17:00 **1727** **Atomic Layer Deposition to Design Internal Surface of Porous Electrode for Accelerating Charge and Mass Transfer in Fuel Cells** – Y. Chen (West Virginia University), K. Gerdes (U.S. DOE National Energy Technology Laboratory), and X. Song (West Virginia University)

Solid Oxide Cells 5 – 17:20 – 18:20
Chair(s): WooChul Jung and Robert A Walker

17:20 **1728** ***(Invited)* Ionic Conducting Ceramic Membranes – Potential Applications - Materials - Components – Transport in Asymmetric Structures** – W. A. Meulenberg (Forschungszentrum Jülich GmbH - IEK-1), S. Baumann (Forschungszentrum Jülich GmbH, IEK-1), F. Schulze-Küppers (Forschungszentrum Jülich GmbH - IEK-1), W. Deibert (Forschungszentrum Jülich GmbH, IEK-1), and O. Guillon (Jülich Aachen Research Alliance, JARA-Energy, Forschungszentrum Jülich GmbH, IEK-1)

18:00 **1729** **Modeling Thermochemical Energy Storage and Release in Redox Cycles of $Ca_{1-x}Sr_xMnO_{3-\Delta}$** – L. Imponenti (Colorado School of Mines), R. J. Braun (Mechanical Eng. Dept., Colorado School of Mines), and G. S. Jackson (Colorado School of Mines)

I06 An Invited Symposium on Advances and Perspectives on Modern Polymer Electrolyte Fuel Cells – In Honor of Shimshon Gottesfeld

Energy Technology / Industrial Electrochemistry and Electrochemical Engineering / Physical and Analytical Electrochemistry
Houston Ballroom C, Dallas Sheraton Convention Center

Electrochemistry/Electrocatalysis 1 – 08:00 – 12:00
Chair(s): Masahiro Watanabe and Rod L. Borup

08:00 **1796** ***(Invited)* Stepping in the Dark - Active Site Density and Turn over Frequency in PGM-Free Metal-Nitrogen Doped Carbon (M-N-C) ORR Fuel Cell Electrocatalysts** – P. Strasser (Technical University Berlin)

08:30 **1797** ***(Invited)* Catalysts for Fuel Cells** – P. P. Lopes (Argonne National Laboratroy), D. Strmcnik, R. Wang, H. Lv, N. Becknell, N. M. Markovic, and V. Stamenkovic (Argonne National Laboratory)

08:55 **1798** ***(Invited)* Highly Active and Robust Pt-Skin/Pt Alloy Two-Way Catalysts for Oxygen Reduction and Hydrogen Oxidation in PEFCs** – H. Uchida (Clean Energy Research Center, University of Yamanashi, Fuel Cell Nanomaterials Center, University of Yamanashi), G. Shi, S. Kobayashi (Clean Energy Research Center, University of Yamanashi), H. Yano (Fuel Cell Nanomaterials Center, University of Yamanashi), J. Inukai (Clean Energy Research Center, University of Yamanashi), D. A. Tryk, and A. Iiyama (Fuel Cell Nanomaterials Center, University of Yamanashi)

09:15 **1799** ***(Invited)* Challenges and Opportunities in Developing Anode Catalysts for Direct Ethanol and Ammonia Fuel Cells** – J. X. Wang (Chemistry Department, Brookhaven National Laboratory)

09:35 **1800** ***(Invited)* Electrocatalysis from First-Principles: Reaction Mechanisms and Ideas for Improved Materials** – M. Mavrikakis, A. O. Elnabawy, and J. A. Herron (University of Wisconsin - Madison)

10:00 **Break**

10:20 **1801** ***(Invited)*** **Hierarchical *"Core-Shell"* Low-Loading Pt Electrocatalysts for the Oxygen Reduction Reaction Based on a Graphene *"Core"* and a Carbon Nitride *"Shell"*** – V. Di Noto (Dept. of Industrial Engineering, University of Padova, INSTM), E. Negro (Dept. of Industrial Engineering, University of Padova, Centro Studi "Giorgio Levi Cases"), A. Nale, Y. Bang (Dept. of Industrial Engineering, University of Padova), K. Vezzù (Dept. of Industrial Engineering, University of Padova, CMBM, University of Padova), G. Pagot (Dept. of Industrial Engineering, University of Padova, Centro Studi "Giorgio Levi Cases"), and G. Pace (CNR-ICMATE)

10:45 **1802** ***(Invited)*** **Polymer Hydrogel-Derived Carbon Supports for Highly Stable Pt/C Cathode Catalysts in PEM Fuel Cells** – Z. Qiao (University at Buffalo, SUNY), D. Li (Los Alamos National Lab), J. S. Spendelow (Los Alamos National Laboratory), and G. Wu (University at Buffalo, the State University of New York)

11:05 **1803** ***(Invited)*** **Precious Metal-Free Electrocatalysis: Accomplishments and Challenges** – P. Zelenay (Los Alamos National Laboratory)

11:30 **1804** ***(Invited)*** **Shape-Controlled Multimetallic Nanoparticle Electrocatalysts** – B. Roldan Cuenya (Fritz Haber Institute of the Max Planck Society)

Electrochemistry/Electrocatalysis 2 – 13:40 – 17:20
Chair(s): Piotr Zelenay, Huyen N Dinh and Gang Wu

13:40 **1805** ***(Invited)*** **Fundamental Studies of PEM Fuel Cell Catalyst Layer Architectures** – R. L. Borup, A. M. Baker, N. Macauley, K. Chintam, D. Richard, D. A. Langlois, and R. Mukundan (Los Alamos National Laboratory)

14:00 **1806** ***(Invited)*** **Recent Progress in PEFC Technology and Future Direction** – Y. Kamitaka, A. Shinohara, T. Suzuki (Toyota Central R&D Labs., Inc.), H. Yamada (Toyata Central R&D Labs., Inc.), K. Kodama, R. Jinnouchi, and Y. Morimoto (Toyota Central R&D Labs., Inc.)

14:25 **1807** ***(Invited)*** **Fuel Cells Fueled By Sustainable Liquid Fuels** – G. L. Soloveichik (Advanced Research Projects Agency-Energy (ARPA-E))

14:45 **1808** ***(Invited)*** **Self-Supported Nanoporous Carbon Scaffold As a Novel Material for Use in Fuel Cells and Electrolysis Cells** – M. Atwa (Department of Chemistry, Uninversity of Calgary, Department of Chemistry, Suez Canal University), X. Li (Deparment of Chemistry, University of Calgary), E. Bertin, J. Parnian, X. Tong, J. Li, and V. I. Birss (Department of Chemistry, University of Calgary)

15:10 **1809** ***(Invited)*** **Polymer Electrolyte Fuel Cell Catalysis - Older Goodies and New Concepts** – T. J. Schmidt (ETH Zürich)

15:35 **1810** ***(Invited)*** **Insights from the inside: Imaging Water in the Porous Structures of Fuel Cells** – F. N. Büchi, J. Eller, H. Xu (Electrochemistry Laboratory, Paul Scherrer Institut), and P. Boillat (ECL and LNS Laboratories, Paul Scherrer Institut)

16:00 **Break**

16:20 **1811** ***(Invited)*** **Progress Towards High Power Density and Durable PEFCs with PGM-Free Cathodes** – M. A. Uddin, L. Langhorst (Carnegie Mellon University), H. Zhang (University at Buffalo, the State University of New York), Y. Guo, X. Xu, D. Beltran (Carnegie Mellon University), G. Wu (University at Buffalo, the State University of New York), and S. Litster (Carnegie Mellon University)

16:40 **1812** ***(Invited)*** **Rechargeable-Liquid Fuel Cells and Hydrogen Carriers: Recent Progress and Key Challenges** – M. L. Perry (United Technologies Research Center)

17:00 **1813** ***(Invited)*** **Translating Knowledge from PEM and AEM Fuel Cells to Biofuel Cells and Hybrid Fuel Cells** – S. D. Minteer (University of Utah)

Energy Technology Division Research Award Address – 17:20 – 18:00
Chair(s): Andrew M. Herring

17:20 **1814** ***(Energy Technology Division Research Award Address)*** **Transition Metal-Nitrogen-Carbon Catalysts for Oxygen Reduction Reaction:Surface Chemistry, Morphology and Reactivity** – P. Atanassov (University of California, Irvine)

K02 Electron-Transfer Activation in Organic and Biological Systems

Organic and Biological Electrochemistry / Energy Technology / Physical and Analytical Electrochemistry / Sensor
Pearl 3, Dallas Sheraton Hotel

Electron-Transfer Activation in Organic and Biological Systems - Session 1 – 08:00 – 11:40
Chair(s): Graham T. Cheek and Dennis G Peters

08:00 **1857** **Electrochemical Reduction of Chlorpyrifos at Silver Cathodes in Dimethylformamide** – E. C. R. McKenzie and D. G. Peters (Indiana University)

08:20 **1858** **Electrochemical Reduction of Acetochlor at Carbon and Silver Cathodes in Dimethylformamide** – A. G. Couto Petro and D. G. Peters (Indiana University)

08:40 **1859** **Electrochemical Investigation of Halogenated Hydroxybenzonitriles at Silver Cathodes in Dimethylformamide** – T. J. Nugen, E. C. R. McKenzie, and D. G. Peters (Indiana University)

09:00 **1860** **The Role of H-Bonding in PCET: The Chemically Reversible One Electron, Three Acid Reduction of N-Methyl-4,4'-Bipyridine Radical in Acetonitrile** – D. K. Smith, K. Pavlova, A. Medina, M. Rivera, and N. T. Smith (San Diego State University)

09:20 **1861** **The Role of H-Bonding in Non-Concerted Proton-Coupled Electron Transfer: Explaining the Voltammetry of Phenylenediamines in the Presence of Weak Bases in Acetonitrile** – L. A. Clare (San Diego State University), T. D. Pham, L. Rafou, A. Buenaventura, V. Mikhaylova, and D. K. Smith (San Diego State University)

09:40 **Break**

10:00 **1862** **Electrochemical Studies of Amino Acid: Metal Ion Interactions** – P. O. Choi, D. C. Clark, and G. T. Cheek (United States Naval Academy)

10:20 **1863** **Photoelectrosynthesis of 2,5-Furandicarboxylic Acid (FDCA) and Impact of Band-Gap on Conversion Yield** – S. Hosseini and D. G. Peters (Indiana University)

10:40 **1864** **Visible Light-Driven Cross Coupling Reactions Catalyzed By B_{12} Complex with Photosensitizer** – H. Shimakoshi, L. Chen, Y. Hisaeda, and Y. Anai (Kyushu University)

11:00 **1865** **Ethanol Production from *Saccharum Spontanum* Biomass Native to Nepal Using Bioelectrochemical Cell** – J. Joshi (CDBT, Tribhuvan University)

11:20 **1866** **Use of Imidoxyl Radical Mediators for Electrochemical Oxidation/Depolymerization of Lignin** – M. Rafiee (University of Wisconsin-Madison) and S. S. Stahl (University of Wisconsin - Madison)

Electron-Transfer Activation in Organic and Biological Systems - Session 2 – 14:00 – 15:00
Chair(s): Diane K Smith and Graham T. Cheek

14:00 **1867** **NADPH As a Sole Reducing Agent for Silver Nanoparticle Formation - TEM and Electrochemical Insight at the Ensemble and Single Entity Level** – S. Hietzschold, A. Walter, C. Davis, A. Taylor, and L. Sepunaru (University of California, Santa Barbara)

14:20 **1868** **Bioelectrochemistry of Human Liver Microsomes Attached to Magnetic Nanoparticles** – S. Krishnan, R. Nerimetla, G. Premaratne (Oklahoma State University), and H. Liu (Beijing Normal University)

14:40 **1869** **Electrochemical Behaviors of Some Metallic Materials during Biofilm Formations in LB Liquid Culture with *Escherichia coli*** – H. Kanematsu (National Institute of Technology Suzuka College), A. Tazaki, R. Itoh (National Institute of Technology, Suzuka College), H. Yamada (National Institute of Technology, Nara College), D. M. Barry (Clarkson University, SUNNY CANTON), N. Hirai, A. Ogawa, T. Kogo, D. Kuroda (National Institute of Technology Suzuka College), K. Tsunashima (National Institute of Technology Wakayama College), and K. Katakura (National Institute of Technology, Nara College)

Lone Star B/C, Dallas Sheraton Convention Center

K02 Poster Session – 18:00 – 20:00

- **1870** **The Study of Electron Transfer at the Interface of Cytochromes and Iron Oxide Minerals** – H. Wang, A. Johs, J. F. Browning, L. Liang, and A. Tennant (Oak Ridge National Lab)
- **1871** **Mechanistic Insight into Photoelectrochemical Conversion of Alkyl Monohalides to Aldehydes** – R. Lee, S. Hosseini, and D. G. Peters (Indiana University)

L01 Physical and Analytical Electrochemistry, Electrocatalysis, and Photoelectrochemistry General Session and Grahame Award Symposium

Physical and Analytical Electrochemistry
Trinity 3, Dallas Sheraton Hotel

Physical and Analytical Electrochemistry Division David C. Grahame Award Address – 08:25 – 12:10
Chair(s): Alice H. Suroviec

08:25 **Introductory Remarks**

08:30 **1901** ***(Physical and Analytical Electrochemistry Division David C. Grahame Award Address)*** **Electroanalytical Techniques for Studying Nitrogenase Enzyme Mechanisms** – S. D. Minteer (University of Utah)

09:05 **1902** ***(Invited)*** **Brief Historical Overview and Current Status of Electrochemical Neurotransmitter Detection** – A. Shadlaghani, M. Farzaneh, D. Kinser, and R. C. Reid (University of North Texas)

09:30 **Break**

09:40 **1903** ***(Invited)*** **Engineering of Enzymatic Bioelectrochemical Interface for *In Vivo* Analysis** – F. Wu and L. Mao (University of the Chinese Academy of Sciences)

10:05 **1904** ***(Invited)*** **Redox Active Metallic and Glyco-Based Nanoparticles for Enzymatic Bioelectrocatalysis** – X. Chen, J. L. Hammond, A. J. Gross, F. Giroud, R. Borsali, and S. Cosnier (Grenoble Alpes University)

10:30 **1905** ***(Invited)*** **Confocal Raman Microscopy in the Study of Membrane Materials for Energy Conversion** – C. Korzeniewski (Texas Tech University), R. Cai, J. Kitt (University of Utah), Y. Liang (Texas Tech University), S. D. Minteer, and J. M. Harris (University of Utah)

10:55 **1906** ***(Invited)*** **Current Understanding and Future Aspects of Direct Electron Transfer Mechanism of Fad Dependent Glucose Dehydrogenase Complex** – K. Sode (The University of North Carolina at Chapel Hill, North Carolina State University)

11:20 **1907** ***(Invited)*** **13 Vitamins on a Potential Axis** – M. D. Lovander, D. L. Parr IV, B. Parke, J. Lyon, and J. Leddy (University of Iowa)

11:45 **1908** ***(Invited)*** **High-Precision Analyses of *True* Single-Molecule Chemistry using Nanopore Methods** – H. Ren (Miami University), C. G. Cheyne, A. M. Fleming, C. J. Burrows, M. A. Edwards, and H. S. White (University of Utah)

Lone Star B/C, Dallas Sheraton Convention Center

L01 Poster Session – 18:00 – 20:00

- **1909** **Photoelectrochemical Biosensing** – J. Tang (Stanford University)
- **1910** **Epitaxial Growth of Iron Tungstate Nanosheets on One-Dimensional Photoanodes for Efficient Solar Water Oxidation** – H. Lin (The Hong Kong University of Science and Technology) and S. Yang (Peking University Shenzhen Graduate School, The Hong Kong University of Science and Technology)

- **1911** **Heavy Metals Extaction and Separation By Electrodeposition on a STEEL Substrate from Wastewater** – Y. Addi (USTHB-ENPEI)
- **1912** **Hot Holes Assist Plasmonic Nanoelectrode Dissolution** – A. Al-Zubeidi, B. S. Hoener, S. S. E. Collins, W. Wang, S. Kirchner, S. A. Hosseini Jebeli, A. Joplin (Rice University), W. S. Chang (University of Massachusetts Dartmouth, Rice University), S. Link, and C. F. Landes (Rice University)
- **1913** **Fabrication of Piezoelectric Platforms for Studying Strain in Electrocatalysis** – M. J. Counihan (University of Illinois at Urbana-Champaign), B. H. Simpson (University of Illinois at Urbana-Champaign, California Institute of Technology), and J. Rodriguez-Lopez (University of Illinois at Urbana-Champaign)
- **1914** **Study of the Electrochemical Mechanism of Dyes in Ionic Liquid By NIR Spectroelectrochemistry** – P. Fanjul (Metrohm), D. Ibáñez, A. Junquera-Pérez, M. B. González-García, and D. Hernández-Santos (Metrohm DropSens)

L02 Impedance Technologies, Diagnostics, and Sensing Applications 5

Physical and Analytical Electrochemistry

Trinity 3, Dallas Sheraton Hotel

Impedance Technologies, Diagnostics, and Sensing Applications 5 – 14:05 – 18:00

Chair(s): Petr Vanýsek and Andrew Campion Hillier

14:05 **Introductory Remarks**

14:10 **1930** **Flexible Impedimetric Sensors for Detection of Pollutants** – L. Stanciu, S. Diaz, L. K. Lin, and A. M. Ulloa-Gomez (Purdue University)

14:30 **1931** **An Electrochemical Impedance Spectroscopy Study of Hydroxide Ion Conduction in Polymer Electrolytes** – J. Li and K. Lian (University of Toronto)

14:50 **1932** **Disentangling Thermodynamic and Kinetic Effects at Photoelectrochemical Interfaces Via Intensity-Modulated High-Frequency Resistivity (IMHFR)** – R. T. Pekarek, S. Christensen (National Renewable Energy Lab), J. Liu (National Renewable Energy Laboratory), and N. Neale (National Renewable Energy Lab)

15:10 **1933** **Electrical Impedance Spectroscopy and Its Application in the Study of Electrochemical Sensors** – P. Vanýsek (Brno University of Technology, Northern Illinois University), J. Hovancová (University of P. J. Šafárik in Košice), and R. Oriňaková (Pavol Jozef Šafárik University)

15:30 **Break**

16:00 **1934** **Four Probe Impedance and Transference Number Analysis on Polymer Electrolytes in Liquid Phase** – L. Y. Su (Chemical Engineering, National Taiwan University) and N. L. Wu (National Taiwan University)

16:20 **1935** **Direct Electron Transfer Type Faradaic Enzyme EIS** – J. Okuda-Shimazaki (The University of North Carolina at Chapel Hill, North Carolina State University), Y. Ito (Tokyo University of Agriculture and Technology), N. Loew (The University of North Carolina at Chapel Hill, North Carolina State University), W. Tsugawa (Tokyo University of Agriculture and Technology), and K. Sode (The University of North Carolina at Chapel Hill, North Carolina State University)

16:40 **1936** **On the Electrochemical Impedance Spectroscopy of Marcus-Hush-Chidsey Heterogeneous Kinetics** – K. B. Knudsen (Department of Chemical Engineering, UC Berkeley, Energy Storage and Distributed Resources Division, LBNL) and B. D. McCloskey (Energy Storage and Distributed Resources Division, LBNL, Department of Chemical Engineering, UC Berkeley)

17:00 **1937** **Pyeis: A Python-Based Electrochemical Impedance Spectroscopy Analyzer and Simulator** – K. B. Knudsen (Department of Chemical Engineering, UC Berkeley, Lawrence Berkeley National Laboratory)

17:20 **1938** **Potential-Dependent Double Layer Capacitance at Room Temperature Ionic Liquids - Carbon Electrode Interfaces Studied By Electrochemical Impedance Spectroscopy** – G. M. Swain and K. Bhardwaj (Michigan State University)

17:40 **1939** **MS and EIS Characterization of Electrolessly Deposited Composite Metals on Carbon Fiber Surfaces** – R. Nelson (Florida A&M University - Florida State University), V. G. Watson, D. Kannan, M. Weetom (FAMU-FSU College of Engineering), M. H. Weatherspoon (Florida A&M University - Florida State University), and E. E. Kalu (Florida A&M University - Florida State University COE)

Lone Star B/C, Dallas Sheraton Convention Center

L02 Poster Session – 18:00 – 20:00

- **1940** **SLOCK™- Sleep Sock for Tracking Chronobiology** – S. Upasham (University of Texas, Dallas) and S. Prasad (The University of Texas at Dallas)
- **1941** **Characterization of Surface and Bulk Properties of an Electrochemical Biosensor for Reliable Detection of Inflammatory Biomarkers** – B. Jagannath (The University of Texas at Dallas), S. Muthukumar (Enlisense LLC), and S. Prasad (University of Texas at Dallas)

L03 Computational Electrochemistry 5

Physical and Analytical Electrochemistry / Energy Technology / Industrial Electrochemistry and Electrochemical Engineering
Trinity 1, Dallas Sheraton Hotel

Ab Initio Molecular Dynamics – 08:00 – 10:00
Chair(s): Stephen J. Paddison

08:00 **1954** ***(Invited)* Discovering Design Principles for Anion Exchange Membranes with High Hydroxide Conductivity: An *Ab Initio* Molecular Dynamics Study** – M. E. Tuckerman, T. E. Zelovich, and Z. E. Long (New York University)

08:40 **1955** **Electrochemical Oxidation of Liquid Ammonia on Pt(100) Electrode: First-Principles Study** – D. Skachkov (University of Florida, Case Western Reserve University) and V. R. Chitturi (Wonik Materials North America LLC)

09:00 **1956** **The Role of Theory in the Development of Electrocatalysts: Case Study on Pt-Skin/Pt Alloy Nanoparticles for Hydrogen Oxidation and Evolution** – D. A. Tryk (Fuel Cell Nanomaterials Center, University of Yamanashi), G. Shi (Clean Energy Research Center, University of Yamanashi), H. Yano, H. Uchida, and A. Iiyama (Fuel Cell Nanomaterials Center, University of Yamanashi)

09:20 **1957** **Anion Exchange Membranes with Low Hydration Conditions from an Ab Initio Molecular Dynamics Perspective** – T. Zelovich, L. Vogt (New York University), D. R. Dekel (Technion Israel Institute of Technology), M. Hickner (The Pennsylvania State University), C. Bae (Rensselaer Polytechnic Institute), S. J. Paddison (University of Tennessee, Knoxville), and M. E. Tuckerman (New York University)

09:40 **1958** **Strain-Induced Ionic Conductivity of Cubic $Li_{6.25}Al_{0.25}La_3Zr_2O_{12}$ solid Electrolyte** – A. Moradabadi (Technische Universität Darmstadt, Freie Universität Berlin) and P. Kaghazchi (Forschungszentrum Jülich, Institute of Energy Research)

DFT – 10:20 – 12:20
Chair(s): Iryna V. Zenyuk and Stephen J. Paddison

10:20 **1959** ***(Invited)* The Electronic Structure Underlying Electrochemistry of Two-Dimensional Materials** – Y. Liu (The University of Texas at Austin)

11:00 **1960** **Single Mo Atom Supported on N-Doped Black Phosphorus As an Efficient Electrocatalyst for Nitrogen Fixation at Ambient Conditions** – P. Ou and J. Song (McGill University)

11:20 **1961** **Characterization of Lithium Peroxide Growth Mechanisms at Li-O_2 Battery Discharge Conditions Using *Ab Initio* Computations** – J. B. Haskins (NASA Ames Research Center), H. Pham (Lawrence Berkeley National Laboratory), and J. W. Lawson (NASA Ames Research Center)

11:40 **1962** **Formation of Small Polaron and Polaronic Charge Transfer within $BiVO_4$ Photocatalyst** – H. P. Sarker and M. N. Huda (University of Texas at Arlington)

12:00 **1963** **Electron Density Topological Analysis of Adsorbates on Pt and Pt Alloy Fuel Cell Catalytic Layers** – E. S. Smotkin (Northeastern University) and N. Dimakis (University of Texas Rio Grande Valley)

Continuum Modeling – 14:00 – 15:40
Chair(s): Scott Calabrese Barton and Stephen J. Paddison

14:00 **1964** ***(Invited)* Mechanical Forces Around the Diffuse Double Layer** – C. W. Monroe (Department of Engineering Science, University of Oxford)

14:40 **1965** **CO Site Preference on Copper Surfaces in Electrochemical Environments: Deciphering Voltage and Electrolyte Composition Effects** – S. E. Weitzner, S. A. Akhade, J. B. Varley, B. C. Wood, S. E. Baker, and E. B. Duoss (Lawrence Livermore National Laboratory)

15:00 **1966** **Electrostatics to Electrodynamics Via an Additional Frame of Reference** – G. Kennell and R. Evitts (University of Saskatchewan)

15:20 **1967** **Capacitive Deionization Systems for Water Desalination Applications: Role of the Electrosorption Resistance and Non-Electrostatic Binding in the Porous Electrodes** – Y. Salamat and C. H. Hidrovo (Northeastern University)

L04 Polyoxometallates and Nanostructured Metal Oxides in Efficient Electrocatalysis, Energy Conversion, and Charge Storage

Physical and Analytical Electrochemistry / Energy Technology
Trinity 2, Dallas Sheraton Hotel

Polyoxometallates and Nanostructured Metal Oxides in Efficient Electrocatalysis, Energy Conversion, and Charge Storage 3 – 08:00 – 09:30
Chair(s): Vito Di Noto and Ronny Neumann

08:00 **1974** ***(Keynote)* The Use of Polyoxometallates in Proton Conducting Membranes for Electrochemical Energy Conversion** – A. M. Herring and M. C. Kuo (Colorado School of Mines)

08:40 **1975** ***(Invited)* Nanofibrous Doped Tin Oxide As Electrocatalyst Support for PEM Fuel Cells and Electrolysers** – S. Cavaliere, I. Jiménez-Morales, F. Haidar, D. J. Jones, and J. Rozière (CNRS - ICGM - AIME - University of Montpellier)

09:10 **1976** **Preparation of Carbon Metal Oxide Composites for Hybrid Supercapacitor Applications** – S. Malekpour, K. J. Balkus Jr. (The University of Texas at Dallas), and J. P. Ferraris (University of Taxas at Dallas)

Polyoxometallates and Nanostructured Metal Oxides in Efficient Electrocatalysis, Energy Conversion, and Charge Storage 4 – 10:00 – 11:50
Chair(s): Jose Ramon Galan-Mascaros, Pawel J. Kulesza and Iwona Agnieszka Rutkowska

10:00 **1977** ***(Keynote)* Tuning the Activity and Selectivity of CO_2 Electroreduction Catalysts through Nanostructuring and Controlled Oxidation** – B. Roldan Cuenya (Fritz Haber Institute of the Max Planck Society)

10:40 **1978** ***(Keynote)* Electroreduction of CO_2 on Pb and Bi Nanoneedles** – D. Guay (EMT-INRS), M. Fan, S. Garbarino, A. C. Tavares (INRS-EMT), S. Prabhudev, and G. A. Botton (McMaster University)

11:20 **1979** ***(Invited)* Photo-Electrode Hybrid Materials Based on Metal-Oxide and Pi-Conjugated Units for Solar-Energy Conversion Devices** – M. P. Santoni, M. Jouini, A. Delices, Z. Xu, C. Z. Dong, S. Bellynck (Université Paris Diderot - Sorbonne Paris Cité), I. A. Rutkowska, and P. J. Kulesza (University of Warsaw)

Polyoxometallates and Nanostructured Metal Oxides in Efficient Electrocatalysis, Energy Conversion, and Charge Storage 5 – 14:00 – 15:30
Chair(s): Beatriz Roldan Cuenya and Frederic Maillard

14:00 **1980** ***(Keynote)* Perovskite Lanthanum Titanium Oxides for Solar Water Splitting** – N. Wu (West Virginia University)

14:40 **1981** ***(Invited)* Charge Carriers Behaviour in Solar Energy Harvesting & Converting Semiconducting Systems.** – K. Bienkowski (University of Warsaw), M. Jadwiszczak, A. Dubiel (Universty of Warsaw), M. Arasimowicz, and R. Solarska (University of Warsaw)

15:10 **1982** **Purely Protonic Solar Cells Fabricated from Photoacid-Modified Ion-Exchange Membranes** – L. Schulte and S. Ardo (University of California, Irvine)

Polyoxometallates and Nanostructured Metal Oxides in Efficient Electrocatalysis, Energy Conversion, and Charge Storage 6 – 16:00 – 17:30
Chair(s): Renata Anna Solarska and Daniel Guay

16:00 **1983** ***(Keynote)* Use of Conducting Metal Oxides to Modulate Charge Density Gradients in Ionic Liquids** – K. Ma, R. Jarosova, G. M. Swain, and G. J. Blanchard (Michigan State University)

16:40 **1984** ***(Invited)* Oxygen Evolution and Reduction on $La_{0.5}Sr_{0.5}Co_{0.8}Fe_{0.2}O_{3-\Delta}$ Perovskites with Tunable Structural Features** – A. C. Tavares (INRS - Énergie, Matériaux et Télécommunications), F. Deganello (CNR – Istituto per lo Studio dei Materiali Nanostrutturati), J. G. Rivera (CIDETEQ - Queretaro), J. Valdez (INRS - Énergie, Matériaux et Télécommunications), G. Orozco Gamboa (CIDETEQ - Queretaro), and A. Yurtsever (INRS - Energie, Materiaux et Telecommunications)

17:10 **1985** **Nano Architectured Binder-Free Metal Oxide Electrodes for High Voltage Supercapacitor** – K. Sambath Kumar (Department of Materials Science and Engineering, UCF, Nanoscience Technology Center, UCF), J. Cherusseri (Nanoscience Technology Center, UCF), and J. Thomas (CREOL, ollege of Optics and Photonics, UCF, NanoScience Technology Center, UCF)

Lone Star B/C, Dallas Sheraton Convention Center

L04 Poster Session – 18:00 – 20:00
Chair(s): Pawel J. Kulesza, Iwona Agnieszka Rutkowska and Vito Di Noto

- **1986** **Chemically Regenerative Redox Fuel Cell As Alternative to Conventional Proton Exchange Membrane Fuel Cell** – P. Y. Blanchard, N. Donzel, M. Dupont, J. Rozière, and D. J. Jones (CNRS - ICGM - AIME - University of Montpellier)
- **1987** **Exploring Catalytic Traits of so_4^{2-}-Functionalized Iron Oxides Exploited to Decompose Aqueous Recalcitrant Pollutants** – J. Kim, Y. J. Choe, and S. H. Kim (Korea Institute of Science and Technology)
- **1988** **Construction of Dawson-Type Molybdovanadophosphoric Acid-Based Electrochemical Sensor and Its Application in Sensing Folic Acid** – H. Xu and M. Zhang (Harbin Engineering University)

M01 Sensors, Actuators, and Microsystems General Session

Sensor
Trinity 5, Dallas Sheraton Hotel

Nanosensors – 08:00 – 12:00
Chair(s): Jessica E. Koehne and Larry A. Nagahara

08:00 **2004** **Nanocrystalline Electro-Chemo-Mechanical Actuator Operating at Room Temperature** – E. Makagon, E. Mishuk, S. Cohen, E. Wachtel, and I. Lubomirsky (Weizmann Institute of Science)

08:20 **2005** ***(Invited)* Sensing, Measuring and Imaging Surface Charge with Nanoscale Pipettes** – L. A. Baker (Department of Chemistry, Indiana University)

09:00 **2006** **Cobalt Containing Zeolitic Imidazolate Framework Incorporated Electrospun Carbon Nanofibers As Free-Standing Film Sensor for Electrochemical Detection of Hydrogen Peroxide** – M. A. Riaz and Y. Chen (The University of Sydney)

09:20 **2007** **Halides Perovskite Piezoelectric Nanogenerators As Electroskin for Electromechanical Energy Harvesting and Physiological Monitoring** – D. B. Kim and Y. S. Cho (Yonsei University)

09:40 **2008** **Nanoarray Device for Detection of Gas Phase I_2** – K. C. Klavetter (Sandia National Laboratories), J. J. Coleman (Sandia National Labs), C. R. Perez, and M. P. Siegal (Sandia National Laboratories)

10:00 **Break**

10:20 **2009** **Functional Iron Oxide (Fe_2O_3) Nanoparticles Based Gas Sensor Operating at High Temperature** – Y. C. Huang, S. C. Liao, R. W. Chuang (National Cheng Kung University), and T. J. Hsueh (National Kaohsiung University of Science and Technology)

10:40 **2010** **New Electrochemical Sensor for Hg(II) Trace Detection in Natural Waters: Electrode Functionalization with Gold Nanoparticles and Diazonium Salts** – F. Fezai, P. Gros, M. Meireles, and D. Evrard (Laboratoire de Génie Chimique)

11:00 **2011** **Characterization of Arsenic Adsorption on Metal Oxide Nanoparticles By Nanoimpact Electrochemistry** – F. Hosseini Narouei (Clarkson university), S. Andreescu, and D. Andreescu (Clarkson University)

11:20 **2012** **Electrochemical Detection of Dissolved Hydrogen Sulfide By Platinum-Modified Multi-Walled Carbon Nanotubes Sensors** – S. Mohajeri, A. Dolati, and S. Salmani Rezaie (Sharif University of Technology)

IoT Sensors – 14:00 – 17:00
Chair(s): Bryan A. Chin and Larry A. Nagahara

14:00 **2013** **Embedded Ceramic-Based Passive Wireless Sensors for Harsh-Environment Applications** – K. Sivaneri Varadharajan Idhaiam (West Virginia University), E. M. Sabolsky (West Virginia University, U.S. DOE, National Energy Technology Laboratory), K. Sabolsky, L. Redinger, H. Palakurthi (West Virginia University), D. S. Reynolds (WVU - Computer Science and Electrical Engineering), and K. Sierros (West Virginia University)

14:20 **2014** **Millimetre-Wave Bow-Tie Reconfigurable Antenna for 5G Applications** – T. K. Saha, M. A. Riheen, and P. K. Sekhar (Washington State University Vancouver)

14:40 **2015** **Development of a Wireless Surface Acoustic Wave Methane Sensor Using a Metal-Organic Framework As a Sensing Layer for Natural Gas Pipelines** – J. Devkota (National Energy Technology Laboratory, AECOM Pittsburgh), T. Hong (National Energy Technology Laboratory), J. Culp (National Energy Technology Laboratory, AECOM Pittsburgh), and P. R. Ohodnicki Jr. (National Energy Technology Laboratory)

15:00 **2016** **Distributed Fiber Optic pH Sensor for the Application in the Wellbore** – F. Lu (National Energy Technology Laboratory, ORISE), R. F. Wright, P. Lu (National Energy Technology Laboratory, AECOM), and P. R. Ohodnicki Jr. (National Energy Technology Laboratory, Carnegie Mellon University)

15:20 **2017** **Optical Fiber-Based Corrosion Sensor with Fe/SiO_2 Coating** – R. F. Wright, P. Lu (National Energy Technology Laboratory, AECOM), M. Ziomek-Moroz (DOE/NETL), and P. R. Ohodnicki Jr. (National Energy Technology Laboratory, Carnegie Mellon University)

15:40 **2018** **Advanced Electrochemical Sensors for Monitoring Relative Humidity and Internal Corrosion Rates of Natural Gas Transmission Pipelines Containing H_2s** – M. Ziomek-Moroz (DOE/NETL), T. Duffy, D. M. Hall, and S. N. Lvov (The Pennsylvania State University)

16:00 **Break**

16:20 **2019** **Ultrathin Hydrophobic Uhmwpe Membrane for Moisture Sensing and Removal through Water Confinement Effect** – Q. GU, L. Xie (HongKong University of Science and Technoilogy), J. Li (The Hong Kong University of Science and Technology), X. Huang (HongKong University of Science and Technoilogy), and P. Gao (The Hong Kong University of Science and Technology)

16:40 **2020** **Inkjet Printing on PET Substrate: Printing Properties Investigation and Performance Analysis** – M. A. Riheen, T. K. Saha (Washington State University Vancouver), and P. K. Sekhar (Washington State University, Vancouver)

M03 Sensors for Precision Medicine

Sensor
Trinity 4, Dallas Sheraton Hotel

Sensors for Precision Medicine - Session 1 – 08:00 – 12:40
Chair(s): Praveen K. Sekhar and Jessica E. Koehne

08:00 **2069** ***(Invited)*** **Multifunctional Nanoplatforms for Biomedical Applications** – D. Ma (Institut national de la recherche scientifique (INRS))

08:40 **2070** **A Carbon Nanotube-Based Impedimetric Biosensor for Detection of Micro-RNA** – H. Asadi and R. P. Ramasamy (University of Georgia)

09:00 **2071** ***(Invited)*** **Nanozyme Integrated Microfluidic Devices for Smart Health Monitoring** – C. Z. Li (Florida International University), C. Zhang (Shannxi Normal University), and T. Lin (Florida International University)

09:40 **Break**

10:00 **2072** ***(Invited)*** **Multifunctional Surface-Enhanced Raman Spectroscopy (SERS) Probes for Targeted Detection of Cancer Cells** – M. Li (Central South University)

10:40 **2073** **Microfluidic Chemotaxis Assay through Stable Chemical Gradient** – C. S. Lee (Chungnam National University)

11:00 **2074** ***(Invited)*** **Nano Composite Platforms: Synthesis and Biological Applications Including Cancer Diagnosis** – M. Packirisamy (Concordia University)

11:40 **2075** **Development in Two-Dimensional Nanomaterials for Wearable Health Monitoring Systems** – E. Lee, A. VahidMohammadi, D. Lee, J. Yoon, M. Beidaghi (Auburn University), Y. S. Yoon (Gachon University), and D. J. Kim (Materials Research and Education Center)

12:00 **2076** ***(Invited)*** **Towards New Near-Infrared Triggered Theranostic Nanoplatforms** – F. Vetrone (INRS-EMT, Université du Québec)

Sensors for Precision Medicine - Session 2 – 14:00 – 17:40
Chair(s): Dong-Joo Kim and Nianqiang (Nick) Wu

14:00 **2077** ***(Invited)*** **Substrate-Directed Electrocrystallization As a Manufacturing Method for Nanowire Sensors** – G. Mao, M. Kilani, and X. Yu (Wayne State University)

14:40 **2078** **Advancing Electrochemical Microsensor Technologies Using Carbon Nanomaterials for Chronic Dopamine Detection** – A. Y. Chang, G. Dutta, S. Siddiqui, and P. U. Arumugam (Louisiana Tech University)

15:00 **2079** ***(Invited)*** **Diffusion Map Analysis of Physiological Signals** – T. Nakamura and S. Hagan (British Columbia Institute of Technology)

15:40 **Break**

16:00 **2080** ***(Invited)*** **Electrochemically Tunable Sensors for Passive Sweat Analytics and Its Applications for Wearable Technologies** – S. Prasad (University of Texas at Dallas), S. Muthukumar (EnLiSense LLC), D. Kinnamon (University of Texas, Dallas), R. D. Munje (The University of Texas at Dallas), S. Upasham, and K. C. Lin (University of Texas, Dallas)

16:40 **2081** **Sensing Platform for Antiviral Drug in Pharmaceuticals and Human Physiology Exploiting Electrocatalytic Properties of Carbon Nanomaterials** – P. Tarlekar and S. Chatterjee (Institute of Chemical Technology)

17:00 **2082** ***(Invited)*** **Modularized Inexpensive Detection of Biomarkers for Medical Applications** – P. H. Carey IV, J. Yang, C. W. Chang, F. Ren, S. J. Pearton (University of Florida), S. Y. Lu (National Chiao Tung University), J. Lin (University of Florida), Y. T. Liao (National Chiao Tung University), B. Lobo, M. Gebhard, and M. E. Leon (University of Florida)

Z01 General Student Poster Session

All Divisions
Lone Star B/C, Dallas Sheraton Convention Center

Z01 General Student Poster Session – 18:00 – 20:00

- **2126** **A Flexible Al//Fe(III) and Aqds-Doped PANI Air Battery with Capacity Self-Restoring Performance** – H. Cao Jr., S. Si (Central South University), X. Xu, and J. Li (Hunan Chemical Vocational Technology)
- **2127** **Study on the Stability of Sulfide Solid-State Electrolyte Based upon Electronic Structure Calculated from First Principles Calculation** – H. Kim, T. Hwang, M. Cho (Seoul National University), and K. Cho (The University of Texas at Dallas)
- **2128** **Understanding of Correlation between Li Diffusion and Local Environments in Solid Electrolyte Based on Kinetic Energy Barriers As Local Structure Variations By First Principles Calculation** – T. Hwang, H. Kim, M. Cho (Seoul National University), and K. Cho (The University of Texas at Dallas)
- **2129** **Fabrication of Flexible Energy Storage Device Using MnO_2@Graphene Composite Synthesised By Electrochemical Exfoliation Method** – H. T. Das (Pondicherry University)
- **2130** **Facile Mn Surface Doping of Ni-Rich Layered Cathode Materials for Lithium Ion Batteries** – J. H. Kim (Kyunghee University), W. Cho (Korea Electronics Technology Institute), and M. S. Park (Kyunghee University)
- **2131** **Tailoring Microstructures and Ionic Conductivities of $Li_{1+X}Al_xGe_{2-X}(PO_4)_3$ (LAGP) Solid Electrolytes for All-Solid-State Batteries** – Y. C. Kim (Kyung Hee University), M. S. Park (Kyunghee University), and K. N. Jung (Korea Institute of Energy Research)
- **2132** **Study on the Structural and Surface Changes during Lithiation/Delithiation Processes in Copper Sulfide** – J. S. Nam, J. H. Lee, S. M. Hwang, and Y. J. Kim (SKKU Advanced Institute of Nanotechnology (SAINT))
- **2133** **CO_2-Derived Manganese-Oxide Carbon Composites As Electrode Materials for Fuel Cells and Supercapacitors** – J. H. Park, W. Y. Choi (KAIST), Y. Kim (LG Chem), and J. W. Lee (KAIST)
- **2134** **Advanced Porous Membranes with Slit-like Selective Layer for Flow Battery** – L. Qiao, H. Zhang, W. Lu, C. Xiao, Q. Fu, X. Li (Dalian Institute of Chemical Physics), and I. F. J. Vankelecom (Katholieke Universiteit Leuven)
- **2135** **Vertically Aligned Laminate Porous Electrode: Amaze the Performance with a Maze Structure** – X. Li (Dalian Institute of Chemical Physics), H. Zhang Sr. (Dalian Institute of Chemical Physics,CAS), and Y. Yu (Dalian Institute of Chemical Physics)
- **2136** **Additive-Mediated Electrode-Electrolyte Interphase for Long Service-Life, High-Nickel Cathodes for Lithium-Ion Batteries** – J. Li and A. Manthiram (The University of Texas at Austin)
- **2137** **Rational Design of a Dual-Function Hybrid Cathode Substrate for Lithium-Sulfur Batteries** – L. Luo and A. Manthiram (The University of Texas at Austin)
- **2138** **Effect of the Cooling Process on the Structure and Charge/Discharge Cycling Performance of Li_2MnO_3 -$LiNi_{0.5}Mn_{0.5}O_2$ -$LiNi_{1/3}Co_{1/3}Mn_{1/3}O_2$ Li-Rich Solid-Solution Layered Oxide Cathode Materials for Li-Ion Battery** – F. Nomura, T. Gunji, T. Ohsaka, and F. Matsumoto (Kanagawa University)
- **2139** **Improvement of High-Rate Discharging Performance of $LiFePO_4$ Cathodes By Forming Micrometer-Sized through-Holed Electrode Structures with a Pico-Second Pulsed Laser** – T. Tsuda, T. Gunji, N. Ando, T. Tanabe (Kanagawa University), S. Nakamura (National Insititute of Technology Nagaoka College), N. Soma (Wired Co., Ltd), N. Hayashi (Industrial Research Institute of Niigata Prefecture), T. Ohsaka, and F. Matsumoto (Kanagawa University)

- **2140** **Improvement of High-Rate Performance of $LiFePO_4$ Cathode with through-Holed $LiFePO_4$/Activated Carbon Hybrid Electrode Structure Fabricated with a Pico-Second Pulsed Laser** – T. Watanabe, T. Tsuda, T. Gunji, N. Ando, T. Tanabe (Kanagawa University), S. Nakamura (National Insititute of Technology Nagaoka College), N. Soma (Wired Co., Ltd), N. Hayashi (Industrial Research Institute of Niigata Prefecture), T. Ohsaka, and F. Matsumoto (Kanagawa University)
- **2141** **Understanding How Structure Influences Electrochemical Behavior When ZnO Is Used to Suppress Aluminum Corrosion in Alkaline Electrolytes** – E. Faegh, S. Shrestha, X. Zhao, and W. E. Mustain (University of South Carolina)
- **2142** **Understanding SEI Formation on Conversion-Based Metal Oxide Anodes** – B. Ng and W. E. Mustain (University of South Carolina)
- **2143** **Performance of Lead Acid Battery Using Graphite Based Composite As Cathode Current Collector** – Y. Nakamura, T. Ohkubo, H. Okano (National Institute of Technology, Kagawa College), T. Inoue, T. Hosokawa, A. Takeda (Toyo Tanso Co., Ltd.), T. Iwai, T. Yabutsuka, S. Takai (Graduate School of Energy Science, Kyoto University), and T. Yao (National Institute of Technology, Kagawa College)
- **2144** **The Development of Redox-Active Helical Polypeptides for Battery Application** – T. Nguyen, A. D. Easley, C. H. Yu, J. Fan, R. Letteri, X. He, L. Su, J. L. Lutkenhaus, and K. Wooley (Texas A&M University)
- **2145** **Potential Dependences of Discharge Characteristics of Li-O_2 Batteries with Various Electrolytes** – K. Nishioka, K. Morimoto, T. Kusumoto (Graduate School of Engineering Science, Osaka University), J. Seki, Y. Hase (Toyota Central R&D Labs., Inc.), and S. Nakanishi (Graduate School of Engineering Science, Osaka University, Research Center for Solar Energy Chemistry)
- **2146** **Self-Recovery of Capacity in Lithium Metal Hybrid Lithium Ion Battery** – R. Pathak, K. Chen, Y. Zhou, and Q. Qiao (South Dakota State University)
- **2147** **Nanostructured Nickel Hydroxide Cathodes for Energy Dense, Safe, Aqueous Rechargeable Nickel–Zinc Batteries** – S. W. Kimmel (Texas State University, U.S. Naval Research Laboratory), J. S. Ko (Former NRL/NRC Postdoctoral Associate, U S. Naval Research Laboratory), J. W. Long (U.S. Naval Research Laboratory), J. F. Parker (U.S. Naval Research Laboratory, Surface Chemistry Branch (Code 6170)), D. R. Rolison (Surface Chemistry Branch (Code 6170), U.S. Naval Research Laboratory), and C. P. Rhodes (Texas State University)
- **2148** **Ultrasmall $NiMoO_4$ Nanoparticle Embedded on Carbon Matrix for High Performance Asymmetric Supercapacitors** – G. P. Sharma, R. G. Pala (Indian Institute of Technology Kanpur), and S. Sivakumar (Indian Institute of Technology at Kanpur)
- **2149** **Cathode Properties of $Na_3FePO_4CO_3$ Prepared By Mechanical Milling Method for Na-Ion Battery** – B. W. Xie (IGSES, Kyushu University), S. Okada (IMCE, Kyushu University), A. Kitajou (ORI,Yamaguchi University), Y. Fujita, N. Oka, T. Nishida (Kindai University), W. Kobayashi, and T. Takahara (Tosoh Corporation)
- **2150** **Promoting the Cyclic Performance and Boosting Li^+transport of LiV_3O_8 Via Ca Doping** – Y. Xu (China University of Geosciences (Wuhan))
- **2151** **Oxidation Kinetics of Electrospun Compatibilized Immiscible PBI:6FDD Polymer Blends** – J. P. Ferraris (University of Taxas at Dallas), K. J. Balkus Jr. (The University of Texas at Dallas), and S. D. Panangala (University of Taxas at Dallas)
- **2152** **Hierarchical Porous Carbons Synthesized By CO_2 Conversion with $CaCO_3$ Nano-Template** – J. H. Park, Y. K. Kim, and J. W. Lee (KAIST)
- **2153** **Carbon-Electrode Dielectrophoresis to Identify *Candida* strains** – E. Barnett, M. Vogel, C. Hammond, C. Bisbee, P. Jones, D. M. Keck, and R. Martinez-Duarte (Clemson University)
- **2154** **Bimetallic−Organic Framework-Derived Hierarchically Porous Co-Zn-N-C As Efficient Catalyst for Acidic Oxygen Reduction Reaction** – Z. Meng (Wuhan University of Technology)
- **2155** **Investigation of Solvent Effects on Electrochemical Quartz Crystal Microbalance (eQCM) Studies of Carbon Nanomaterials** – R. A. Quinlan, A. R. Carrion, R. A. Outlaw, and D. Premathilake (Christopher Newport University)
- **2156** **Exploring the Synergy between Nanoparticles and Passivation Film Chemistry Relevant to Cu Chemical Mechanical Planarization (CMP) Slurry Formulation** – C. F. Graverson, A. M. Mikos, M. G. Salinas, M. Hill (Lewis University, Department of Chemistry), A. Mlynarski (Lewis University), and J. J. Keleher (Lewis University, Department of Chemistry)
- **2157** **Corrosion Behavior of Fe-Cr-Al Alloy for Anode Current Collector in Oxygen Atmosphere** – H. Y. Woo, S. C. Kwon, and J. H. Lee (Chungnam National University)
- **2158** **Corrosion Behaviour of Fecral Alloy for Anode Current Collector in Hot Liquid Silver** – G. S. Lim (Chungnam National University, Republic of Korea), S. H. Cho (Rapidly Solidified Materials Research Center), S. C. Kwon, and J. H. Lee (Chungnam National University, Republic of Korea)
- **2159** **Passivation and Depassivation Behavior of Zinc in Concrete** – M. Maeda, A. Ooi, E. Tada, and A. Nishikata (Tokyo Institute of Technology)
- **2160** **Electrical Characterizations of Amorphous Silicon Carbide** – N. Geramifard, A. Joshi-Imre, and S. F. Cogan (The University of Texas at Dallas)

- **2161** **Role of Additive Structure on Controlling Ceria/Substrate Interactions Relevant to Shallow Trench Isolation (STI) Chemical Mechanical Planarization (CMP)** – K. M. Wortman-Otto, C. Saucedo, and J. J. Keleher (Lewis University, Department of Chemistry)
- **2162** **Probing the Effect of Point of Use Filtration on Cu CMP Slurry Health** – M. G. Salinas, T. B. Zubi, and J. J. Keleher (Lewis University, Department of Chemistry)
- **2163** **Enhancing Post-Chemical Mechanical Planarization (CMP) Cleaning in the Presence of Polyelectrolyte-Based Chemistry Relevant to Shallow Trench Isolation** – A. M. Mikos, C. F. Graverson, T. B. Zubi, and J. J. Keleher (Lewis University, Department of Chemistry)
- **2164** **Crystallization of Atomic Layer Deposited MgO Thin Filmsas a Buffer Layer for Rocksalt Beo Film Growth** – H. Lee, B. Wang, and C. S. Hwang (Seoul National University)
- **2165** **Investigation on Electrical Properties of Hydrogen Doped Sputtered Boron Carbon Nitride Thin Films** – S. D. Nehate (University of Central Florida) and K. B. Sundaram (Univ. of Central Florida)
- **2166** **Spectroscopic Investigation of Complex Redox Equilibria in Cupric Chloride Subtractive Etching for Cu High Density Interconnects** – G. Issac, A. Lambert, J. Caperton, A. Salunke, L. Lu, and O. Chyan (University of North Texas)
- **2167** **An Investigation of the Role of Rapid Chlorine Hydrolysis on the Performance of Electrochemically-Mediated Desalination** – C. D. Davies, S. Johnson, and R. M. Crooks (The University of Texas at Austin)
- **2168** **Eco-Friendly Electroreduction of Indium Tin Oxide Using SOM Anode in Molten Salts** – S. C. Kwon and J. H. Lee (Chungnam National University)
- **2169** **Characterization of $CaZrO_3$ Coating Layer Formed on YSZ Plate for SOM Anode in $CaCl_2$-CaF_2-CaO Electrolyte** – W. B. Kim (Chungnam National University, Republic of Korea), H. Nersisyan (Rapidly Solidified Materials Research Center), S. C. Kwon (Chungnam National University, Republic of Korea), B. U. Yoo (Korea Institute of Materials Science), and J. H. Lee (Chungnam National University, Republic of Korea)
- **2170** **Developing of Novel Electrorefining Process of Titanium from Cuti Alloy in K-Free Molten Salt** – V. E. Ri (Chungnam National University), Y. J. Lee (Ziron Tech), B. U. Yoo (Korea Institute of Materials Science), H. Nersisyan (Rapidly Solidified Materials Research Center), and J. H. Lee (Chungnam National University, Republic of Korea)
- **2171** **Scale Formation on $Na_4Mn_9O_{18}$ Insertion Electrodes in Electrochemical Deionization** – Y. Zhang (Carnegie Mellon Univerisity), S. Shanbhag, M. Mauter, and J. Whitacre (Carnegie Mellon University)
- **2172** **Effect of Brightener Concentration on Recrystallization Process of Electroplated Cu** – C. H. Yang, Y. W. Lee, C. Y. Lee, Y. H. Huang, and C. E. Ho (Yuan Ze University)
- **2173** **Pulsed Electrodeposition of Si Under Light Illumination in Ionic Liquid** – S. Watanuki (Waseda University), Y. Fukunaka (Nanotechnology Research Institute, Waseda), and T. Homma (Res. Org. for Nano&Life Innovation, Waseda University)
- **2174** **Synthesis of Cobalt Selenide Thin Films and Their Electrocatalytic Properties in Water Splitting Process** – A. M. Kwiecińska, D. Kutyla, K. Kolczyk, K. Skibinska, P. Zabinski, and R. Kowalik (AGH University of Science and Technology)
- **2175** **A Study on the Decontamination Possibility of Simulated Radioactive Inconel 600 – Co Alloy Using Electrorefining in LiCl-KCl Electrolyte** – W. S. Choi (Chungnam National University), Y. J. Lee (Ziron Tech), S. H. Lee (Chungnam National University), and J. H. Lee (Chungnam National University, Republic of Korea)
- **2176** **Non-Volatile, Multi-Level Optical Information Storage of Block Copolymer Structural Color** – H. Eoh, H. S. Kang, T. H. Park, K. L. Kim, H. Lee, and C. Park (Dept of Materials Science Engineering, Yonsei University)
- **2177** **Fabrication of Localized Silicon-on-Insulator Based Rhombus-Shaped Channels in Silicon** – M. Ogini, M. Voyantzis, P. K. Koech, A. Alice Francis, S. Mohan, M. Deo, and S. Albin (Department of Engineering, Norfolk State University)
- **2178** **Fabrication of Silicon Quantum Dots from Silicon Nanowires by a Combined Process of Chemical Etching and Ultrasonication** – A. Alice Francis, S. Mohan, P. K. Koech, M. E. Ogini, M. Deo, and S. Albin (Department of Engineering, Norfolk State University)
- **2179** **Characteristics of $Al_xGa_{1-X}n$/GaN Grown on Sapphire Substrates with Different AlN Layers Inserted** – K. Bun (The University of Cambodia)
- **2180** **Growth of High-Quality GaN Films on Multi-AlN/Sapphire Templates By MOCVD** – K. Bun (The University of Cambodia)
- **2181** **Room Temperature Atomic Layer Deposition of ZnO Observed By in Situ IR Absorption Spectroscopy** – K. Yoshida, K. Saito, M. Miura, K. Kanomata (Yamagata University), and F. Hirose (CREST, JST, Yamagata University)
- **2182** **High-Temperature Stability of YSZ/Msz Membrane in Molten Salts** – H. Ryu and J. H. Lee (Chungnam National University, Republic of Korea)
- **2183** **Ultrasonication Assisted Production of Silicon Nanoparticles from Nanowires** – S. Mohan, A. Alice Francis, P. K. Koech, M. E. Ogini, M. Deo, and S. Albin (Department of Engineering, Norfolk State University)

- **2184** **Epitaxial Grown Ferroelectric Polymers on Graphene Layer for Non-Volatile Transistor Memory with Graphene Channel** – K. L. Kim and C. Park (Dept of Materials Science Engineering, Yonsei University)
- **2185** **Annealing Studies of RF Sputtered $CuGaO_2$ Thin Films** – A. K. Saikumar (University Of Central Florida) and K. B. Sundaram (Univ. of Central Florida)
- **2186** **Optical Studies of RF Sputtered $CuInO_2$ Thin Films** – G. Skaria (University of Central Florida), A. K. Saikumar (University Of Central Florida), S. D. Nehate (University of Central Florida), and K. B. Sundaram (Univ. of Central Florida)
- **2187** **Thermal Management of Dynamic Operation of Solid Oxide Cell-Based Energy Storage System for 2 Renewable Electricity Scenarios** – P. Mottaghizadeh (University of California, Irvine, National Fuel Cell Research Center), M. Fardadi (University of California, Los Angeles), F. Jabbari (University of California, Irvine), and J. Brouwer (National Fuel Cell Research Center, University of California, Irvine)
- **2188** **Study on the Stability and Durability of Dual Metal-Doped TiO_2 Catalyst Support for Pt** – M. F. M. Labata (University of California Merced) and P. Y. A. Chuang (University of California, Merced)
- **2189** **Rheological Study of Micro Porous Layer and Its Effect on Transport Properties in a PEMFC** – S. Mehrazi (University of California Merced) and P. Y. A. Chuang (University of California, Merced)
- **2190** **Analytical Modeling of Two-Phase Water Transport in a PEMFC** – M. A. Rahman, F. Mojica, and P. Y. A. Chuang (University of California, Merced)
- **2191** **Study of Transport Behavior in an Anion Exchange Membrane Fuel Cell** – M. Sarker, F. Mojica, and P. Y. A. Chuang (University of California, Merced)
- **2192** **Rheological Study of Electrode Ink for a PEMFC: I/C and Solid Content** – D. Yang and P. Y. A. Chuang (University of California, Merced)
- **2193** **Study of Channel-Induced Convective Mass Transport in a PEMFC Using Limiting Current Method** – F. Mojica, M. Sarker, M. A. Rahman, and P. Y. A. Chuang (University of California, Merced)
- **2194** **Development of a Conductive Biomimetic Nanocomposite Anode for Improved Microbial Fuel Cell Efficiency** – A. D. Dunne, M. D. Puckett, N. E. Yuede, and J. J. Keleher (Lewis University, Department of Chemistry)
- **2195** **Thermal Stability and Cyclic Sealing Performance of Glass Composite Seals** – T. Kim, S. Park, and J. C. Lee (Myongji University)
- **2196** **Structural and Electronic Assessment of Heterogeneous PANI@UiO-66 Composite Photoelectrode Material** – J. J. Shanahan, D. S. Kissel (Lewis University, Department of Chemistry), and E. Sullivan (Illinois State University)
- **2197** **Flue Gas Derived Carbon Electrocatalysts for Enhancing Oxygen Reduction Reaction** – J. H. Park, S. Baik, and J. W. Lee (KAIST)
- **2198** **Two-Dimensional CoS_x/SnS_x Chalcogenides Layered Ultrathin Nanosheets for Electrocatalytic Hydrogen Evolution** – D. H. Kim, S. S. Shinde, and J. H. Lee (Hanyang University)
- **2199** **Morphology-Controlled Pt Alloy Nanoparticles for Oxygen Reduction Reaction** – T. Nakamoto (Tohoku University), R. Seki (Panasonic Corporation), S. Yokoyama (Tohoku University), S. Tsuchida (Panasonic Corporation), H. Takahashi, and K. Tohji (Tohoku University)
- **2200** **Efficient and Inexpensive All-Iron Alkaline Water Electrolyzer** – D. Mitra, B. Zayat, and S. R. Narayanan (University of Southern California)
- **2201** **Investigation of Activation Process of Membrane Electrode Assembly Obtained By Various Formulation Conditions for High-Temperature Polymer Electrolyte Fuel Cell** – D. H. Kim, E. A. Lee, and C. Pak (Gwangju Institute of Science and Technology)
- **2202** **Failure Mechanism of PEM Fuel Cell after a Durability Testing of 1000 h Under High Back Pressures** – C. Cai, Y. Rao, S. Li, and M. Pan (Hubei Key Laboratory of Fuel Cell, Wuhan university of technology)
- **2203** **Electrodeposited Co-Mo-TiO_2 Electrocatalysts for the Hydrogen Evolution Reaction (HER)** – C. Wang and E. J. Podlaha (Clarkson University)
- **2204** **High Surface Area Reverse Electroactuation Energy Harvesting** – P. R. Adhikari (University of North Texas) and R. C. Reid (University of Utah)
- **2205** **Preparation of Freeze-Casted Tubular SOFC with a Modified Anode Functional Layer** – B. Emley and Y. Yao (University of Houston)
- **2206** **Characterizing the Performance of Biologically Templated Membrane Electrode Assemblies for Low-Loaded Electrodes in Proton Exchange Membrane (PEM) Electrolyzers** – C. Kim, N. Pramounmat, and J. N. Renner (Case Western Reserve University)
- **2207** **Design of a Bimetallic Electrode (Ag-Cu) for Electrochemical Reduction of Carbon Dioxide (CO_2) to Value-Added Chemical Products.** – E. M. Reyes Pérez, R. Natividad Rangel, G. Roa Morales (Universidad Autónoma del Estado de México), and M. T. Ramírez Silva (Universidad Autónoma Metropolitana)
- **2208** **Nanostructured Carbon-Free Tantalum Oxide-Supported Platinum for Highly Active and Stable Acidic Oxygen Reduction Electrocatalysts** – C. P. Rhodes and L. S. Aguirre (Texas State University)
- **2209** **Hydrogen Isotope Effects during Water Electrolysis Using Liquid and Polymer Membrane Electrolytes** – L. M. S. Silva (Clemson University)

- **2210** **Single-Atoms As the Active Site with High Selectivity for Electrochemical Application** – H. Xu, T. Xu (Northern Illinois University), and D. J. Liu (Argonne National Laboratory)
- **2211** **Ultrasonic Spray Pyrolysis Deposition of NiO Thin Film for Efficient Perovskite Solar Cell** – C. HU (Hong Kong University of Science and Technology) and S. Yang (Peking University Shenzhen Graduate School)
- **2212** **Highly Stable Silver Nanowires Based Bilayered Flexible Transparent Conductive Electrode** – M. A. Shinde (Yeungnam University), M. Koduru, M. Rakibuddin (Yeungnam university), and H. Kim (Yeungnam University)
- **2213** **Design of Enzyme-Based Biosensors for Monitoring Pollutants in Gold Mining Environments** – A. A. Adio-Adepoju (University of Lagos, Lagos , Nigeria, Robert Gordon University , Aberdeen, UK), W. Okiei (University of Lagos, Lagos, Nigeria), C. Fernandez (Robert Gordon University, Aberdeen, UK), I. Akinbulu, G. Ibrahim, and B. Ojobe (University of Lagos, Lagos, Nigeria)
- **2214** **Perturbation of Ureidopyrimidinone Polymerization Via Electrochemical Redox Reactions of Electro-Active Ureidopyrimidinones** – M. Cedano and D. K. Smith (San Diego State University)
- **2215** **Time-Resolved Single-Cell Lysis Kinetics of Metal Nanoparticle-Infused Biopolymer Matrices** – D. M. Danhausen, T. J. Beckmann, and J. J. Keleher (Lewis University, Department of Chemistry)
- **2216** **Novel Synthesis of [2,3] Naphthaloporphyrins** – S. Kumar (University Of North Texas), W. Webre, C. Stewart, F. D'Souza (University of North Texas), and H. Wang (Univeristy of North Texas)
- **2217** **Using Electron-Transfer-Induced Proton Transfer to Control Binding Strength in H-Bond Dimers** – H. Choi and D. K. Smith (San Diego State University)
- **2218** **Electrochemically-Controlled Dimerization in Ferrocene Ureidopyrimidone Derivatives. the Effect of Ferrocene Position** – V. Mikhaylova and D. K. Smith (San Diego State University)
- **2219** **The Role of H-Bonding in Proton-Coupled Electron Transfer: The Reduction of N-Methyl-4,4'-Bipyridine Radical in Acetonitrile in the Presence of Acidic Alcohols** – K. Pavlova and D. K. Smith (San Diego State University)
- **2220** **Use of a Redox-Responsive 4 H-Bond Ureidopyrimidone (UPy) Array to Control Polymerization in a Upy-Based Supramolecular Polymer** – K. Vuong, M. Cedano, and L. A. Clare (San Diego State University)
- **2221** **Photoelectrochemical Pyramid Texturization of n-Type Ge (100) Probed By Integrated Electrochemical Chamber/X-Ray Photoelectron Spectroscopy** – G. H. A. Abrenica (KU Leuven, IMEC), M. V. Lebedev (Ioffe Institute), H. Le (IMEC), A. Hajduk (TU Darmstadt), M. Fingerle (Darmstadt University of Technology), T. Mayer (Darmstadt University of Technology, Germany), S. De Gendt (KU Leuven, imec), and D. H. van Dorp (IMEC)
- **2222** **Development of Adsorptive Membrane for Removal and Reclamation of Chromium from Tannery Wastewater** – F. S. Hussain (NCE in Analytical Chemistry, University of Sindh Jamshoro)
- **2223** **Removal of Adsorbed CO on Pt Electrode By Reaction with Alcohols** – K. Iida and Y. Mukouyama (Tokyo Denki University)
- **2224** **Uio-Type Metal-Organic Framework Thin Film with Redox-Active Linkers: Development and Charge Transport Behavior** – B. A. Johnson (Uppsala University), A. Bhunia (National Institute of Technology Puducherry), H. Fei (Tongji University), S. M. Cohen (University of California, San Diego), and S. Ott (Uppsala University)
- **2225** **Development of a Photocatalytic Cellulose Nanocomposite Media for Organic Pollutant Degradation** – S. J. Baker, J. L. Tabert, and J. J. Keleher (Lewis University, Department of Chemistry)
- **2226** **Continuous Microfluidic Pump Involving Conducting Polymer Modified Redox-Magnetohydrodynamics (R-MHD)** – F. Z. Khan, D. N. Parette, and I. Fritsch (University of Arkansas)
- **2227** **The Development of a Direct Electron Transfer Type Open Circuit Potential Based Glucose Sensor Utilizing Microneedle Type Gold Electrode** – I. Lee (The University of North Carolina at Chapel Hill, Tokyo University of Agriculture and Technology), N. Loew, J. Okuda-Shimazaki (The University of North Carolina at Chapel Hill, North Carolina State University), W. Tsugawa, K. Ikebukuro (Tokyo University of Agriculture and Technology), and K. Sode (The University of North Carolina at Chapel Hill, North Carolina State University)
- **2228** **Electrochemical Transformation of 4-Chlorophenol for the Determination of Chloride in Advanced Oxidation Processes** – M. Molina, G. Roa-Morales, P. Balderas, D. Amado, R. N. Rangel, and C. E. Barrera (Universidad Autónoma del Estado de México, CCIQS UAEM-UNAM)
- **2229** **Electrocatalytic Activities of Gold Nanoparticles on Glassy Carbon Prepared By Simple Electrochemical Method** – H. Okada, Y. Fukuda, Y. Mukouyama (Tokyo Denki University), M. Saito, and T. Nishimura (Osaka Research Institute of Industrial Sci. and Tech.)
- **2230** **Photoelectrochemical Properties of (K, Na) NbO_3 (KNN) Thin Film** – M. Kurohagi, Y. Mukouyama, S. Ishii (Tokyo Denki University), H. Ohsaka, and I. Kanno (Kobe University)

- **2231** **Study of Electrochemical Behavior of Gases in Ionic Liquids** – Y. Zhang (Xi'an University of Architecture and Technology) and J. Xue (, Xi'an University of Architecture and Technology)
- **2232** **Conjugation of an α-Helical Peptide to the Surface of Gold Nanoparticles** – L. Wilder, W. Fies, C. Rabin, L. J. Webb (Department of Chemistry - University of Texas at Austin), and R. M. Crooks (The University of Texas at Austin)
- **2233** **Optimization of a Conductive Hydrogel Nanocomposite for Use in Responsive Wound Management Technology** – A. N. Linhart, H. R. Lange (Lewis University, Department of Chemistry), W. E. Chura (Lewis University, Department of Biology), and J. J. Keleher (Lewis University, Department of Chemistry)
- **2234** **Modeling Fermi Levels in Metal Functionalized TiO2 Sensors for Applications in Volatile Organic Biomarker Detection** – L. McKinnon, Y. Saffary, S. Mohanty, and K. Prisbrey (University of Utah)
- **2235** **Liquid-Phase Exfoliation of Transition Metal Dichalcogenide Nanosheets with Zwitterionic Detergents and Their Inkjet-Printed Photodetectors** – H. Lee, H. Eoh, K. L. Kim, and C. Park (Dept of Materials Science Engineering, Yonsei University)
- **2236** **Electrochemical Detection of Endocrine Disruptor (Bisphenol Compounds) in the Consumer Applications** – R. Tom (Navajo Technical University), A. M. Varman (Arizona State University), and T. Soundappan (Navajo Technical University)
- **2237** **Utilization of Highly Purified Single Wall Carbon Nanotubes Dispersed in Polymer Thin Films for an Improved Performance of an Electrochemical Glucose Sensor** – P. P. Tumkur, V. Goornavar, and G. T. Ramesh (Norfolk State University)
- **2238** **Improved Gas-Phase Detection of Volatile Organic Compounds Using a Solid-State Conductive Polymer Electrolyte** – C. N. Willis, Y. Saffary, M. Misra, S. K. Mohanty, and A. Tripathy (University of Utah)

Wednesday, May 29

Highlights

1200h..... Energy Technology Division Graduate Student Award Address sponsored by Bio-Logic – *City View 8, Sheraton Hotel*
1400h..... Industrial Electrochemistry and Electrochemical Engineering Division Student Achievement Award Address – *Pearl 5, Sheraton Hotel*
1400h..... Technical Exhibit opens, ECS Career Expo and Resume Review – *Lone Star B/C, Sheraton Convention Center*
1530h..... Networking Break – *Lone Star B/C, Sheraton Convention Center*
1800h..... Technical Exhibit, and General Poster Session – *Lone Star B/C, Sheraton Convention Center*

A01 Battery and Energy Technology Joint General Session

Energy Technology / Battery
Houston Ballroom A, Dallas Sheraton Convention Center

Electrolytes – 08:00 – 10:00
Chair(s): Mariappan Parans Paranthaman and Jie Xiao

08:00 **69** **Highly Concentrated Aqueous Gel Electrolytes for Diverse Battery Applications** – A. V. Cresce (U.S. Army Research Laboratory), N. T. Eidson (US Army Research Laboratory), and K. C. Xu (U.S. Army Research Laboratory)

08:20 **70** **Layered Ionic Conductor $Na_2Zn_2TeO_6$: Crystal Structure and Stacking Faults** – X. Li, F. Bianchini, J. Wind, P. Vajeeston (University of Oslo), D. Wragg, and H. Fjellvåg (University of Oslo, Dept. of Chemistry and SMN)

08:40 **71** **Freeze Tape Casting Derived $Li_7La_3Zr_2O_{12}$ Electrolyte Architecture with Oriented Ion Conduction Channels** – E. Yi (Lawrence Berkeley National Laboratory), H. Shen (Lawrence Berkeley National Laboratory, Xi'an Jiaotong University), S. Sofie (Montana State University), G. Chen, and M. Doeff (Lawrence Berkeley National Laboratory)

09:00 **72** **Evaluation of Polymeric Binders in Aqueous Electrolyte Environment** – G. T. Pace and W. Wu (Aquion Energy)

09:20 **73** **A High-Performance Polymer Electrolyte Membrane Enhanced By Graphene Oxide Doped By Redox Species** – X. Zhou, Z. Yan, Y. Wang, C. Zhang, X. Qiao (University of Miami), A. N. Mansour, G. H. Waller (Naval Surface Warfare Center, Carderock Division), C. Martin (Navy Surface Warfare Center at Carderock), and Z. Du (Oak Ridge National Laboratory)

09:40 **74** **Fundamental Investigation of $AlCl_3$-Amide Electrolyte for Application in Aluminum Ion Battery** – M. Malik, K. L. Ng, and G. Azimi (University of Toronto)

Supercapacitor 1 – 10:00 – 12:20
Chair(s): Edward M. Sabolsky and Rahul Singhal

10:00 **75** **Realizing an Asymmetric Supercapacitor Employing Carbon Nanotubes Anchored to Mn_3O_4 Cathode and Fe_3O_4 Anode** – A. Kumar, D. Sarkar (Indian Institute of Science), S. Mukherjee (Indian Institute of Science, Bangalore, INDIA), S. Patil (Indian Institute of Science - Bangalore), D. D. Sarma, and A. K. Shukla (Indian Institute of Science)

10:20 **76** **Role of Oxygen Vacancy in Copper-Cobalt Spinel Nanostructures for Electrochemical Energy-Storage** – N. C. D. Nath and J. J. Lee (Dongguk University)

10:40 **77** **Thickness Effects on Charge and Discharge Characteristics of CeO_x Mim Capacitors** – K. Hisatsune (School of Engineering, Tokyo Institute of Technology), T. Hoshii, I. Muneta, H. Wakabayashi, K. Tsutsui, and K. Kakushima (Tokyo Institute of Technology)

11:00 **78** **Elastic Cu@Ppy Sponge for Hybrid Device with Energy Conversion and Storage** – Z. Li (Beijing Institute of Nanoenergy and Nanosystems) and Z. Li (Beijing Institute of Nanoenergy and Nanosystems,CAS)

11:20 **79** **Structural and Electrochemical Properties of Ni and Co Doped $LaMnO_3$ Nanocrystalline Powders As an Supercapacitor Electrode** – E. Binici, N. Solak (Istanbul Technical University), U. Unal (Chemistry Department, Koc University, Koc University Surface Science and Technology Center), and C. Yilmaz Akkaya (Koc University Surface Science and Technology Center)

11:40 **80** **Synthesis of Nitrogen-Doped Molybdenum Sulphide and Molybdenum Sulphide/Oxide Nanocomposite As Active Materials for Supercapacitor Electrode** – C. K. Kanade, V. K. Kanade (SAINT, Sungkyunkwan University), S. Hong (Mechanical Engineering, Sungkyukwan University), and T. Kim (Mechanical Engineering, Sungkyunkwan University, SAINT, Sungkyunkwan University)

12:00 **81** **Electrochemical Analysis of the Printed $NiCo_2O_4$ // Reduced Graphene Oxide Solid-State Hybrid Supercapacitors on Fabric Substrates for Wearable Applications** – P. Sundriyal and S. Bhattacharya (IIT Kanpur)

Supercapacitor 2 – 14:00 – 18:00
Chair(s): Rahul Singhal and Edward M. Sabolsky

14:00 **82** **Alkali Metal Chlorides Based Hydrogel As Eco-Friendly Neutral Electrolyte for Bendable Solid-State Capacitor** – H. Li (Beihang University), Z. Li (Beijing Institute of Nanoenergy and Nanosystems,CAS), and Y. Fan (Beihang University)

14:20 **83** **Influence of Processing Routes on the Electrochemical Performance of Supercapacitors (EDLCs) Fabricated from Biomass-Derived Activated Carbons** – G. A. Yakaboylu, C. Jiang (West Virginia University), T. Yumak (Sinop University), J. W. Zondlo, J. Wang, and E. M. Sabolsky (West Virginia University)

14:40 **84** **Fabrication and Supercapacitive Properties of Thick Nanostructured Anodic Films on 304 Stainless Steel** – Y. Wang (IMS, University of South-Eastern Norway), G. Li (MNSRC, Taiyuan University of Technology), K. Wang (University of Southeast Norway), and X. Chen (IMS, University of South-Eastern Norway,)

15:00 **85** **Electrochemical Effects of Annealing Temperature on Anodic 304 Stainless Steels** – Y. Wang (IMS, University of South-Eastern Norway), G. Li (MNSRC, Taiyuan University of Technology), K. Wang (University of Southeast Norway), and X. Chen (IMS, University of South-Eastern Norway,)

15:20 **86** **Cell Optimisation of Supercapacitors through the Use of a Quasi-Reference Electrode and Potentiostatic Analysis** – L. Le Fevre (University of Manchester)

15:40 **87** **Graphene like Porous Carbon Sheets Derived from Hibiscus Cannabinus As a Versatile Electrochemical Energy Storage Material** – K. Nanaji (ARCI, IIT Madras), U. V. Varadaraju (IIT Madras), S. Anandan, and T. N. Rao (ARCI)

16:00 **Break**

16:20 **88** **Porous Carbon Materials with Ultrahigh Surface Area for High Energy Density Supercapacitors and High Power Density Electrochemical Thermocell.** – L. Zhang (Institute of Chemical Materials), R. H. Baughman (Alan G. MacDiarmid NanoTech Institute, UTD), and Y. Chen (College of Chemistry, Nankai University)

16:40 **89** **Sputtered Iridium Oxide Microsupercapacitors Operating in Physiological Electrolytes** – J. Maeng, N. Geramifard, B. Chakraborty, and S. F. Cogan (The University of Texas at Dallas)

17:00 **90** **Binder Free Synthesis of Sulphur Doped $Co_3V_2O_8$ Nanoarray for Hybrid Asymmetric Supercapacitor Application in Aqueous and Non-Aqueous Medium** – G. P. Sharma, P. K. Gupta, R. G. Pala (Indian Institute of Technology Kanpur), and S. Sivakumar (Indian Institute of Technology at Kanpur)

17:20 **91** **Development of a New 3D Hybrid Nanostructured Carbon/MnO_2 Framework By Automated Spray Coating and Electrodeposition As High Performance Electrode Material for Supercapacitor Applications** – G. Pognon, C. Rogier, and C. Galindo (Thales Research & Technology)

A02 Lithium Ion Batteries and Beyond

Battery / Physical and Analytical Electrochemistry

Lone Star A2, Dallas Sheraton Convention Center

Lithium Ion Anodes 3 – 08:00 – 12:00
Chair(s): Chunmei Ban, Jodie L. Lutkenhaus and Siddarthh Patwardhan

08:00 **295** **The Application of Magnesiothermic Reduction of Silica to Produce Porous Silicon for Lithium Ion Batteries** – J. Entwistle and S. Patwardhan (The University of Sheffield)

08:20 **296** **Electrochemical Properties of Amorphous Silica As an Anode Material for Li-Ion Batteries** – V. Renman, M. V. Blanco, A. Norberg, and F. Vullum-Bruer (Norwegian University of Science and Technology)

08:40 **297** **Tunable Syntheses of Advanced Silicon Anodes Using Cyclohexasilane** – R. A. Elgammal (The Coretec Group)

09:00 **298** **Coconut Sprout-Derived Graphitized Carbon Based Sodium Ion Capacitors** – V. Surendran, A. R. Suviresh, T. V. Vineesh, B. Babu, and M. M. Shaijumon (IISER Thiruvananthapuram)

09:20 **299** **Nanocarbon Composites for Energy Storage Applications** – L. Ci (Shandong University)

09:40 **Break**

10:00 **300** **Silicon Nano Wires Anodes for High-Performance Lithium Ion Batteries** – E. Peled, D. Schneier, F. Patolsky (School of Chemistry, Tel Aviv University), D. Golodnitsky (School of Chemistry, Tel Aviv University, Wolfson Applied Materials Research Center, TAU), S. Menkin, G. Davidi, N. Harpak, E. Mados, and G. Ardel (School of Chemistry, Tel Aviv University)

10:20 **301** **Tannic Acid As a Binder in Silicon Anodes for Lithium-Ion Batteries** – K. Sarang (Texas A&M University, Chemical Engineering) and J. L. Lutkenhaus (Texas A&M University)

10:40 **302** **Alleviate Gassing Problem of $Li_4Ti_5O_{12}$ Anode Using Polymeric Artificial Solid-Electrolyte-Interphase** – Y. H. Chang (National Taiwan University), F. M. Wang (National Taiwan University of Science and Technology), H. C. Wu (Industrial Technology Research Institute), and N. L. Wu (National Taiwan University)

11:00 **303** **Light-Weight and Flexible Carbon Nanotubes (CNT) Tissues As Anode Materials for Flexible Li-Ion Microbatteries** – V. A. Sugiawati (Aix-Marseille University), F. Vacandio (MADIREL), Y. Ein-Eli (Technion - Israel Institute of Technology), and T. Djenizian (Ecole Nationale Superieure des Mines de Saint-Etienne)

11:20 **304** **Red Phosphorous-Span Composite Anode through Electrostatic Spray Deposition for High Performance Lithium-Ion Batteries** – A. Rabiei Baboukani, I. Khakpour, E. Adelowo, V. Drozd, and C. Wang (Florida International University)

11:40 **305** **The Decoupling of Solid-Electrolyte Interphase Formation from the Mechanical Deformation of Silicon Electrodes** – Y. Yin, L. Cao, T. Yoon, K. N. Wood, E. Arca, C. Stetson, C. Xiao, M. Schnabel (National Renewable Energy Laboratory), G. Yang (Oak Ridge National Laboratory), G. Teeter, C. Jiang (National Renewable Energy Laboratory), J. Nanda (Oak Ridge National Laboratory), and C. Ban (National Renewable Energy Laboratory)

Lone Star A1, Dallas Sheraton Convention Center

Lithium Ion Cathodes 1 – 08:00 – 12:20
Chair(s): Yiman Zhang and Xinhua Liang

08:00 **306** **Surface Modification for Suppressing Interfacial Parasitic Reactions of Nickel-Rich Lithium-Ion Cathode** – J. Cai (University of Arkansas), H. Gao (University of Toronto), G. Xu (Argonne National Laboratory), L. Li, Y. Ren (X-ray Science Division, Argonne National Laboratory), X. Meng (University of Arkansas), K. Amine (Chemical Sciences/Engineering Division, ANL, Stanford University), and Z. Chen (Argonne National Laboratory)

08:20 **307** **Redox Chemistry in Conventional Layered Lithium Metal Oxide Cathodes** – W. Tong, N. Li, W. Yang, S. Sallis (Lawrence Berkeley National Laboratory), B. D. McCloskey (Energy Storage and Distributed Resources Division, LBNL), and J. K. Papp (University of California, Berkeley)

08:40 **308** **Cooperating Effects of Conformal Iron Oxide ALD Coating and Post-Annealing on Li-Rich Layered Cathod** – Y. Gao, Z. Shang (Missouri University of Science and Technology), X. He (University of Missouri-Columbia), J. Park, and X. Liang (Missouri University of Science and Technology)

09:00 **309** **Multi-Textured Structure Cathode Materials to Accommodate the Fast Charging for Lithium Secondary Batteries** – B. C. Min (Dong-A University), S. M. Lee (Korea Electrotechnology Research Institute), and J. S. Kim (Dong-A University)

09:20 **310** **A Discovery of an Unexpected Metal Dissolution of Thin-Coated Cathode Particles: Its Theoretical and Experimental Explanations** – Y. He (Missouri University of Science and Technology), S. Sarkar (Missouri University of Science and Technology, Rolla), X. Liang, and J. Park (Missouri University of Science and Technology)

09:40 **Break**

10:00 **311** **Taking LCO to the Next Level: Atomic Layer Deposition for Enhanced Performance of Power Electronics Materials** – B. K. Hughes, M. N. Herbert-Walters, J. E. Trevey, and D. M. King (Forge Nano)

10:20 **312** **Nano-Rod Gradient Li[Ni0.81Co0.06Mn0.13] O2: Preserving Cathode Structure for Long-Term Cycling (1000 Cycles) Li-Ion Batteries** – H. Sun (University of Texas at Austin), C. S. Yoon (Hanyang University), A. Heller (The University of Texas at Austin), and C. B. Mullins (University of Texas at Austin)

10:40 **313** **Recycling Spent Battery Cathode Materials Using Electrochemical Relithiation** – X. Li (National Renewable Energy laboratory), A. Burrell, and C. Ban (National Renewable Energy Laboratory)

11:00 **314** **Structural and Electrochemical Characterization of Thin Film Li_2MoO_3 Cathodes** – E. C. Self, Y. Zhang, A. Kercher (Oak Ridge National Laboratory), N. D. Phillip (University of Tennessee), F. M. Delnick, and J. Nanda (Oak Ridge National Laboratory)

11:20 **315** **A Comparison of Electrode Surface Films Formed with Different Oxide Cathodes for Lithium-Ion Batteries** – E. M. Erickson (The University of Texas at Austin, Bar-Ilan University), W. Li, and A. Manthiram (The University of Texas at Austin)

11:40 **316** **Structure and Electrochemistry of LiV_3O_8 Thin Film Electrode: Effect of Diffusion Rate and Concentration on Cell Polarization** – Y. Zhang (Oak Ridge National Laboratory), A. C. Marschilok (Brookhaven National Laboratory), K. J. Takeuchi (Stony Brook University), A. Kercher (Oak Ridge National Laboratory), E. S. Takeuchi (Brookhaven National Lab), and N. J. Dudney (Oak Ridge National Laboratory)

12:00 **317** **Dry Processed Nickel-Rich Layered Transition Metal Oxide Cathode Electrode** – J. Shin (Maxwell Technologies, Inc.), Y. Yudi, P. Magsino, W. Wong (Maxwell Technologies), and H. Duong (Maxwell Technologies, Inc.)

Lone Star A2, Dallas Sheraton Convention Center

Lithium Ion Anodes 4 – 13:40 – 18:00
Chair(s): Toshihiro Kondo and Jae W. Lee

13:40 **318** **Performance of Si Anodes in Ionic Liquid Electrolytes with Added Carbonates** – D. T. Rogstad, F. Vullum-Bruer, and A. M. Svensson (Norwegian University of Science and Technology)

14:00 **319** **Dandelion-like Mesoporous SiO_x@C Nanoparticles for High-Capacity and Ultralong Lifespan Lithium-Ion Battery Anode** – Z. Li, H. Zhao, and J. Wang (University of Science and Technology Beijing)

14:20 **320** **Facile Technique for the Production of Metal Oxide Anodes for Lithium Ion Batteries** – E. İnel (Istanbul Technical University), B. D. Karahan (Istanbul Medipol University), and O. Keles (Istanbul Technical University)

14:40 **321** **CoP_3@Ppy Microcubes As Anode for Lithium-Ion Batteries with Improved Cycling and Rate Performance** – Q. Liu (Huazhong University of Science and Technology)

15:00 **322** **The Critical Size of Sn Nanograins for Achieving High Round-Trip Efficiency of Reversible Conversion Reaction in Lithiated SnO_2 Nanocrystals** – R. Z. Hu (South China University of Technology) and M. Zhu (South China University of Technology, Guangzhou, China)

15:20 **323** **Visualization of Anti-Pulverization of Nickel Sulfide in Hierarchical Carbons Shells** – J. H. Park and J. W. Lee (KAIST)

15:40 **324** **A New Formulation of the Pseudo2D Battery Model Coupling Macroscopic and Microscopic Deformations** – W. Mai, K. Smith, and A. M. Colclasure (National Renewable Energy Laboratory)

16:00 **325** **Pre-Electrochemical Treatment Effect of Cu Eqcm Electrode on Lithium Electrodeposition/Dissolution Processes** – T. Kondo, K. S. Smaran, A. Ohama, A. Niida, and K. Nishihara (Ochanomizu University)

16:20 **326** **Graphene Pliable Pockets Remedying Nanocrystalline Metal Anode for All Li-Ion Types Energy Storages Induced By Polymer-Triggered Synthesis Process in an Expeditious, Scalable and Inexpensive Way** – J. H. Won and J. K. Kang (Korea Advanced Institute of Science and Technology)

16:40 **327** **Morphology Controlled Fabrication of Nanostructured Molybdenum Oxides By Different Mineralizers Via Hydrothermal Synthesis Method** – E. İnel (Istanbul Technical University) and B. D. Karahan (Istanbul Medipol University)

17:00 **328** **Quantifying Reaction Products of Silicon Monoxide Electrodes during Initial Cycle in Lithium-Ion Batteries** – D. Yu, T. Tan, and P. K. Lee (City University of Hong Kong)

17:20 **329** **Effect of Different Carbon Precursors on SiO_2/C Anodes for Li-Ion Batteries** – M. V. Blanco (Norwegian University of Science and Technology), V. Renman (Department of Chemistry - Ångström, Uppsala University), and F. Vullum-Bruer (Norwegian University of Science and Technology)

17:40 **330** **An Investigation of SEI Layer Composition in Presence of Nano-Fillers in Mcmb Electrodes** – S. Ahamad and A. Gupta (Indian Institute of Technology Delhi)

Lone Star A1, Dallas Sheraton Convention Center

Lithium Ion Cathodes 2 – 14:00 – 18:20
Chair(s): Leon Shaw, Gary Koenig and Dongchang Chen

14:00 **331** **Characterization of Chemical and Electrochemical Lithiation/ Delithiation of $LiFePO_4$** – D. Gupta and G. Koenig (University of Virginia)

14:20 **332** **Understanding the Effects of Ultra-Thin Al_2O_3 Coatings Prepared By Atomic Layer Deposition on Lithium Ion Battery Cathode Materials** – D. Kang, A. U. Mane, J. W. Elam, E. F. Barry (Argonne National Laboratory), R. Warburton, and J. Greeley (Purdue University)

14:40 **333** **Binder-Induced Interface Stabilization and Performance Improvement of Nickel-Rich Cathode** – H. Q. Pham (Chungnam National University), H. Y. Lee (Chungnam National University, Republic of Korea), H. M. Jung (Kumoh National Institute of Technology, Republic of Korea), and S. W. Song (Chungnam National University, Republic of Korea)

15:00 **334** **Atomic Layer Deposition of Nanocomposite Fluoride Coatings for Li-Ion Batteries** – A. U. Mane, D. Choudhury, A. Gutierrez, J. R. Croy (Argonne National Laboratory), and J. W. Elam (Joint Center for Energy Storage Research)

15:20 **335** **Influence of Binder Coverage on Interfacial Chemistry of Thin Film $LiNi_{0.6}Mn_{0.2}Co_{0.2}O_2$ Cathodes** – N. D. Phillip (University of Tennessee) and G. M. Veith (Oak Ridge National Laboratory)

15:40 **336** **Tunable LiAlO2/Al2O3 Coating to Improve the Specific Capacity and Cycle Stability of Nano-LiCoO2** – L. Shaw (Illinois Institute of Technology), M. Ashuri (Wanger Institute for Sustainable Energy Research), Q. He (Wanger Institute for Sustainable Energy Research (WISER)), and J. A. Kaduk (Illinois Institute of Technology)

16:00 **337** **Fabrication and Characterization of Porous Thin Film Cathodes Prepared By RF Sputtering for Li-Ion Microbatteries** – V. A. Sugiawati (Aix-Marseille University), F. Vacandio (MADIREL), and T. Djenizian (Ecole Nationale Superieure des Mines de Saint-Etienne)

16:20 **338** **Performance Studies of $Cu_xFe_{1-X}F_2$ Conversion Cathode Materials** – J. K. Ko, D. Fuentevilla, G. H. Waller, and A. N. Mansour (Naval Surface Warfare Center, Carderock Division)

16:40 **339** **Unraveling the Origin of Performance Degradation in High-Capacity Cation-Disordered Oxide Cathodes** – D. Chen and G. Chen (Lawrence Berkeley National Laboratory)

17:00 **340** **One Dimensional Nanomaterials for Emerging Energy Storage** – L. Mai (Wuhan University of Technology)

17:20 **341** **Compact Lithium-Ion Battery Electrodes Fabricated with Lightweight Reduced Graphene Oxide-Based Aerogels** – J. P. Pender (The University of Texas at Austin), H. Xiao (The University of Minnesota), Z. Dong, K. A. Cavallaro, J. A. Weeks, A. Heller (The University of Texas at Austin), C. J. Ellison (The University of Minnesota), and C. B. Mullins (University of Texas at Austin)

17:40 **342** **Low Cost, Scalable Active Material Coating for Higher Energy Density Li-Ion Batteries** – C. M. Lang, P. D. Moran, and J. T. Herb (Physical Sciences Inc.)

18:00 **343** **Development of Carbon Fiber-Based Electrodes for Lithium-Ion Battery** – Y. H. Liu (National Central University), H. H. Lin (Industrial Technology Research Institute of Taiwan), and C. H. Hsu (National Cheng Kung University)

A03 Large Scale Energy Storage 10

Energy Technology / Battery / Industrial Electrochemistry and Electrochemical Engineering / Physical and Analytical Electrochemistry

San Antonio Ballroom B, Dallas Sheraton Convention Center

Aqueous Systems - Design/Diagnostics 2 – 08:00 – 10:30

Chair(s): Bin Li and Shelley D. Minteer

08:00 **438** **Mechanistic Insights of V^{2+}/V^{3+} Reaction on Glassy Carbon for Vanadium Redox Flow Batteries** – H. Agarwal, J. Florian, A. Shelton, B. Goldsmith, and N. Singh (University of Michigan Ann Arbor)

08:20 **439** **Spectroscopic Determination of V^V Concentration of Vanadium Flow Battery Catholytes** – N. Quill, D. Oboroceanu (Physics Dept., Bernal Institute, University of Limerick), S. P. Albu, C. Lenihan (Department of Physics, University of Limerick), D. N. Buckley, and R. P. Lynch (Physics Dept., Bernal Institute, University of Limerick, Dept. of Chem. Eng., Case Western Reserve University)

08:40 **440** **Investigation of Faradaic Contributions from Bipolar Plates to Areal Current Density in Vanadium Redox Flow Batteries** – M. Daugherty, D. Aaron, and M. M. Mench (University of Tennessee)

09:00 **441** **The Effect of Channel Tapering on the Performance of Vanadium Redox Flow Batteries** – P. A. García-Salaberri, C. Moreno-Carrero (University Carlos III of Madrid), T. C. Gokoglan (University of Massachusetts Lowell), M. Vera (University Carlos III of Madrid), and E. Agar (University of Massachusetts Lowell)

09:20 **442** **A No-Mixing Design of Vanadium Redox Flow Batteries** – B. Liu, R. Zhu, J. Sun, and M. Zheng (Zhejiang University)

09:40 **443** **Analysis of Flow Field Scale-up, Design Tradeoffs, and Shunt Current in Redox Flow Battery Stacks** – J. Houser, D. Aaron, and M. M. Mench (University of Tennessee)

10:00 **444** ***(Invited)* RKP Vanadium Flow Battery and its Application** – X. Ma (Dalian Rongke Power Integration Co., Ltd.), H. Zhang (Dalian Institute of Chemical Physics), X. Xu, S. Jiang, J. Wu, T. Chigan, H. Wang, H. Zhao, and N. Chen (Dalian Rongke Power Integration Co., Ltd.)

Non-Aqueous Systems - Electrolytes/Electrode Materials 1 – 10:40 – 12:40

Chair(s): Shelley D. Minteer and Bin Li

10:40 **445** ***(Invited)* Understanding Benzothiadiazole Based Anolyte Materials for Nonaqueous Redox Flow Cells** – L. Zhang, J. Zhang (Joint Center for Energy Storage Research (JCESR)), X. Wei (Indiana University-Purdue University Indianapolis), F. R. Brushett (Joint Center for Energy Storage Research, MIT), and I. A. Shkrob (Argonne National Laboratory)

11:10 **446** **Electrochemical Energy Storage with Mediator-Ion Solid Electrolytes** – X. Yu and A. Manthiram (The University of Texas at Austin)

11:30 **447** **Development of Redox Flow Battery Based on Lithium Ion Secondary Battery System** – H. Nariyama (Panasonic Corpotaion), S. Ito (Panasonic Corporation), Y. Okada (Panasonic corporation), Y. Inatomi, and M. Fujimoto (Panasonic Corporation)

11:50 **448** **Iron(tris pyridyl-imine) Complexes As Redox Couples for Non-Aqueous Redox Flow Battery Applications** – S. Maurya, N. Smythe, B. L. Davis, G. Andrade, S. Sharma, E. J. Park, J. Gordon, Y. S. Kim, and R. Mukundan (Los Alamos National Laboratory)

12:10 **449** **Diketopyrrolopyrrole Based Derivative for Non-Aqueous Redox Flow Battery** – S. Sharma (Indian Institute of Science Bangalore), R. Suman (Indian Institute of Science - Bangalore), S. Ray (Indian Institute of Science Bangalore), N. Aetukuri (Indian Institute of Science, Bangalore), A. K. Shukla (Indian Institute of Science), and S. Patil (Indian Institute of Science - Bangalore)

Non-Aqueous Systems - Electrolytes/Electrode Materials 2 – 14:00 – 15:40
Chair(s): Pawel J. Kulesza and Jagjit Nanda

14:00 **450** **Mechanically Robust Crosslinked Membranes for Non-Aqueous Redox Flow Batteries** – M. Lehmann (Oak Ridge National Laboratory, University of Tennessee), G. Yang, E. C. Self (Oak Ridge National Laboratory), B. Li (Oak Ridge National Laboratory, University of Tennessee), F. M. Delnick, J. Nanda, and T. Saito (Oak Ridge National Laboratory)

14:20 **451** **Sodium Thiophosphate Cathodes and Polymeric Membranes for High Energy Density Redox Flow Batteries** – E. C. Self, F. M. Delnick, G. Yang, M. Lehmann, D. B. Gilmer, R. E. Ruther, T. Saito, and J. Nanda (Oak Ridge National Laboratory)

14:40 **452** **Design of Mechanically Robust Polymer Membranes for Non-Aqueous Flow Battery** – M. Lehmann, G. Yang, P. Cao, E. C. Self, F. M. Delnick, J. Nanda, and T. Saito (Oak Ridge National Laboratory)

15:00 **453** **Fluorenone Based Anolyte for an Aqueous Organic Redox-Flow Battery** – J. Rodriguez Jr. and L. Pozzo (University of Washington)

15:20 **454** **Low Temperature Molten Sodium-Based Batteries for Large Scale Electrical Energy Storage** – E. D. Spoerke, S. Percival, L. J. Small, A. Peretti, J. Lamb, and B. R. Chalamala (Sandia National Laboratories)

Non-Aqueous Systems - Design/Diagnostics – 15:50 – 17:30
Chair(s): Jagjit Nanda and Shelley D. Minteer

15:50 **455** **Real-Time Reservoir Balancing and Leak-Free Nonaqueous Cell Design for Flow Batteries** – K. P. Smith, D. A. Howey, P. Ascencio, and C. W. Monroe (Department of Engineering Science, University of Oxford)

16:10 **456** **Investigating Anionic Chemistry of Na-Metal Halide Batteries for Large Scale Energy Storage Applications** – X. Zhan, X. Lu, J. F. Bonnett, N. L. Canfield, H. J. Chang, J. Sepulveda, V. Sprenkle, and G. Li (Pacific Northwest National Laboratory)

16:30 **457** **Screening Membranes and Electrolytes for High Performance Nonaqueous Flow Cells** – Z. Liang (Departement of Chemistry, University of Kentucky), N. H. Attanayake (Department of Chemistry, University of Kentucky), J. L. Barton (Joint Center for Energy Storage Research, MIT, Department of Chemical Engineering, MIT), F. R. Brushett (Joint Center for Energy Storage Research, MIT, Department of Chemical Engineering,MIT), J. Landon (Department of Chemical and Materials Engineering, Center for Applied Energy Research University of Kentucky), and S. A. Odom (University of Kentucky)

16:50 **458** **Generation, Isolation, and Analysis of the Charged States of Organic Redox Flow Battery Materials** – S. A. Odom (University of Kentucky)

17:10 **459** **Investigation of Non-Aqueous Electrolyte and Crossover of Perfluorsulfonate Ion Exchange Membrane in a Non-Aqueous Flow Battery** – K. Lou and T. A. Zawodzinski (University of Tennessee, Knoxville, TN, Oak Ridge National Laboratory, Oak Ridge, TN)

A04 Battery Student Slam 3

Battery

San Antonio Ballroom A, Dallas Sheraton Convention Center

A04 Battery Student Slam Session 1 – 08:00 – 11:20
Chair(s): Feng Lin, Guoying Chen, David Mitlin, Susan A. Odom, Laurence J. Hardwick and Veronica Augustyn

08:00 **Introductory Remarks**

08:10 **460** **High Performance Li-Ion Battery Electrode with Hierarchical Ordered Porous Microstructure** – M. Azami-Ghadkolai, S. E. Creager, and R. Bordia (Clemson University)

08:20 **461** **New Forms of Lithium Metal Anode** – S. Li, H. Wang, J. Whitacre, and K. Matyjaszewski (Carnegie Mellon University)

08:30 **462** **An Ultra-Long Cycle Life Sn Anode with High-Rate Performance for Sodium Ion Batteries** – C. Kim (Gyeongsang National University), I. Kim (Gyeongsang National University,), H. H. Kim, M. K. Sadan, H. Yeo, G. B. Cho (Gyeongsang National University), J. P. Ahn (Korea Institute of Science and Technology (KIST)), J. H. Ahn, and H. J. Ahn (Gyeongsang National University)

08:40 **463** **Electrospun $Ca_2Fe_2O_5$ Nanofibers As Anode for Next Generation Li Ion Batteries** – S. K. Sundriyal and Y. Sharma (Indian Institute of Technology, Roorkee, India)

08:50 **464** **Reversible Li Insertion in Guest Free Type II Si Clathrates for Li-Ion Battery Anodes** – A. Dopilka, J. M. Weller (Arizona State University), S. Bobev (University of Delaware), and C. K. Chan (Arizona State University)

09:00 **465** **Introduction of New Iron Sulfate Cathode Material for Na-Ion Batteries with Great Power-Capability and out Standing Cyclability** – W. Ko, H. Park, Y. Lee, and J. Kim (Sejong University)

09:10 **466** **Monoclinic Na2.4V2(PO4)3/Conductive Polymer Composite As High Capacity Cathodes for Na-Ion Batteries** – Y. Lee, H. Park, W. Ko, S. T. Myung, and J. Kim (Sejong University)

09:20 **467** **A Square Channel Vanadium Phosphite Framework As Cathode for Li- and Na- Ion Batteries** – P. Sandineni, P. Madria (Missouri University of Science & Technology), and A. Choudhury (Missouri University of Science and Technology)

09:30 **Break**

10:00 **468** **The Stability and the Electrochemical Properties of $Na_3V^{3+}_{2-y}V^{4+}_{y}(PO_4)_2F_{3-y}O_y$ ($0 \leq y \leq 2$)** – H. B. L. Nguyen (ICMCB-CNRS, Univ. Bordeaux, Bordeaux INP, Pessac, France), T. Broux (LRCS, Université de Picardie Jules Verne, Amiens, France), P. Sanz Camacho (ICMCB), F. Fauth (CELLS - ALBA Synchrotron, Barcelona, SPAIN), D. Carlier, J. Olchowka (ICMCB-CNRS, Univ. Bordeaux, Bordeaux INP, Pessac, France), C. Masquelier (LRCS, Université de Picardie Jules Verne, Amiens, France), and L. Croguennec (ICMCB-CNRS, Univ. Bordeaux, Bordeaux INP, Pessac, France)

10:10 **469** **Three-Dimensional Compositional and Charge Heterogeneities in Sodium Layered Oxide Cathode Materials** – M. M. Rahman and F. Lin (Department of Chemistry, Virginia Tech)

10:20 **470** **Improving Reversibility of Anionic Redox Reaction of $NaVO_3$ By Metal Doping for Sodium-Ion Batteries** – B. Su and D. Y. W. Yu (City University of Hong Kong)

10:30 **471** **Plasma Enhanced Formation of Lithium Nitride As Artificial SEI Layer for Lithium Metal Batteries** – K. Chen, R. Pathak, Q. Qiao, and Y. Zhou (South Dakota State University)

10:40 **472** **Polymeric Coating on Lithium Metal Surface for the Stabilization of Electrode-Electrolyte Interface** – H. Zhou, H. Liu, and P. Liu (University of California San Diego)

10:50 **473** **Taming Cathode-Solid Electrolyte Interfaces with Organic Cathode Materials for All-Solid-State Batteries** – F. Hao, X. Chi, Y. Liang, and Y. Yao (University of Houston)

11:00 **474** **Enhanced Solid Electrolyte Interface (SEI) on Li Metal Surfaces through Catalytic Electrolyte Decomposition** – J. A. Lochala, B. Wu (University of Arkansas), T. Tarverne (SUNY Polytechnic Institute), and J. Xiao (Pacific Northwest National Laboratory)

11:10 **475** **Stress-Induced Interface Instability during Ion Intercalation in Battery Compounds** – Y. Zhang and M. Tang (Rice University)

A04 Battery Student Slam Session 2 – 14:00 – 17:20
Chair(s): Feng Lin, Veronica Augustyn, David Mitlin, Guoying Chen, Laurence J. Hardwick and Susan A. Odom

14:00 **476** **Proton Polymer Electrolytes in Fuel Cell** – T. Safari (University of Qom) and M. Safari (Payam Noor Delijan University)

14:10 **477** **Understanding the Roles of Mass Transport in Electrochemical Plating Process of Lithium** – Y. Tian, B. Wu, J. A. Lochala (University of Arkansas), and J. Xiao (Pacific Northwest National Laboratory, University of Arkansas)

14:20 **478** **Correlation between Pulse Charging, Volume Expansion and Structural Degradation in Silicon Electrodes for Li-Ion Batteries** – L. S. de Vasconcelos and K. Zhao (Purdue University)

14:30 **479** **Effects of Porous Separators on Dendrite Growth in Lithium Batteries** – A. Cannon and E. Ryan (Boston University)

14:40 **480** **Identifying the Performance Limitations of Layered Oxide Sodium-Ion Batteries Using EIS** – L. A. Middlemiss (The University of Sheffield), A. J. R. Rennie, R. Sayers (Faradion Limited), and A. R. West (The University of Sheffield)

14:50 **481** **Anionic Redox in Li-Rich Rocksalt Oxides Studied Via X-Ray Photoelectron Spectroscopy** – J. A. Coca Clemente, L. J. Hardwick, and V. R. Dhanak (University of Liverpool)

15:00 **482** **Defect-Enhanced Phase Transformation Kinetics in Intercalation Compounds** – K. Yang, L. Hong, and M. Tang (Rice University)

15:10 **483** **First Principles Investigation of Grain Boundary Effects in Perovskite-Type Lithium Lanthanum Titanate Solid Electrolyte** – P. R. Conlin and K. Cho (The University of Texas at Dallas)

15:20 **484** **Understanding the Reaction Uniformity during Discharge of Thick Electrodes** – F. Wang and M. Tang (Rice University)

15:30 **Break**

16:00 **485** **Role of Coprecipitation and Calcination of Precursors on Phase Homogeneity and Electrochemical Properties of Battery Active Materials** – H. Dong, A. Wang, and G. Koenig (University of Virginia)

16:10 **486** **Drop-on-Demand 3D Printed Lithium-Ion Batteries** – I. Ben Barak (Tel Aviv University), D. Schneier (School of Chemistry, Tel Aviv University), Y. Kamir, M. Goor, I. Shekhtman, D. Golodnitsky (Tel Aviv University), and E. Peled (School of Chemistry, Tel Aviv University)

16:20 **487** **Understanding the Electrochemical Deposition Process of Silver Metal** – W. A. Martin, J. A. Lochala, B. Wu (University of Arkansas), and J. Xiao (Pacific Northwest National Laboratory)

16:30 **488** **Nanomanufacturing Transition Metal Oxide Composite Electrode Architectures Via Electrodeposition** – M. Spencer, O. Yildiz, P. Bradford, and V. Augustyn (North Carolina State University)

16:40 **489** **Influence of the Formulation on the Microstructure and Thus Performance of Li-Ion Batteries** – O. Rynne (Université de Montréal), M. Dubarry (University of Hawaii, Hawaii Natural Energy Institute), C. Molson (Pierre-and-Marie-Curie University), D. Lepage (Université de Montréal), D. Ayme-Perrot (Total), A. Prébé (Hutchinson SA), D. Rochefort (Université de Montréal), and M. Dollé (Department of Chemistry, University of Montreal)

16:50 **490** **3D Porous Urchin-like $NH_4V_3O_8{\cdot}2H_2o$ Microspheres Constructed for High-Performance and Long-Life Rechargeable Aqueous Zinc Ion Battery** – J. Lai, W. Xu, and Y. Wang (Louisiana State University)

17:00 **491** **Electrode Design for Improving Fast Charging Performance without Loss of Energy Density in Lithium Ion Batteries** – D. W. Kim (SKKU advanced material & science engineering), J. B. Yoo, and Y. J. Kim (SKKU Advanced Institute of Nanotechnology (SAINT))

17:10 **492** **Effect of Carbon Nanohorns on the Electrochemical Performance of Orthorhombic, Hexagonal and Monoclinic Tungsten Trixode Nanoplatelets As High-Energy Anode Material for Lithium-Ion Batteries** – S. R. Sahu, V. R. Rikka (ARCI), P. Haridoss (IIT Madras), R. Gopalan, and R. Prakash (ARCI)

A06 Battery Safety and Failure Modes

Battery / Industrial Electrochemistry and Electrochemical Engineering

State Room 1, Dallas Sheraton Convention Center

Safety Under Fast Charging Protocols – 08:00 – 11:20
Chair(s): Guangsheng Zhang and Boryann Liaw

08:00 **Welcoming Remarks**

08:10 **595** ***(Invited)* Extreme Fast Charging of Lithium-Ion Battery: Understanding Bottlenecks and Safety Issues** – T. R. Tanim, E. J. Dufek (Idaho National Laboratory), M. C. Evans (Idaho National Lab), C. C. Dickerson, and B. Liaw (Idaho National Laboratory)

08:50 **596** ***(Invited)* Lithium Plating and Its Impact on the Safety of Lithium-Ion Cell** – J. Zhang (Beijing Co-innovation Center for Electric Vehicles, Tsinghua University), Z. Liu, P. Dong, and Z. Li (Tsinghua University)

09:30 **Break**

10:00 **597** **Non-Uniform Li Plating Behavior of Li-Ion Cells in a Battery Pack with Bottom, Symmetric Top-Bottom, or Side Cooling Thermal Management Systems during Fast Charging** – M. M. Forouzan (SF Motors Inc, SF Motors), S. Khaleghi Rahimian (SF Motors), S. Han, Y. Liu, and Y. Tang (SF Motors Inc)

10:20 **598** **Detection and Quantification of Lithium Plating on Graphite in Low Temperature and Fast Charging Operation** – C. Fear, A. N. Mistry (Purdue University), R. E. Carter, C. T. Love (U.S. Naval Research Laboratory), and P. P. Mukherjee (Purdue University)

10:40 **599** **Overcharging $Li(Ni_{0.5}Mn_{0.3}Co_{0.2})O_2$//Graphite Cells: A Systematic Study** – I. Bloom, N. L. Dietz Rago (Argonne National Laboratory), D. G. Graczyk, Y. Tsai, S. Naik, E. Lee (Argonne National Lab), Z. Du, Y. Sheng, J. Li (Oak Ridge National Laboratory), D. L. Wood III (University of Tennessee), L. A. M. Steele (Sandia National Laboratories), J. Lamb (Sandia National Laborates), S. Spangler (Sandia National Labs), C. Grosso, and K. R. Fenton (Sandia National Laboratories)

11:00 **600** **Long–Term Aging – Overdischarge Degradation Mechanisms Interplay in Li-Ion Pouch Cells** – D. Juarez-Robles (Purdue University), J. A. Jeevarajan (Underwriter's Laboratories Inc.), and P. P. Mukherjee (Purdue University)

Novel Materials and Structures – 13:00 – 15:50
Chair(s): Xuning Feng and Loraine Torres-Castro

13:00 **Introductory Remarks**

13:10 **601** ***(Invited)* A New Paradigm of Li-Ion Batteries for Both High Safety and High Specific Energy** – C. Y. Wang (Electrochemical Engine Center, Pennsylvania State Univ.)

13:50 **602** **Considering Cracking and Dissolution in the Evolution of Solid Electrolyte Interphase (SEI) during Lithium-Ion Battery Cycling** – L. Liu and P. Guan (The University of Kansas)

14:10 **603** **Modeling and Experimental Studies of Zn Dendrites Formation and Growth** – V. Yurkiv, T. Foroozan, A. Ramasubramanian (University of Illinois at Chicago), R. Paoli (Argonne National Laboratory, University of Illinois at Chicago, Chicago), M. Ragone, R. Shahbazian-Yassar, and F. Mashayek (University of Illinois at Chicago)

14:30 **604** **Chemically-Engineered Host Materials Enabling Safe Sodium Metal Anodes** – C. Wang, H. Wang, J. Luo, and W. Li (Dartmouth College)

14:50 **605** **Durability and Reliability of Commercial Lithium-Ion Cells As a Function of Chemistry and Cycling Conditions** – Y. Preger, H. M. Barkholtz, A. Fresquez, F. A. Mier, B. R. Chalamala, and S. Ferreira (Sandia National Laboratories)

15:10 **606** **The Influence of Grain Structure in SEI on Lithium Diffusivity and Electrodeposition in Li-Metal Batteries** – A. Ramasubramanian, V. Yurkiv, M. Ragone, T. Foroozan, R. Shahbazian-Yassar, and F. Mashayek (University of Illinois at Chicago)

15:30 **607** **Thermally Stable Aramid Nanofiber Separators for Energy Storage** – A. Patel, K. Wilcox, I. George, R. Juneja, and J. L. Lutkenhaus (Texas A&M University)

B01 Carbon Nanostructures for Energy Conversion and Storage

Nanocarbons / Battery / Physical and Analytical Electrochemistry

City View 8, Dallas Sheraton Hotel

Energy Harvesting – 08:00 – 11:20
Chair(s): Jeffrey L. Blackburn

08:00 **621** ***(Invited)*** **Large Low Temperature Thermoelectric Power Factor from Nanostructured Carbon-Based Nanocoatings** – J. Grunlan (Texas A&M University)

08:20 **622** ***(Invited)*** **Thermoelectric properties of Fermi-level tuned and Aligned Single Wall Carbon Nanotubes** – K. Yanagi (Tokyo Metropolitan University)

08:40 **623** ***(Invited)*** **Controlling Energy Transport in Tailored Carbon Nanotubes Networks for Energy Harvesting Applications** – A. J. Ferguson and J. L. Blackburn (National Renewable Energy Laboratory)

09:00 **624** ***(Invited)*** **High Performance Carbon Nanotube –Laminated Perovskite Solar Cells** – A. Shawky, I. Jeon, R. Xiang, T. Inoue (The University of Tokyo), Y. Matsuo (University of Science and Technology of China, The University of Tokyo), and S. Maruyama (The University of Tokyo, AIST)

09:20 **625** ***(Invited)*** **Benzothiadiazole-Based Dye Photosensitizers for Water Splitting Using Dye-Encapsulated Carbon Nanotubes** – Y. Takaguchi (Okayama University), H. Miyake (Yamaguchi University), R. Sagawa, D. Miyamoto, and T. Tajima (Okayama University)

09:40 **Break**

10:00 **626** **Carbon Nanotubes to Outperform Metal Using Dopant Engineering and Hole-Transporting Layer Control in Perovskite Solar Cells** – I. Jeon, A. Shawky (The University of Tokyo), E. Kauppinen (Aalto University School of Science), Y. Matsuo (University of Science and Technology of China), and S. Maruyama (The University of Tokyo)

10:20 **627** **Long-Lived Free Charge Carriers at Heterojunctions between Semiconducting Single-Walled Carbon Nanotubes and Perylene Diimide Electron Acceptors** – H. S. Kang (National Renewable Energy Laboratory), O. Reid (University of Colorado at Boulder), T. J. Sisto, S. Peurifoy, B. Zhang, C. Nuckolls (Columbia University), and J. L. Blackburn (National Renewable Energy Laboratory)

10:40 **628** **Triangular Carbon Quantum Dots with Narrow Bandwith Emission for Leds** – L. Fan (Beijing Normal University)

11:00 **629** **The Feasibility of Energy Extraction from Acidic Wastewater By Capacitive Mixing with a Molecular-Sieving Carbon Cathode** – B. Shapira (Bar Ilan University), E. Avraham (Bar-Ilan University), and D. Aurbach (Bar Ilan University)

Catalysis 1 – 11:20 – 12:20
Chair(s): Min-Kyu Song

11:20 **630** **Stable Lithium-Sulfur Full Cell Enabled By Dual Functional Interconnected Mesocarbon Array** – H. Zhu (Hongli Zhu)

11:40 **631** ***(Invited)*** **Functional Design of Nanoscale Carbon for Active and Durable Electrocatalyst** – S. Park, C. Y. Ahn, J. M. Yoo, and Y. E. Sung (Seoul National University (SNU))

12:00 **632** **Scalable Pore Size Tuning Process for Seeking Better Cathode of Lithium Ion Capacitor and Development of High-Performance Full Cell Device through It** – J. H. Won and J. K. Kang (Korea Advanced Institute of Science and Technology)

Catalysis 2 – 14:00 – 17:00
Chair(s): Jeffrey L. Blackburn and Xiulei Ji

14:00 **633** ***(Invited)*** **Robust Two- and Three-Dimensional Conjugated Organic Structures for Electrochemical Applications** – J. B. Baek (UNIST)

14:20 **634** **Positive Effect of Induced Hydrophobicity in 3D N-Doped Porous Graphene Towards ORR Activity Under Acidic Condition** – S. Singh, K. Takeyasu, M. Furukawa (University of Tsukuba, Japan), and J. Nakamura (University of Tsukuba)

14:40 **635** **Recent Mechanistic Understanding of Oxygen Reduction Reaction over Pt-Supported 3D Carbon Nanofiber Catalysts** – B. Liu, J. Xu, A. Elangovan, and J. Li (Kansas State University)

15:00 **636** **Single-Walled Carbon Nanotube-*Clostridium Ljungdahlii* hybrid for Carbon Dioxide Fixation to Value-Added Chemicals** – Z. Li, D. Svedruzic, W. Xiong, B. J. Tremolet de Villers, and J. L. Blackburn (National Renewable Energy Laboratory)

15:20 **637** ***(Invited)*** **Non-Precious Metal Catalysts with Designed Carbon Nanostructures and Controlled Active Sites for Oxygen Reduction Reaction and CO2 Reduction** – J. Lee (Korea Advanced Institute of Science and Technology)

15:40 **Break**

16:00 **638** **Phosphorus and Iron Doped-Porous Carbon As an Efficient Electrocatalyst for Oxygen Reduction Reaction in Alkaline Medium** – N. Norouzi, F. A. Choudhury, and H. M. El-Kaderi (Virginia Commonwealth University)

16:20 **639** **Hybrid Graphene/Metal Oxygen Reduction Reaction Catalyst: An Insight at Sandwiched Single Layer Graphene Interdiffusion Barrier, Preserving Sharp Metallic Interface for Atomically-Thin Core@Shell Architectures** – A. Abdelhafiz (Georgia Institute of Technology), A. Vitale (Pacific Northwest National Laboratory), and F. M. Alamgir (Georgia Institute of Technology)

16:40 **640** **Development of Bimetallic Non-Platinum Group Metal Catalysts Based on Metal Organic Framework Precursors** – L. LaRochelle Richard, Q. Jia, and S. Mukerjee (Chemistry and Chemical Biology, Northeastern University)

B02 Carbon Nanostructures in Medicine and Biology

Nanocarbons / Organic and Biological Electrochemistry / Sensor
City View 6, Dallas Sheraton Hotel

Graphene Biosensor Devices – 14:40 – 15:40
Chair(s): Daniel A. Heller and Delphine Bouilly

14:40 **664** ***(Invited)*** **Biomedical Applications of Metal Nanoparticle-Decorated Carbon Nanostructures** – A. Star (University of Pittsburgh)

15:00 **665** ***(Invited)*** **Biocompatible Doped Graphene Quantum Dots Enabling Visible/Near-Infrared Imaging, Drug Delivery and Cancer Detection** – A. V. Naumov, E. Campbell, M. T. Hasan, R. Gonzalez-Rodriguez, and G. R. Akkaraju (Texas Christian University)

15:20 **666** ***(Invited)*** **Novel Three-Dimensional Fuzzy Graphene (3DFG)-Based Platform for Interrogation of Excitable Cells** – S. K. Rastogi (Carnegie Mellon University, BME), M. Scopelliti (Carnegie Mellon University, ECE), J. Bliley (Carnegie Mellon University, BME), N. Johnson (Carnegie Mellon University, MSE), D. Shiwarski (Carnegie Mellon University, BME), R. Garg (Carnegie Mellon University, MSE), A. Feinberg (Carnegie Mellon University, BME, MSE), M. Chamanzar (Carnegie Mellon University, ECE, BME), and T. Cohen-Karni (Carnegie Mellon University, BME, MSE)

Graphene and Novel Nanocarbons – 16:00 – 18:00
Chair(s): Ardemis Anoush Boghossian and Markita P Landry

16:00 **667** ***(Invited)*** **Applications and Safety of 2D Materials** – M. Prato (University of TRIESTE)

16:20 **668** ***(Invited)*** **Graphene for Bioapplications: Toxicological Studies and Integration in 3D-Scaffolds** – E. Vazquez (Universidad de Castilla-La Mancha)

16:40 **669** **Carbon Nanostructures and Nanocapsules: Preparation and Biological Behaviour** – T. DaRos (Trieste University)

17:00 **670** ***(Invited)*** **Fast-Scan Nanogap Voltammetry at Double-Carbon-Fiber Ultramciroelectrodes** – S. Amemiya (University of Pittsburgh)

17:20 **671** **Biofilms By *E.coli* & *S.Epidermidis* and Its Sensing Possibility By Graphene-Dispersed Silane Coating** – H. Kanematsu (National Institute of Technology Suzuka College), R. Nakagawa (National Institute of Technology, Suzuka College), K. Sano (D&D Corporation), D. M. Barry (Clarkson University), R. Itoh (National Institute of Technology, Suzuka College), H. Yamada (National Institute of Technology, Nara College), N. Hirai (National Institute of Technology Suzuka College), H. Miura (Suzuka University of Medical Science), A. Ogawa, T. Kogo, D. Kuroda (National Institute of Technology Suzuka College), K. Tsunashima (National Institute of Technology Wakayama College), and K. Katakura (National Institute of Technology, Nara College)

17:40 **672** **Intracellular Imaging and Thermal Sensing Using Fluorescent Carbon Dots** – J. R. Macairan and R. Naccache (Concordia University)

B03 Carbon Nanotubes - From Fundamentals to Devices

Nanocarbons / Physical and Analytical Electrochemistry

Devices 2 – 08:00 – 09:40
Chair(s): Han Htoon

08:00 **736** **Charge Transport in Mixed Semiconducting SWCNT Networks with Tailored Diameter Distributions** – M. Brohmann, F. J. Berger (Heidelberg University, Physical Chemistry, Heidelberg University, Centre for Advanced Materials), and J. Zaumseil (Heidelberg University, Physical Chemistry)

08:20 **737** ***(Invited)*** **Control of Diazonium Chemistry Defects on Nanocarbon Field-Effect Transistors** – D. Bouilly, C. M. Bazan, A. Beraud, and A. Bencherif (Universite de Montreal)

08:40 **738** ***(Invited)*** **Progress in Carbon Nanotube Terahertz Photodetectors** – F. Léonard (Sandia National Laboratories)

09:00 **739** **Functionalized Carbon Nanotube Phototransistors with Sub-Femtowatt Sensitivity at Room Temperature** – K. J. Bergemann (Sandia National Labs) and F. Léonard (Sandia National Laboratories)

09:20 **740** ***(Invited)*** **Mechanical and Gas Transport Properties of Pristine and Cross-Linked Carbon Nanotube Materials** – A. N. Volkov (University of Alabama)

Optics 2 – 10:00 – 12:20
Chair(s): Jean-Sébastien Lauret

10:00 **741** ***(Invited)*** **Organic Molecular Tuning of Many-Body Interaction Energies in Air-Suspended Carbon Nanotubes** – S. Tanaka, K. Otsuka (RIKEN), K. Kimura (RIKEN, The University of Tokyo), A. Ishii, H. Imada, Y. Kim, and Y. K. Kato (RIKEN)

10:20 **742** ***(Invited)*** **sp^3 Defects of Single Walled Carbon Nanotubes: Photonic and Electronic Integration** – H. Htoon (MPA-CINT, Los Alamos National Laboratory)

10:40 **743** ***(Invited)* Super-Localization of Excitons in Carbon Nanotubes at Cryogenic Temperatures** – C. Raynaud (Ecole Normale Supérieure, Université Paris Diderot), T. Claude (Universite Paris Diderot, Ecole Normale Superieure), R. Amara (NTU, Singapore, Sorbonne Université), A. Graf (Heidelberg University), J. Zaumseil (Heidelberg University, Physical Chemistry), J. S. Lauret (Laboratoire Aimé Cotton, ENS Paris Saclay), Y. Chassagneux (CNRS), and C. Voisin (Ecole Normale Supérieure)

11:00 **744** **Decay Dynamics and Diffusion Lengths of Bright and Dark Excitons in Air-Suspended Carbon Nanotubes** – A. Ishii (RIKEN), H. Machiya (RIKEN, The University of Tokyo), and Y. K. Kato (RIKEN)

11:20 **745** **Photoluminescence Intensity Fluctuations and Temperature-Dependent Decay Dynamics of Individual Carbon Nanotube Sp^3 Defects** – Y. Kim (MPA-CINT, Los Alamos National Laboratory), K. Velizhanin (Theoretical Division, Los Alamos National Laboratory), X. He, I. Sarpkaya (MPA-CINT, Los Alamos National Laboratory), Y. Yomogida, T. Tanaka, H. Kataura (Nat. Inst. of Advanced Industrial Science and Technology), S. K. Doorn, and H. Htoon (MPA-CINT, Los Alamos National Laboratory)

11:40 **746** ***(Invited)* Thermo-Excitonic Properties of Semiconducting Single-Walled Carbon Nanotubes** – Y. Miyauchi (Institute of Advanced Energy, Kyoto University, Graduate School of Science, Nagoya University)

12:00 **747** **Nanocarbons through the Artist's Lens** – J. Cohen, J. Harvey (Memorial Sloan Kettering), Y. Chyan, J. M. Tour (Rice University), and D. A. Heller (Weill Cornell Medicine, Cornell University)

Devices 3 – 14:00 – 14:40
Chair(s): Tomohiro Shiraki

14:00 **748** **Flexible PDMS Foams Decorated with Multi–Walled CNTs for Unprecedented Detection of Ultralow Strain and Pressure Coupled with Large Working Range** – R. Iglio, S. Mariani, V. Robbiano (University of Pisa), L. Strambini (Italian National Research Council), and G. Barillaro (University of Pisa)

14:20 **749** **Carbon Nanotube-Inorganic Hybrid Systems and Devices** – M. Palma (Queen Mary University of London)

B08 Porphyrins, Phthalocyanines, and Supramolecular Assemblies

Nanocarbons / Organic and Biological Electrochemistry
City View 7, Dallas Sheraton Hotel

Porphyrins at Solid Surfaces – 08:00 – 09:40
Chair(s): K W Hipps and Ursula Mazur

08:00 **916** **Adsorption and Desorption Rates for Pophyrins and Phthalocyanines on Gold from Solution.** – K. W. Hipps and U. Mazur (Washington State University)

08:20 **917** **Cooperative Dynamics in Oxygen Binding Reaction to Cobalt Porphyrins at the Solution/Solid Interface** – U. Mazur and K. W. Hipps (Washington State University)

08:40 **918** **Gas Phase Synthesis and Deposition of Directly Fused Porphyrin Tapes: Reaction Mechanism and Central Metal Ion Effect.** – G. Bengasi (Luxembourg Institute of Science and Technology, Johannes Gutenberg University of Mainz,), K. Baba (Luxembourg Institute of Science and Technology), O. Back (Johannes Gutenberg University of Mainz), O. De Castro, G. Frache (Luxembourg Institute of Science and Technology), K. Heinze (Johannes Gutenberg University of Mainz), and N. D. Boscher (Luxembourg Institute of Science and Technology)

09:00 **919** **Conductive Directly Fused Metalloporphyrin Coatings By Chemical Vapour Deposition – from Singly to Triply Fused** – N. D. Boscher (Luxembourg Institute of Science and Technology), G. Bengasi (Luxembourg Institute of Science and Technology, Johannes Gutenberg University of Mainz), K. Baba (Luxembourg Institute of Science and Technology), K. Heinze (Johannes Gutenberg University of Mainz), and G. Frache (Luxembourg Institute of Science and Technology)

09:20 **920** **Site-Specific Coordination Chemistry and Beyond: Novel Properties in Low Dimensional Supramolecular Architectures of Porphins at Surfaces** – J. Girovsky (Paul Scherrer Institute, present address: University of Cambridge), M. Baljozovic (Paul Scherrer Institute, EMPA Materials Science and Technology), S. Nowakowska (University of Basel), J. Nowakowski (Paul Scherrer Institute), C. Wäckerlin (Paul Scherrer Institute, EMPA Materials Science and Technology), J. Dreiser (Paul Scherrer Institute), J. Lobo Checa (University of Zaragoza), L. Gade (University of Heidelberg), S. Decurtins, S. X. Liu (University of Bern), P. Oppeneer (University of Uppsala), N. Ballav (IISER Pune, India), and T. A. Jung (Paul Scherrer Institute)

Energy Conversion – 10:00 – 12:20
Chair(s): Timothy P Bender and Fernando Langa

10:00 **921** **Electrochemical Advances in Boron Subnaphthalocyanines (BsubNcs) for Organic Photovoltaic Applications: The Ambient Stability of Bsubnc Mixed Alloys; Their Separation and Electrochemical Properties; And Chemical Progresses Towards Pure Bsubncs to Yield Their Individual Electrochemical Evaluation** – T. P. Bender (Department of Chemical Engineering and Applied Chemistry)

10:20 **922** **Structural Design of Porphyrins for Binary and Ternary Organic Solar Cells with High Efficiency and Low Energy Loss** – V. Cuesta (Univ. Castilla-la Mancha), M. Vartanian (Univ. Castilla-la mancha), G. Sharma (LNM Inst. of Information Technology Demed University), P. de la Cruz, and F. Langa (Universidad de Castilla-La Mancha)

10:40 **923** **Molecular Design of Metal Phthalocyanines with Strong Electron-Donating Substituents for Perovskite Solar Cells** – G. Zanotti (National Research Council - Italy)

11:00 **924** **Metallomacrocycle-Driven Atomically Dispersed M-N_x Sites on Carbon Nanostructures for Electrocatlyic Energy Conversion Reactions** – S. H. Joo (Ulsan National Institute of Science and Technology)

11:20 **925** **Advanced Polyphthalocyanine–Derived Electrode Materials for Energy Storage and Conversion** – L. Liu, S. Yang, Y. Qin, Z. Zhang, and F. Wang (Beijing University of Chemical Technology)

11:40 **926** **Star-Shaped Magnesium Tetraethynylporphyrin Bearing Four Peripheral Electron-Accepting Functionalities for Organic Solar Cell** – Y. Matsuo (University of Science and Technology of China) and H. Wang (University of Science and technology of China)

12:00 **927** **Charge Transport within Metal-Organic Frameworks: The Role of Topologically Controlled Charge Hopping Process** – P. Deria (Southern Illinois University Carbondale), K. Maindan, and X. Li (Southern Illinois University-Carbondale)

Catalysis – 14:00 – 15:40
Chair(s): Dorota Gryko and David L Officer

14:00 **928** **Porphyrin and Phthalocyanine Graphene Assemblies As Electrocatalysts for CO_2 Reduction** – D. L. Officer (University of Wollongong)

14:20 **929** **Degradation and Stabilization of Porphyrin-Based Metal Organic Framework Electrocatalysts for the Oxygen Reduction Reaction** – M. B. Stevens (Stanford University, Department of Chemical Engineering), G. Chen, Y. Liu (Stanford University, Department of Materials Science and Engineering), L. King (Stanford University, Department of Chemical Engineering), R. Sinclair (Stanford University, Department of Materials Science and Engineering), Z. Bao, and T. F. Jaramillo (Stanford University, Department of Chemical Engineering)

14:40 **930** **Hydrogen and Oxygen Evolution Reactions Catalyzed By Metal Porphyrins and Corroles** – R. Cao (Shaanxi Normal University)

15:00 **931** **Homogeneous and Heterogeneous Porphyrin Architectures for Electrocatalysis** – G. F. Moore, B. L. Wadsworth, D. Khusnutdinova, M. Flores, A. M. Beiler, E. A. Reyes Cruz, Y. Zenkov, and J. M. Urbine (Arizona State University)

15:20 **932** **Vitamin B_{12} - a Bioinspired Catalyst for Organic Reactions** – D. Gryko (Institute of Organic Chemistry Polish Academy of Sciences)

Supramolecular Architectures – 16:00 – 18:00
Chair(s): Nathalie Solladie and Jonathan P. Hill

16:00 **933** **Subphthalocyanine Fused Dimer and Subphthalocyanines Conjugates** – G. Zango, V. Mariñas, O. Fernandez-Vera, L. Gallego, G. Lavarda, D. P. Medina, M. V. Martínez-Díaz (Autonoma University of Madrid), and T. Torres (Autonoma University of Madrid, IMDEA Nanociencia, 28049 Madrid, Spain)

16:20 **934** **Light Triggers Molecular Shuttling in Rotaxanes** – D. M. Guldi (Universität Erlangen-Nürnberg)

16:40 **935** **Helical Supramolecular Porphyrin Assemblies** – T. Haino (Graduate School of Science, Hiroshima University)

17:00 **936** **Nucleosides As Organizing Architectural Moieties.** – N. Solladie (Laboratoire de Chimie de Coordination - CNRS)

17:20 **937** **Self-Assembly and Sensing Properties of Rim-Functionalized Oxoporphyrinogens** – J. P. Hill (WPI Center for Materials Nanoarchitectonics), M. K. Chahal (National Institute for Materials Science), J. Labuta (WPI Center for Materials Nanoarchitectonics), D. Payne (National Institute for Materials Science), W. Webre, F. D'Souza (University of North Texas), and K. Ariga (WPI Center for Materials Nanoarchitectonics)

17:40 **938** **Dynamic Molecular Invasion into Multiply Interlocked Catenane Composed of Porphyrins and Phthalocyanine** – K. Tanaka, Y. Yamada, R. Ito, S. Ogino (Nagoya University), and T. Kato (Kyoto University)

B09 Nano for Industry

Nanocarbons / Industrial Electrochemistry and Electrochemical Engineering / Physical and Analytical Electrochemistry / Interdisciplinary Science and Technology Subcommittee / Dielectric Science and Technology
City View 5, Dallas Sheraton Hotel

NANO for Industry 1 – 08:00 – 09:40
Chair(s): Elena Bekyarova

08:00 **957** ***(Invited)* A New Category of Transparent Conductive Films: Printed Carbon Nanotube Hybrids** – R. A. Prada Silvy and D. J. Arthur (Chasm Advanced Materials)

08:20 **958** ***(Invited)* All-in-One Graphene Composite-Based Fiberwearable Supercapacitor** – A. Yu (University of Waterloo)

08:40 **959** ***(Invited)* Advanced Nanostructured Electrode Materials for Lithium-Sulfur Batteries** – Z. Chen (University of Waterloo)

09:00 **960** **Facile Synthesis of Industrially Scalable and Cost Effective WO_3 for Electrochromic Device and Photocatalysis** – M. Rakibuddin, M. A. Shinde, and H. Kim (Yeungnam University)

09:20 **961** **The Industrial Advantages of Arginine Capped Magnetite Nanoparticles** – F. Kashanian and M. Habibi-Rezaei (School of Biology College of Science University of Tehran)

NANO for Industry 2 – 10:00 – 11:40
Chair(s): Aiping Yu

10:00 **962** ***(Invited)*** **Nano-FTIR Correlation Nanoscopy for Organic and Inorganic Material Analysis** – S. Mastel, N. F. Hartmann, and T. Gokus (neaspec GmbH)

10:20 **963** ***(Invited)*** **Nanostructured Materials for Higher Energy and Higher Power Lithium-Ion Batteries** – G. Yushin (Georgia Institute of Technology, Sila Nanotechnologies, Inc.)

10:40 **964** ***(Invited)*** **Design of Metal - Carbon Nanotube Structures for Electronic and Optoelectronic Applications** – W. Li, M. Chen, and E. Bekyarova (University of California, Riverside)

11:00 **965** ***(Invited)*** **Synthesis and Properties of All SWCNT Metallic Nanotube Wire** – D. Lashmore, P. Bystricky, and J. Bulmer (American Boronite Corporation)

11:20 **966** ***(Invited)*** **Stray Light Suppression Using Carbon Nanotube Based Black Coating** – D. Wang, T. D. Hall (Faraday Technology, Inc.), R. Radhakrishnan (Faraday Technology), M. Inman, E. J. Taylor, B. Skinn, and S. Snyder (Faraday Technology, Inc.)

NANO for Industry: Keynote Speaker Session 1 – 11:40 – 12:20
Chair(s): Slava V. Rotkin

11:40 **967** ***(Keynote)*** **Nanomaterials Transitions to Industry: Energy, Medicine and Devices** – J. M. Tour (Rice University)

NANO for Industry: Keynote Speaker Session 2 – 14:00 – 16:00
Chair(s): Slava V. Rotkin

- **968** ***(Keynote)*** **Electrochemical Artificial Muscle Yarns and Textiles That Harvest and Store Environmentally Available Energies** – R. H. Baughman (Alan G. MacDiarmid NanoTech Institute, UTD)
- **969** ***(Keynote)*** **Facile Sorting of Single Walled Carbon Nanotubes According to Their Electronic Types** – M. Chan-Park (NTU)
- **970** ***(Keynote)*** **Some Commercialization Successes in Unconventional Micro/Nanotechnologies** – J. A. Rogers (Northwestern University)

NANO for Industry: Panel Session – 16:20 – 18:00
Chair(s): Slava V. Rotkin

16:20 **Panel Discussion**

C01 Corrosion General Session

Corrosion
City View 1, Dallas Sheraton Hotel

Corrosion in Various Environments 2 – 08:20 – 12:00
Chair(s): Jamie Noel and Masayuki Itagaki

08:20 **1020** **Corrosion Mechanisms of Austenitic Steel in Salt Rock Repositories of High-Level Radioactive Waste** – A. G. Munoz (Gesellschaft für Anlagen- und Reaktorsicherheit GRS) and D. Schild (Karlsruher Institut für Technologie KIT)

08:40 **1021** **High Temperature Oxidation of Zircaloy-4 Under Conditions Simulating a Loss of Cooling Accident in Spent Fuel Pools Examined with Raman Imaging and ^{18}O Tracer Techniques** – A. Kasperski (LEPMI-CNRS, IRSN), M. Guérain (IRSN, LEPMI-CNRS), M. Gestin (IRSN, Mines Saint-Etienne), C. Duriez (IRSN), and M. Mermoux (LEPMI-CNRS)

09:00 **1022** **Microstructural Evolution of 52M Weld Metal Near the Fusion Boundary and Oxide Films Formed in Simulated PWR Primary Water** – K. Zhang (Shanghai University, School of Mater. Sci.& Eng.), J. Ma (Shanghai University), F. Ning (Shanghai University,School of Mater. Sci.& Eng.), T. Cui (Shanghai University, School of Mater. Sci. & Eng.), Y. Jia (Shanghai University,School of Mater. Sci.& Eng.), and Z. Lu (School of Mater. Sci. and Eng.,Shanghai University)

09:20 **1023** **Corrosion Behavior of Steel Buried in Soil Under Natural Rainfall Conditions at Outdoor Test Field** – S. Mineta, S. Ohki, M. Mizunuma, and M. Tsuda (NTT Device Technology Labs, NTT Corporation)

09:40 **Break**

10:00 **1024** **The Interdependent Deposit-Metal Interaction during Underdeposit Corrosion (UDC)** – A. N. Shamso (Imperial College London), A. M. Abdullah (Qatar University), N. Laycock (Qatar Shell), and M. P. Ryan (Imperial College London)

10:20 **1025** **Fatigue and Static Crack Growth Rate Study of Carbon Steel for Corrosion Prevention of Natural Gas Transmission Pipelines** – J. H. Tylczak (National Energy Technology Laboratory), A. Chandra, R. Thodla (DNV USA), and M. Ziomek-Moroz (DOE/NETL)

10:40 **1026** **Corrosion Behavior of Ni-Mo Alloys in CO_2-Saturated Salinity Environment at Gas Hydrate Formation Temperatures** – C. E. Ozigagu, T. Zhou, S. Sanders, and T. D. Golden (University of North Texas)

11:00 **1027** **Magnetic Field Effect on Anodic Dissolution of Axle Steel in Bicarbonate Solution with Chlorides** – F. Ning (Shanghai University,School of Mater. Sci.& Eng.), K. Zhang (Shanghai University, School of Mater. Sci.& Eng.), T. Cui (Shanghai University, School of Mater. Sci. & Eng.), S. Ling, J. Ma (Shanghai University), Z. Lu (School of Mater. Sci. and Eng.,Shanghai University), and C. Yu (Shanghai University)

11:20 **1028** **Magnetic Field Effect on Anodic Dissolution Behavior of Iron in Sodium Perchlorate Solution** – S. Cai, Y. Tang (Shanghai University), F. Ning (Shanghai University,School of Mater. Sci.& Eng.), S. Ling (Shanghai University), T. Cui (Shanghai University, School of Mater. Sci. & Eng.), J. Ma (Shanghai University), and Z. Lu (School of Mater. Sci. and Eng.,Shanghai University)

11:40 **1029** **Anodic Polarization Behavior of Iron in Phosphoric Acid Solution Under the Action of Magnetic Field** – Y. Tang, S. Cai (Shanghai University), F. Ning (Shanghai University,School of Mater. Sci.& Eng.), S. Ling (Shanghai University), K. Zhang (Shanghai University, School of Mater. Sci.& Eng.), J. Ma (Shanghai University), Z. Lu (School of Mater. Sci. and Eng.,Shanghai University), and C. Yu (Shanghai University)

D01 Chemical Mechanical Polishing 15

Dielectric Science and Technology

Pearl 2, Dallas Sheraton Hotel

Chemical Mechanical Polishing 15 - Session 3 – 08:30 – 12:05
Chair(s): Jason J. Keleher and Vimal H. Chaitanya

08:30 **Welcoming Remarks - G. Bahar Basim, University of Florida**

08:35 **1042** ***(Invited)*** **Recent Advances in SiC CMP** – R. L. Rhoades (Revasum)

09:15 **1043** **Fujimi's New SiC CMP Slurry Development** – S. Hirano (FUJIMI INCORPORATED, Advanced Industrial Science and Technology), S. Takami, N. Noguchi, T. Ishibashi, Y. Ito, H. Oda, S. Arakawa, Y. Mori (FUJIMI INCORPORATED), B. Greene, J. Sanford, J. Riesen (FUJIMI CORPORATION), and T. Kato (Advanced Industrial Science and Technology)

09:45 **Break**

10:00 **1044** **Electrochemical Evaluations for Barrier CMP Optimization** – G. B. Basim (University of Florida) and R. Yagan (Koc University)

10:30 **1045** **Prediction of Pad Wear Depending on Structural Factors of Diamond Conditioner** – T. Kim (Mechanical Engineering, Sungkyunkwan University, SAINT, Sungkyunkwan University)

11:00 **1046** **Advances in Pad Conditioning for Enhancement of CMP Process Stability over Pad Life** – A. J. Khanna, P. Jawali, D. Redfield, R. Kakireddy, A. Chockalingam, D. Benvegnu, M. Yang, S. Rozo, J. Fung, M. Cornejo, I. Abramson, M. Yamamura, Z. Yuan, and R. Bajaj (Applied Materials Inc.)

11:30 **1047** **Performance of Trizact™ Microreplicated Pad in W Buff Marathon Process** – A. W. Simpson, J. Stomberg, D. Muradian, D. LeHuu, C. Loesch, and V. Laraia (3M Company, Electronics Materials Solutions Division)

12:00 **Concluding Remarks - Robert Rhoades, Revasum**

E01 Electrodeposition for Advanced Node Interconnect Metallization Beyond Copper

Electrodeposition

Pearl 1, Dallas Sheraton Hotel

Cobalt Interconnect – 09:00 – 12:00
Chair(s): Qiang Huang and Shafaat Ahmed

09:00 **1048** ***(Invited)*** **Cobalt Interconnects at 36nm Beol Pitch and Beyond: Material Challenges & Circuit-Level Performance Impact** – N. Lanzillo, K. Yogendra, C. C. Yang, R. Vega (IBM Research), R. Bolam (IBM), K. Choi, R. Robison, and L. Clevenger (IBM Research)

09:40 **1049** ***(Invited)*** **Cobalt Damascene Chemistry for Advanced Interconnect** – E. Najjar and S. Sun (MacDermid Enthone Electronics Solutions)

10:00 **1050** ***(Invited)*** **Cobalt Bottom-up Filling for Advanced Node Interconnect Metallization** – J. Wu, F. Wafula, S. Branagan, H. Suzuki, and J. van Eisden (Atotech USA, LLC)

10:20 **1051** ***(Invited)*** **Electrodeposition of Ferromagnetic Materials for Advanced Interconnect and MEMS** – T. P. Moffat (NIST), N. L. Ritzert (Theiss Research/NIST), R. Wang (National Institute of Standards and Technology), C. H. Lee (Korea Atomic Energy Research Institute), S. K. Kim (Chung-Ang University), T. Braun, and D. Josell (NIST)

10:40 **Break**

11:00 **1052** ***(Invited)*** **In-Situ Investigation of the Role of Boric Acid during the Electrodeposition of Cobalt** – M. A. Miller, J. Wall, J. Sukamto, and E. G. Webb (Moses Lake Industries - Advanced Research Center)

11:20 **1053** **Electrochemical Nucleation and Growth of Cobalt in Presence of Dioxime Additives** – Y. Hu and Q. Huang (The University of Alabama)

11:40 **1054** ***(Invited)*** **Process Control of Advanced Cobalt Interconnect Plating Bath** – M. Pavlov, E. Shalyt, D. Lin, and J. Wang (ECI Technology)

Copper and Other Metals – 14:00 – 17:20
Chair(s): James Kelly and Jian Zhou

14:00 **1055** **Improved Copper Damascene Wires Using Direct Plate on Cobalt Process** – L. J. Brogan, Y. Liu, M. M. Huie, J. D. Reid (Lam Research Corporation), J. Kelly (IBM Albany Nanotechnology Center), H. K. Shobha (IBM Research at Albany Nanotech), H. Huang (IBM Research, Albany), K. Motoyama (IBM Research at Albany Nanotech), and C. K. Hu (IBM T.J. Watson Research Center)

14:20 **1056** **A Effect of Halide on Cobalt Electrodeposition for through-Silicon-Via(TSV) Application** – Y. Kim, J. Lee, K. Park (Hanyang University), C. Lee (Hanyang university), and B. Yoo (Hanyang University)

14:40 **1057** **Bottom-up Gold Filling of High Aspect Ratio Trenches :Toward a Mechanistic Understanding** – S. Ambrozik (National Institute of Standards and Technology, NIST), T. P. Moffat, and D. Josell (NIST)

15:00 **1058** **Self-Annealing Behavior of Electroplated Cu in the Blind-Hole Structure** – C. H. Yang, Y. W. Lee, C. Y. Lee, Y. H. Huang, and C. E. Ho (Yuan Ze University)

15:20 **Break**

15:40 **1059** ***(Invited)* Bottom-up Electrodeposition** – T. Braun, D. Josell, and T. P. Moffat (NIST)

16:00 **1060** ***(Invited)* Towards Spatially Resolved Chemical Analysis of Sn/Ag Solder Bumps By Means of Laser Ablation Ionization Mass Spectrometry (LIMS)** – A. Cedeño López, P. Moreno-García (Dpt. of Chemistry and Biochemistry, University of Bern), V. Grimaudo, A. Riedo, M. Tulej, R. Wiesendanger, R. Lukmanov, P. Wurz (Physics Institute, University of Bern), and P. Broekmann (Dpt. of Chemistry and Biochemistry, University of Bern)

16:20 **1061** **Multi-Scale Study of Branched Electrodeposits** – C. Kharbachi, F. Chauvet, and T. Tzedakis (Laboratoire de Génie Chimique)

16:40 **1062** **Water-in-Salt Electrolytes for the Electrodeposition of Ruthenium for Interconnect Applications** – W. D. Sides and Q. Huang (The University of Alabama)

17:00 **1063** **Electroless Metal Deposition Using Multivalent Metal Ions As Reducing Agents** – E. Norkus and L. Tamašauskaitė-Tamašiūnaitė (Center for Physical Sciences and Technology)

Lone Star B/C, Dallas Sheraton Convention Center

E01 Poster Session – 18:00 – 20:00

- **1064** **Hybrid Electrodeposition and Characteristics of Ag-Graphene Composite Films on Cu Sheets Toward High-Performance Electric Connectors** – S. Sakaida (Nagoya Institute of Technology), S. Z. S. Kure-Chu (Nagoya Institute of Tehnology), T. Hihara (Nagoya Institute of Technology), and H. Yashiro (Dept. of Chemistry and Bio-Sciences, Iwate University)
- **1065** **Extraction Effect of Ni-Zn By Electrodeposition from Aqueous Acid Solutions** – Y. Addi (USTHB-ENPEI)

F01 Industrial Electrochemistry and Electrochemical Engineering General Session

Industrial Electrochemistry and Electrochemical Engineering

Pearl 5, Dallas Sheraton Hotel

Industrial Electrochemistry and Electrochemical Engineering Division General Session 1 – 08:00 – 12:00
Chair(s): Douglas P. Riemer and John A. Staser

08:00 **1066** **Selective Ion Removal from Water Using Flow-through Electrode Capacitive Deionization** – M. R. Cerón, S. A. Hawks, J. M. Knipe, C. K. Loeb, C. Zhan, T. A. Pham, M. Stadermann, and P. G. Campbell (Lawrence Livermore National Laboratory)

08:20 **1067** **Capacitive Deionization Using Activate Carbon Electrodes Obtained from Different Precursors** – K. M. Barcelos, R. L. Zornitta, and L. A. M. Ruotolo (Federal University of Sao Carlos)

08:40 **1068** **Asymmetric Redox Active Electrodes for Brackish Water Deionization and Selective Adsorption of Micro-Pollutants** – F. He, A. Hemmatifar, M. Z. Bazant, and T. A. Hatton (Massachusetts Institute of Technology)

09:00 **1069** **Ag Membranes for Electrochemical CO2 to CO Conversion in an MEA Type Set-up** – B. Seger, G. Larrazabal, P. Strøm-Hansen, J. P. Heli (Technical University of Denmark), and K. Therkildsen (Siemens A/S)

09:20 **1070** **Intensifying the CO_2 Electrolysis Process** – S. Bhargava (University of Illinois Urbana-Champaign, Intl. Institute of Carbon Neutral Energy Research), F. Proietto (University of Illinois Urbana-Champaign, Università degli Studi di Palermo), D. Azmoodeh (University of Illinois Urbana-Champaign), D. A. Henckel, X. S. Chen, E. R. Cofell (University of Illinois Urbana-Champaign, Intl. Institute of Carbon Neutral Energy Research), S. Verma (University of Illinois Urbana-Champaign, Royal Dutch Shell Inc.), J. Pigos, C. J. Brooks (Honda Research Institute USA Inc.), A. A. Gewirth, and P. J. A. Kenis (University of Illinois Urbana-Champaign, Intl. Institute of Carbon Neutral Energy Research)

09:40 **Break**

10:00 **1071** **Effects and Characterizations of Pulse Electrodeposition Parameters of Silver on Surface Roughness and Scattering Parameters of Horn Antennas** – C. Başaran (ASELSAN Inc., Middle East Technical University) and I. Karakaya (Middle East Technical University)

10:20 **1072** **Electrochemical Investigation of the $Cu^{2+} \rightarrow Cu^{1+}$ Reduction Reaction in Ethaline Deep Eutectic Solvent** – K. Steinberg, D. Shen, N. Shaheen, and R. Akolkar (Case Western Reserve University)

10:40 **1073** **Selective Electroless Copper Plating on a Polymer Substrate *Via* Magnetic Field Application** – S. Danilova, J. E. Graves (Coventry University), G. W. V. Cave (Nottingham Trent University), and A. J. Cobley (Coventry University)

11:00 **1074** **Electrodeposition of Aluminum Using Chloroaluminate Ionic Liquids Under Dry Air Conditions** – M. Miyake, M. Hirata, and T. Hirato (Kyoto University)

11:20 **1075** **A Molten Salt Electrochemical Approach for the Synthesis of Graphite** – P. Bagri (Oak Ridge National Lab), H. Luo (Oak RIdge National Lab), and S. Dai (Oak Ridge National Laboratory)

11:40 **1076** **Deposition of Dopamine Thin Film As an Adhesion Layer in Heterogeneous Interfaces for Metallization Process** – S. C. Chou, P. S. Hung, C. J. Wang, G. R. Wang, W. A. Chung, and P. W. Wu (National Chiao Tung University)

Industrial Electrochemistry and Electrochemical Engineering Division Student Achievement Award Address – 14:00 – 14:40
Chair(s): Douglas P. Riemer and John A. Staser

14:00 **1077** ***(Industrial Electrochemistry and Electrochemical Engineering Division Student Achievement Award Address)*** **Fundamental Understanding on Cell Performance Enhancement of Flow Batteries with Serpentine Flow Field Structures** – X. Ke, R. F. Savinell, and J. S. Wainright (Case Western Reserve University, Cleveland, Ohio, USA)

Industrial Electrochemistry and Electrochemical Engineering Division General Session 2 – 14:40 – 16:40
Chair(s): Douglas P. Riemer and John A. Staser

14:40 **1078** **A Novel Flow Electrochemical Reactor for Intensifying Diffusion-Limited Electrochemical Processes** – B. Bayatsarmadi, M. Horne, M. Chen, and T. Rodopoulos (CSIRO)

15:00 **1079** **Developing a Physics-Based Model of the Electrocoating Process: Experimentation and Simulation** – T. Marlar (Dept. Chemical Engineering, Brigham Young University), F. Padash (Dept. of Chemical Engineering, Brigham Young University), A. Trainor (Dept. Chemical Engineering, Brigham Young University), W. Liu (Ford Motor Company), B. Okerberg, S. R. Zawacky (PPG Industries Inc.), and J. N. Harb (Dept. of Chemical Engineering, Brigham Young University)

15:20 **Break**

15:40 **1080** **A Study of Dark TiO_2 Coating on Pure Titanium By Micro Arc Oxidation** – Y. F. Hong (Department of Materials Science and Engineering, NTU), H. Lee (Huang-Chieh Metal Composite Material Tech. Co.), and H. C. Lin (Department of Materials Science and Engineering, NTU)

16:00 **1081** **High Temperature Oxidation Resistance of Cr Coatings on 22MnB5 Steel Electroplated in Trivalent Cr Baths** – C. Y. Huang and C. S. Lin (Department of Materials Science and Engineering, NTU)

16:20 **1082** **Influence of ZrO_2 Incorporation into Coating on Electrochemical Response of Low-Carbon Steel Processed By Plasma Electrolytic Oxidation** – K. M. Lee (POSCO)

Lone Star B/C, Dallas Sheraton Convention Center

F01 Poster Session – 18:00 – 20:00

- **1083** **Impact of Manufacturing Tolerance on Lithium Ion Electrode and Cell Physical Properties** – W. Yourey (Penn State University, Hazleton)
- **1084** **Electrochemical Behavior and Extraction of Yttrium on Cu Electrode in LiCl-KCl Eutectic** – W. Li, W. Han, M. Li, X. Yang (Harbin engineering university), and Y. Sun (Harbin Engineering University)
- **1085** **Performance Comparison of the Electrolytic Cells Having Different Configurations for the Production of HCl and NaOH from NaCl** – J. Kim (Korea University, Korea Institute of Science and Technology), S. Abbas (Korea University of Science and Technology, Korea Institute of Science and Technology), K. B. Lee (Korea University), and H. Y. Ha (Korea Institute of Science and Technology, Korea University of Science and Technology)
- **1086** **Electrochemical Behavior of Nd and the Preparation of Mg-Al-Nd Alloys in LiCl-NaCl Molten Salt** – Y. Zhang, W. Han (Harbin Engineering University), M. Li, X. Yang (Harbin engineering university), and Y. Sun (Harbin Engineering University)
- **1087** **Electrochemical Co-Reduction of Ce (III) and Ga (III) and Preparation of the Intermetallic Compound in LiCl-KCl Eutectic** – D. Yang, W. Han (Harbin Engineering University), and M. Li (Harbin engineering university)
- **1088** **Electrochemical Behavior of Ga^{3+}, NO_3^- and NH_4^+ Ions and Electrodeposition of GaN in Aqueous Solutions** – J. Kang (Nagoya University), K. Kuroda, and M. Okido (IMaSS, Nagoya University)
- **1089** **Supercapacitor Prognosis for POWER Electronic Applications** – A. EL Mejdoubi (Université de Caen Normandie), J. Sabor (Université Moulay Ismail, Morocco), H. Chaoui (Carleton University, Ottawa, ON, Canada), and H. Gualous (Université de Caen Normandie)

F04 Multiscale Modeling, Simulation and Design 3: Enhancing Understanding, and Extracting Knowledge from Data

Industrial Electrochemistry and Electrochemical Engineering / Energy Technology
Pearl 4, Dallas Sheraton Hotel

Multiscale Modeling, Simulation and Design 3: Enhancing Understanding, and Extracting Knowledge from Data - Session 3 – 08:00 – 12:00
Chair(s): John N. Harb and Venkat R. Subramanian

08:00 **1135** ***(Invited)*** **Hierarchy of Stochastic Scales in Intercalation Electrodes** – P. P. Mukherjee and A. N. Mistry (Purdue University)

08:40 **1136** ***(Invited)*** **Modeling of Lithium Plating Induced By Heterogeneities at Varied Length-Scales in Lithium-Ion Batteries** – K. Smith, F. L. E. Usseglio-Viretta, A. M. Colclasure, W. Mai (National Renewable Energy Laboratory), A. N. Mistry, P. P. Mukherjee (Purdue University), S. Santhanagopalan, and M. Keyser (National Renewable Energy Laboratory)

09:20 **Break**

09:40 **1137** ***(Invited)*** **Fully-Coupled 3D Electrochemical-Thermal Modeling of Cylindrical Lithium-Ion Batteries** – P. M. Gomadam (Medtronic Energy and Component Center)

10:20 **1138** ***(Invited)*** **Exact and Approximate Methods for Analytical Modeling of Thermal and Electrochemical Transport in Li-Ion Batteries** – A. Jain (The University of Texas at Arlington)

11:00 **1139** ***(Invited)* Ion Conduction in Glassy Electrolytes for Sodium Ion Batteries – an Atomistic Perspective** – A. M. Dive and S. Banerjee (Washington State University)

11:40 **1140** **Linear Stability Analysis of Time-Dependent Electrodeposition in Charged Porous Media** – E. Khoo, H. Zhao, and M. Z. Bazant (Massachusetts Institute of Technology)

Multiscale Modeling, Simulation and Design 3: Enhancing Understanding, and Extracting Knowledge from Data - Session 4 – 14:00 – 17:40
Chair(s): Ankur Jain and John N. Harb

14:00 **1141** ***(Invited)* Exploring Fuel Cell Catalyst Layers at Multiple Scales** – T. A. Zawodzinski Jr. (University of Tennessee-Knoxville), R. Subbaraman (Apple, Inc), C. N. Sun (Oak Ridge National Laboratory), and N. M. Cantillo (The University of Tennessee - Knoxville)

14:40 **1142** ***(Invited)* Growth of Self-Ordered Anodic Oxide Nanomaterials By Coupled Ion Migration and Viscous Flow** – P. Mishra and K. Hebert (Iowa State University)

15:20 **1143** **Multiscale Modeling of Multiphase Transport in PEM Water Electrolyzer** – J. Zhou (Lawrence Berkeley national Laboratory), H. Johansen (Lawrence Berkeley National Laboratory - CRD), N. Danilovic (Lawrence Berkeley National Laboratory), I. V. Zenyuk (University of California Irvine), and A. Z. Weber (Lawrence Berkeley National Laboratory)

15:40 **Break**

16:00 **1144** **Numerical Modeling of Anode-Supported Solid Oxide Fuel Cell Using Openfoam** – D. H. Jeon (Dep. of Mechanical System Eng., Dongguk University), S. B. Lee, J. E. Hong, and R. H. Song (Korea Institute of Energy Research (KIER))

16:20 **1145** **Prediction of Electrochemical Characteristics for Yttrium Doped Barium Zirconate Based Solid Oxide Fuel and Electrolyzer Cells Using a Multiscale Framework** – P. Priya, C. Zhang, and N. R. Aluru (University of Illinois at Urbana Champaign)

16:40 **1146** **Water Oxidation and Surface Protonation of Small IrO_x Clusters** – G. Juhasz (Tokyo Institute of Technology)

17:00 **1147** ***(Invited)* Intermediate Transport on Flexible Cascade Surfaces with Electrostatic Channeling** – Y. Liu and S. Calabrese Barton (Michigan State University)

Lone Star B/C, Dallas Sheraton Convention Center

F04 Poster Session – 18:00 – 20:00

- **1148** **Deep Learning for Defects Analysis and Atomic-resolution Imaging of Battery Materials** – M. Ragone (University of Illinois at Chicago)
- **1149** **Open-Circuit Voltage Anomalies in Yttria-Stabilized Zirconia and Samaria-Doped Ceria Bilayered Electrolytes** – T. Miyashita (Miyashita Clinic)
- **1150** **Combined Simulative and Experimental Multi-Scale Approach to Study the Microstructural Evolution of a Ni-Based SOFC Anode Under Operating Conditions** – A. Marusczyk (Robert Bosch GmbH), P. Haremski (Karlsruhe Institute of Technology, Robert Bosch GmbH), P. W. Hoffrogge (Hochschule Karlsruhe), D. Schneider (Karlsruhe Institute of Technology, Hochschule Karlsruhe), B. Nestler (Hochschule Karlsruhe, Karlsruhe Institute of Technology), M. Wieler, and P. Lupetin (Robert Bosch GmbH)
- **1151** **Sensitivity Analysis Based on Monte Carlo Simulations of a 1D Accelerated Mechanistic Model of a Proton Exchange Membrane Fuel Cell** – V. Kannan (National University of Singapore, Cambridge CARES), A. C. Fisher (University of Cambridge, Cambridge CARES), and E. K. Birgersson (National University of Singapore, Cambridge CARES)

G01 Silicon Compatible Emerging Materials, Processes, and Technologies for Advanced CMOS and Post-CMOS Applications 9

Electronics and Photonics / Dielectric Science and Technology
City View 2, Dallas Sheraton Hotel

2D Materials, Devices and Integration – 08:30 – 10:50
Chair(s): Stefan De Gendt and Kuniyuki Kakushima

08:30 **1190** ***(Invited)* 2D Materials: Crystal Growth for Future Device Structures** – L. Colombo (University of Texas at Dallas)

09:10 **1191** ***(Invited)* 2D Materials for Nanoelectronics: Prospects and Materials Integration Challenges** – R. M. Wallace (University of Texas at Dallas)

09:50 **Break**

10:10 **1192** ***(Invited)* Two-Dimensional Materials for Electronic Devices: Transition-Metal Dichalcogenides and Topological Insulators** – W. Vandenberghe, A. Laturia, S. Tiwari (University of Texas at Dallas), B. Sorée (imec, KU Leuven), and M. Van de Put (University of Texas at Dallas)

MOL/BEOL Material and Process Technology – 10:50 – 12:10
Chair(s): Durgamadhab Misra and Yaw S. Obeng

10:50 **1193** **Etch Damage Reduction of Ultra Low-k Dielectric By Using Pulsed Plasmas** – J. K. Jang (Advanced Materials Sci. and Eng., SungKyunKwan Univ,, Foundry Division, Samsung Electronics), H. W. Tak, K. C. Yang, Y. J. Shin, and G. Y. Yeom (Advanced Materials Sci. and Eng., SungKyunKwan Univ,)

11:10 **1194** **Capping Layer Effect on Lifetime of Plasma Etched Copper Lines** – M. Li, J. Q. Su, and Y. Kuo (Texas A&M University)

11:30 **1195** **Void-Free Copper Electrodeposition in Full Wafer Thickness through-Silicon Vias with 10:1 Aspect Ratios** – R. P. Schmitt, L. A. Menk, E. D. Baca, and A. E. Hollowell (Sandia National Laboratories)

11:50 **1196** **Nondestructive Methods for Characterizing Copper Electrofilled through *Silicon Vias*** – E. D. Baca (Sandia National Laboratories), G. Taggart, J. Romero (Sandia National Labs), R. P. Schmitt, L. A. Menk, and A. E. Hollowell (Sandia National Laboratories)

Technologies for Advanced Integrated Circuits 2 – 14:30 – 16:40
Chair(s): Kuniyuki Kakushima and Durgamadhab Misra

14:30 **1197** ***(Invited)* Cavity-Free Micro Thermoelectric Energy Harvester with Si Nanowires** – T. Watanabe, M. Tomita, T. Zhan, K. Shima, Y. Himeda, R. Yamato (Waseda University), T. Matsukawa (National Institute of AIST), and T. Matsuki (National Institute of AIST, Waseda University)

15:10 **1198** **Charge Pumping in Ultrathin SOI Tunnel FETs: Impact of Back-Gate Voltage** – C. Diaz Llorente (CEA-LETI, MINATEC Campus), C. G. Theodorou (IMEP-LAHC, INP MINATEC), J. P. Colinge (CEA-LETI, MINATEC Campus), S. Cristoloveanu (IMEP-LAHC, INP MINATEC), S. Martinie, C. Le Royer (CEA-LETI, MINATEC Campus), G. Ghibaudo (IMEP-LAHC, INP MINATEC), and M. Vinet (CEA-LETI, MINATEC Campus)

15:30 **Break**

16:00 **1199** **Roles of Inner and Outer Fringe and Asymmetric Coupling Effect in Concentric Double-MIS(p) Tunneling Diodes** – Y. H. Chen and J. G. Hwu (National Taiwan University)

16:20 **1200** **Effect of Silver Nanoparticles on the Electrical Characteristics of Oxide/Semiconductor Heterojunctions** – A. Rezk, Y. Abbas, I. Saadat, A. Nayfeh, and M. Rezeq (Khalifa University)

G02 Processes at the Semiconductor Solution Interface 8

Electronics and Photonics / Dielectric Science and Technology / Electrodeposition / Physical and Analytical Electrochemistry
City View 3, Dallas Sheraton Hotel

Processes at the Semiconductor Solution Interface - Session 4 – 08:20 – 09:40
Chair(s): Philippe M. Vereecken and Robert P. Lynch

08:20 **1219** ***(Invited)* Atomic-Scale Investigations of TiO_2 surfaces in Ambient and Solution Environments** – M. A. Hines (Cornell University)

09:00 **1220** **Chemical and Electrochemical Regeneration of InP after GD-OES/XPS Profiling Experiments** – S. Bechu, D. Badroudine (Institut Photovoltaique d'Ile de France, Institut Lavoisier de Versailles UMR8180 CNRS-UVSQ), A. Loubat (Institut Lavoisier de Versailles UMR8180 CNRS-UVSQ), C. Eypert, S. Gaiaschi (Horiba Jobin Yvon S.A.S.), D. Aureau, M. Frégnaux, J. Vigneron, A. M. Gonçalves, N. Simon (Institut Lavoisier de Versailles UMR8180 CNRS-UVSQ), P. Chapon (Horiba Jobin Yvon S.A.S.), M. Bouttemy, and A. Etcheberry (Institut Lavoisier de Versailles UMR8180 CNRS-UVSQ)

09:20 **1221** **Study of Se and Ge Solutions at Different Phs to Form Gese Via E-ALD** – P. Howell and J. L. Stickney (University of Georgia)

Processes at the Semiconductor Solution Interface - Session 5 – 10:00 – 12:40
Chair(s): Colm O'Dwyer

10:00 **1222** ***(Invited)* Analysis of Charge Transfer Reactions with Semiconductor Ultramicroelectrodes** – S. Maldonado (University of Michigan)

10:40 **1223** **Emergent Growth of Semiconductor Nanopatterns Via Directed Illumination** – M. C. Meier, A. I. Carim, S. Yalamanchili, J. R. Thompson, H. A. Atwater, and N. S. Lewis (California Institute of Technology)

11:00 **1224** **Modification of the Electrochemical Behavior of InP Electrodes Induced By Ionic Bombardment: The Case of the Response of the Ce^{4+}/Ce^{3+} Couple** – D. Aureau, J. Vigneron, M. Bouttemy, M. Frégnaux, N. Simon, A. Etcheberry, and A. M. Gonçalves (Institut Lavoisier de Versailles UMR8180 CNRS-UVSQ)

11:20 **1225** ***(Invited)* Ordered Mesoporous Metal Oxide Thin Films: From Room Temperature Ferroelectrics to Tunable Magnetic Materials** – T. Brezesinski (Institute of Nanotechnology, Karlsruhe Institute of Technology)

12:00 **1226** ***(Invited)* Electron Dynamics at the $CuWO_4$/Electrocatalyst Interface for Photoelectrochemical Water Oxidation** – T. Hamann (Michigan State University)

Processes at the Semiconductor Solution Interface - Session 6 – 14:00 – 16:20
Chair(s): Andrew Campion Hillier and Robert P. Lynch

14:00 **1227** ***(Invited)* Wet-Chemical Etching of III-V Semiconductors: Towards Atomic-Layer-Scale Processing** – D. H. van Dorp (imec, Belgium), S. Arnauts (Imec), J. Kelly (University Utrecht), and F. Holsteyns (imec)

14:40 **1228** **SiN_x Deposition at Low Temperature Using UV-Irradiated NH_3** – Y. Shiba, A. Teramoto, T. Suwa (Tohoku University), K. Ishii, A. Shimizu, K. Umezawa (Tokyo Electron Technology Solutions Ltd.), R. Kuroda, and S. Sugawa (Tohoku University)

15:00 **1229** ***(Invited)* Time Resolved Spectroscopy of Charge Carriers in TiO_2 Anatase and Rutile Single Crystals. Effect of Oxygen Defects and Electrons/Holes Scavengers** – K. Katsiev and H. Idriss (Catalysis Department, SABIC)

15:40 **1230** **Nanoscale Wet Chemical Engineering of III-V Quantum Dots for Emerging Solar Applications** – M. Bouttemy, D. Aureau, M. Frégnaux (Institut Lavoisier de Versailles UMR8180 CNRS-UVSQ), Y. Shoji, Z. Jehl (RCAST, The University of Tokyo, Tokyo 153-8904, Japan), D. Suchet (Ecole Polytechnique , IPVF UMR 9006, Palaiseau, France.), J. F. Guillemoles (CNRS , IPVF UMR 9006, Palaiseau, France), A. Etcheberry (Institut Lavoisier de Versailles UMR8180 CNRS-UVSQ), and Y. Okada (RCAST, The University of Tokyo, Tokyo 153-8904, Japan)

16:00 **1231** **Study of Electrodeposited High Entropy Single Element (HESE) Cu for Cu-Cu Direct Bonding** – C. Lee (Hanyang university), Y. Kim (Hanyang University), R. Kim (Hanyang university), J. Lee (Hanyang University), J. Kim (hanyang university), and B. Yoo (Hanyang university)

G03 Organic Semiconductor Materials, Devices, and Processing 7

Electronics and Photonics

City View 4, Dallas Sheraton Hotel

Processing Technologies – 08:30 – 10:00
Chair(s): Alexander Kloes

08:30 **1245** ***(Invited)*** **Design and Fabrication of Organic Thin Film Transistors Using Solution-Processable Liquid Crystalline Phthalocyanine Derivatives** – A. K. Ray (Brunel University London)

09:00 **1246** ***(Invited)*** **A Simple and Efficient Solution-Based Technique to Electrically Dope Organic Semiconductors** – F. A. Larrain, C. Fuentes-Hernandez, W. F. Chou, V. A. Rodriguez-Toro, and B. Kippelen (Georgia Institute of Technology)

09:30 **1247** ***(Invited)*** **Laser Printed Organic Field-Effect Transistors on Paper** – O. D. Jurchescu (Wake Forest University)

Electronic and Biomedical Applications 1 – 10:30 – 12:00
Chair(s): Asim Kumar Ray

10:30 **1248** ***(Invited)*** **Controlling Nanotube-Nanotube Interactions in Carbon Nanotube Networks: Implications for Energy Transport and Harvesting** – A. J. Ferguson and J. L. Blackburn (National Renewable Energy Laboratory)

11:00 **1249** ***(Invited)*** **Device Variations of Artificial Neurons and Implications for Realizing Organic Electronic Neuromorphic Circuits** – L. E. Calvet (Centre de Nanosciences et Nanotechnologies (UMR 9001))

11:30 **1250** ***(Invited)*** **Electrodeposited POLY(3,4-ETHYLENEDIOXYTHIOPHENE) (PEDOT) for Invasive Recording and Stimulating Neural Electrodes** – C. Bodart, N. Rossetti, and F. Cicoira (Polytechnique Montréal)

Electronic and Biomedical Applications 2 – 14:00 – 17:30
Chair(s): Asim Kumar Ray

14:00 **1251** ***(Invited)*** **Polymer Resistive Electronic Memory: Exploiting Bistability of Current-Voltage Characteristics** – J. Pfleger, Y. R. Panthi, D. Rais, and D. Výprachtický (Institute of Macromolecular Chemistry CAS)

14:30 **1235** ***(Invited)*** **Role of Domain Purity in Non-Fullerene Acceptor Based Organic Solar Cells** – S. Mukherjee and D. M. DeLongchamp (National Institute of Standards and Technology)

15:00 **Break**

15:20 **1253** ***(Invited)*** **Printing Transistors Circuits: Interest of Organic Materials and Challenges** – M. Charbonneau, D. Locatelli, S. Lombard, C. Laugier, L. Tournon, K. Romanjek, A. Gaitis, R. Coppard, and C. Serbutoviez (CEA Liten)

15:50 **1254** ***(Invited)*** **Enhancing the Performance of Polymer Thin-Film Transistors** – A. Dodabalapur, X. Wang, and K. Liang (The University of Texas at Austin)

16:20 **1255** ***(Invited)*** **High-Frequency Operation of Vertical Organic Field-Effect Transistors** – H. Kleemann (Technische Universität Dresden, Institut für Angewandte Photophysik)

16:50 **1256** ***(Invited)*** **Recent Developments in Contact-Controlled Transistors** – R. A. Sporea (University of Surrey)

Lone Star B/C, Dallas Sheraton Convention Center

G03 Poster Session – 18:00 – 20:00

- **1257** **Trap-Free Charge Transport Approaches in Polymer Thin Film Transistors** – C. M. McCulley and A. Dodabalapur (The University of Texas at Austin)
- **1258** **Transient Response and Charge Transport in Organic and Polymer Thin-Film Transistors** – O. Krutko and A. Dodabalapur (The University of Texas at Austin)
- **1259** **Effects of Doping States of Polyaniline Thin Films on Their Photo-Responsive Properties** – J. Choi (Sahmyook University)

H01 Wide Bandgap Semiconductor Materials and Devices 20

Electronics and Photonics

Austin Ballroom 1, Dallas Sheraton Hotel

II-VI and III-V Epitaxy and Process – 09:00 – 11:40
Chair(s): Vidhya Chakrapani and Erica A. Douglas

09:00 **1290** ***(Invited)*** **Phonon Heat Transport Processes and Thermal Conductivity of II-Oxide and III-V Superlattices: Wave-like Coherent Transport in CaTiO3/SrTiO3 Superlattices and Ballistic-Diffusive Transport in GaAs/Alas Superlattices** – P. Hopkins (University of Virginia, Charlottesville)

09:30 **1291** **Effect of Proton Irradiation on Breakdown Field of Hexagonal Boron Nitride** – D. Lee, H. Park, J. Bae, and J. Kim (Korea University)

09:50 **1292** **Remote Epitaxy of ZnO Microrods on Graphene-Coated Substrates** – J. Jeong, S. Hong, and Y. J. Hong (Sejong University)

10:10 **Break**

10:30 **1293** ***(Invited)*** **Enabling 5nm and Beyond Device Fabrication with New Etch Technologies** – A. Ranjan (TEL Technology Center, America LLC) and P. Ventzek (Tokyo Electron America Inc.)

11:00 **1294** **Minority Carrier Lifetime Extraction Methodology of SiC Epitaxial Layer** – K. Sasaki, J. Song, T. Hoshii, H. Wakabayashi, K. Tsutsui (Tokyo Institute of Technology), I. Mizushima, T. Yoda (NuFlare Technology, Inc., Tokyo Institute of Technology), and K. Kakushima (Tokyo Institute of Technology)

11:20 **1295** **Stability and Electronic Properties of Silicon-Rich Silicon Carbide Structures** – N. D. Alkhaldi, S. K. Barman (The University of Texas at Arlington), and M. N. Huda (University of Texas at Arlington,)

H02 Solid-state Electronics and Photonics in Biology and Medicine 6

Electronics and Photonics / Sensor

Austin Ballroom 2, Dallas Sheraton Hotel

Emerging Sensing and Diagnostic Systems 1 – 08:00 – 12:10
Chair(s): Yu-Cheng Chen and Do Hwan Kim

08:00 **1334** ***(Invited)*** **nanopore-Nanoelectrode Multifunctional Nanopipette for Single Entity and Single Cell Analysis and Imaging** – J. He (Florida International University)

08:30 **1335** ***(Invited)*** **Cell-Devices Interface: From Single Cell to 3D Tissue Analysis** – C. Z. Li (Florida International University)

09:00 **1336** ***(Invited)*** **optically Controlled Nanowired Biointerfaces** – B. Tian (the University of Chicago)

09:30 **Break**

09:40 **1337** ***(Invited)*** **Nanoporous Titaninum Nitride Electrodes for Neural Probes** – M. M. C. Cheng (Wayne State University)

10:10 **1338** ***(Invited)*** **Optical Detection of Streptavidin-Biotin Binding on Nanoporous Anodic Alumina Pore Surface** – L. Pol, J. Ferré-Borrull, E. Xifré-Pérez, J. Pallares, and L. F. Marsal (Universitat Rovira i Virgili)

10:40 **1339** ***(Invited)*** **Surface Plasmon Resonance-Based Biosensing and Precision Medicine** – N. Wu (West Virginia University)

11:10 **1340** **An in-Situ Impedance-Based Whole Blood Anticoagulation Diagnosis Technology** – Y. C. Huang, J. S. Jheng (Graduate Institute of Electronics Engineering, National Taiwan University), K. H. Chiang (Grad. Inst. of Biomedical Electronics and Bioinformatics, National Taiwan University), and C. T. Lin (National Taiwan University, Grad. Inst. of Biomedical Electronics & Bioinformatics)

11:30 **1341** **Highly Sensitive Solid-Liquid Interfacing Triboelectric Nanosensor for Self-Powered Mercury Ion Detection** – S. W. Chen, Y. J. Lin, and Z. H. Lin (National Tsing Hua University)

11:50 **1342** **An Ion-Sensitive Field-Effect Transistor with Three-Dimensional Extended-Gate Architecture** – N. Y. Teng (Graduate Institute of Electronics Engineering, National Taiwan University), G. Y. Chen (Grad. Inst. of Biomedical Electronics & Bioinformatics, National Taiwan University), R. X. Wang, and C. T. Lin (Graduate Institute of Electronics Engineering, National Taiwan University)

Emerging Sensing and Diagnostic Systems 2 – 13:30 – 18:00
Chair(s): Chih-Ting Lin and Jin He

13:30 **1343** ***(Invited)*** **visco-Poroelastic & Iontronic Pump: New Strategy for Ultrasensitive Artificial Skin Sensors** – D. H. Kim (Hanyang University)

14:00 **1344** ***(Invited)*** **Design Integrated Microfluidic Chips for *in Vitro* Diagnosis** – B. R. Li (National Chiao Tung University)

14:30 **1345** ***(Invited)*** **Optically Innervated Surgical Sensing for Situation-Aware Surgeries** – H. Ren (e52242728)

15:00 **1346** ***(Invited)*** **Bio-Lasers: An Emerging Field Bridging Laser Photonics and Biomedicine** – Y. C. Chen (Nanyang Technological University, Singapore)

15:30 **Break**

15:50 **1347** ***(Invited)*** **Flexible Nanogenerators for Energy Harvesting and Self-Powered Biomedical Devices** – Y. Xie (Nanjing University of Posts and Telecommunications)

16:20 **1348** **High Efficient Bi_2Te_3 Thermalcatalyst for Environmental Disinfection** – S. W. Chan, Y. J. Lin, and Z. H. Lin (National Tsing Hua University)

16:40 **1349** **Adaptation of SERS-Active Materials to Analysis of Certain Molecules By Electroless Corrosive Deposition of Coinage Metals on Silicon Nanostructures** – N. Khinevich, S. Zavatski, and H. Bandarenka (BSUIR)

17:00 **1350** **Formation of Platinum Nanocrystals on Silicon Nanotubes and I*n Vitro* Anti-Cancer Activity of the Composites** – N. T. Le (Texas Chrisitian University), G. R. Akkaraju, and J. L. Coffer (Texas Christian University)

17:20 **1351** **Improvement in Sensitivity of InN Resitive Gas Sensor By Thickness Modulation for Liver Malfunction Application** – A. Agarwal, S. Kumar Rai, K. Avinash, and J. A. Yeh (National Tsing Hua University)

17:40 **1352** **Ultrafast InAs Quantum Dot Scintillation Detector** – K. Dropiewski, A. Minns, M. Yakimov, V. Tokranov (SUNY Polytechnic Institute), P. Murat (Fermi National Accelerator Laboratory), and S. Oktyabrsky (SUNY Polytechnic Institute)

H03 Wearable and Flexible Electronic and Photonic Technologies 2

Electronics and Photonics / Dielectric Science and Technology / Physical and Analytical Electrochemistry / Sensor / Interdisciplinary Science and Technology Subcommittee
Austin Ballroom 3, Dallas Sheraton Hotel

Wearable and Flexible Electronic and Photonic Technologies - Session 4 – 08:10 – 09:30
Chair(s): Colm O'Dwyer

08:10 **1367** ***(Invited)*** **Two-Dimensional Material Derived Supercapacitor Yarns As Weaveable Energy-Storage Units** – W. Gao (North Carolina State University)

08:50 **1368** ***(Invited)*** **Silicon Nanomembrane-Based Flexible Photodetector and Sensors** – G. Li, Q. Guo, E. Song, G. Huang, and Y. Mei (Fudan University)

Wearable and Flexible Electronic and Photonic Technologies - Session 5 – 10:00 – 12:20
Chair(s): Wei Gao and Durgamadhab Misra

10:00 **1369** **Flexible, Stretchable and Healable Electronics** – F. Cicoira (Polytechnique Montréal)

10:40 **1370** ***(Invited)*** **Molecular Sensors for Human Performance Monitoring and Protection** – M. Brothers (711th Human Performance Wing, AFRL), D. Sim (Air Force Research Laboratory, National Research Council Research Associate Program), A. Islam, J. Slocik (Air Force Research Laboratory, UES Inc), B. Maruyama, M. Rubenstein, R. Naik, and S. Kim (Air Force Research Laboratory)

11:20 **1371** **Solar Powered Monitoring System Development for Smart Farming and Internet of Thing Applications** – W. Y. Chung, R. H. Luo, C. L. Chen, S. Heythem, C. F. Chang, and C. C. Po (Chung-Yuan Christian University)

11:40 **1372** **When Stretchable Sensing Meet Flexible Robotics** – H. Ren (National University of Singapore)

12:00 **1373** **High Efficiency Multi-Level Flexible Triboelectric Nanogenerator for Wearable Electronics** – A. Ravichandran, M. Ramuz, and S. Blayac (EMSE-CMP)

Wearable and Flexible Electronic and Photonic Technologies - Session 6 – 14:00 – 17:20
Chair(s): Colm O'Dwyer

14:00 **1374** ***(Invited)*** **Point-of-Use Flexible Sensors for Health and Environmental Applications: Assessment of Motor Skills and Chemical Exposure** – M. Amit (University of California San Diego), R. Mishra (UC San Diego), J. Wang, and T. N. Ng (University of California San Diego)

14:40 **1375** ***(Invited)*** **Hybridized Electronics for Wearable Healthcare: From the Skin to below the Skin** – S. Xu (University of California, San Diego)

15:20 **1376** ***(Invited)*** **Stretchable Conductive Nanocomposite for Soft Bioelectronics** – D. H. Kim (Seoul National University)

16:00 **1377** ***(Invited)*** **Characterization of Mxene/ Graphene Supercapacitor Yarns Using Time and Frequency Models** – J. Mainka (LEMTA, CNRS, Université de Lorraine), W. Gao, N. He (North Carolina State University), A. Caillon, Q. Liu, S. Thénaux-Vignon (LEMTA, CNRS, Université de Lorraine, École Nationale Supérieure des Mines Nancy ENSMN), J. Dillet, and O. Lottin (LEMTA, CNRS, Université de Lorraine)

16:40 **1378** ***(Invited)*** **Multifunctional Mxene-Based Fibres** – J. Razal (Deakin University)

I01 Hydrogen or Oxygen Evolution Catalysis for Water Electrolysis 5

Energy Technology / Industrial Electrochemistry and Electrochemical Engineering / Physical and Analytical Electrochemistry
State Room 2, Dallas Sheraton Convention Center

PEM Electrolysis 1 – 08:00 – 12:20
Chair(s): Marcelo Carmo, Feng-Yuan Zhang and Peter N. Pintauro

08:00 **Welcoming Remarks**

08:05 **1427** ***(Invited)*** **Degradation Aspects of Electrocatalysts and Materials in PEM Water Electrolyzers** – M. Carmo (Forschungszentrum Juelich GmbH)

08:35 **1428** **Influence of A-Site Cations on Performance of $A_2Ir_2O_7$ Pyrochlore Oxygen Evolution Catalysts in Acidic Condition** – M. A. Hubert, L. A. King, A. M. Patel (Stanford University), M. Bajdich (SLAC National Accelerator Laboratory), and T. F. Jaramillo (Stanford University, SLAC National Accelerator Laboratory)

08:55 **1429** **Structure-Activity Data Mining for Hydrogen Evolution Reaction at Organic Molecular Electrocatalysts** – X. Yin, E. F. Holby, and P. Zelenay (Los Alamos National Laboratory)

09:15 **1430** **Highly Ordered 1-D IrO_2 Electrode Synthesized with Titanium Oxide Nanotube Array for OER** – C. Yan (Guangzhou Institute of Energy Conversion), Z. Lu, Y. Shi (Guangzhou Institute of Energy Conversion, CAS), Z. Wang (Guangzhou Institute of Energy Conversion), C. Guo, and H. Tan (Guangzhou Institute of Energy Conversion, CAS)

09:35 **Break**

09:50 **1431** ***(Invited)*** **Developing Thin and Tunable Catalyst –Coated Liquid/Gas Diffusion Layers with Ultralow Catalyst Loadings** – F. Y. Zhang (UT Space Institute, University of Tennessee, Knoxville)

10:20 **1432** **Synthesis and Evaluation of Novel Iridium Ruthenium Oxide Catalysts Supported on Reduced Graphene Oxide for Oxygen Evolution Reaction** – M. Hara, P. Joshi, H. H. Huang, and M. Yoshimura (Toyota Technological Institute)

10:40 **1433** **TiO_2-MoO_x-Supported Iridium As Electrocatalysts for the Oxygen Evolution Reaction in PEM Based Electrolysis** – E. J. Kim (Korea Advanced Institute of Science and Technology), J. Shin (University of California, San Diego), and E. Cho (KAIST)

11:00 **1434** **Ultra-Low Noble Metal Containing One-Dimensional Nanorods: High Performance Oer Electrocatalyst for Acid Mediated PEM Based Water Electrolysis** – S. D. Ghadge (Dept. of Chemical Engineering, University of Pittsburgh), O. I. Velikokhatnyi, M. K. Datta, and P. N. Kumta (University of Pittsburgh)

11:20 **1435** **Electroless Deposited IrO_x Nanoparticles for Ni Foam Functionalization with Low Iridium Loading** – R. G. Milazzo (CNR IMM), S. M. S. Privitera, S. Scalese (CNR-IMM), F. Monforte (CNR-IMM, Università di Catania), G. G. Condorelli (Università di Catania), and S. Lombardo (CNR-IMM)

11:40 **1436** **Highly Efficient Hydrogen Evolution of Platinum Via Tuning Interfacial Dissolved-Gas Concentration** – L. Luo, X. Zhao, and R. Ranaweera (Wayne State University)

12:00 **1437** **Highly Conductive Catalyst with Advanced Manufacturing for Efficient Oxygen Evolution Reaction** – G. Yang (University of Tennessee Space Institute), S. Yu, Y. Li (UT), Z. Kang (NREL), G. Bender, B. S. Pivovar (National Renewable Energy Laboratory), J. Green (NREL), D. A. Cullen (Oak Ridge National Laboratory), and F. Y. Zhang (UT Space Institute, University of Tennessee, Knoxville)

PEM Electrolysis 2 – 13:45 – 17:40
Chair(s): Yu Huang, Di-Jia Liu and Sanjeev Mukerjee

13:45 **Introductory Remarks**

13:50 **1438** ***(Invited)* Surface Engineered Ptm-O Alloy for High Hydrogen Evolution Reaction Rate at Low Overpotential** – Y. Huang (University of California, Los Angeles)

14:20 **1439** **Optimization By Experimental Design of the Synthesis of $Ru_xIr_{1-X}O_2$ Electrocatalysts for the Oxygen Evolution Reaction in a PEM-URFC** – C. Lamy (Institut Européen des Membranes, CNRS, Univ Montpellier), B. Guenot (IEM/CNRS), T. Audichon (CEA), S. Baranton, and C. Coutanceau (Université de Poitiers, IC2MP, UMR CNRS 7285)

14:40 **1440** **Investigation of New Pt Alloy Catalyst with Rare Earth Elements for Hydrogen Evolution Reaction** – C. K. Baik, S. W. Lee (Gwangju Institute of Science and Technology), M. S. Kim, G. S. Chai (Radiation Technology eXcellence (RTX)), and C. Pak (Gwangju Institute of Science and Technology)

15:00 **1441** **Iridium and Iridium Oxide Performance in Electrolysis and Resolving Half- and Single-Cell Test Differences** – S. M. Alia, M. A. Ha, G. C. Anderson (National Renewable Energy Laboratory), C. Ngo, S. Pylypenko (Colorado School of Mines), and R. E. Larsen (National Renewable Energy Laboratory)

15:20 **1442** **Iridium-Based Catalysts for Acidic Water Splitting: Oxygen Evolution and Dissolution Mechanisms** – S. Cherevko (Forschungszentrum Jülich GmbH), K. Mayrhofer (Helmholtz-Institute Erlangen-Nürnberg), O. Kasian, and S. Geiger (Max-Planck-Institut für Eisenforschung GmbH)

15:40 **Break**

15:50 **1443** ***(Invited)* PGM-Free Oer Catalysts for PEM Electrolyzer Application** – L. Chong, H. Wang (Argonne National Lab), and D. J. Liu (Argonne National Laboratory)

16:20 **1444** **Mechanistic Investigation with Kinetic Parameters on Water Oxidationcatalyzed By Manganese Oxide Nanoparticle Film** – H. Seo, K. Jin, S. Park, K. H. Cho, K. G. Lee (Seoul National University), Đ. T. Nguyen, J. S. Lee (Chonnam National University), and K. T. Nam (Seoul National University)

16:40 **1445** **Direct Visualization of Ultra-Fast and Micro-Scale Bubble Evolutions and Electrochemical Reactions in Proton Exchange Membrane Electrolyzer Cells** – Y. Li, S. Yu, G. Yang (University of Tennessee Space Institute), D. A. Talley (University of Tennessee), and F. Y. Zhang (UT Space Institute, University of Tennessee, Knoxville)

17:00 **1446** **Graphene-Dot Wrapped PtMo Nanosponge As a Highly Efficient Electrocatalyst for Hydrogen Evolution Reactions in Both Acidic and Alkaline Media** – V. T. Nguyen, N. A. Nguyen, Y. Ali, and H. S. Choi (Chungnam National University)

17:20 **1447** **Ir/TiC/Pt Vs. Pt-Ir/TiC in Role of Magnetron Sputtered Thin-Film Catalyst for Anode of PEM Reversible Fuel Cell** – P. Kúš, A. Ostroverkh (Charles University), I. Khalakhan (Charles Univeristy), R. Fiala (Central European Research Infrastructure Consortium, Charles University), Y. Kosto, B. Šmíd, Y. Lobko, Y. Yakovlev, J. Nováková, I. Matolínová, and V. Matolín (Charles University)

Lone Star B/C, Dallas Sheraton Convention Center

I01 Poster Session – 18:00 – 20:00
Chair(s): Nemanja Danilovic and Hui Xu

- **1448** **MoS_2/NiS_2 Composites for Efficient Hydrogen Evolution Both in Acidic and Alkaline Media** – J. Hu and C. Zhang (Kunming University of Science and Technology)
- **1449** **A Highly Active and Stable Electrocatalyst Based on Nicos Nano-Flower Structure for Hydrogen Evolution Reaction** – Y. Ali, V. T. Nguyen, N. A. Nguyen, and H. S. Choi (Chungnam National University)
- **1450** **Plasma-Treated Niau Nanosponge As an Efficient Electrocatalyst for Hydrogen Evolution Reaction** – N. A. Nguyen, V. T. Nguyen, Y. Ali, and H. S. Choi (Chungnam National University)
- **1451** **Surface Ligand Effects on Ni-Fe-Based Nanocatalysts for Oxygen Evolution Reaction** – R. Manso, P. Acharya, L. F. Greenlee, and J. Chen (University of Arkansas)

- **1452** **Development of Supported Iridium Oxides As the Low Noble Metal Loading Anode for PEM Water Electrolyser** – Y. Shi, Z. Lu, H. Tan, C. Guo (Guangzhou Institute of Energy Conversion, CAS), Z. Wang, and C. Yan (Guangzhou Institute of Energy Conversion)
- **1453** **Preparation of Sb-Doped SnO_2 Nanoparticle with High Surface Area for Use As a Stable Anode Catalyst Support for PEM Electrolyzers.** – X. Zhou (Tongji Universtity School of Automotive Studies), B. Li (School of Automotive Studies), D. Yang (Clean Energy Automotive Engineering Center), H. Lv, and C. Zhang (School of Automotive Studies)
- **1454** **Bifunctional Transition Metal Oxide-Based Oxygen Electrode Catalysts for Unitized Reversible Fuel Cells** – S. R. Choi, S. Lee, and J. Y. Park (Sejong University)
- **1455** **Study the Activity of a Novel Ni-Based Electrocatalyst for Oxygen Evolution Reaction in Alkaline Media** – R. Ghahremani and J. A. Staser (Ohio University)
- **1456** **3D Micro Porous Cobalt−Iron−Phosphorus Electrocatalyst for Overall Water Splitting** – H. Kim (KAIST), S. Oh (Korea Advanced Institute of Science and Technology), E. Cho (KAIST), and H. Kwon (Korea Advanced Institute of Science and Technology)
- **1457** **One-Step Electrodeposition Synthesized High Performance Quarternary Ni-Co-S-P for Efficient Water-Splitting** – Y. Tian, J. Yu, Z. Lin, and J. Wang (Harbin Engineering University)
- **1458** **Composite of Nickel Oxide Hexagonal Sheet Supported on Carbon Nitride for Photo-Electrochemical Water Splitting** – P. Chaudhary and P. P. Ingole (Indian Institute of Technology Delhi)
- **1459** **Three-Dimensional CoS_2-MoS_2 Hetero-Nanosheets Architecture from Polyoxometalate for Highly Efficient Electrocatalytic Hydrogen Evolution** – J. Lei, G. G. Bizuneh, M. Zheng, and Q. Dong (Xiamen University)

I02 Materials for Low Temperature Electrochemical Systems 5

Energy Technology / Physical and Analytical Electrochemistry

Houston Ballroom B, Dallas Sheraton Convention Center

Fuel Cell Performance and Characterization 4 – 08:00 – 12:20
Chair(s): James L. Young and Swami Kumaraguru

08:00 **1532** **Polarization Analysis of Durable Low Loading Pt/C Electrodes Produced By Reactive Spray Deposition Technology for Low Humidity Conditions** – R. J. Ouimet, H. Yu, L. J. Bonville, and R. Maric (University of Connecticut)

08:20 **1533** **Study and Modeling of PEM Fuel Cell Using Electrochemical Impedance Spectroscopy** – V. Konduru (General Motors Company), S. Arisetty (General Motors Company, Global Fuel Cell Activities), and S. Kumaraguru (General Motors Company)

08:40 **1534** **Investigation on the Impact of Carbon Porosity in the Microporous Layer of PEM Fuel Cells** – R. Govindarajan, J. Payoyo, and D. P. Wilkinson (University of British Columbia)

09:00 **1535** **Visualization of Liquid Water in a Metal Foam Flow-Field Based Polymer Electrolyte Fuel Cell Via Neutron Radiography** – Y. WU, D. J. L. Brett (University College London), and P. R. Shearing (Electrochemical Innovation Lab, UCL, London)

09:20 **1536** **Parametric Study of Fabrication Conditions for High-Performance Gas-Diffusion-Electrode-Based Membrane-Electrode Assemblies** – M. Wang, A. C. Yang-Neyerlin, K. C. Neyerlin, J. Pfeilsticker (National Renewable Energy Laboratory), S. Medina (Colorado School of Mines), C. Stetson (National Renewable Energy Laboratory), S. Pylypenko (Colorado School of Mines), M. Ulsh, and S. A. Mauger (National Renewable Energy Laboratory)

09:40 **Break**

10:00 **1537** **Preparation of Platinum Nanostructures Directly Grown on Microporous Layer By an Electrodeposition Technique for a Commercial-Scale PEMFC** – C. H. Chiang, M. Y. Wang, and T. K. Yeh (National Tsing Hua University)

10:20 **1538** **Two-Phase Flow Characterization in PEM Fuel Cells Using Machine Learning** – A. D. Santamaria, M. Mortazavi, V. Chauhan, and J. Benner (Western New England University)

10:40 **1539** **Oxygen Transport Resistance in PEMFC Catalyst Layer Based on Ultra-Micro Electrode (UME) Theory** – Z. Lu, J. Yang, C. Xu, C. Wang, and J. Waldecker (Ford Motor Company)

11:00 **1540** **Electrolyzer Components and Coatings: Methods for *Ex-Situ* Accelerated Stress Testing** – W. Callahan, T. Guerrero, E. Klein, J. C. Vidal, G. Bender, and J. L. Young (National Renewable Energy Laboratory)

11:20 **1541** **PEM Electrolyzer Characterization and Limitations When Using Carbon-Based Hardware and Material Sets** – J. L. Young (National Renewable Energy Laboratory), F. Ganci (National Renewable Energy Laboratory, University of Palermo), S. Madachy (National Renewable Energy Laboratory), S. Fischer, M. Carmo (Forschungszentrum Juelich GmbH), and G. Bender (National Renewable Energy Laboratory)

11:40 **1542** **Impact of Surface Functionalization of Pt/Graphitized Carbon on Catalyst Layer Structure and PEMFC Performance** – A. Z. Taning (Korea Institute of Energy Research (KIER), University of Science and Technology (UST)), S. Woo, S. H. Park (Korea Institute of Energy Research (KIER)), and S. D. Yim (Korea Institute of Energy Research (KIER), University of Science and Technology (UST))

12:00 **1543** **Electrocatalyst Evaluation of 3D Printed Microfluidic Membraneless Glucose Biofuel Cell with Integrated Pencil Graphite Electrodes** – M. Bandapati (Birla Institute of Technology and Science, Pilani), P. Rewatkar (Birla Institute of Science and Technology Pilani), B. Krishnamurthy, and S. Goel (Birla Institute of Technology and Science Pilani)

General Electrocatalysis 5 – 14:00 – 18:00
Chair(s): Raphaël Chattot and Yoshiharu Uchimoto

14:00 **1544** ***(Invited)* Promoting Surface Distortion for Improved Fuel Cell Electrocatalysis** – R. Chattot (CNRS, LEPMI, F-38000 Grenoble, France, ESRF, ID31 Beamline, 38043 Grenoble, France), L. Dubau, and F. Maillard (CNRS, LEPMI, F-38000 Grenoble, France)

14:40 **1545** **Activity and Durability of Organic Ligands Modified Platinum Catalyst for Oxygen Reduction Reaction** – Y. Ikehata (Toyota Motor Corpotration)

15:00 **1546** **Intrinsic Strain Tuning of Electrocatalyst for Oxygen Reduction Reaction** – G. Liu (School of Physics and Electronics, Hunan University), Z. Zeng (School of Chemical Engineering, Purdue University), H. Deng (Hunan University), and J. Greeley (Purdue University)

15:20 **1547** **High-Index Faceted Platinum Nanoflowers Catalysts for Proton Exchange Membrane Fuel Cell** – A. Abdelhafiz (Georgia Institute of Technology) and M. Liu (School of Materials Science and Engineering, Georgia Tech)

15:40 **1548** **Electrocatalytic Activities and Stabilities of Selenium Based Cobalt-Nickel Binary and Ternary Chalcogenides** – J. Liu, J. Zheng, Q. Gong, T. Zhang, and X. Cheng (Xiamen University)

16:00 **1549** **Investigation of Pt-Nb-NbO_x Loaded on TiN As Cost-Effective Electrocatalyst for Polymer Electrolyte Membranes Fuel Cell** – N. F. Daudt (Universidade Federal de Santa Maria), A. Poozhikunnath (Center for Clean Energy Engineering), H. Yu, L. J. Bonville (University of Connecticut), and R. Maric (Center for Clean Energy Engineering)

16:20 **1550** **Electrochemical Synthesis of Cu-Cu_2o Composite Layers and Its Catalytic Properties Towards Ethylene Generation** – K. Mech, M. Bisztyga-Szklarz, and K. Szacilowski (AGH University of Science and Technology)

16:40 **1551** **Effect of the Specific Adsorption of Sulfonate Group in Ionomer and Adsorbed Oxide Species on the Oxygen Reduction Reaction Activity of PEFC Catalyst** – Y. Wang, K. Yamamoto (Kyoto University), T. Uchiyama (Human and Environmental Studies, Kyoto University), N. Takao (Device-functional analysis Department, NISSAN ARC, Ltd.), H. Imai (Device Analysis Department, NISSAN ARC, Ltd.), K. Yokoyama, S. Sugawara (FC-Cubic Technology Research Association), K. Shinohara (Fuel Cell Cutting-edge Research Center (FC-Cubic)), and Y. Uchimoto (Kyoto University)

17:00 **1552** **Vibrating Powders: Eqcm Measurement of Potential Dependent IrO_2 Mass Changes for Voltage Reversal Tolerant PEMFC Anodes** – C. E. Moore (University of British Columbia), F. Afsahi, A. P. Young, S. Knights (Ballard Power Systems), and E. L. Gyenge (University of British Columbia)

17:20 **1553** **Oxygen Reduction Reaction, Catalyst Development** – S. Siahrostami (University of Calgary)

17:40 **1554** **The Interparticle Distance Effect on Transient Platinum Dissolution: Degradation at High and Low Loadings** – D. J. S. Sandbeck (Forschungszentrum Jülich, Friedrich-Alexander-Universität Erlangen-Nürnberg), M. Inaba (University of Copenhagen), J. Bucher, A. Zana (University of Bern), M. Arenz (University of Bern, University of Copenhagen), and S. Cherevko (Forschungszentrum Jülich GmbH)

Lone Star B/C, Dallas Sheraton Convention Center

I02 Poster Session – 18:00 – 20:00

- **1555** **MOF-Derived Alloy Nanoparticles for Highly Durable Fuel Cell Electrocatalysts** – J. M. Yoo, D. Y. Chung, C. Y. Ahn (Seoul National University (SNU), Institute for Basic Science (IBS)), and Y. E. Sung (Institute for Basic Science (IBS), Seoul National University (SNU))
- **1556** **Investigation of Hydrazine Electro-Oxidation on Zinc-Cobalt Coating Modified with Gold Nanoparticles** – D. Šimkūnaitė, A. Zabielaitė, A. Balčiūnaitė, J. Vaičiūnienė, A. Selskis (Center for Physical Sciences and Technology), R. Vaitkus (Center for Physical Sciences and Technology, Vilnius University), L. Tamašauskaitė-Tamašiūnaitė, and E. Norkus (Center for Physical Sciences and Technology)
- **1557** **Hydrogen Oxidation Reaction on Metal@Pt Core-Shell Catalysts in Alkaline Electrolyte** – J. Hu and C. Zhang (Kunming University of Science and Technology)
- **1558** **Application of Platinum Nanoparticles Decorated Needle-Shaped Cobalt for Methanol and Ethanol Oxidation** – E. Norkus, A. Zabielaitė, D. Šimkūnaitė, J. Vaičiūnienė, V. Pakštas, and L. Tamašauskaitė-Tamašiūnaitė (Center for Physical Sciences and Technology)
- **1559** **Development of New Electrocatalytic Nanomaterials for the Oxidation of Ammonia As Anodic Materials in a Direct Ammonia Fuel Cell** – E. Saab, M. Asteazaran, G. Cespedes, and A. M. Castro Luna (Universidad Tecnologica Nacional - UTN-FRLP)
- **1560** **Temperature Effect on Hydrogen Underpotential Deposition for Pt/C** – D. Takimoto, S. Hideshima, and W. Sugimoto (Shinshu University)
- **1561** **Super-Strong Nafion/PVA/Uhmwpe Membranes for Proton and Hydroxide Ion-Exchange Fuel Cells** – J. Li, Q. Zhang, R. Li, and P. Gao (The Hong Kong University of Science and Technology)

- **1562** **The Influence of Catalyst Ink on the Urea Oxidation Reaction Activity Evaluated in a Three-Electrode System** – N. Kakati (University of California Merced) and P. Y. A. Chuang (University of California, Merced)
- **1563** **Effect of NH_3 Etching on Fe-N-C Catalyst for Oxygen Reduction Reaction in Direct Methanol Fuel Cell** – Z. Luo, C. Hou, X. Zhang, Y. Zhang, and X. Liu (Harbin Institute of Technology)
- **1564** **Electrochemical and Ultra-Small Angle X-Ray Scattering Study of Ionomer Adsorption on Catalytic Sites in PEFC Electrodes** – A. A. Farghaly, N. N. Kariuki, J. Park, and D. J. Myers (Argonne National Laboratory)
- **1565** **Fuel Cell Catalysts Encased in 1D and 3D Porous Frameworks** – A. A. Farghaly, N. N. Kariuki, and D. J. Myers (Argonne National Laboratory)
- **1566** **Reduced Graphene Oxide / Polyaniline (rGO/PANI) Composite As Pt Support for Oxygen Reduction Reaction: Effect of PANI Content** – N. M. Sánchez-Padilla, V. Méndez, S. Fernández Tavizón, R. Benavides, and D. Morales-Acosta (Centro de Investigación en Química Aplicada)
- **1567** **Growth and Annealing Properties of Carbon Nanofibers on Carbon Black By Using Chemical Vapour Deposition** – J. D. Kim, T. Nishimura, and H. Nakao (National Institute for Materials Science (NIMS))
- **1568** **Ultra-Stable Imidazolium-Based Anion Exchange Membranes for Alkaline Fuel Cell Applications** – H. Lyu, J. L. Shih, J. P. Melchior, V. D. P. N. Nziko, I. Popovs, R. Custelcean, X. G. Sun, V. Bryantsev, and S. Jansone-Popova (Oak Ridge National Laboratory)

I03 Renewable Fuels via Artificial Photosynthesis or Heterocatalysis 4

Energy Technology / Sensor

I03 Poster Session – 18:00 – 20:00
Chair(s): Heli Wang

- **1641** **Hydrogen PEC Supernode: Emergent Degradation Mechanisms with Integration and Scale up of PEC Devices** – J. L. Young, T. G. Deutsch (National Renewable Energy Laboratory), and N. Danilovic (Lawrence Berkeley National Laboratory)
- **1642** **Electroreduction of CO_2 to High-Value Products Using Selenide Based Electrocatalysts** – A. Saxena (Missouri University of Science & Technology), J. Masud (The University of Kansas), and M. Nath (Missouri University of Science & Technology)
- **1643** **Photoelectrochemical Hydrogen Generation Using a Bis-Chelating Nickel PNP Catalyst Tethered to Band-Edge Modified Si(111)|TiO2** – J. M. Gurrentz, D. G. Boucher, and M. J. Rose (University of Texas at Austin)
- **1644** **Photoreactions with CO/CO_2 Promoted By Hot Electrons in Plasmonic Metastructures** – L. Chang, W. Wang, Z. Wang, and A. Govorov (Institute of Fundamental and Frontier Science)
- **1645** **Fabrication of Photocatalytic Active Zinc Oxide Thin Films By Atomic Layer Deposition** – G. D. Han, J. S. Park, H. J. Choi, and J. H. Shim (Korea University)
- **1646** **SnO_x Nanosheets Anchored on Mwcnts Modified with Different Functional Groups for Selective Electrochemical Reduction of CO_2 to C1 Products** – Q. Zhang and J. Qiao (Donghua University)
- **1647** **Electrochemical Production of Formic Acid / Formate By CO_2 Electrolysis Using High Performance Gas Diffusion Electrodes** – A. Löwe (University of Stuttgart), D. Kopljar, F. Bienen (German Aerospace Center), N. Wagner (German Aerospace Center, DLR), and E. Klemm (University of Stuttgart)
- **1648** **Rapid One-Pot Synthesis of *A*- and *B*-$Cu_2V_2O_7$ and Their Use in Photoelectrochemical Water Splitting** – M. K. Hossain (The University of Texas) and K. Rajeshwar (University of Texas)

I05 Heterogeneous Functional Materials for Energy Conversion and Storage 2

High-Temperature Energy, Materials, & Processes / Battery / Energy Technology / Physical and Analytical Electrochemistry
State Room 4, Dallas Sheraton Convention Center

Polymer Electrolyte Membrane Fuel Cells 1 - Membrane Properties – 08:00 – 09:40
Chair(s): Wilson K. S. Chiu and Thomas F. Fuller

08:00 **1730** ***(Invited)* Role of Imaging in Modeling of Cathode Catalyst Layers in Proton Exchange Membrane Fuel Cells** – T. F. Fuller (School of Chemical & Biomolecular Engineering)

08:40 **1731** ***(Invited)* Optimizing the Structure and Composition of PFSA/PVDF Fuel Cell Membranes** – P. N. Pintauro, R. Wycisk, and D. Powers (Vanderbilt University)

09:20 **1732** **Electrochemical Characterization of Ion Exchange Composite Membrane with Various Ion Exchange Group Moieties** – T. Y. Son (Gyeongsang National University in Korea), T. H. Ko, K. H. Kim, and S. Y. Nam (Gyeongsang National University)

Polymer Electrolyte Membrane Fuel Cells 2 - Anion Exchange Membranes and Catalysts – 10:00 – 12:40
Chair(s): John R. Varcoe and Paul A Kohl

10:00 **1733** ***(Invited)* High Conductivity, Stable Anion Conducting Membranes Based on Poly(norbornene)** – P. A. Kohl, G. Huang, and M. Mandal (Georgia Institute of Technology)

10:40 **1734** ***(Invited)*** **Low Ionic Resistance Radiation-Grafted Cation- and Anion-Exchange Membranes for Reverse Electrodialysis (salinity gradient power) Application: Cross-Linking Is Essential for High Permselectivities.** – T. Willson, R. Bance-Soualhi (University of Surrey), I. Hamerton (University of Bristol), and J. R. Varcoe (University of Surrey)

11:20 **1735** ***(Invited)*** **Development of High Performance Non-PGM Electrocatalysts and Electrodes for the Oxygen Reduction Reaction in Aemfcs** – X. Peng (University of South Carolina), V. Kashyap (National Chemical Lab, Pune, India), S. Kurungot (National Chemical Laboratory), and W. E. Mustain (University of South Carolina)

12:00 **1736** **An Investigation into the Self-Purging Mechanism of Anion Exchange Membrane Fuel Cells Exposed to Carbon Dioxide** – J. A. Wrubel, A. A. Peracchio, B. N. Cassenti (University of Connecticut), K. N. Grew (U.S. Army Research Laboratory), and W. K. S. Chiu (University of Connecticut)

12:20 **1737** **Biodegradable Self-Powered Electronics** – Z. Li (Beijing Institute of Nanoenergy and Nanosystems,CAS)

Polymer Electrolyte Membrane Fuel Cells 3 - Heterogeneous Catalysts and Gas Diffusion Layers – 13:20 – 15:40
Chair(s): Ahmet Kusoglu and Vito Di Noto

13:20 **1738** ***(Invited)*** **Nano-Structured ORR Catalysts for PEM Fuel Cells** – J. Lim and E. Cho (KAIST)

14:00 **1739** ***(Keynote)*** **Interplay between Properties, Electrical Response and Conductivity Mechanism in Hybrid Inorganic-Organic Ion-Exchange Membranes for Electrochemical Applications** – V. Di Noto (Dept. of Industrial Engineering, University of Padova, INSTM), K. Vezzù (CMBM, University of Padova, Dept. of Industrial Engineering, University of Padova), E. Negro (Centro Studi "Giorgio Levi Cases", Dept. of Industrial Engineering, University of Padova), C. Sun, A. Nale, Y. Bang (Dept. of Industrial Engineering, University of Padova), G. Pagot (Dept. of Industrial Engineering, University of Padova, Centro Studi "Giorgio Levi Cases"), and G. Pace (CNR-ICMATE)

14:40 **1740** **Microstructure and Transport Analyses in Polymer Electrolyte Membrane Fuel Cells: Comparing Modeling Approaches** – C. R. Randall and S. C. DeCaluwe (Colorado School of Mines)

15:00 **1741** **The Examination and Characterisation of Water Transport in Metal Gas Diffusion Layers for PEMFC Via EIS and Neutron Imaging.** – K. F. Fahy, C. Lee, J. K. Lee, B. Zhao (University of Toronto), J. M. LaManna, E. Baltic, D. S. Hussey, D. L. Jacobson (National Institute of Standards and Technology), and A. Bazylak (University of Toronto)

15:20 **1742** **On the Potential of 3D Printed Micro Structured Porous Media to Enhance PEM Fuel Cell Performance** – V. P. Schulz (University of Toronto, DHBW Mannheim), S. Schmitz (DHBW Mannheim), B. Auvity (University of Nantes), and T. Starke (3D MicroPrint GmbH)

Polymer Electrolyte Membrane Fuel Cells 4 - Membranes – 16:00 – 18:00
Chair(s): EunAe Cho and Steven C. DeCaluwe

16:00 **1743** ***(Invited)*** **Preparing Composite Electrolytes: A Comedy in Two Acts** – T. A. Zawodzinski Jr. (University of Tennessee-Knoxville)

16:40 **1744** ***(Invited)*** **Transport-Stability Relationships in Composite Polymer-Electrolyte Membranes** – A. Kusoglu (Lawrence Berkeley National Laboratory)

17:20 **1745** ***(Invited)*** **Elucidating Ion Transport Mechanisms in Polymerized Ionic Liquids** – H. Liu and S. J. Paddison (University of Tennessee, Knoxville)

Lone Star B/C, Dallas Sheraton Convention Center

I05 Poster Session – 18:00 – 20:00
Chair(s): Wilson K. S. Chiu and Srikanth Gopalan

- **1746** **Defect Engineering of $NiCo_2(O, S)_x$/S-CNTs Oxygen Electrocatalysts for Rechargeable Quasi-Solid-State Flow Zinc–Air Batteries** – N. Xu, T. Su, K. N. Richard, Y. Wang, X. D. Zhou (University of Louisiana at Lafayette), and J. Qiao (Donghua University)
- **1747** **Synthesis of Pt/C Catalyst Using Carbon Support Derived from Tamarind Seeds through Hetroatom Doping for Oxygen Reduction Reaction** – Y. P. Kharwar (Indian Institute of Technology Madras), S. Akula, A. K. Sahu (CECRI-CSIR Madras Unit Chennai), and K. Ramanujam (Indian Institute of Technology Madras)
- **1748** **Optimization of Anion Exchange Membranes Derived from Bacterial Cellulose for Solid-State Supercapacitors** – X. Guo (Donghua Universtiy) and J. Qiao (Donghua University)
- **1749** **Characterization of Surface Changes on Molybdenum Nitride Thin Films during the Oxygen Reduction Reaction Using Operando Grazing Incidence X-Ray Absorption Spectroscopy** – M. B. Stevens, M. E. Kreider (Stanford University, Department of Chemical Engineering), B. M. Gibbons (Stanford University), A. Gallo (Stanford University, SLAC National Accelerator Laboratory), A. Mehta, R. Davis (SLAC National Accelerator Laboratory), L. A. King (Stanford University, Department of Chemical Engineering), and T. F. Jaramillo (Department of Chemical Engineering, Stanford University)

- **1750** **Anion Exchange Membrane Fuel Cell Application of Synthesized Poly(ether ether ketone) Containing Imidazolium** – S. Y. Nam (Gyeongsang National University), T. Y. Son (Gyeongsang National University in Korea), T. H. Ko, and K. H. Kim (Gyeongsang National University)
- **1751** **In Situ Exsolved Co Nanoparticles on Ruddlesden-Popper Material As Highly Active Catalyst for CO_2 Electrolysis to CO** – S. Park, Y. Kim, H. Han (Department of Chemical Engineering, POSTECH), Y. S. Chung (Pohang University of Science and Technology), W. Yoon, J. Choi, and W. B. Kim (Department of Chemical Engineering, POSTECH)
- **1752** **3D Analysis of Observed and Simulated Microstructure Evolution in SOFC Anodes** – M. Wieler (Robert Bosch GmbH), F. Wankmüller, A. Weber (IAM-WET, Karlsruhe Institute of Technology (KIT)), P. W. Hoffrogge (Hochschule Karlsruhe), D. Schneider (Hochschule Karlsruhe, Karlsruhe Institute of Technology), B. Nestler (Karlsruhe Institute of Technology, Hochschule Karlsruhe), P. Haremski (Robert Bosch GmbH, Karlsruhe Institute of Technology), and P. Lupetin (Robert Bosch GmbH)
- **1753** **Design and Fabrication of Solid Electrolyte for the Prevention of Electrode/Electrolyte Delamination** – M. J. Son and H. T. Lim (Changwon National University)
- **1754** **Embedded Reference Electrode in Segmented Cathodes to Understand in-Plane Performance Variation on Anode-Supported SOFCs** – M. W. Kim, J. M. Kim, H. S. Park, and H. T. Lim (Changwon National University)
- **1755** **Highly Uniform Al_2O_3 Coating on HSAB Nanoparticle Using Vibration Atomic Layer Deposition** – J. H. Oh, S. W. Park, H. J. Choi, G. D. Han, E. J. Shin, and J. H. Shim (Korea University)
- **1756** **Ag-YSZ Nanocomposites As Alternative Catalysts for Platinum for High Performance Low Temperature Solid Oxide Fuel Cells** – E. J. Shin, H. J. Choi, G. D. Han, J. H. Oh, and J. H. Shim (Korea University)
- **1757** **Influence of Ink Composition and Operation Parameters on the Performance of Fe-N-C** – C. Gallenkamp, M. Kübler, and U. I. Kramm (Technische Universität Darmstadt)
- **1758** **Cu-Based Bimetallic Electrocatalysts for CO_2 Electrochemical Conversion to Valuable Chemicals: Study of Product Selective Distribution** – M. R. C. Casale and F. H. B. Lima (IQSC - Institute of Chemistry of Sao Carlos)
- **1759** **Fabrication of Nanofibrous $La_{1-X}Sr_xCoO_3$/GDC Composite Cathode Using a Combination of Chemically Assisted Electrodeposition and Infiltration Techniques for Solid Oxide Fuel Cells** – S. B. Lee (Korea Institute of Energy Research (KIER)), S. U. Rehman (KIER), R. H. Song, T. H. Lim, and J. E. Hong (Korea Institute of Energy Research (KIER))
- **1760** **Fabrication of Solid Oxide Fuel Cell Composite Cathodes Using a Desktop Inkjet Printer** – J. S. Park, G. D. Han, H. J. Choi, E. H. Kang, and J. H. Shim (Korea University)
- **1761** **Nanocomposites of Honeycomb Double Layered MnO_2 Nanosheets /Cobalt Doped Hollow Carbon Nanofiber for Application in Supercapacitor and Primary Zinc-Air Battery** – X. Yang, W. Peng, K. Fu, L. Mao, J. Jin, S. Yang, and G. Li (donghua university)
- **1762** **Doped-Zirconia Treated Silver Nanocomposite Cathode for High Performance Low Temperature Solid Oxide Fuel Cells** – H. J. Choi, G. D. Han, J. S. Park, J. H. Oh, and J. H. Shim (Korea University)
- **1763** **Synergistic Hybrid MoS_2/Fe_2O_3 Composites for Efficient Hydrogen Evolution in Alkaline Media** – J. Hu and C. Zhang (Kunming University of Science and Technology)
- **1764** **Solid Acid Catalysts from Biowaste and Their Potential for Biodiesel Production** – S. S. Memon (NCE in Analytical Chemistry, University of Sindh Jamshoro)
- **1765** **Enhancement of Electrochemical Properties of Anode-Supported Solid Oxide Fuel Cells using In-situ Synthesis of Multi-doped Ceria Nanoparticles** – J. E. Hong, H. Ahmad Ishfaq, T. H. Lim, S. B. Lee, S. J. Park, R. H. Song (Korea Institute of Energy Research (KIER)), and K. T. Lee (DGIST)

I06 An Invited Symposium on Advances and Perspectives on Modern Polymer Electrolyte Fuel Cells – In Honor of Shimshon Gottesfeld

Energy Technology / Industrial Electrochemistry and Electrochemical Engineering / Physical and Analytical Electrochemistry

Houston Ballroom C, Dallas Sheraton Convention Center

Anion Exchange Membranes/Polymer Electrolytes 1 – 08:00 – 12:00
Chair(s): Hui Xu and Adam Z. Weber

08:00 **1815** ***(Invited)*** **Effects of an Alkyl Spacer and the Cationic Group on the Hydrated Morphology of Anion Exchange Membranes** – S. J. Paddison (University of Tennessee, Knoxville), X. Luo, and Z. Zhu (University of Tennessee)

08:25 **1816** ***(Invited)*** **Limits of Polymer Electrolyte Membranes** – C. Mittelsteadt (Giner, Inc.)

08:50 **1817** ***(Invited)*** **Materials/System Tradeoffs for Automotive Fuel Cell Applications** – C. S. Gittleman (General Motors) and A. Kongkanand (Global Fuel Cell Business, General Motors)

09:15 **1818** ***(Invited)*** **Low Temperature Electrolysis for Hydrogen at Scale** – S. Mukerjee (Chemistry and Chemical Biology, Northeastern University), I. Kendrick, and H. Doan (Northeastern University)

09:40 **1819** ***(Invited)*** **Pathways Towards High-Performance Reversible Alkaline Membrane Fuel Cells** – H. Xu (Giner Inc.), G. Wu (University at Buffalo, the State University of New York), and Y. Yan (University of Delaware)

10:00 **Break**

10:20 **1820** ***(Invited)*** **U.S. DOE Early-Stage Alkaline Membrane Fuel Cell R&D** – D. C. Papageorgopoulos, D. Peterson, D. Ho (U.S. Department of Energy), G. Kleen (U. S. Department of Energy), N. L. Garland, and S. T. Thompson (U.S. Department of Energy)

10:45 **1821** ***(Invited)*** **Performance of Nanofiber Meas in a Hydrogen/Air Fuel Cell with Low Relative Humidity Feed Gases** – P. N. Pintauro, K. Waldrop, J. Slack, D. Powers, R. Wycisk (Vanderbilt University), C. Gumeci, J. Parrondo, and N. Dale (Nissan Technical Center North America)

11:10 **1822** ***(Invited)*** **Molecular Engineering of Quaternary Ammonium Aromatic Polymers for Anion Exchange Membrane Fuel Cells** – C. Bae (Rensselaer Polytechnic Institute)

11:35 **1823** ***(Invited)*** **Quantitative Understanding of CO_2 Behavior in Anion Exchange Membrane Fuel Cells** – Y. Zheng, X. Peng, and W. E. Mustain (University of South Carolina)

Anion Exchange Membranes/Polymer Electrolytes 2 – 13:40 – 18:00
Chair(s): Yushan Yan and Peter N. Pintauro

13:40 **1824** ***(Invited)*** **Modeling of Carbon Dioxide Exposure and Mitigation in Hydroxide Exchange Membrane Fuel Cells** – B. P. Setzler, L. Shi, T. Wang, and Y. Yan (University of Delaware)

14:00 **1825** ***(Invited)*** **Switching from Low-Density to High-Density Polyethylene As a Base Material for Radiation-Grafted Anion-Exchange Membranes Leads to Much Higher Alkaline Membrane Fuel Cell Performances** – L. Wang and J. R. Varcoe (University of Surrey)

14:25 **1826** ***(Invited)*** **Anion Exchange Membranes** – M. Hickner (The Pennsylvania State University)

14:50 **1827** ***(Invited)*** **Anion Exchange Membranes Based on Functionalized Block Copolymers** – M. Yandrasits, C. Laskowski, T. Gillard (3M Corporate Research Materials Lab), M. Kurkowski (3M Energy Components Program), M. Lindsay (3M Corporate Research Materilas Lab), B. S. Pivovar, and Z. R. Owczarczyk (National Renewable Energy Laboratory)

15:15 **1828** ***(Invited)*** **Stable and Conductive Anhydrous Proton Conducting Membranes Based on Polycations Blended with Polybenzimidazole** – C. G. Arges, G. Venugopalan, and S. Kole (Louisiana State University)

15:35 **Break**

15:55 **1829** ***(Invited)*** **Ten Years on: Evolution, Status and Future of Alkaline Exchange Membrane Fuel Cell Systems** – M. Page, A. Amel, C. Azra, A. Kitayev, and C. Ben-Yehuda (PO-CellTech)

16:15 **1830** ***(Invited)*** **High Performance Alkaline Membrane Fuel Cells Powered By Direct Ammonia** – B. Achrai, G. Tamir (PO-CELLTECH), A. Kitayev (PO-CellTech), E. Tal-Gutelmacher, and M. Page (PO-CELLTECH)

16:40 **1831** ***(Invited)*** **Comparison of Hydrogen Pump and Electrochemical Impedance Spectroscopy Methods for Proton Transport Resistance Measurements in Catalyst Layers** – D. C. Sabarirajan (Tufts University), Y. Qi (University of California, Irvine), and I. V. Zenyuk (University of California Irvine)

17:05 **1832** ***(Invited)*** **Water and Thermal Management in Polymer-Electrolyte Fuel Cells** – A. Z. Weber (Lawrence Berkeley National Laboratory)

17:30 **1833** ***(Invited)*** **Progress in Alkaline Membranes and Alkaline Membrane Fuel Cells at the National Renewable Energy Lab** – A. Neyerlin (National Renewable Energy Laboratory), D. Strasser (National Renewable Energy Lab), C. M. Antunes (National Renewable Energy Laboratory), K. Meek (National Renewable Energy Lab), Z. R. Owczarczyk, and B. S. Pivovar (National Renewable Energy Laboratory)

17:55 **Concluding Remarks**

K03 Young Investigators in Organic and Biological Electrochemistry

Organic and Biological Electrochemistry / Physical and Analytical Electrochemistry
Pearl 3, Dallas Sheraton Hotel

Young Investigators in Organic and Biological Electrochemistry - Session 1 – 08:05 – 11:20
Chair(s): Graham T. Cheek and Sadagopan (Gopan) Krishnan

08:05 **Welcoming Remarks**

08:10 **1872** ***(Invited)*** **Detection of Hydrophobic Analytes on a Nanomolar Scale Via Cyclodextrin Mediated Surfaces** – J. M. Halpern, Z. Panahi, M. Merrill, S. Marnoto, L. Li, and E. Ziino (University of New Hampshire)

08:40 **1873** **A 3rd generation Biosensor Towards the Continuous Long-Term Glucose Monitoring without Ag/AgCl Reference Electrode** – L. Ramašauskas (Vilnius Gediminas Technical University), M. Dagys (UAB "Bioanalizes sistemos", Ltd), and D. Ratautas (Vilnius Gediminas Technical University, Vilnius University)

09:00 **1874** **Micro Paper-Based Electrochemical Device for Small Molecule Diabetes Biomarkers** – J. Niroula, G. Premaratne, and S. Krishnan (Oklahoma State University)

09:20 **1875** **Real-Time Insight into the Doping Mechanism of Redox-Active Organic Radical Polymers** – S. Wang, F. Li, A. D. Easley, and J. L. Lutkenhaus (Texas A&M University)

09:40 **Intermission**

10:00 **1876** **Development of Electrochemical Nanosensor for the Detection of Malaria Parasite in Clinical Samples** – O. R. Obisesan (Obafemi Awolowo University, Ile Ife, Nigeria, Mahatma Gandhi University, Kottayam, India), A. S. Adekunle (Obafemi Awolowo University, Ile-Ife), J. A. O. Oyekunle (Obafemi Awolowo University, Ile Ife, Nigeria), and S. Thomas (Mahatma Gandhi University, Kottayam, India)

10:20 **1877** **Controlling Ureidopyrimidinone Polymerization Via Electrochemical Redox Reactions** – M. Cedano and D. K. Smith (San Diego State University)

10:40 **1878** **Electrochemically Stable and Adherent PEDOT Coatings for High Quality EMG Recording** – N. Rossetti, P. Luthra, A. Lee, C. Bodart Leguen, and F. Cicoira (Polytechnique Montréal)

11:00 **1879** **Control of Bond Strength in H-Bond Dimers Via Proton Transfer Induced By Electron Transfer** – H. Choi and D. K. Smith (San Diego State University)

Young Investigators in Organic and Biological Electrochemistry - Session 2 – 14:00 – 15:05
Chair(s): Alice H. Suroviec and Sadagopan(Gopan) Krishnan

14:00 **Welcoming Remarks**

14:05 **1880** **Selectively Modified Odorant Molecules for Odor Mitigation** – M. M. Vasquez, E. Ngaboyamahina (Duke University), C. A. De March, H. Matsunami (Duke University School of Medicine), and J. T. Glass (Duke University)

14:25 **1881** **Protein Film, and Diffusion–Controlled Voltammetry of Hemeproteins on a Single Surface** – B. Gerroll (Indiana Universtity Bloomington) and D. G. Peters (Indiana University)

14:45 **1882** **Insights into Nanoarchitectual Structures to Enhance the Catalysis Properties of Human Liver Microsomes** – J. T. Moulton, G. Premaratne, J. Niroula, and S. Krishnan (Oklahoma State University)

Lone Star B/C, Dallas Sheraton Convention Center

K03 Poster Session – 18:00 – 20:00

- **1883** **Crosslinkable Nitroxide Radical Polymer for Energy Storage Applications** – S. Wang, A. D. Easley, F. Li, and J. L. Lutkenhaus (Texas A&M University)
- **1884** **Semi-Automated Electrochemical Microfluidic Immunoarray for Cancer Diagnostics** – L. DhanapalaMudiyanselage, A. L. Jones (University of Connecticut), and J. F. Rusling (National Univ of Ireland at Galway)

L01 Physical and Analytical Electrochemistry, Electrocatalysis, and Photoelectrochemistry General Session and Grahame Award Symposium

Physical and Analytical Electrochemistry
Trinity 3, Dallas Sheraton Hotel

Spectroelectrochemistry 4 – 08:00 – 11:20
Chair(s): Pawel J. Kulesza, Andrew M. Herring, Vito Di Noto and Iwona Agnieszka Rutkowska

08:00 **1915** **In-Situ Ultra-Low Frequency SERS Observation at Electrified Interfaces** – K. Ikeda (Nagoya Institute of Technology)

08:20 **1916** **Mechanistic Insights into Enzymatic Nitric Oxide Reduction Revealed By Surface-Enhanced Infrared Absorption Spectroscopy** – M. Kato, Y. Masuda, S. Nakagawa (Hokkaido University), T. Tosha (Riken), and I. Yagi (Hokkaido University)

08:40 **1917** **Versatility of Time-Resolved Raman Spectroelectrochemistry: From the Resolution of Mixture of Vitamins to the Detection Pesticides** – P. Fanjul (Metrohm), D. Ibáñez, A. Junquera-Pérez, M. B. González-García, and D. Hernández-Santos (Metrohm DropSens)

09:00 **Break**

09:20 **1918** **Solvent Effects on Nafion Dispersion Structure Probed By Infrared Spectroscopy** – Y. Liang and C. Korzeniewski (Texas Tech University)

09:40 **1919** **Electrochemical Cell with Electrolyte Flow Enables *Operando* ATR-IR Spectroscopy of Electrocatalytic CO_2 Reduction through Control of Mass Transport** – J. C. Lin (SUNCAT Center for Interface Science and Catalysis, Stanford University Department of Chemical Engineering), J. E. Aviles Acosta (Stanford Univ. Dept. of Materials Science & Engineering, SUNCAT Center for Interface Science and Catalysis), C. Hahn, and T. F. Jaramillo (SLAC National Accelerator Laboratory)

10:00 **1920** **Probing the Impact of Interfacial Electric Fields and Hydrogen-Bonding Interactions on the Electroreduction of CO to Ethylene** – M. Waegele (Boston College)

10:20 **1921** **Focal Point Sequestration for Operando Raman Confocal Micro-Spectroscopy of Fuel Cell Catalytic Layers** – E. S. Smotkin (Northeastern University)

10:40 **1922** **A Novel Electrochemical-Electron Paramagnetic Resonance Spectroscopic Technique for in-Situ Radical Formation and Detection on Graphite Pencil Electrode.** – M. A. Morsy (King Fahd University of Petroleum & Minerals), A. M. Kawde (King Fahd University of Petroleum and Minerals), and L. M. Bui (Adani Systems Inc.)

11:00 **1923** **Operando Observation of Cobalt Catalysts for Water Splitting By X-Ray and Infrared Absorption Spectroscopy** – K. Yamada, Y. Sakata, and M. Yoshida (Yamaguchi University)

Physical and Analytical Electrochemistry, Electrocatalysis, and Photoelectrochemistry General Session 3 – 13:00 – 15:30
Chair(s): Faisal M. Alamgir and Charlotte Flatebo

13:00 **1924** **Pt Nanowires with High Catalytic Activity and Durability Towards Methanol Oxidation Reaction** – Y. Liu (university of Arkansas), D. Geng (University of Science and Technology Beijing), and X. Meng (University of Arkansas)

13:20 **1925** **Using an Ultrasonic Input for Ammonium Persulfate Electrosynthesis and Advanced Oxidation Processes** – A. G. Wallace, P. J. McHugh, and M. Symes (University of Glasgow)

13:40 **1926** **Electrodissolution Inhibition of Gold Nanorods with Oxoanions** – C. Flatebo, S. S. E. Collins, B. S. Hoener, Y. Cai, S. Link, and C. F. Landes (Rice University)

14:00 **Break**

14:30 **1927** **Clear-to-Black Dynamic Windows with Minute-Long Switching Using Reversible Metal Electrodeposition** – S. M. Islam (University of Nevada, Reno), T. S. Hernandez (Stanford University), M. McGehee (University of Colorado, Boulder), and C. J. Barile (University of Nevada, Reno)

14:50 **1928** **Determination of Surface Area and Reaction Rate Constant from Cyclic Voltammetry Considering Voltage-Dependence of the CPE Parameters** – P. Charoen-amornkitt, T. Suzuki (Osaka University), and S. Tsushima (JST-PRESTO)

15:10 **1929** **A Versatile Architecture for Electronically Tunable Electrocatalytic Activity: Graphene-Templated Atomically Thin Pt Supported on Oxygen-Deficient Titania** – C. Bell, D. C. Lee (Georgia Institute of Technology), C. Rouleau (Oak Ridge National Laboratory), K. Sasaki (Chemistry Department, Brookhaven National Laboratory), M. Williams (Clark Atlanta University), and F. M. Alamgir (Georgia Institute of Technology)

L04 Polyoxometallates and Nanostructured Metal Oxides in Efficient Electrocatalysis, Energy Conversion, and Charge Storage

Physical and Analytical Electrochemistry / Energy Technology

Trinity 2, Dallas Sheraton Hotel

Polyoxometallates and Nanostructured Metal Oxides in Efficient Electrocatalysis, Energy Conversion, and Charge Storage 7 – 10:00 – 11:50
Chair(s): Gary J. Blanchard and Ana C Tavares

10:00 **1989** ***(Keynote)* Lithiated Fluorinated *"Core-Shell"* Nanoparticles As Single-Ion-Conducting Electrolytes for Lithium Batteries** – K. Vezzù (Dept. of Industrial Engineering, University of Padova, CMBM, University of Padova), G. Pagot (Dept. of Industrial Engineering, University of Padova, Centro Studi "Giorgio Levi Cases"), E. Negro (Centro Studi "Giorgio Levi Cases", Dept. of Industrial Engineering, University of Padova), A. Nale, Y. Bang (Dept. of Industrial Engineering, University of Padova), and V. Di Noto (Dept. of Industrial Engineering, University of Padova, INSTM)

10:40 **1990** ***(Keynote)* Tuning the Electrochemical Properties of Polyoxometalates: Impact on Photosensitizer-Polyoxometalate Dyads and Electronic Molecular Junctions** – A. Proust, F. Volatron, S. Blanchard, and G. Izzet (Sorbonne Université)

11:20 **1991** ***(Invited)* Nitride Plasmonics for Enhanced Electrochemical Oxidation** – B. Simpkins (U.S. Naval Research Laboratory), A. Purdy (Naval Research Laboratory), A. Epshteyn (U.S. Naval Research Laboratory), S. Giles, J. Wynne (Naval Research Laboratory), and O. A. Baturina (U.S. Naval Research Laboratory)

Polyoxometallates and Nanostructured Metal Oxides in Efficient Electrocatalysis, Energy Conversion, and Charge Storage 8 – 14:10 – 15:30
Chair(s): Andrew M. Herring

14:10 **1992** ***(Keynote)* Monitoring and Preparation-Performance Trends of Co-Based Catalysts for Electrochemical Water Oxidation** – G. R. Patzke, K. Lienau, L. Reith, C. A. Triana, R. J. Müller (University of Zurich), and D. Bleiner (Empa Dübendorf)

14:50 **1993** **Single Nanoparticle Electrochromism Reveals Heterogeneous Charge Storage Rates and Ion Trapping Sites in Pseudocapacitive Smart Windows** – J. Sambur and R. C. Evans (Colorado State University)

15:10 **1994** **The Effect of Pore Structure on Coaxial Electrospun and Pyrolyzed Polyacrylonitrile Derivatives and Phosphotugnstic Acid for Hybrid Electrode Supercapacitors.** – J. A. Garcia, K. J. Balkus Jr., and J. P. Ferraris (The University of Texas at Dallas)

Polyoxometallates and Nanostructured Metal Oxides in Efficient Electrocatalysis, Energy Conversion, and Charge Storage 9 – 16:00 – 17:40
Chair(s): Pawel J. Kulesza, Vito Di Noto and Iwona Agnieszka Rutkowska

16:00 **1995** ***(Keynote)* Promoting Electrochemical Oxygen Evolution in Acidic Media: Hydrophobic Stabilization of Earth Abundant Catalysts** – J. R. Galan-Mascaros (Institute of Chemical Research of Catalonia (ICIQ), ICREA), F. Garcés-Pinedaa, and J. Yua (Institute of Chemical Research of Catalonia (ICIQ))

16:40 **1996** **Understanding the Highly Selective Electroreduction of Carbon Dioxide into Fuels on Hierarchical Oxide-Derived Inverse Opals** – T. D. Nguyen-Phan (National Energy Technology Laboratory, AECOM), D. R. Kauffman (National Energy Technology Laboratory), Y. Zhou, Y. Yu (National Energy Technology Laboratory, AECOM), E. Stavitski (Brookhaven National Laboratory), W. Xu (Argonne National Laboratory), B. H. Howard (National Energy Technology Laboratory), M. Y. Stuckman (National Energy Technology Laboratory, AECOM), I. Waluyo (Brookhaven National Laboratory), C. Wang, C. M. Marin (National Energy Technology Laboratory, AECOM), E. J. Popczun, and P. R. Ohodnicki Jr. (National Energy Technology Laboratory)

17:00 **1997** **Vanadium Oxide Nanoflower – Carbon Nanofiber Composite Electrodes Derived from Poly(acrylonitrile-*co*-itaconic acid)** – M. Wunch (University of Texas at Dallas), S. Mahmood, K. J. Balkus Jr., J. P. Ferraris (The University of Texas at Dallas), and D. J. Yang (University of Texas at Dallas)

17:20 **1998** **A Highly Sensitive and Stable Electrochemical Sensor for Simultaneous Detection of Dopamine and Uric Acid Based on the Phosphovanadotungstate and CNTs Decorated By Chitosan** – Z. Bai and J. Wang (Harbin Engineering University)

M01 Sensors, Actuators, and Microsystems General Session

Sensor

Trinity 5, Dallas Sheraton Hotel

Chemical Sensors 1 – 08:00 – 12:20
Chair(s): Peter J Hesketh and Larry A. Nagahara

08:00 **2021** **Electrochemical Detection of the Pesticide Bentazone Using Shadow-Printed Carbon Electrodes** – J. S. Noori (IPM - Intelligent Pollutant Monitoring, Technical University of Denmark), A. Geto (IPM - Intelligent Pollutant Monitoring), J. Mortensen (Rosklide University), W. E. Svendsen (DTU Nanotech, Technical University of Denmark), and M. Dimaki (Technical University of Denmark)

08:20 **2022** **Enhancing Potentiometric Response Using Modified Ion Sensitive Transistor** – V. Abhinav, R. Patkar, M. Vinchurkar, T. R. Naik, and M. S. Baghini (Indian Institute of Technology Bombay)

08:40 **2023** **Development of a Graphene-Nickel Composite Electrode for Hydroxyl Ion Sensing Applications** – B. Jafari and G. G. Botte (Ohio University)

09:00 **2024** **Redox Active Molecule Induced Metal-Organic Framework Thin Film on Optical Fiber Towards Chemical Sensing of Carbon Dioxide** – K. J. Kim, J. Culp (National Energy Technology Laboratory, Leidos Research Support Team), P. R. Ohodnicki Jr. (National Energy Technology Laboratory, Carnegie Mellon University), P. Cvetic (National Energy Technology Laboratory, Leidos Research Support Team), and A. Goodman (National Energy Technology Laboratory)

09:20 **2025** **Selectivity Enhancement of ZnO Toward Reducing Gases Using Characteristic Response Features Based on Surface Kinetics below 250°C** – I. K. Cheng, C. Y. Lin, and F. M. Pan (National Chiao Tung University)

09:40 **2026** **Carbon Dioxide Sensing Characteristics of $LaFe_{0.8}Co_{0.2}O_3$ – ZnO Thin Films: The Role of Homo and Heterojunctions** – T. Bhowmick, S. Nag, and S. B. Majumder (IIT KHARAGPUR)

10:00 **2027** **Sandwiched Platinum Thin Film TCD for 3-Omega Technique for Detection of Ammonia Gas** – A. Lotfi, M. Navaei (Georgia Tech Research Institute), and P. J. Hesketh (Georgia Institute of Technology)

10:20 **2028** **Polymer/Metal−Organic Framework Composite Sensors for Gas Detection** – T. Hong (National Energy Technology Laboratory), J. Culp, K. J. Kim (Leidos Research Support Team, National Energy Technology Laboratory), and P. R. Ohodnicki Jr. (National Energy Technology Laboratory, Carnegie Mellon University)

10:40 **Break**

11:00 **2029** **Ion-Selective Electrode Based on Thiosemicarbazide Schiff Base As Ionophore for Pb (II) Ion Sensor** – C. Mohan (K R Mangalam University, Sohna Road, Gurugram, India), K. Sharma (Maharaja Agresan Institute of Technology), and S. Kumari (SPC Govt. College, Ajmer, India)

11:20 **2030** **On-Chip Optical Anodic Stripping Voltammetry with Closed-Cell Bipolar Electrode Arrays for Heavy Metals Detection in Water** – E. Fahrenkrug, N. Humphrey, J. Miranda, and B. Thomas (Colorado College)

11:40 **2031** **Ethanol Sensing Characteristics of Nitrogen Doped ZnO and in_2O_3 Thin Films** – P. K. Shihabudeen (Materials Science Centre, IIT Kharagpur) and A. Roy Chaudhuri (Materials Science Centre, IIT Kharagpur, Advanced Technology Development Centre, IIT Kharagpur)

12:00 **2032** **Filter Paper Based Electrochemcial Sensor for Selenium Detection in Water** – P. Devi (Central Scientific Instruments Organsiation) and P. Kumar (Indian Association for Cultivation of Sciences)

Chemical Sensors 2 – 14:00 – 16:00
Chair(s): Petr Vanysek and Larry A. Nagahara

14:00 **2033** **Impact of Titanium Content on the Structural Properties and Sensing Performance of Sol-Gel Synthesized $CeTi_xO_y$ Sensing Films** – C. W. Wang, C. Y. Tan, J. L. Her, and T. M. Pan (Chang Gung University)

14:20 **2034** **Structural Properties and Sensing Characteristics of $YbTaO_4$ Sensing Membranes** – C. H. Chen, T. M. Pan, and J. L. Her (Chang Gung University)

14:40 **2035** **High-Performance $Ce_{0.9}Sr_{0.1}(Zr_{0.53}Ti_{0.47})O_4$ Sensing Membrane Using a Sol-Gel Method for a Solid-State pH Sensor** – T. M. Pan, B. S. Lou, Z. Y. Chen (Chang Gung University), and S. P. Bag (CHANG GUNG UNIVERSITY)

15:00 **2036** **An Electrochemical Approach for Development of Novel Magnetic Multicomponent Alloy Thin Films for Sensor Applications** – C. L. P. Pavithra, R. K. Siri Kiran Janardhana, G. Ummethala, C. Murapaka, S. K. Malladi, and S. R. Dey (Indian Institute of Technology Hyderabad)

15:20 **2037** **Planar and out of Plane Configuration Based Flexible Sensor of PVDF Polymer** – R. Ganguly, A. Acharyya, and R. Ramadurai (Indian Institute of Technology Hyderabad)

15:40 **2038** **Developing High-Performance Non-Enzymatic Glucose Sensors Based on Transition Metal Chalcogenides** – M. Nath, B. Golrokh Amin (Missouri University of Science & Technology), and J. Masud (The University of Kansas)

Lone Star B/C, Dallas Sheraton Convention Center

M01 Poster Session – 18:00 – 20:00
Chair(s): Larry A. Nagahara, Bryan A. Chin, Peter J Hesketh, Gary W. Hunter, Jessica E. Koehne, Aleksandr Simonian and Petr Vanysek

- **2039** **Suspended 2D Material Biosensor for Reliable Sensing** – N. Masurkar, N. K. Thangavel, S. Yurgelevic, G. W. Auner, and L. M. R. Arava (Wayne State University)
- **2040** **Suppression Effects of Oxygen Deficient on Ultrathin Indium Oxide Electrochemical Transistors-Based Biosensors** – J. H. Park, Y. Y. Choi, and Y. S. Rim (Sejong University)
- **2041** **Low-Cost Colorimetric Textile Gas Sensor for Detection of Hydrogen Sulfide** – J. Lee (Kyungpook National University, Korea Institute of Industrial Technology (KITECH)), J. K. Kim (Kyungpook National University, Korea Institue of Industrial Technology (KITECH)), and D. Jung (Korea Institute of Industrial Technology (KITECH))
- **2042** **Study on Sulfonic Acid Functional Group Modified Imidazole Ionic Liquids for Oxygen Concentration Detection** – W. Yin and M. Zhang (Harbin Engineering University)
- **2043** **Simultaneous Detection of Carbendazim and Carbaryl Pesticides on Graphene-Biochar Electrodes Using Response Surface Optimization** – E. M. Sussuchi, M. V. S. SantAnna, S. W. M. M. Carvalho, I. S. C. Carregosa, and E. Santos (Universidade Federal de Sergipe - UFS)
- **2044** **Ultra-Sensitive Electrochemical Determination of Rifampicin Using the TiO_2nanoparticles Decorated Reduced Graphene Oxide Nanocomposite** – V. M. R. Yenugu (sri venkateswara Uinversity), Ľ. Švorc (Slovak University of Technology), S. Bathinapatla (Yogi Vemana University), and M. Gajulapalle (Sri Venkateswara Uinversity)
- **2045** **Electrochemical Determination of Copper(II) Ions in Soil of Cultivation of Vegetables with Use of Bordeaux Syrup** – E. M. Sussuchi, J. O. S. Silva (Universidade Federal de Sergipe - UFS), J. B. S. Lima (Universidade Federal da Bahia - UFBA), S. W. M. M. Carvalho (Universidade Federal de Sergipe - UFS), R. R. Farias, and M. M. Victor (Universidade Federal da Bahia - UFBA)
- **2046** **Galvanic Dissolved Oxygen Sensor Based from Inkjet Printed Silver Cathode and Electrodeposited Zinc Anode** – L. P. Go and E. P. Enriquez (Ateneo de Manila University)
- **2047** **Enhanced Electro-Oxidation of Urea Using Hollow Structured Nickel Manganese Oxide Catalysts** – D. Lee, J. Yoon, E. Lee (Auburn University), S. P. Woo (Yonsei University), Y. S. Yoon (Gachon University), and D. J. Kim (Auburn University)
- **2048** **Non-Enzymatic Urea Biosensor Based on Silver-Nickel Oxyhydroxide Nanorods Composite Electrode** – J. Yoon, D. Lee, E. Lee (Auburn University), Y. S. Yoon (Gachon University), Y. Wang (Auburn University), and D. J. Kim (Materials Research and Education Center)
- **2049** **The Effect of Size and Content of Cerium Oxide on the Efficiency of a Composite Sensor for Hydroxyl Radicals Detection** – S. Duanghathaipornsuk, F. Alateeq, A. C. Alba-Rubio, and D. S. Kim (The University of Toledo)
- **2050** **Non-Enzymatic Electrochemical Detection of Mercury Ions on Graphene Quantum Dot-Based Electrodes** – C. C. Fu, J. W. Yang (Chang Gung University), C. T. Hsieh (YUAN ZE UNIVERSITY), and R. S. Juang (Chang Gung University)
- **2051** **Electrochemsense: Electrochemical Real-Time Pesticide Sensing System** – V. N. Dhamu, D. Sankhala, B. Jagannath, and S. Prasad (The University of Texas at Dallas)

M02 Semiconductor Electrochemistry and Photoelectrochemistry in Honor of Krishnan Rajeshwar - An Invited Symposium

Energy Technology / Physical and Analytical Electrochemistry / Sensor

State Room 3, Dallas Sheraton Convention Center

Electrochemistry and Photoelectrochemistry Session in Honor of Prof. Rajeshwar – 07:50 – 09:30
Chair(s): Csaba Janáky

07:50 **Introductory Remarks**

08:00 **2052** ***(Invited)* Role of Carbons in Electrochemical Applications** – W. A. Wampler (Tokai Carbon CB)

08:30 **2053** ***(Invited)* The Role of Electronic Bulk and Surface Structures for Efficient Photo-Electro-Synthesis** – W. Jaegermann (Darmstadt University of Technology, Technische Universität Darmstadt)

09:00 **2054** ***(Invited)* Photoelectrochemistry of Semiconducting Oxide Materials for Solar Water Splitting** – G. Oskam (CINVESTAV-Mérida)

Material Structure-Performance Session in Honor of Prof. Rajeshwar – 09:50 – 12:20
Chair(s): Scott Calabrese Barton and Pawel J. Kulesza

09:50 **2055** ***(Invited)* Copper(I) Oxide Semiconductor Based Systems for Photoelectrochemical Reduction of Carbon Dioxide** – P. J. Kulesza (University of Warsaw)

10:20 **2056** ***(Invited)* Role of Surface States in Photocatalytic Oxygen Evolution with $CuWO_4$ Particles** – F. E. Osterloh, Z. Wu, Z. Zhao, G. Cheung, R. M. Doughty (University of California-Davis), A. R. Ballestas-Barrientos (University of Sydney), B. Hirmez, R. Han (University of California-Davis), and T. Maschmeyer (The University of Sydney)

10:50 **2057** ***(Invited)* Interfacial Charge-Transfer Excitation at an Anatase-Rutile Junction: A Hypothesis** – B. Ohtani (Institute for Catalysis, Hokkaido University), Y. Shen (Grad School of Environ. Sci, Hokkaido University), A. Nitta, and M. Takashima (Graduate School of Environmental Science, Hokkaido Univ.)

11:20 **2058** ***(Invited)*** **Mixed-Metal Oxides: Tuning Their Structures and Properties for Uses in the Capture and Conversion of Solar Energy** – P. A. Maggard (North Carolina State University)

11:50 **2059** ***(Invited)*** **Directing Reaction Paths to Electrodeposit Opportune Nano *Pn*-junctions from Cu-in-Se Compounds** – S. Menezes (InterPhases Solar)

Photovoltaics and Solar Fuel Session in Honor of Prof. Rajeshwar – 13:40 – 15:40
Chair(s): Heli Wang

13:40 **2060** ***(Invited)*** **Anodic TiO_2 Nanotube Layers: Efficient Photocatalyst** – H. Sopha, M. Krbal (University of Pardubice), S. Ng (Brno University of Technology), M. Motola, F. Dvorak, R. Zazpe, J. Prikryl (University of Pardubice), and J. M. Macak (Brno University of Technogy, University of Pardubice)

14:10 **2061** ***(Invited)*** **TiO_2 Nanotube Arrays: Photoelectrochemical and Photocatalytic Applications** – P. Schmuki (University of Erlangen-Nuremberg), N. Liu (University of Erlangen-Nuremberg (FAU)), and M. Altomare (University of Erlangen-Nuremberg)

14:40 **2062** ***(Invited)*** **Bi-Based Solar Absorbers for Thin-Film Photovoltaic and Solar Fuels** – D. Tiwari (University of Bristol) and D. Fermin (School of Chemistry, University of Bristol)

15:10 **2063** ***(Invited)*** **Electrochemistry for Sustainable Solar Photovoltaics** – M. Tao (Arizona State University)

Photoelectrochemistry Progress Session in Honor of Prof. Rajeshwar – 16:00 – 18:00
Chair(s): Nianqiang (Nick) Wu

16:00 **2064** ***(Invited)*** **Confined Molecular Electrocatalyst for Electrochemical and Photoelectrochemical Hydrogen Evolution Reaction** – K. Uosaki (National Institute for Materials Science), T. Masuda, C. Kurniawan, Y. Sun, and H. Noguchi (Hokkaido University, National Institute for Materials Science)

16:30 **2065** ***(Invited)*** **Progress in Photoelectrochemical Energy Conversion** – B. A. Parkinson (University of Wyoming)

17:00 **2066** ***(Invited)*** **Materials By Design Principles in Artificial Photosynthesis: Discovery and Synergistic Integration of Light Absorbers, Electrocatalysts and Membranes for Complete, Stable, Efficient, and Safe Solar Fuels Generator** – N. S. Lewis (California Institute of Technology)

17:30 **2067** ***(Invited)*** **Four Decades of Photoelectrochemistry and Semiconductor Electrochemistry: Some Reflections** – K. Rajeshwar (University of Texas)

Lone Star B/C, Dallas Sheraton Convention Center

M02 Poster Session – 18:00 – 20:00
Chair(s): Heli Wang and Csaba Janáky

• **2068** **Synthesis of CdTe Semiconductor Nanocrystals on Hydrotalcite Matrix Surface for Electrochemical Detection of Ciprofloxacin** – E. M. Sussuchi, S. W. M. M. Carvalho, I. F. Gimenez, and M. V. S. SantAnna (Universidade Federal de Sergipe - UFS)

M03 Sensors for Precision Medicine

Sensor
Trinity 4, Dallas Sheraton Hotel

Sensors for Precision Medicine - Session 3 – 08:00 – 12:40
Chair(s): Jessica E. Koehne and Leyla Soleymani

08:00 **2083** ***(Invited)*** **Self-Powered Sensors Employing Biofuel Cells: Wearable and Ingestible Bioelectronics** – I. Jeerapan (University of California, San Diego) and J. Wang (UCSD)

08:40 **2084** **Creating Clinically-Relevant Biosensors-Integrating Hierarchically Structured Transducers with Dynamic Signal Recognition Elements** – L. Soleymani, Y. Chan, and A. Hosseini (McMaster University)

09:00 **2085** ***(Invited)*** **Garment Integrated Sensors Created Using Reactive Vapor Deposition** – T. L. Andrew (UMass Amherst)

09:40 **Break**

10:00 **2086** ***(Invited)*** **Emerging Nanomaterial Inks for Additive Manufacturing of Wearable Sensors** – K. Fujimoto, T. Pandhi, N. E. Mansoor, F. Muramutsa, H. Subbaraman, and D. Estrada (Boise State University)

10:40 **2087** **Quantitative Electrochemical Analysis of Cathepsin Bactivity Using Carbon Nanofiber Nanoelectrode Arrays Withoptimized Peptide Substrate Length and Temperature** – Y. Song, H. Fan, M. J. Anderson, J. G. Wright, D. H. Hua (Kansas State University), J. E. Koehne, M. Meyyappan (NASA Ames Research Center), and J. Li (Kansas State University)

11:00 **2088** ***(Invited)*** **Solid State Electrochemical Gas Sensors: Fundamentals, Materials and Applications** – V. Thangadurai and S. Mulmi (University of Calgary)

11:40 **2089** **Highly Sensitive Detection of Protein Biomarkers Using Graphene Field-Effect Transistor Integrated with a Microfluidic Platform** – N. I. Khan, S. Ghosh, M. Mousazadehkasin, J. G. Tsavalas, and E. Song (University of New Hampshire)

12:00 **2090** ***(Invited)*** **Gamma Irradiated WO_3 Nanostructures for Electrochemical Sensing of Multiple Depression Biomarkers** – C. Sekar and A. A C (Alagappa University)

Sensors for Precision Medicine - Session 4 – 14:00 – 17:40
Chair(s): Yuehe Lin and Pengyu Chen

14:00 **2091** ***(Invited)*** **Plasmonic Nanostructures for Early Disease Detection and Precision Cancer Therapeutics** – K. Curtin, X. Gao (West Virginia University), J. Boryczka (West Virginia Univeristy), P. Zheng, S. Kasani, and N. Wu (West Virginia University)

14:40 **2092** ***(Invited)*** **Toward Self-Powered and Skin-Conformal Sensor Devices - Integration of Ultra-Thin Sensors with Organic Solar Cells** – K. Fukuda (RIKEN), T. Someya (The University of Tokyo), and S. Park (RIKEN)

15:20 **Break**

15:40 **2093** ***(Invited)*** **Inkjet Printing of Impedance Sensors for Living Tissues Monitoring** – R. Bernasconi, D. Meroni, A. Aliverti, and L. Magagnin (Politecnico di Milano)

16:20 **2094** **Electrochemical Sensors to Monitor Multi-Drug Resistant Organisms in the Gut Microbiome** – A. Argun, M. Rana, A. Weber, M. Manoukian (GINER, INC.), A. Koh, and E. Toprak (University of Texas Southwestern Medical Center)

16:40 **2095** **Multiplexed Surface Plasmon Imaging of Circulating Biomarkers** – S. Krishnan, G. Premaratne, Z. H. Al Mubarak, and A. Dharmaratne (Oklahoma State University)

17:00 **2096** ***(Invited)*** **Electrochemical Preparation of Micro and Nano Structures and Systems in Silicon for (Bio)Sensing and Nano(Medicine) Applications** – G. Barillaro (University of Pisa)

Lone Star B/C, Dallas Sheraton Convention Center

M03 Poster Session – 18:00 – 20:00

- **2097** **PDMS/Uhmwpe Dura Mater Substitute Laminated with Conductive Graphene for Intracranial Pressure Sensing** – Q. Zhang, R. Li, J. Li, and P. Gao (The Hong Kong University of Science and Technology)
- **2098** **Microfabrication and Characterization of Microwire Microbiosensors for Simultaneous Detection of Glutamate and GABA** – C. Gong (Lousiana Tech University), I. Hossain, P. Doughty, T. Murray, P. U. Arumugam (Louisiana Tech University), and C. Tan (Institute for Micromanufacuring)
- **2099** **Unusual pH - Dependent Electrochemical Activity of Nitrogen Doped Graphene Oxide Towards Selective and Simultaneous Determination of Hydroquinone and Catechol** – A. Natarajan (Pondicherry Univeristy), E. Jayabal, and V. Rangarajan (Pondicherry University)
- **2100** **Disposable and Inexpensive Electrochemical Biosensor to Detect Ciprofloxacin** – N. P. Trevino, D. Ganta, W. Montes, and C. Guzman (Texas A&M Intl University)
- **2101** **A Real-Time Wearable Sensor to Monitor Alcohol Consumption through Ethyl Glucuronide Detection** – K. C. Lin, D. Sankhala (University of Texas at Dallas), S. Muthukumar (Enlisense LLC), and S. Prasad (University of Texas at Dallas)
- **2102** **Rapid Selection of Active Circulating Tumor Cells Using Combined Electrical and Optical Detection in a "Lab on Chip" Platform** – V. A. Kamat (Florida International University), T. Zhukov (Florida Analytical Imaging Solutions), and S. Bhansali (Florida International University)
- **2103** **The Use of Lab on a Chip Devices to Evaluate Infectious Biofilm Formation and Assess Antibiotics and Nano Drugs Treatments** – N. Bourguignon (Universidad Tecnológica Nacional, Buenos Aires, Florida International University), V. A. Kamat (Florida International University), B. Lerner, M. Perez (Universidad Tecnológica Nacional (UTN), Buenos Aires, Universidad de Buenos Aires (UBA), Buenos Aires), and S. Bhansali (Florida International University)
- **2104** **Microscale Surface Nanostructuration and Catalysis of Metallic Electrodes through Electrochemical Deposition and Dissolution in Ionic Liquids** – J. Jiang and R. Mariani (Idaho National Laboratory)
- **2105** **Leveraging Electrochemical Technique to Screen for Sepsis As a Point-of-Care-Device** – A. Tanak (The University Of texas at dallas), S. Muthukumar (Enlisense LLC), I. A. Hashim (UT southwestern medical center), and S. Prasad (University of Texas at Dallas)
- **2106** **Microfabrication and Characterization of Gold Nanoring Electrodes on Silicon Micro Pillar for Neurochemical Sensing** – H. Yin (Louisiana Tech University), C. Tan (Institute for Micromanufacuring), S. Siddiqui, and P. U. Arumugam (Louisiana Tech University)
- **2107** **An Improved Amperometric Microsensor Microarrays with High Sensitivity and High Selectivity for *Ex-Vivo* Glutamate Detection** – C. Tan (Institute for Micromanufacuring), P. Doughty (Louisiana Tech University), K. Magee (Clemson University), T. Murray, S. Siddiqui, and P. U. Arumugam (Louisiana Tech University)
- **2108** **A Novel Target Receptor Design and Biosensing Platform Using RAFT Polymer-Based Molecular Templating** – B. Si, R. Yang, G. Dutta, J. Csoros, H. M. N. Ahmad, W. R. Seitz, and E. Song (University of New Hampshire)
- **2109** **Selective Monitoring of Anti-Cancer Drug in Real Sample Matrix Employing Nanomaterial Based Electrochemical Biosensor** – R. Savalia and S. Chatterjee (Institute of Chemical Technology)
- **2110** **Bifunctionality of Carbon Nanotubes – Chitosan Film Based Biosensor for Selective Determination of Atropine in Biological Fluids and Leaf Extract of *Datura Stramonium*** – S. S. Mane and S. Chatterjee (Institute of Chemical Technology)
- **2111** **An Electrochemical Sensor for Disease Diagnosis and Decision Making By Passively Monitoring Chloride Ion Levels in Human Sweat** – A. Ganguly (University of Texas At Dallas -) and S. Prasad (University of Texas at Dallas)

• 2112 **Layer-By-Layer Biofunctionalization As a Novel Route for High-Sensitivity and High-Specificity Label-Free Affinity Biosensing with Nanostructured Materials** – S. Mariani, V. Robbiano (University of Pisa), L. Strambini (Italian National Research Council), A. Debrassi, G. Egri, L. Daehne (Surflay Nanotec GmbH), and G. Barillaro (University of Pisa)

Thursday, May 30

A01 Battery and Energy Technology Joint General Session

Energy Technology / Battery

Houston Ballroom A, Dallas Sheraton Convention Center

Battery Modelling 1 – 08:00 – 12:00
Chair(s): Hui Xu, Ming Tang and Wolfram Jaegermann

08:00	**92**	**Modeling the Effects of Cycling on Dendrite Growth in Lithium Batteries** – J. Tan (Shenzhen University) and E. Ryan (Boston University)
08:20	**93**	**Performance of Li-Ion Batteries: Contribution of Electronic and Ionic Factors** – W. Jaegermann (Technische Universität Darmstadt) and R. Hausbrand (Darmstadt University of Technology)
08:40	**94**	**Understand and Mitigate Reaction Non-Uniformity in Battery Electrodes** – K. Yang, Y. Zhang, F. Wang, and M. Tang (Rice University)
09:00	**95**	**Structure of Confined Ionic Liquids in Graphitic Nanopores from Ab-Initio Molecular Dynamics Simulations** – T. A. Pham (Lawrence Livermore National Laboratory), R. Coulthard (Yale University), M. Zobel (University of Bayreuth), S. Buchsbaum (Lawrence Livermore National Laboratory), D. Plata (Massachusetts Institute of Technology), B. C. Wood, F. Fornasiero, and E. Meshot (Lawrence Livermore National Laboratory)
09:20	**96**	**Three-Dimensional Modeling of Mediator-Enhanced Solid-State Supercapacitors** – X. Zhou, Y. Wang, X. Qiao, C. Zhang (University of Miami), and A. N. Mansour (Naval Surface Warfare Center, Carderock Division)
09:40		**Break**
10:00	**97**	**Comsol Modelling of the Experimental Results Obtained from a Lithium Ion Battery with a Low Binder Content Lithium Iron Phosphate ($LiFePO_4$) Cathode** – V. G. Watson, D. R. R. Kannan, L. Morris (FAMU-FSU College of Engineering), A. Shellikeri (Florida State University, Aero-Propulsion, Mechatronics and Energy Center), P. L. Moss (Florida A&M University - Florida State University), M. H. Weatherspoon (FAMU-FSU college of Engineering), J. P. Zheng (Florida State University), Y. D. Yeboah (FAMU-FSU College of Engineering), and E. E. Kalu (Florida A&M University - Florida State University COE)
10:20	**98**	**Optimization of Energy Transfer during Active Balancing of Lithium-Ion Batteries** – P. L. Moss, D. R. Rajagopalan Kannan, R. Sonavane, and M. H. Weatherspoon (Florida A&M University - Florida State University)
10:40	**99**	**Towards an Atomic-Level Understanding of Solid Electrolyte Interphase Formation through Molecular Simulation** – M. J. Boyer and G. S. Hwang (University of Texas at Austin)

11:00 **100** **Impact of Solid Electrolyte Interphase (SEI) Stiffness on Lithium Dendrite Growth** – P. Barai and V. Srinivasan (Argonne National Laboratory)

11:20 **101** **Na^+ Ion Transport in Glassy Electrolytes for Solid-State Sodium Ion Batteries: A Reactive Molecular Dynamics Study** – A. M. Dive and S. Banerjee (Washington State University)

11:40 **102** **Electro-Chemo-Mechanics of Si-C Composite Anode Particles Using Cyclic Voltammetry Simulations** – S. Mohanty, P. Y. Kumbhar, R. K. Annabattula, and N. Swaminathan (Indian Institute of Technology Madras)

Battery Modelling 2 – 14:00 – 16:20
Chair(s): Emily Ryan and Hui Xu

14:00 **103** **A First-Principle Study Towards Understanding Surface Reactions in Li-I_2 Batteries** – Z. Liu (Hunan University)

14:20 **104** **Modeling and Simulations of Aerosol Jet 3D Printed Electrodes for Lithium-Ion Batteries** – J. Li (Missouri University of Science and Technology), M. Saleh, R. Panat (Carnegie Mellon University), and J. Park (Missouri University of Science and Technology)

14:40 **105** **Numerically Efficient Algorithm for Solving Pseudo 2-Dimensional Li-Ion Cell Model** – S. Han (SF Motors Inc)

15:00 **106** **Nonlinear Model Predictive Control Strategies for Optimal Charging of a Lithium-Ion Battery** – S. V. Aduru (BattGenie Inc., Seattle), M. Pathak (BattGenie Inc, Seattle), S. Kolluri (BattGenie Inc, Seattle, University of Washington, Seattle), R. D. Braatz (Massachusetts Institute of Technology), and V. R. Subramanian (BattGenie Inc., Seattle, University of Washington)

15:20 **107** **Efficient Third-Party Abstraction of Lithium-Ion Batteries for Asset Modeling** – M. Rogall (University of Warwick, EDF Energy), D. Greenwood, A. Barai, R. Bhagat (University of Warwick), P. Luk (Cranfield University), and M. Brucoli (EDF Energy)

15:40 **108** **Lithium Ion Batteries and Next Generation Energy Storage Technology - Adoption to Aircraft and Aerospace** – R. A. Brewer (Lockheed Martin)

16:00 **109** **Addressing Space Cell and Battery Safety Design through Standardized Qualification Tests: American Institute of Aeronautics and Astronautics S-144-2018** – B. Reed (WR Scientific Incorporated)

A02 Lithium Ion Batteries and Beyond

Battery / Physical and Analytical Electrochemistry
Lone Star A2, Dallas Sheraton Convention Center

Beyond Lithium Ion 1 – 08:00 – 12:00
Chair(s): Hyunpyo Lee, Mohit Mehta and Zhenyou Li

08:00 **344** **High Energy Density Li-Air Battery with the Polymer Electrolyte Coated CNTs Electrode Via Layer-By-Layer Method** – H. Lee (Samsung Electronics Co., Ltd.), D. J. Lee (Samsung Electronics), M. Kim, H. Kim, H. J. Kwon (Samsung Electronics Co., Ltd.), H. C. Lee (Samsung Electronic Co., Ltd.), and D. Im (Samsung Electronics Co., Ltd.)

08:20 **345** **Rechargeable Aluminum/Natural Graphite Battery Based on Deep Eutectic Solvents** – K. L. Ng, M. Malik, and G. Azimi (University of Toronto)

08:40 **346** **Room Temperature Fluoride Ion Batteries** – A. R. Munnangi (Helmholtz Institute Ulm (HIU)), I. Mohammad (Tallinn University of Technology), and M. Fichtner (Karlsruhe Institute of Technology (KIT))

09:00 **347** **A Multi-Physics Study on High-Power Li-O_2 Batteries for Electric Aircrafts** – M. Mehta (Analytical Mechanics Associates, Inc., NASA AMES Research Center), K. B. Knudsen (Energy Storage and Distributed Resources Division, LBNL, Department of Chemical Engineering, UC Berkeley), D. A. Dornbusch (NASA Glenn Research Center, Case Western Reserve University), W. R. Bennett (NASA Glenn Research Center), L. J. Abbott (Analytical Mechanics Associates, Inc., NASA AMES Research Center), J. B. Haskins (NASA Ames Research Center), B. D. McCloskey (Energy Storage and Distributed Resources Division, LBNL, Department of Chemical Engineering, UC Berkeley), and J. W. Lawson (NASA Ames Research Center)

09:20 **348** **Transparent Conducting Oxides As Cathodes in Li-O_2 batteries: A First Principles Computational Investigation** – B. Radhakrishnan (AMA Inc,, NASA Ames Research Center) and J. W. Lawson (NASA Ames Research Center)

09:40 **Break**

10:00 **349** **A Long Cycle-Life and High-Rate Magnesium-Ion Battery Anode Enabled through Self-Healing By Near-Room-Temperature Solid-Liquid Phase Transition** – L. Wang, S. S. Welborn, and E. Detsi (School of Engineering, University of Pennsylvania)

10:20 **350** **Regulating Ca^{2+} Electrolyte Transport and Stability for Calcium Metal Deposition** – N. T. Hahn, K. R. Zavadil (Material, Physical and Chemical Sciences Center, Sandia National Laboratories), J. Self (Lawrence Berkeley National Laboratory), T. Seguin (Energy Technologies Division, Lawrence Berkeley National Laboratory), and K. A. Persson (Lawrence Berkeley National Laboratory, Joint Center for Energy Storage Research)

10:40 **351** **Decoupling the Role of Anion and Solvent on Mg Electrodeposition Efficiency through Interfacial Speciation Determination** – K. R. Zavadil, N. T. Hahn (Sandia National Laboratories), X. Feng, E. Anquillare, J. Guo, T. Seguin (Lawrence Berkeley National Laboratory), and K. A. Persson (Lawrence Berkeley National Laboratory, University of California at Berkeley)

11:00 **352** **Dendrite-Free Epitaxial Growth of Lithium for Efficient Charging of Li–O_2 Batteries with Improved Cycle Life** – A. Dutta, K. Ito, and Y. Kubo (National Institute for Materials Science)

11:20 **353** **Intercalation of Solvated Magnesium-Ions into Layered Transition Metal Sulfide for Fast Mg Storage** – Z. Li (Helmholtz Institute Ulm (HIU), Karlsruhe Institute of Technology (KIT)), Z. Zhao-Karger (Helmholtz Institute Ulm (HIU), Karlsruhe Institute of Technology (KIT), Germany), and M. Fichtner (Helmholtz Institute Ulm (HIU), Karlsruhe Institute of Technology (KIT))

11:40 **354** **Elucidating Zn, Mg, and Ca Electrodeposition Mechanisms in Nonaqueous Electrolytes for Next-Generation Metal Batteries** – K. Ta (University of Illinois at Urbana-Champaign), K. A. See (University of Illinois, Urbana-Champaign), R. Zhang, M. Shin, R. Rooney, E. K. Neumann (University of Illinois at Urbana-Champaign), and A. A. Gewirth (University of Illinois)

Lone Star A1, Dallas Sheraton Convention Center

Lithium Ion Cathodes 3 – 08:00 – 12:20
Chair(s): David L Wood III and Jimmy-Xuan Shen

08:00 **355** **Direct Electrodeposition Li-V-Mn-Ni-O Composite Films on Al Foils Toward Li Ion Battery Cathode Materials** – T. Inoue (Nagoya Institute of Technology), S. Z. S. Kure-Chu (Nagoya Institute of Tehnology), Y. Moriguchi, R. Miyazaki, T. Hihara (Nagoya Institute of Technology), and H. Yashiro (Iwate University)

08:20 **356** **Incorporation of Aluminum into High-Nickel Layered Oxide Cathodes: An Interphase and Structural Study** – J. Li and A. Manthiram (The University of Texas at Austin)

08:40 **357** **Development of Selenium Substituted Lithium Titanium Sulfide Materials ($Li_2TiSe_xS_{3-x}$) As Positive Electrodes for Li-Ion Batteries** – Y. Celasun (Univ. Grenoble Alpes, CEA, LITEN, F-38054 Grenoble, France), J. F. Colin, D. Peralta, and S. Martinet (CEA, LITEN, F-38054 Grenoble, France)

09:00 **358** **Processing, Fast Formation, and Performance of Aqueous-Processed Low-Co Cathodes for High-Energy Lithium-Ion Pouch Cells** – D. L. Wood III, M. Wood, C. Mao, J. Li, R. E. Ruther, and Z. Du (Oak Ridge National Laboratory)

09:20 **359** **A Study of Particle Size Effect on the Voltage Behavior of $Li_xNi_{0.5}Mn_{1.5}O_4$ Electrode** – Y. Xie (California State University Fresno)

09:40 **Break**

10:00 **360** **A Materials Genome Approach for Discovery of Novel Li-Ion Cathodes** – J. X. Shen (UC Berkeley), K. A. Persson (Lawrence Berkeley National Laboratory), and M. Horton (Lawarence Berkeley National Lab)

10:20 **361** **A Simple Surface Modification Technique to Improve the Electrochemical Properties of NMC Family Cathode Materials** – M. Ashuri, Q. He (Wanger Institute for Sustainable Energy Research (WISER), Illinois Institute of Technology), and L. Shaw (Illinois Institute of Technology, Wanger Institute for Sustainable Energy Research (WISER))

10:40 **362** **Surface Modifications on $LiCoO_2$-Based Cathodes for High-Density Lithium-Ion Batteries with Long Cycle Life** – Z. Feng and T. Holstun (Oregon State University)

11:00 **363** **High-Voltage Cathode Materials for Li-Ion Batteries; $LiNi_{0.5}Mn_{1.5}O_4$ Stabilized By Surface Coating** – E. R. Oestli (Norwegian University of Science and Technology), N. P. Wagner (SINTEF Industry), A. M. Svensson, and F. Vullum-Bruer (Norwegian University of Science and Technology)

11:20 **364** **Solvent-Free Mechano-Fusion Assisted Carbon Coatings for High Capacity Cathode - a Practically Feasible Approach** – V. Selvamani, N. Phattharasupakun, J. Wutthiprom, and M. Sawangphruk (Vidyasirimedhi Institute of Science and Technology)

11:40 **365** **Influence of Calcination Temperature on the Performance of Li and Mn Rich $Li_{1.2}Mn_{0.54}Co_{0.13}Ni_{0.13}O_2$layered Electrode for Lithium Ion Battery** – S. Piraman and S. Alagar (ALAGAPPA UNIVERSITY)

12:00 **366** **Improved Electrochemical Performance of Al_2O_3-Coated $LiNi_{0.6}Mn_{0.2}Co_{0.2}O_2$ Cathodes By Atomic Layer Deposition** – X. Wang, J. Cai (University of Arkansas), J. Li (Oak Ridge National Laboratory), and X. Meng (University of Arkansas)

Lone Star A3, Dallas Sheraton Convention Center

Modeling – 08:00 – 12:20
Chair(s): Venkat R. Subramanian and Partha P. Mukherjee

08:00 **367** **Modelling the Impact of Manufacturing Uncertainties on Lithium-Ion Batteries** – O. Schmidt (Inst. of Energy & Process Systems Eng., TU Braunschweig, Battery LabFactory Braunschweig), M. Thomitzek (Inst. of Machine Tools & Production Tech., TU Braunschweig, Battery LabFactory Braunschweig), F. Röder (Inst. of Energy & Process Systems Eng., TU Braunschweig, Battery LabFactory Braunschweig), S. Thiede, C. Herrmann (Inst. of Machine Tools & Production Tech., TU Braunschweig, Battery LabFactory Braunschweig), and U. Krewer (Inst. of Energy & Process Systems Eng., TU Braunschweig, Battery LabFactory Braunschweig)

08:20 **368** **Physical Properties Needed to Enable Extreme Fast Charging of High Energy Density Graphite/NMC Cells** – A. M. Colclasure (National Renewable Energy Laboratory), A. R. Dunlop, S. E. Trask, B. J. Polzin, A. N. Jansen (Argonne National Laboratory), and K. Smith (National Renewable Energy Laboratory)

08:40 **369** **"Dead" Lithium: Interface Evolution and Characterization** – D. Tewari, S. Perumaram Rangarajan, and P. P. Mukherjee (Purdue University)

09:00 **370** **Impedance Based Electrode Diagnostics of Charge-Discharge Kinetics in Li-Ion Pouch Cells** – S. Perumaram Rangarajan (Purdue University), Y. Barsukov (Texas Instruments Inc.), and P. P. Mukherjee (Purdue University)

09:20 **371** **Mixed Mode Growth Model for the Solid Electrolyte Interface (SEI)** – N. Kamyab, J. W. Weidner, and R. E. White (University of South Carolina)

09:40 **Break**

10:00 **372** **Review of Capacity Fade Models for Lithium-Ion Batteries** – L. Teo (University of Washington), M. Pathak (University of Washington, BattGenie Inc.), A. J. Crawford, V. Viswanathan (Pacific Northwest National Laboratory), D. T. Schwartz (University of Washington), and V. R. Subramanian (University of Washington, Pacific Northwest National Laboratory)

10:20 **373** **Li Dendrite Nucleation from First Principles Perspective** – E. P. Kamphaus (Texas A&M University) and P. B. Balbuena (Texas A& M University)

10:40 **374** **Theoretical Study of Lithium Electrodeposition on Lithium Metal Anodes** – M. S. Angarita-Gomez (Texas A&M University) and P. B. Balbuena (Texas A& M University)

11:00 **375** **Mechanistic Investigations of Interfacial Stochasticticity in Lithium Metal Anodes** – A. Verma and P. P. Mukherjee (Purdue University)

11:20 **376** **Computational Insights to Charge Transfer Kinetics at the Cathode/Electrolyte Interface** – Y. Li (Northwestern Polytechnical University)

11:40 **377** **Mechanism Explaining the Onset of Dendritic Li Electrodeposition Via Considerations of Li-Ion Transport within the SEI Layer** – A. Maraschky and R. Akolkar (Case Western Reserve University)

12:00 **378** **Multi-Paradigm Modeling Approach to Simulate the Link between the Fabrication Process and the Performance of Li-Ion Batteries** – A. C. Ngandjong, A. Rucci, E. Primo, T. Lombardo, M. Chouchane, Z. Su, A. Shodiev (LRCS (CNRS&UPJV), RS2E), and A. A. Franco (LRCS (CNRS&UPJV), RS2E, ALISTORE-ERI, Institut Universitaire de France)

Lone Star A2, Dallas Sheraton Convention Center

Beyond Lithium Ion 2 – 13:40 – 17:20
Chair(s): Huilin Pan, Linhua Hu and Megan B. Sassin

13:40 **379** **Highly Reversible Reactions in Neutral Aqueous Zinc Battery Systems** – H. Pan, Y. Jin, Y. Shao, J. Liu, D. Reed, and V. Sprenkle (Pacific Northwest National Laboratory)

14:00 **380** **Characterising the Structure and Electrochemical Behaviour of Manganese Hexacyanochromate: Highlighting the Role and Importance of Structural Water at Low Potentials.** – S. Wheeler and M. Pasta (University of Oxford)

14:20 **381** **Structural and Electrochemical Insights into Iron-Based Fluoro(hydroxy)Phosphate a_xFePO_4y (A= Na, Li; Y= F, OH) As Cathode Materials for Aqueous Batteries** – L. Sharma (Indian Institute of Science, Bangalore), S. Okada (IGSES, Kyushu University), and P. Barpanda (Indian Institute of Science)

14:40 **382** **2.5 V Battery with Stripping/Plating of Stainless Steel** – H. Wang (SEE, City University of Hong Kong) and D. Y. W. Yu (City university of Hong Kong)

15:00 **383** **Achieving High Capacity at High Rates in Aqueous-Based Zn-Ion Batteries Via Advanced 3D Electrode Design and Mixed-Salt Electrolytes** – M. B. Sassin (U.S. Naval Research Laboratory), J. S. Ko, M. D. Donakowski (Former NRL/NRC Postdoctoral Associate), J. F. Parker (Surface Chemistry Branch (Code 6170)), J. W. Long (U.S. Naval Research Laboratory), and D. R. Rolison (Surface Chemistry Branch (Code 6170))

15:20 **384** **Transition Metal Cations Stabilized Layered Vanadate Cathodes for Zinc-Ion Batteries** – C. Liu and G. Cao (University of Washington)

15:40 **385** **Lithium Intercalated Layered Manganese Oxide/Reduced Graphene Oxide As the Bifunctional Electrocatalyst for Zn-Air Battery** – S. Kosasang, N. Ma, and M. Sawangphruk (Vidyasirimedhi Institute of Science and Technology)

16:00 **386** **Magnesium Chromium Oxide Nanocrystals: Synthesis and Electrochemistry** – L. Hu (JCESR at University of Illinois at Chicago), I. Johnson (University College London), S. Kim (Argonne National Laboratory), G. M. Nolis (JCESR at University of Illinois at Chicago), J. W. Freeland (X-ray Science Division), H. Yoo (Pusan National University), T. T. Fister (Chemical Sciences and Engineering Division), A. Ploszajski, L. McCafferty, T. Ashton (University College London), J. Darr (Department of Chemistry, University College London), and J. Cabana (University of Illinois at Chicago)

16:20 **387** **Modelling Mg Storage and Mobility in V_2O_5 and Anatase TiO_2** – K. McColl and F. Corà (University College London)

16:40 **388** **Interfacial Behavior of Magnesium Ions at Electrode/Electrolyte Interface during Magnesium Deposition Reaction** – F. Tuerxun, M. Hattori, K. Yamamoto (Kyoto University), T. Mandai (Faculty of Science and Engineering, Iwate University), M. Matsui (Kobe University), Y. Tateyama (National Institute for Materials Science (NIMS)), T. Uchiyama (Kyoto University), T. Takeguchi (Faculty of Science and Engineering, Iwate University), K. Kanamura (Tokyo Metropolitan University), and Y. Uchimoto (Kyoto University)

17:00 **389** **A Highly Hierarchical Hollow Sodium Sulfide Nanospheres Embedded in Spongy Carbon Composite As Cathode for High-Rate Performance Sodium-Sulfur Batteries** – C. Wang, H. Wang, and W. Li (Dartmouth College)

Lone Star A1, Dallas Sheraton Convention Center

Diagnostics 2 – 14:00 – 17:20

Chair(s): Xiao-Guang Yang and Zhijia Du

14:00 **390** **High-Accuracy Life Estimation of Large-Size Lithium-Ion Battery Operated Under Diversified SOC Change** – N. Ukumori, S. Yamate, and S. Hitomi (GS Yuasa International Ltd.)

14:20 **391** **Study of Charge–Discharge Energy Prediction Using Neural Networks for Improving the Operational Economic Efficiency of Lithium-Ion Battery Aggregation** – M. Arima (Daiwa Can Company, Ritsumeikan University), L. Lin, and M. Fukui (Ritsumeikan University)

14:40 **392** **Radiation Curing and Its Application in Li Cells** – Z. Du (Oak Ridge National Laboratory), C. J. Janke (Oak Ridge National Lab), J. Li (Oak Ridge National Laboratory), and D. L. Wood III (University of Tennessee)

15:00 **393** **An Experimental Analysis on the Impacts of Different Pulse Charging Frequencies on Lithium Ion Batteries** – D. R. Rajagopalan Kannan, P. L. Moss, and M. H. Weatherspoon (Florida A&M University - Florida State University)

15:20 **394** **The Effects of Cell Design on Li Plating in Li-Ion Cells: A Real Insight into Cell Design Optimization for Minimizing Li Plating** – M. M. Forouzan (SF Motors Inc), S. Khaleghi Rahimian (SF Motors), S. Han, Y. Liu, and Y. Tang (SF Motors Inc)

15:40 **395** **Crack Behavior of Secondary Particles in Li-Ion Battery Electrodes during Lithiation/De-Lithiation Cycles** – Y. Zhang (Shanghai university) and Z. Guo (shanghai university)

16:00 **396** **High Energy Density Flexible Battery with Self-Standing Binder- and Collector-Free Electrodes** – O. A. Kuznetsov (Honda Research Institute), E. Pigos (Nanosynthesis Plus Ltd.), G. Chen (Honda Research Institute USA Inc.), and A. R. Harutyunyan (Honda Research Institute USA Inc)

16:20 **397** **Climate-Immune Extreme Fast Charging of High Energy Li-Ion Batteries** – X. G. Yang, T. Liu, S. Ge, and C. Y. Wang (Electrochemical Engine Center, Pennsylvania State Univ.)

16:40 **398** **Critical Safety Boundaries of Lithium Electrodeposition Against Nanoporous Ceramic Separators** – P. Bai (Washington University in St. Louis)

17:00 **399** **Design and Development of 21700 Type Cells for Electric Vehicle Applications** – G. Yang, C. P. Huang, B. Huang, C. Mao, and Y. Liu (SF Motors Inc)

A04 Battery Student Slam 3

Battery

San Antonio Ballroom A, Dallas Sheraton Convention Center

A04 Battery Student Slam Session 3 – 08:10 – 12:00

Chair(s): Feng Lin, Susan A. Odom, Guoying Chen, David Mitlin, Laurence J. Hardwick and Veronica Augustyn

08:10 **493** **Photoactive Zn-Air-Batteries Suing Cobalt Oxide As the Photocatalyst at the Cathode** – C. Tomon, S. Kalasina, S. Duangdangchote, A. Krittayavathananon, and M. Sawangphruk (Vidyasirimedhi Institute of Science and Technology)

08:20 **494** **Polyaniline-Modified Hydrolyzed Polyethylene Separators for High-Performance Lithium-Sulfur Batteries** – S. Tubtimkuna, J. Wutthiprom, P. Chiochan, S. Duangdangchote, A. Krittayavathananon, and M. Sawangphruk (Vidyasirimedhi Institute of Science and Technology)

08:30 **495** **Shutdown-Enabled Electrospun Polyimide Composite Film Prepared By Novel Spin-Coating Method with Polyethylene As Separator for Rechargeable Lithium-Ion Batteries** – C. T. Hsieh and C. C. Hu (Depart. of Chemical Engineering, National Tsinghua Univ.)

08:40 **496** **Understanding the Effects of Structural Water in Tungsten Oxide for High Power Electrochemical Capacitor Applications** – J. B. Mitchell (North Carolina State University), N. R. Geise (Stanford University), A. R. Paterson (North Carolina State University), J. S. Ko (NRC Postdoc at the U.S. Naval Research Laboratory), J. W. Long (U.S. Naval Research Laboratory), M. F. Toney (SLAC National Accelerator Laboratory), and V. Augustyn (North Carolina State University)

08:50 **497** **Engineering the Low-Temperature Performance of Li-S Batteries** – A. Gupta and A. Manthiram (The University of Texas at Austin)

09:00 **498** **The Magnesium-Sulfur Battery with High Rate and Improved Capacity Using Cu Nanoparticle Additives** – P. He, H. O. Ford, L. C. Merrill, and J. L. Schaefer (University of Notre Dame)

09:10 **499** **Bioinspired Electrodes for Structural Supercapacitors** – P. Flouda, D. Lagoudas, and J. Lutkenhaus (Texas A&M University)

09:20 **500** **Exploring Biomass-Derived Electrode Precursors for Vanadium Redox Flow Batteries** – C. T. C. Wan (Massachusetts Institute of Technology, Joint Center for Energy Storage Research), D. L. Barreiro (Massachusetts Institute of Technology), A. Forner-Cuenca (Massachusetts Institute of Technology, Joint Center for Energy Storage Research), J. W. Barotta (Massachusetts Institute of Technology), Y. M. Chiang (Massachusetts Institute of Technology, Joint Center for Energy Storage Research), F. R. Brushett (Joint Center for Energy Storage Research, MIT, Department of Chemical Engineering,MIT), M. J. Buehler, and F. J. Martin-Martinez (Massachusetts Institute of Technology)

09:30 **501** **Effect of Adscititious Water on the Mechanism of Mg^{2+} Intercalation in Tungsten Oxides from Non-Aqueous Electrolytes** – R. Wang (North Carolina State University), T. Kobayashi (Ames Laboratory), Y. Zhang (Vanderbilt University), P. V. Bonnesen (Oak Ridge National Laboratory), P. T. Cummings (Vanderbilt University), M. Pruski (Ames Laboratory), and V. Augustyn (North Carolina State University)

09:40 **Break**

10:10 **502** **Origin of Fast Ion Conduction in $Li_{10}GeP_2S_{12}$, a Superionic Conductor** – A. Bhandari and J. Bhattacharya (Indian Institute of Technology Kanpur)

10:20 **503** **CNF/S Cathodes for RT Na-S Batteries in Carbonate Electrolyte: Understanding the Role of Sulfur Phase and Solid Electrolyte Interphase** – R. Pai, A. Singh, A. Rafie, and V. Kalra (Drexel University)

10:30 **504** **The Electrochemistry of Low-Temperature Molten Quinones for All-Organic Redox Flow Batteries** – B. R. Howell and J. W. Gallaway (Northeastern University)

10:40 **505** **Effects of Particle Sizes of Active Materials and Conductive Additive on the Electrochemical Performance of a Semi-Solid Flow Battery** – B. Liu, T. Chen, J. Sun, and M. Zheng (Zhejiang University)

10:50 **506** **Failure Analysis of the Rechargeable Porous Zinc Electrode in Alkaline Electrolyte** – M. J. D'Ambrose (Chemical Engineering, The City College of New York), G. G. Yadav, D. Turney (CUNY Energy Institute at the City College of New York), J. W. Gallaway (Northeastern University), M. Nyce (CUNY Energy Institute at the City College of New York), R. J. Messinger (The City College of New York), and S. Banerjee (CUNY Energy Institute at the City College of New York)

11:00 **507** **High-Voltage Aqueous Redox Flow Battery Utilizing Metal Coordination Chemistry** – B. Robb and M. P. Marshak (University of Colorado Boulder)

11:10 **508** **Predicting the Solubility of Potential Redox Flow Battery Materials Using a Quantitative Structure-Property Relationship Models** – T. M. Suduwella (University of Kentucky, Joint Center for Energy Storage Research), S. Robinson (University of Utah, Joint Center for Energy Storage Research), N. H. Attanayake (University of Kentucky, Joint Center for Energy Storage Research), M. S. Sigman (University of Utah, Joint Center for Energy Storage Research), and S. A. Odom (University of Kentucky, Joint Center for Energy Storage Research)

11:20 **509** **Layered Hybrid Catalyst Containing N-Doped Graphene Oxide and Transition Metal Doped MnO_2 with Enhanced Bifunctional Activity for Zinc Air Battery Applications** – A. Mathur and A. Halder (Indian Institute of Technology Mandi)

11:30 **Concluding Remarks**

B01 Carbon Nanostructures for Energy Conversion and Storage

Nanocarbons / Battery / Physical and Analytical Electrochemistry

City View 8, Dallas Sheraton Hotel

Energy Storage 1 – 08:00 – 12:00
Chair(s): Avetik R Harutyunyan and Xiulei Ji

08:00 **641** ***(Invited)* Design and Application of Advanced Materials in Electrochemical Energy Storage Systems** – Z. Chen (University of Waterloo)

08:20 **642** **Hierarchically Designed 3D-Nanostructures Using Surface Engineered Graphene Shells** – K. K. Sarigamala, S. Shukla (Indian Institute of Technology Bombay), A. Struck (Rhine-Waal University of Applied Sciences), and S. Saxena (Indian Institute of Technology Bombay)

08:40 **643** **Polyluminol Modified Carbon Nanotube Electrodes for Electrochemical Capacitors** – J. N'Diaye and K. Lian (University of Toronto)

09:00 **644** ***(Invited)* Fundamental Understanding of Faradaic and Non-Faradaic Processes in Carbon-Based Supercapacitors** – G. S. Hwang (University of Texas at Austin)

09:20 **645** **Graphene/Poly(3,4-ethylenedioxythiophene): Polystyrenesulfonate Hybrid Electrodes for All Solid-State Flexible Supercapacitors** – J. Cherusseri (University of Central Florida, Nanoscience Technology Center, UCF), K. Sambath Kumar (University of Central Florida, Nanoscience Technology Center), and J. Thomas (NanoScience Technology Center, UCF, Department of Materials Science and Engineering, UCF)

09:40 **Break**

10:00 **646** **Carbon Nanotube As Conductive Additive for Lithium Ion Batteries** – J. Kirner, L. Zhang, Y. Qin, A. N. Jansen, and W. Lu (Argonne National Laboratory)

10:20 **647** ***(Invited)* Encapsulating Various Sulfur Allotropes Within Graphene Nanocages for Long-Lasting Lithium Storage** – J. Lu (Argonne National Laboratory)

10:40 **Coffee Break**

11:00 **648** ***(Invited)*** **Computational Electrochemistry of Carbon Materials for Energy Storage** – S. S. Jang (Georgia Institute of Technology)

11:20 **649** ***(Invited)*** **Holey Graphene Electrode Architectures** – Y. Lin (National Institute of Aerospace) and J. W. Connell (NASA Langley Research Center)

11:40 **650** **Biomass Based Porous Carbons As Promising Composite Cathodes for Lithium Sulfur Battery** – A. A. Arie, H. Kristianto (Parahyangan Catholic University), and J. K. Lee (Korea Institute of Science and Technology)

Energy Technology Division Graduate Student Award Address sponsored by Bio-Logic – 12:00 – 12:20
Chair(s): Jeffrey L. Blackburn

12:00 **651** ***(Energy Technology Division Graduate Student Award Address sponsored by Bio-Logic)*** **Biomass-Derived Carbon Materials for Next-Generation Electrochemical Energy Storage Systems** – Z. Gao and X. Li (University of Virginia)

Energy Storage 2 – 14:00 – 17:00
Chair(s): Min-Kyu Song

14:00 **652** ***(Invited)*** **Carbon Nanostructures for Energy Storage** – A. R. Harutyunyan (Honda Research Institute USA Inc)

14:20 **653** **A Facile Way to Synthesize Carbon-Coated $LiMn_{0.7}Fe_{0.3}PO_4$/Reduced Graphene Oxide Sandwich-Structured Composite for Lithium Ion Batteries** – D. Ding, Y. Maeyoshi, M. Kubota, J. Wakasugi (ABRI Co., Ltd.), K. Kanamura (ABRI Co., Ltd., Tokyo Metropolitan University), and H. Abe (ABRI Co., Ltd.)

14:40 **654** **Influence of Ionic Liquid Electrolyte on Carbon Nanofibres Derived from Oxygen-Functionalized-Graphene for Novel Supercapacitors Electrode** – K. O. Oyedotun, T. M. Masikhwa (University of Pretoria), S. Lindberg, A. Matic (Chalmers University of Technology), P. Johansson (Department of Physics, Chalmers University of Technology), and N. Manyala (University of Pretoria)

15:00 **655** ***(Invited)*** **Directional Flow-Aided Sonochemistry Yields Graphene with Tunable Defects to Provide Fundamental Insight on Sodium Metal Plating Behavior** – D. Mitlin (Clarkson University)

15:20 **656** **Bipolar Electrochemically Exfoliated Graphene for Supercapacitor Application** – I. Khakpour, A. Rabiei Baboukani (Florida International University), A. Allagui (University of Sharjah), and C. Wang (Florida International University)

15:40 **Break**

16:00 **657** **Ni Wrapped-Carbon Nanofiber Based Anode for High Areal Capacity for Li-Ion Battery** – T. P. Plateau (Missouri University of Science and Technology), S. Sarkar (Missouri University of Science and Technology, Rolla), H. Pham, and J. Park (Missouri University of Science and Technology)

16:20 **658** ***(Invited)*** **Tailoring Mesoporous Carbons and Related Materials for Energy-Storage and Energy-Conversion Applications** – S. Dai (Oak Ridge National Laboratory)

16:40 **659** **High Performance Supercapacitor Electrode Material from PAN/6FDA-Daba Polymer Blends** – J. P. Ferraris (University of Taxas at Dallas), K. J. Balkus Jr. (The University of Texas at Dallas), and S. D. Panangala (University of Taxas at Dallas)

B02 Carbon Nanostructures in Medicine and Biology

Nanocarbons / Organic and Biological Electrochemistry / Sensor
City View 6, Dallas Sheraton Hotel

Carbon Nanotubes 1 – 08:00 – 09:40
Chair(s): Tatiana DaRos and Januka Budhathoki-Uprety

08:00 **673** **Oxygen-Doped Carbon Nanotubes for Near-Infrared Imaging Probes** – T. Okazaki (CNT-Application Research Center, AIST)

08:20 **674** ***(Invited)*** **Single Luminescent Carbon Nanotubes Interrogate the Live Brain Extracellular Space at the Nanoscale** – L. Cognet (Institut d'Optique & CNRS, Univ. Bordeaux, France)

08:40 **675** ***(Invited)*** **DNA Library Evolution of Carbon Nanotube Molecular Recognition** – M. P. Landry (Chan-Zuckerberg Biohub) and S. Jeong (University of California Berkeley)

09:00 **676** ***(Invited)*** **Aqueous Dispersion and Characterization of Carbon Nanotubes Functionalized By Biomimetic Glycopolymers** – M. Cantwell, K. K. Chan, X. L. Sun, and G. Ao (Cleveland State University)

09:20 **677** **A Nanobioengineering Frontier for Next-Generation Optical Devices** – A. A. Boghossian (École Polytechnique Fédérale de Lausanne)

Carbon Nanotubes 2 – 10:00 – 12:20
Chair(s): Nicole M Iverson and Daniel Roxbury

10:00 **678** ***(Invited)*** **Advances in NIR Fluorescent Swnt Sensors for Biomedical Applications** – M. Strano (Massachusetts Institute of Technology)

10:20 **679** ***(Invited)*** **Near-Infrared Fluorescence Modulation of Refolded DNA Aptamer-Functionalized Single-Walled Carbon Nanotubes for Optical Sensing** – K. Lee, A. Nojoomi, J. Jeon (University of Texas at Arlington), C. Y. Lee (Ulsan National Institute of Science and Technology), and K. Yum (University of Texas at Arlington)

10:40 **680** ***(Invited)*** **Step-Wise Molecular Self-Assembly on Single-Wall Carbon Nanotube Networks: Towards Development of Delivery Systems of Highly Potent but Difficult to Administer Drugs** – M. F. Islam (Carnegie Mellon University)

11:00 **681** ***(Invited)*** **Targeted Near Infrared Sensing and Imaging with GFP-Nanobody Carbon Nanotube Hybrids** – S. Kruss (Göttingen University)

11:20 **682** **Protein Biomarker Detection with Carbon Nanotube-Based Sensors** – J. Budhathoki-Uprety (North Carolina State University) and D. A. Heller (Weill Cornell Medicine, Cornell University)

11:40 **683** **Understanding Corona Exchange Dynamics on Single-Walled Carbon Nanotubes with Multiplexed Fluorescence Monitoring** – R. L. Pinals, D. Yang, W. Cao (University of California, Berkeley), and M. P. Landry (Chan-Zuckerberg Biohub)

12:00 **684** **Real-Time Near-Infrared Confocal Imaging of Bacterial Cell Division in the Presence of Single-Walled Carbon Nanotubes** – A. Antonucci, N. Schuergers, V. Zubkovs, and A. A. Boghossian (École Polytechnique Fédérale de Lausanne)

Nanocarbon Optoelectronics in Biomedicine – 14:00 – 16:20
Chair(s): Geyou Ao and Sebastian Kruss

14:00 **685** ***(Invited)*** **Sequence-Dependent Stability and Fate of DNA-Wrapped Single-Walled Carbon Nanotubes in Mammalian Cells** – M. Gravely, M. M. Safaee, and D. Roxbury (University of Rhode Island)

14:20 **686** **Biomolecular Sensors Based on Microfluidics-Embedded Graphene Field-Effect Transistors** – D. Bouilly, C. M. Bazan, M. Sauvage, and A. Bencherif (Universite de Montreal)

14:40 **687** ***(Invited)*** **Development and Utilization of an in Vitro Single Walled Carbon Nanotube System to Quantify Extracellular Nitric Oxide Concentration** – N. M. Iverson (University of Nebraska Lincoln), J. A. Stapleton, J. Glas (University of Nebraska-Lincoln), and E. M. Hofferber (University of Nebraska Lincoln)

15:00 **688** ***(Invited)*** **Biological Multiphoton Imaging Techniques for Tracking Non-Fluorescent Carbon Nanomaterials** – S. J. Corr (Rice University, Baylor College of Medicine), E. Kakadiaris (RICE UNIVERSITY), M. McDOWELL (Rice University), E. Lewis (Baylor College of Medicine), T. Sonka, A. Anderson (BAYLOR COLLEGE OF MEDICINE), A. Marti (RICE UNIVERSITY), and L. J. Wilson (Rice University Department of Chemistry)

15:20 **689** **Carbon Nanotube Biohybrids: From Protein Site-Specific Coupling to the Fabrication of Reconfigurable (multi)Sensing Systems and Devices** – M. Palma (Queen Mary University of London)

15:40 **690** **Directed Evolution of the Optoelectronic Properties of Synthetic Nanomaterials** – B. P. Lambert, A. J. Gillen, N. Schuergers, S. J. Wu, and A. A. Boghossian (École Polytechnique Fédérale de Lausanne)

16:00 **691** **Progress Towards Single-Walled Carbon Nanotube Applications in Biomedicine and the Exoneration of Toxicity** – D. A. Heller, T. V. Galassi (Weill Cornell Medicine, Cornell University), P. V. Jena (Memorial Sloan Kettering Cancer Center), G. Ao (Cleveland State University), D. Roxbury (University of Rhode Island), M. Zheng (National Institute of Standards and Technology), and R. M. Williams (Memorial Sloan Kettering Cancer Center)

B04 Nano in Latin America

Nanocarbons / Dielectric Science and Technology / Electronics and Photonics
City View 5, Dallas Sheraton Hotel

NANO in Latin America 1 – 09:00 – 09:40
Chair(s): Mauricio Terrones and Ljubisa R Radovic

09:00 **755** ***(Invited)*** **Biomass-Derivative Molecules for the Sustainable Synthesis of Carbon-Doped High-Performance Nanostructured Materials** – J. Matos (University of Concepción) and P. S. Poon (UDT-Universidad de Concepción)

09:20 **756** ***(Invited)*** **Graphitization of Carbon Obtained from Local Biomass (babassu) and Their Electrochemical Properties** – A. Ghosh (Federal University of Piaui), C. D. A. Razzino (Vale do Paraíba University (UNIVAP)), A. Dasgupta, K. Fujisawa (Pennsylvania State University), J. Cunha (Federal Univesrsity of Para), A. O. Lobo (Federal University of Piaui, Vale do Paraíba University (UNIVAP)), J. Robinson, M. Terrones (Pennsylvania State University), and B. C. Viana (Federal University of Piaui)

NANO in Latin America 2 – 10:00 – 12:20
Chair(s): Juan Matos and Monica Cerro-Lopez

10:00 **757** ***(Invited)*** **A Review of Defects in 2D Metal Dichalcogenides: Doping, Alloys, Interfaces, Vacancies and Their Effects in Catalysis & Optical Emission** – M. Terrones (Pennsylvania State University)

10:20 **758** ***(Invited)*** **Synthesis of Helical-CNT and Stacked Graphene-CNF Using a Copper Foil As Catalyst in a Chemical Vapor Deposition System** – J. L. Fajardo-Díaz, E. Munoz-Sandoval, and F. Lopez-Urias (IPICYT)

10:40 **759** ***(Invited)*** **On the Active Sites in the Graphene-Catalyzed Oxygen Reduction Reaction** – L. R. Radovic (Univ Concepcion (Chile) and Penn State Univ (USA))

11:00 **760** ***(Invited)*** **Resonance Raman Spectroscopy Studies in 2D and 1D Nanocarbons** – A. G. G. Souza Filho (Universidade Federal do Ceará)

11:20 **761** ***(Invited)*** **Nanocarbons Fabricated By CVD: Medical and Electrochemical Applications** – E. Munoz-Sandoval (IPICYT)

11:40 **762** ***(Invited)*** **Assembly of Electrochemically Reduced Graphene Oxide, at the Nano and Microscales, for the Preparation of Functional Coatings.** – L. F. Chazaro Ruiz (Instituto Potosino de Investigación Cientifica y Tec), J. A. Quezada Renteria (Instituto Potosino de Investigacion Cientifica y Tec), J. R. Rangel-Mendez (Instituto Potosino de Investigación Científica y Tec), and C. O. Ania (CEMHTI, CNRS (UPR 3079), Univ. Orleans)

12:00 **763** ***(Invited)*** **Oxygen Reduction Reaction at MN4 and MN5 Catalysts - Calculated and Experimental O_2-Fe Binding Energies, Activity Indexes, Volcano Correlations** – F. Tasca (Universidad de Santiago de Chile), J. H. Zagal (University of Santiago de Chile), W. Orellana (Universidad Andres Bello), and J. Marco (ROCASOLANO CENTER, MADRID)

NANO in Latin America 3 – 14:00 – 15:20
Chair(s): Federico Tasca and Luis Felipe Cházaro-Ruiz

14:00 **764** ***(Invited)*** **Tuning the Electrocatalytic Activity of Fe Phthalocyanine Via Axial Ligation to Multiwalled Carbon Nanotubes and Via Ligand Substitution: Electrochemistry of l-Cysteine and l-Cystine** – J. H. Zagal (University of Santiago de Chile)

14:20 **765** ***(Invited)*** **Cyclic Voltammetry of Gold Nanoparticles: Comparative Analysis of Redox, Electronic and Optical Properties** – A. Figueroa-Gonzalez, M. Cerro-Lopez, and M. A. Mendez-Rojas (Fundacion Universidad de las Americas Puebla)

14:40 **766** ***(Invited)*** **Hydrogen Peroxide Electrochemical Sensing Based on a TiO_2 nanotubes Electrode Modified with *Hibiscus Sabdariffa L*. Anthocyanins** – M. Martinez-Pacheco, J. D. Lozada-Ramirez, and M. Cerro-Lopez (Fundacion Universidad de las Americas Puebla)

15:00 **767** ***(Invited)*** **Long Cycling Life Aluminum-Ion Batteries By Nanocarbon Electrode Optimization, a Comparative Study for Sustainability in Rechargeable Batteries** – C. G. Carvajal-Rossainz (Carbomex Nanomateriales SA de CV.), M. Cerro-Lopez, M. A. Mendez-Rojas (Fundacion Universidad de las Americas Puebla), E. Munoz-Sandoval, F. Lopez-Urias (IPICYT), T. A. Espinoza-Lopez, J. Perez-Andrade (Carbomex Nanomateriales SA de CV.), and I. G. Jimenez-Flores (Fundacion Universidad de las Americas Puebla)

B08 Porphyrins, Phthalocyanines, and Supramolecular Assemblies

Nanocarbons / Organic and Biological Electrochemistry
City View 7, Dallas Sheraton Hotel

Biological Systems – 08:00 – 09:40
Chair(s): Koichiro Ishimori and Muniappan Sankar

08:00 **939** **From Ferrous HRP to Compound I and Back: The Role of Protein and the Mediators in Reversible Redox Transitions** – G. LeVasseur, A. Stettler, D. Chen (Michigan State University), Z. Zhang (Anhui University of Chinese Medicine), and D. A. Proshlyakov (Michigan State University)

08:20 **940** **Structural Factors for Regulation of Electron Transfer from Cytochrome *C* to Cytochrome *C* Oxidase** – K. Ishimori (Hokkaido University)

08:40 **941** **Bright Quadruplex Nanostructures Using Masked Porphyrin Lanterns** – J. Jayawickramarajah, P. Pathak, and R. S. Vik (Tulane University)

09:00 **942** **Supramolecular Assemblies Recognized Gastric Cancer Biomarkers in Biological Fluids** – R. I. Stefan-van Staden (INCEMC)

09:20 **943** **Erythropoietin Accelerates a Cancer Specific Porphyrins' Accumulation** – H. Matsui and H. Kurokawa (University of Tsukuba, Faculty of Medicine)

Porphyrinoid Photo Physics – 10:00 – 12:20
Chair(s): Victor V. Nemykin and Sergei Vinogradov

10:00 **944** **Tuning up Redox and Photophysical Properties of Donor-Acceptor Dichromophoric Dyads and Triads Toward a Rational Design of New Light-Harvesting Materials** – V. V. Nemykin (University of Manitoba), Y. V. Zatsikha (Univesity of Manitoba), Y. P. Kovtun (Institute of Organic Chemistry), and D. A. Blank (University of Minnesota)

10:20 **945** **Porphyrin-Based Triad with Exceptionally High Magnetic Field Effects (MFE) on Phosphorescence** – D. Andrianov and S. Vinogradov (University of Pennsylvania)

10:40 **946** **Photophysics of Phosphorus Corroles and Application of the Compounds in Triplet-Triplet Annihilation Upconversion** – J. Zhao (Dalian University of Technology)

11:00 **947** **Accelerated Charge Separation and Stabilization in a Fused Bis Zinc Porphyrin-Quinone Conjugate Via Cation-Quinone Interaction** – M. B. Thomas, Y. Hu (University of North Texas), H. Wang (Univeristy of North Texas), and F. D'Souza (University of North Texas)

11:20 **948** **Main Group Element Containing Porphyrins in Construction of Photoanodes** – P. K. Poddutoori (University of Minnesota Duluth)

11:40 **949** **Charged Porphyrin Metal Complexes As Building Units of Ion-Pairing Assemblies and Materials** – H. Maeda (Ritsumeikan University)

12:00 **950** **Electronic Structure of Metal-Organic Complexes from an Optimally-Tuned Range-Separated Hybrid Functional** – L. Kronik (Weizmann Institute of Science)

Porphyrinoids – 14:00 – 15:20
Chair(s): Tomas Torres and David Sánchez-García

14:00 **951** **Photophysical and Electrochemical Studies of *B*-Functionalized Arylaminoporphyrins** – K. Prakash, R. Osterloh (University of Houston), M. Sankar (Indian Institute of Technology Roorkee), and K. M. Kadish (University of Houston)

14:20 **952** **Peripheral π-Extention of Carbazole-Based Porphyrins** – C. Maeda (Okayama University)

14:40 **953** **Thiophene-Fused Expanded Porphyrins with π-System Switching** – T. Higashino and H. Imahori (Kyoto University)

15:00 **954** **Novel Porphyrinoids from α,α-Linked Oligopyrroles** – G. Martínez-Edo, C. Casado-Aguilera, G. Anguera (Institut Químic de Sarrià, Universitat Ramon Llull), B. Kauffmann (Institut Européen de Chimie et Biologie), J. I. Borrell, S. Borrós, and D. Sánchez-García (Institut Químic de Sarrià, Universitat Ramon Llull)

B09 Nano for Industry

Nanocarbons / Industrial Electrochemistry and Electrochemical Engineering / Physical and Analytical Electrochemistry / Interdisciplinary Science and Technology Subcommittee / Dielectric Science and Technology
City View 5, Dallas Sheraton Hotel

NANO for Industry 3 – 08:00 – 09:00
Chair(s): Gleb Yushin and Stefan Mastel

08:00 **971** **Design and Construction of Novel High-Performance Paper-Based Flexible Micro-Supercapacitors** – W. Liu, M. Zhang, and A. Yu (University of Waterloo)

08:20 **972** **Morphology Controlled $MnCo_2O_{4.5}$ Induced By Graphene Quantum Dots and Their Application in Supercapacitors** – M. Zhang and A. Yu (University of Waterloo)

08:40 **973** ***(Invited)* Nano Carbon and Polymeric Materials for Energy Conversion and Storage** – Y. Chen (College of Chemistry, Nankai University)

F01 Industrial Electrochemistry and Electrochemical Engineering General Session

Industrial Electrochemistry and Electrochemical Engineering
Pearl 5, Dallas Sheraton Hotel

Industrial Electrochemistry and Electrochemical Engineering General Session 3 – 08:00 – 11:00
Chair(s): Douglas P. Riemer and John A. Staser

08:00 **1090** **Conversion of Carbon Dioxide into Valuable Chemicals through Electrochemical Reduction Using Transition Metal Electrocatalysts** – M. Kassie Birhanu, M. C. Tsai, C. T. Chen, A. Woldu Kahsay, T. S. Zeleke, K. Belay Ibrahim, C. J. Huang, W. N. Su, and B. J. Hwang (National Taiwan University of Science and Technology)

08:20 **1091** **Electrocatalytic Hydrogenation of Biogenic Molecules: Understanding Reactivity Trends** – O. Y. Gutiérrez Tinoco, U. Sanyal, L. C. Meyer, D. M. Camaioni, J. A. Lopez Ruiz, J. Holladay (Pacific Northwest National Laboratory), and J. A. Lercher (Technische Universität München)

08:40 **1092** **Using Boron-Doped Diamond Electrodes for Organic Synthesis** – S. R. Waldvogel (Johannes Gutenberg University Mainz), J. Haupt, M. Berger, and E. Rodrigo (JGU Mainz)

09:00 **1093** **Comparison of Electrochemical Degradation of Sulfonamides with BDD and Pt Electrodes** – H. Li, J. Ye, and C. Zhu (IEDA, CAAS)

09:20 **1094** **"Buried" Surfaces: Membrane-like Coatings for Favorable Electrocatalytic Selectivity** – B. T. Mei (University of Twente), B. Endrodi (University of Szeged - Hungarian Academy of Sciences), V. Smulders (University of Twente), A. Gomes, M. Widlock, N. Simic (Nouryon), G. Mul (University of Twente), and A. Cornell (KTH - Royal Institute of Technology)

09:40 **Break**

10:00 **1095** **Electrochemical Oxidation of Lignin Using a Novel Lead-Free Electrocatalyst** – R. Ghahremani and J. A. Staser (Ohio University)

10:20 **1096** **Development of Biosensor-Based Device for Urea Concentration Measurement in Industrial Fertilizer Samples** – M. Dagys, V. Gureviciene, and J. Razumiene (Life Sciences Center, Vilnius University, UAB "Bioanalizes sistemos", Ltd)

10:40 **1097** **Organic Contamination on Ionic Liquid Polymer Brush and Its Analysis By Raman Spectroscopy** – H. Kanematsu (National Institute of Technology Suzuka College), A. Oizumi (National Institute of Technology, Suzuka College), T. Sato, T. Kamijo, S. Honma (National Institute of Technology, Tsuruoka College), D. M. Barry (Clarkson University, SUNNY CANTON), A. Ogawa, N. Hirai, T. Kogo, D. Kuroda (National Institute of Technology Suzuka College), K. Tsunashima (National Institute of Technology Wakayama College), and M. Yoshitake (National institute for Materials Science)

F04 Multiscale Modeling, Simulation and Design 3: Enhancing Understanding, and Extracting Knowledge from Data

Industrial Electrochemistry and Electrochemical Engineering / Energy Technology

Pearl 4, Dallas Sheraton Hotel

Multiscale Modeling, Simulation and Design 3: Enhancing Understanding, and Extracting Knowledge from Data - Session 5 – 08:00 – 11:40
Chair(s): Ankur Jain

08:00 **1152** ***(Invited)*** **Differential Reference Concentration Cell Method for Determination of Thermodynamic Factors in Concentrated Binary Electrolytes** – A. Wang, T. Hou, and C. W. Monroe (Department of Engineering Science, University of Oxford)

08:40 **1153** **Electrochemical Modeling and Simulation of a Three-Electrode Lead Acid Cell** – A. Subramaniam, T. Jang, S. Kolluri (University of Washington), D. Majumdar, R. Charab, F. Trinidad, D. Jimenez (Exide Technologies), and V. R. Subramanian (University of Washington)

09:00 **1154** **Fast Simulation of Nonlinear Electrochemical Impedance of Lithium-Ion Batteries** – L. Teo (University of Washington), M. Pathak (University of Washington, BattGenie Inc.), T. Jang, M. D. Murbach, D. T. Schwartz (University of Washington), and V. R. Subramanian (University of Washington, Pacific Northwest National Laboratory)

09:20 **1155** **Incorporating GIS Data into a Battery Performance Model for Electric and Hybrid-Electric Buses** – E. E. Eggleton and D. T. Schwartz (University of Washington)

09:40 **Break**

10:00 **1156** **Power Hardware in the Loop (PHIL) Simulation of Battery Packs** – M. Uppaluri, C. Pathak, S. Kolluri, T. Jang (University of Washington), E. J. Dufek (Idaho National Laboratory), V. R. Subramanian, and D. T. Schwartz (University of Washington)

10:20 **1157** **A Mass and Charge Conserving Tanks-in-series Model for Lithium-Ion Batteries** – A. Subramaniam (University of Washington), S. Kolluri (University of Washington, BattGenie Inc, Seattle), C. D. Parke (University of Washington), M. Pathak (BattGenie Inc, Seattle), S. Santhanagopalan (National Renewable Energy Laboratory), and V. R. Subramanian (Pacific Northwest National Laboratory, University of Washington)

10:40 **1158** **Comsol Simulation of Hierarchical Ordered Porous Microstructure Electrode** – M. Azami-Ghadkolai, S. E. Creager, and R. Bordia (Clemson University)

11:00 **1159** **A Tanks-in-Series Electrochemical Engineering Model for Lithium Sulfur Batteries** – C. D. Parke, A. Subramaniam, S. Kolluri (University of Washington), M. Pathak (BattGenie Inc.), and V. R. Subramanian (University of Washington)

11:20 **1160** **Investigation on the Role of Coating Layer Thickness in CeO_2 Coated $LiMn_2O_4$ Particles for Li-Ion Batteries** – Y. Zhu, Y. He, X. Liang, and J. Park (Missouri University of Science and Technology)

Multiscale Modeling, Simulation and Design 3: Enhancing Understanding, and Extracting Knowledge from Data - Session 6 – 14:00 – 15:40
Chair(s): Venkat R. Subramanian and Scott Calabrese Barton

14:00 **1161** **A Highly Efficient Computational Model of Energy Storage Systems for Microgrid Applications** – D. M. Ajiboye, J. Kimball, R. Landers, and J. Park (Missouri University of Science and Technology)

14:20 **1162** ***(Invited)*** **Joint Time-frequency Analysis of Lithium-ion Batteries Undergoing Dynamic EIS** – D. T. Schwartz (University of Washington)

15:00 **1163** ***(Invited)*** **Lithium Metal Plating and Stripping Stability with a Solid Electrolyte Separator across Length Scales from the nm to the mm** – P. Albertus (University of Maryland)

I01 Hydrogen or Oxygen Evolution Catalysis for Water Electrolysis 5

Energy Technology / Industrial Electrochemistry and Electrochemical Engineering / Physical and Analytical Electrochemistry

State Room 2, Dallas Sheraton Convention Center

Reversible Fuel Cells – 07:55 – 10:10
Chair(s): Nemanja Danilovic and Jing Yu

07:55 **Welcoming Remarks**

08:00 **1460** ***(Invited)*** **Highly Active and Durable Ir-Pt Bifunctional Electrocatalyst for Oxygen Evolution and Hydrogen Oxidation Reactions** – N. N. Kariuki, M. Gebhard, A. U. Mane, M. Ferrandon, A. A. Farghaly, J. W. Elam (Argonne National Laboratory), N. Danilovic (Lawrence Berkeley National Laboratory), and D. J. Myers (Argonne National Laboratory)

08:30 **1461** **Bifunctional PGM-Free Hydrogen Evolution and Oxidation Electrocatalysts for AEM Electrodes** – A. Serov, A. Lubers, S. McKinney (Pajarito Powder, LLC), G. McCool (Pajarito Powder LLC), H. Romero (Pajarito Powder, LLC), M. Odgaard (IRD Fuel Cells), I. Kendrick (Northeastern University), S. Pann, S. Mukerjee (Chemistry and Chemical Biology, Northeastern University), C. B. Capuano, K. Ayers (Nel Hydrogen), and B. Zulevi (Pajarito Powder LLC)

08:50 **1462** **Experimental Analysis of Operating Conditions of Proton Exchange Membrane Based Unitized Regenerative Fuel Cells for Efficient and Economic Energy Conversion** – Y. N. Regmi (Lawrence Berkeley National Lab), J. Fornaciari (Lawrence Berkeley National Laboratory), M. Wei (Lawrence Berkeley National Lab), D. Myers (Argonne National Laboratory), A. Z. Weber, and N. Danilovic (Lawrence Berkeley National Laboratory)

09:10 **1463** **Two-Dimensional Nanoframes for High Activity Bifunctional Acidic Oxygen Reduction and Evolution Electrocatalysts** – F. Godinez-Salomon, L. Albiter, and C. P. Rhodes (Texas State University)

09:30 **1464** **Cups Ultrafine Nanoparticles Anchored into N-Doped Carbon Framework for Bifunctional Water Splitting** – J. Yu (Harbin Engineering University)

09:50 **1465** **Pt-Mn/C and Pd-Mn/C Nanoparticles As ORR Electrocatalysts** – M. Ahmadi (Cornell university) and H. D. Abruña (Cornell University)

PEC and Other Systems – 10:10 – 12:40
Chair(s): Hui Xu, John W. Weidner and Xueli Zheng

10:10 **1466** ***(Invited)* Structural Design Via Group Energy Materials for High-Efficient Photoelectrochemical Hydrogen Evolution Reaction** – X. Zheng and Y. Cui (Stanford University)

10:40 **1467** **Electronic Properties of the Co_3O_4 Photoelectrode: Predictions from First-Principles Calculations** – T. A. Pham (Lawrence Livermore National Laboratory), T. Smart, Y. Ping (University of California, Santa Cruz), and T. Ogitsu (Lawrence Livermore National Laboratory)

11:00 **1468** **Interface Effects and Band Edge Engineering in Photocatalytic Bi_2WO_6** – E. Bainglass and M. N. Huda (University of Texas at Arlington)

11:20 **1469** **Methylamine Treated Mn_3O_4 Nanoparticles for Efficient Water Oxidation Catalyst at Neutral Condition** – Y. H. Lee, S. Park, K. G. Lee, M. Y. Lee, K. H. Cho, S. J. Kim, and K. T. Nam (Seoul National University)

11:40 **1470** **Hydrogen Evolution Reaction Catalyzed By Plasmoinic Photo-Electrodes Under Visible Light Illumination** – H. Minamimoto, D. Sato, and K. Murakoshi (Hokkaido University)

12:00 **1471** **A Conical Nanogenerator Consisted of Multi-Walled Carbon Nanotubes** – V. D. Dao, Y. Jeong, I. Yoon, and H. S. Choi (Chungnam National University)

12:20 **1472** **The Effect of $SrCrO_4$ Impurity Phase in $(La_{0.75}Sr_{0.25})_{0.95}Cr_XFe_{1-X}O_{3-\Delta}$ (LSCrF) Nano-Ceramic Powder Series As Catalyst for the Propane Dehydrogenation** – K. Kucuk (Illinois Institute of Technology(IIT))

I02 Materials for Low Temperature Electrochemical Systems 5

Energy Technology / Physical and Analytical Electrochemistry
Houston Ballroom B, Dallas Sheraton Convention Center

Membrane – 08:00 – 11:40
Chair(s): Yu Seung Kim and Stephen E Creager

08:00 **1569** **Bipolar Membrane Development for Fuel Cells and Electrolyzers** – Y. Chen, E. Klein, T. G. Deutsch, and K. C. Neyerlin (National Renewable Energy Laboratory)

08:20 **1570** **Probing Acetonitrile Solvation in Perfluorsulfonate Ion Exchange Membrane By in-Situ FTIR** – K. Lou and T. A. Zawodzinski (University of Tennessee, Knoxville, TN, Oak Ridge National Laboratory, Oak Ridge, TN)

08:40 **1571** **Proton Transport within Acid Aggregates in a Hydrated Precise Sulfophenylated Polyethylene** – B. Paren (University of Pennsylvania), L. Picard (CEA-Grenoble, LITEN/ DEHT/ SCGE/ LGI, France), P. Rannou (CEA-Grenoble, INAC/SPrAM, UMR 5819, France), M. Marechal (CNRS, INAC-SPRAM, CEA), W. Neary, A. Kendrick, J. Kennemur (Florida State University), A. L. Frischknecht (Sandia National Labs), and K. Winey (University of Pennsylvania)

09:00 **1572** **Thickness Dependence Impact on Proton Transport Proton Properties of Nafion® Thin-Film on Platinum Model Electrode** – T. Uchiyama, X. Gao (Kyoto University), K. Yamamoto (Graduate School of Human and Environmental Studies), N. Takao (Device-functional analysis Department, NISSAN ARC, Ltd.), M. Matsumoto, H. Imai (Device Analysis Department, NISSAN ARC, Ltd.), S. Sugawara (FC-Cubic Technology Research Association), K. Shinohara (Fuel Cell Cutting-edge Research Center (FC-Cubic)), and Y. Uchimoto (Kyoto University)

09:20 **1573** **Studies on Proton Transmission across Graphene in Proton-Exchange Membrane Structures** – S. Bukola, L. M. Silva (Clemson University), C. Korzeniewski (Texas Tech University), J. M. Harris (University of Utah), and S. E. Creager (Clemson University)

09:40 **Break**

10:00 **1574** **Phosphoric Acid Loss Mechanism of High Temperature Proton Exchange Membranes** – A. S. Lee (Los Alamos National Lab), Y. K. Choe (AIST), I. Matanovic, and Y. S. Kim (Los Alamos National Laboratory)

10:20 **1575** **Caveat of High Temperature Accelerated Stability Test for Anion Exchange Membranes** – E. J. Park, S. Maurya (Los Alamos National Laboratory), M. Hibbs, C. Fujimoto (Sandia National Laboratory), and Y. S. Kim (Los Alamos National Laboratory)

10:40 **1576** **Advancement of Perfluorinated Alkaline Exchange Membrane Materials Toward Improved Durability** – D. Strasser (National Renewable Energy Lab), A. Neyerlin (National Renewable Energy Laboratory), K. Meek (National Renewable Energy Lab), Z. R. Owczarczyk, C. M. Antunes, and B. S. Pivovar (National Renewable Energy Laboratory)

11:00 **1577** **High-Performance Nafion Membrane Modified Using a 1,2,4-Triazole Derivative** – J. D. Kim (National Institute for Materials Science (NIMS)), A. Ohira (National Institute of Advanced Industrial Sci. Technol.), and H. Nakao (National Institute for Materials Science (NIMS))

11:20 **1578** **Synthesis, Characterization and Performance Evaluation of Hybrid Multiblock Copolymers for Proton Exchange Membrane Fuel Cells** – B. Gaur (NATIONAL INSTITUTE OF TECHNOLOGY HAMIRPUR (H.P), INDIA) and S. Awasthi (LOVELY PROFESSIONAL UNIVERSITY, JALANDHAR)

I03 Renewable Fuels via Artificial Photosynthesis or Heterocatalysis 4

Energy Technology / Sensor

State Room 3, Dallas Sheraton Convention Center

Carbon Dioxide Conversion 2 – 07:50 – 12:20
Chair(s): Pawel J. Kulesza and Jaejoon Lee

07:50 **1649** **Photocatalytic Water Oxidation Using Wide-Gap Semiconductor Modified with First-Low Transition-Metal Oxides Nanoparticles Under Visible Light** – M. Okazaki and K. Maeda (Tokyo Institute of Technology)

08:05 **1650** ***(Invited)* Mixed-Metal-Oxide Based Electrocatalysts for Efficient Reduction of Carbon Dioxide** – I. A. Rutkowska and P. J. Kulesza (University of Warsaw)

08:35 **1651** ***(Invited)* Electrocatalytic Reduction of CO_2in Gas-Phase Electrolyzers: Moving Towards a Relevant Use of CO_2** – T. G. Deutsch, Y. Chen, E. Klein, G. Bender, and K. C. Neyerlin (National Renewable Energy Laboratory)

09:05 **1652** ***(Invited)* New Mixed-Anion Photocatalysts for Water Splitting and CO_2 Fixation** – K. Maeda (Tokyo Institute of Technology)

09:35 **Break**

09:50 **1653** ***(Invited)* Synthesis of Porous Bi Electrocatalysts for Selective Production of Formate from CO_2 and Their Applications** – H. Park (Kyungpook National University)

10:20 **1654** ***(Invited)* Mechanistic Studies of the Direct Electrochemical CO_2 Reduction on Non-Metallic MNC Single Site and MNC/Cu Hybrid Catalysts** – P. Strasser (Technical University Berlin)

10:50 **1655** ***(Invited)* Structure, Composition, Support, and Electrolyte Effects in CO_2 Electroreduction** – B. Roldan Cuenya (Fritz Haber Institute of the Max Planck Society)

11:20 **1656** ***(Invited)* Composition Dependent Performance of Au-Pd Core-Shell Nanocatalysts for CO_2 Electrochemical Reduction** – S. Zhu, X. Qin, and M. Shao (The Hong Kong University of Science and Technology)

11:50 **1657** ***(Invited)* Dilute Cu Alloying in Au Nanostructures for Highly Selective and Long-Term Stability of CO_2 Reduction** – J. T. Song, J. Kim, and J. Oh (Korea Advanced Institute of Science and Technology)

Fundamental Studies on Semiconductors 2 – 13:50 – 17:00
Chair(s): Gary Wiederrecht and Sumit Verma

13:50 **1658** **Modulation of Excited State Dynamics in Semiconductor Electrodes with Electrical Bias** – G. F. Samu (ELI-ALPS Research Institute, University of Szeged), Á. Balog (University of Szeged), R. A. Scheidt, P. V. Kamat (University of Notre Dame), and C. Janáky (University of Szeged, ELI-ALPS Research Institute)

14:05 **1659** ***(Invited)* Ultrafast Studies of Self-Assembled Biomimetic Materials, Metal-Organic-Frameworks, and Plasmonic Metamaterials for Solar Light Harvesting** – G. Wiederrecht (Argonne National Laboratory)

14:35 **1660** **Characterization of Water Oxidation Amorphous Thin Film Catalysts By X-Ray *in-Situ* analysis** – G. Kwon (Brookhaven National Laboratory, Northwestern University/ Argonne National Laboratory), M. Risch (Georg-August-Universität Gättingen), B. G. Cho (Pohang Accelerator Laboratory), S. Chang, J. Heo (Chung-Ang University), H. Kim (Northwestern University), D. M. Tiede, and J. Kim (Argonne National Laboratory)

15:00 **1661** **Charge Carrier Dynamics in Metal-Oxide/ Nanocarbon Hybrid Photoelectrodes** – A. Kormányos (University of Szeged), A. Honarfar, T. Pullerits (University of Lund), and C. Janáky (University of Szeged)

15:15 **1662** **Probing Adsorption on Platinum Group Metals to Understand Fuel Production Via Electrocatalytic Reduction** – D. Richards, J. Akinola, J. X. Liu, B. Goldsmith, and N. Singh (University of Michigan Ann Arbor)

15:30 **1663** **Enhancement of Photocatalytic Hydrogen Generation of Ni Doped CdS Enabled By Improved Ultrafast Charge Transfer** – T. T. Isimjan (Saudi Arabia Basic Industries Corporation) and H. Idriss (UCL (UK))

15:45 **1664** **Methanol Production By H_2 Generated from Water Using Integrated Ultra High Concentrated Solar Cells-Electrolysis and Captured CO_2: A Process Development and Techno-Economy Analysis** – T. T. Isimjan (Saudi Arabia Basic Industries Corporation) and H. Idriss (UCL (UK))

16:00 **1665** **Solution Combustion Synthesis and Rapid Screening of Complex Oxides and Their Composites for Photoelectrochemical Solar Energy Conversion** – M. K. Hossain (The University of Texas) and K. Rajeshwar (University of Texas)

16:15 **1666** **Photocatalytic Overall Water Splitting: Observing H_2 and O_2 Transients with Ni/ NiO_x-Modified Mg:$SrTiO_3$** – B. T. Mei, K. Han, and G. Mul (University of Twente)

16:30 **1667** **Defect Engineering of Titania and Hematite Thin Films By Advanced Plasma Deposition Triggers High Photoelectrochemical Water Splitting Activity** – Š. Kment, A. Naldoni (RCPTM, Palacký University), Z. Hubička (Institute of Physics, ASCR, v.v.i), and R. Zbořil (RCPTM, Palacký University)

16:45 **1668** **Enhanced Electroreduction of Carbon Dioxide to Methanol Using Zinc Dendrites Pulse-deposited on Silver Foam** – Q. H. Low, N. W. X. Loo (National University of Singapore), F. Calle-Vallejo (IQTCUB), and B. S. Yeo (National University of Singapore)

I05 Heterogeneous Functional Materials for Energy Conversion and Storage 2

High-Temperature Energy, Materials, & Processes / Battery / Energy Technology / Physical and Analytical Electrochemistry

State Room 4, Dallas Sheraton Convention Center

Li-Ion Batteries – 08:00 – 09:40
Chair(s): Nian Liu and Vito Di Noto

08:00 **1766** ***(Keynote)* Developing High Voltage Li-Ion Batteries Based on Lithium Cobalt Phosphate (LCP)** – T. R. Jow, J. L. Allen, S. A. Delp (U.S. Army Research Laboratory), D. Liu, C. Kim, M. Cho (CETEES HydroQuébec), A. Guerfi (Research Institute of Hydro-Quebec (IREQ)), and K. Zaghib (CETEES, HydroQuébec)

08:40 **1767** ***(Invited)* Hybrid Li-Ion and Li-O_2 battery Enabled By Oxyhalogen-Sulfur Electrochemistry** – X. Wang (UC San Diego) and Y. S. Meng (University of California San Diego)

09:20 **1768** **Theoretical Investigation of the Effects of Metal Cations on Oxygen Reduction Reaction in Non-Aqueous Li-Air Batteries** – S. H. Rawal (Louisiana State University), B. Drewry (University of Arkansas), W. A. Shelton, and Y. Xu (Louisiana State University)

Solid-state and non-Li Batteries – 10:00 – 12:20
Chair(s): Taiguang Richard Jow and Vito Di Noto

10:00 **1769** ***(Keynote)* Effect of Architecturally Expressed Electrodes and Catalysts on Energy Storage/ Conversion in Aqueous Electrolytes** – D. R. Rolison (U.S. Naval Research Laboratory), J. F. Parker (Surface Chemistry Branch (Code 6170), U.S. Naval Research Laboratory), J. S. Ko (Former NRL/NRC Postdoctoral Associate), B. J. Hopkins (NRL/National Research Council Postdoctoral Associate), C. N. Chervin (U.S. Naval Research Laboratory), P. A. DeSario (Surface Chemistry Branch, Code 6170, U.S. Naval Research Laboratory), M. B. Sassin, and J. W. Long (U.S. Naval Research Laboratory)

10:40 **1770** ***(Invited)* Polymer-Ceramic Composite Electrolytes for All-Solid-Sate Lithium-Ion Batteries** – H. Yang and N. Wu (West Virginia University)

11:20 **1771** ***(Invited)* Directing Mg-Storage Chemistry in Organic Polymers Toward High-Energy Mg Batteries** – H. Dong, Y. Liang, and Y. Yao (University of Houston)

12:00 **1772** **Suppressing Reactivity of Sulfides in Solution Processing Enables Scalable Manufacturing of Thin, Flexible Solid-State Electrolytes** – D. H. S. Tan, A. Banerjee, Z. Deng, E. Wu, H. Nguyen, J. M. Doux, X. Wang, J. H. Cheng, S. P. Ong, S. Meng, and Z. Chen (University of California, San Diego)

Zinc-air Batteries – 14:00 – 15:20
Chair(s): Vito Di Noto and Nian Liu

14:00 **1773** ***(Invited)* Next-Generation Zinc–Air Batteries: Progresses, Challenges, and Perspectives** – N. Xu (Donghua University, University of Louisiana at Lafayette), J. Qiao (Donghua University), and X. D. Zhou (University of Louisiana at Lafayette)

14:40 **1774** ***(Invited)* Nanoscale Material Design of Zinc Anodes for High Energy Rechargeable Aqueous Batteries** – N. Liu (Georgia Institute of Technology)

Capacitors – 15:20 – 16:20
Chair(s): Steven C. DeCaluwe and Wilson K. S. Chiu

15:20 **1775** **Nanoporous Aluminum Oxide Templates of Arbitrary Thickness on Silicon Carrier Wafer** – G. Scisco (University of Florida), A. Skinner (Mainstream Engineering Corporation), J. J. Hill (Mainstream Engineering Corp.), K. S. Jones (University of Florida), and K. J. Ziegler (Department of Chemical Engineering)

15:40 **1776** **Construction of $NiMoO_4$/Polypyrrole Nanocomposites on Carbon Cloth As Advanced Electrodes for High Performance Flexible Supercapacitors** – D. Zhu and J. Wang (Harbin Engineering University)

16:00 **1777** **Novel Synthesis of Mn-Ni-Co Oxide(MNCO)@g-C_3N_4 Ternary Ribbon-like Hetero Nanocomposite for Psuedocapacitor Applications** – N. C. Mawari and S. K. Meher (Malaviya National Institute of Technology, Jaipur, India)

Catalysts – 16:20 – 17:40
Chair(s): Steven C. DeCaluwe and Wilson K. S. Chiu

16:20 **1778** **Modulating Proton and Electron Transfer Dynamics in Molecular Electrocatalysis Using Membrane-Covered Self-Assembled Monolayers** – J. Mennel, R. Gautam, S. Supakul, and C. J. Barile (University of Nevada, Reno)

16:40 **1779** **Copper-Cobalt Spinel Nanostructures As Multifunctional Electrocatalysts** – N. C. D. Nath (Dongguk University), H. Park (Kyungpook National University), and J. J. Lee (Dongguk University)

17:00 **1780** **New Avenues to MOF Derived Cobalt Chalcogenides for Efficient Electrocatalysis** – D. Das and K. Nanda (Indian Institute of Science)

17:20 **1781** **Binary Cobalt Manganese Oxide Systems for Electrocatalytic Applications** – C. H. Chen (National Sun Yat-sen University)

M03 Sensors for Precision Medicine

Sensor

Trinity 4, Dallas Sheraton Hotel

Sensors for Precision Medicine - Session 5 – 08:00 – 12:00
Chair(s): Leyla Soleymani and Dong-Joo Kim

08:00 **2113** ***(Invited)*** **Using Fast Scan Cyclic Voltammetry to elucidate the mechanism of action of Deep Brain Stimulation** – K. H. Lee (Dept. of Neurologic Surgery, Mayo Clinic)

08:40 **2114** **Aggressive Prostate Cancer Detection with an 8-Protein Biomarker Panel** – A. L. Jones, L. DhanapalaMudiyanselage (University of Connecticut), T. Baldo (Federal University of São Carlos), M. Sharafeldin (University of Connecticut), C. E. Krause (University of Hartford), N. Lee (George Washington University), and J. F. Rusling (National Univ of Ireland at Galway)

09:00 **2115** ***(Invited)*** **Glucose Sensor Prepared By the Immobilization of Glucose Oxidase Together with Nanocarbons and Prussian Blue Using Electrodeposition Method** – M. Yasuzawa (Tokushima University), H. P. Jhong (National Taiwan University of Science and Technology, Tokushima University), M. Kurashina (Tokushima University), C. H. Wang, and W. H. Chiang (National Taiwan University of Science and Technology)

09:40 **Break**

10:00 **2116** **Engineered Electroactive Solutions for Electrochemical Detection of Volatile Organic Biomarkers Associated with Disease** – C. N. Willis, M. Misra, and S. K. Mohanty (University of Utah)

10:20 **2117** ***(Invited)*** **Facile Nickel Phosphate Nano/Micro Structure As the High-Performance Electrode for Non-Enzymatic Glucose and pH Sensors** – K. M. Razeeb, P. Narayanasamy, and H. Shao (Tyndall National Institute, University College Cork)

11:00 **2118** **Detection of Pneumonia Volatile Organic Biomarkers Via Nanotube Sensing Platform** – Y. Saffary, L. McKinnon, C. N. Willis, K. Carlson, and S. K. Mohanty (University of Utah)

11:20 **2119** ***(Invited)*** **Closed Bipolar Electrochemistry with Multiplex Optical Readout for Rapid Diagnostics of Sepsis Syndrome Biomarkers** – A. Lopez, C. Oh, and P. W. Bohn (University of Notre Dame)

Sensors for Precision Medicine - Session 6 – 14:00 – 17:40
Chair(s): Ajit Khosla and Peter J Hesketh

14:00 **2120** ***(Invited)*** **Stationary Phase Coatings for a Microfabricated GC Column Integrated with Low Power Ion Trap Mass Spectrometer for Analysis of Volatile Organic Compounds** – T. H. Chang, D. Struk, M. Navaei (Georgia Institute of Technology), V. M. Doroshenko, V. Laiko, E. Moskovets, K. Novoselov (MassTech Inc.), J. M. D. Dimandja, and P. J. Hesketh (Georgia Institute of Technology)

14:40 **2121** **Towards Precision Medicine: Rapid Microfluidic Isolation of Aptamers for Glycan Targets** – T. R. Olsen, X. Meng, M. Stojanovic, and Q. Lin (Columbia University)

15:00 **2122** ***(Invited)*** **Stochastic Sensors As Screening Tools for Fast and Early Detection of Illnesses** – R. I. Stefan-van Staden (INCEMC)

15:40 **Break**

16:00 **2123** ***(Invited)*** **Multi-Material Additive Manufacturing (3D/4D printing)** – A. Khosla, S. Basher (Yamagata University), T. Thundat (University at Buffalo), S. Bhansali (Florida International University), L. A. Nagahara (Johns Hopkins University), M. Kawakami, and H. Furukawa (Yamagata University)

16:40 **2124** **Electrochemical Quantification of Sulfatase Activity for Point-of-Care Diagnosis** – B. Dang, P. Pham (Xavier University of Louisiana), X. Yue (LSU Health Sciences Center), and Z. Wang (Chemistry, Xavier University of Louisiana)

17:00 **2125** ***(Invited)*** **Microfabrication and Electrochemical Activation of Amorphous Carbon Nitride a-CNx Working Electrode Integrated in Microfluidic Chip** – M. C. Horny (CNRS C2N, Sorbonne Université), F. Billon (CNRS and Sorbonne Université), J. M. Siaugue, V. Dupuis (Sorbonne Université and CNRS), M. Lazerges (Université Paris Descartes and CNRS), C. Deslouis (CNRS and Sorbonne Université), A. Pailleret (Sorbonne Université and CNRS), and J. Gamby (CNRS C2N and Univ. Paris Saclay)

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