



CALL FOR PAPERS



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228th ECS Meeting
PHOENIX, AZ

October 11-16, 2015

Hyatt Regency Phoenix &
Phoenix Convention Center



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PHOENIX, AZ
October 11-16, 2015
CALL FOR PAPERS

For all details about the 228th Meeting in Phoenix, please visit www.electrochem.org.
For the full Phoenix Call for Papers, see www.electrochem.org/meetings/biannual/228/.

General Information

The 228th ECS Meeting will be held from October 11-16, 2015. This major international conference offers a unique blend of electrochemical and solid-state science and technology; and serves as a major forum for the discussion of interdisciplinary research from around the world through a variety of formats, such as oral presentations, poster sessions, exhibits, and tutorial sessions.

Abstracts are due no later than May 1, 2015.

Note: Some abstracts may be due earlier than May 1, 2015. Please carefully check the symposium listings for any alternate abstract submission deadlines. For complete details on abstract submission and symposium topics, please see www.electrochem.org/meetings/biannual/228/.

Abstract Submission and Deadlines

Submit one original meeting abstract electronically via the ECS website, no later than **May 1, 2015**. Faxed abstracts, e-mailed abstracts, and late abstracts will not be accepted. In June 2015, all presenting authors will receive an e-mail notifying them of the date, time, and location of their presentation. Only presenting authors with non-U.S. addresses will receive a hardcopy acceptance letter. Other hardcopy letters will be sent only upon request to abstracts@electrochem.org.

Meeting abstracts should explicitly state objectives, new results, and conclusions or significance of the work. Regardless of whether you submit as a poster or an oral presentation, it is at the symposium organizers' discretion whether it is scheduled for an oral or poster presentation. Programming for this meeting will occur in June 2015.

Paper Presentation

All authors selected for either oral or poster presentations will be notified in June 2015. Oral presentations must be in English. Both LCD projectors and laptops will be provided for oral presentations. **Presenting authors MUST bring their presentation on a USB flash drive to be used with the laptop that will be provided in each technical session room.** If a presenting author would like to use his/her own laptop for presentation, we strongly suggest that the author verify laptop/projector compatibility in the presentation room prior to the start of the session or all other presentations. Speakers requiring additional equipment must make written request to the ECS headquarters office at least one month prior to the meeting and appropriate arrangements will be worked out, subject to availability, and at the expense of the author. Poster presentations should be displayed in English, on a board approximately 3 feet 10 inches high by 3 feet 10 inches wide (1.17 meters high by 1.17 meters wide), corresponding to the abstract number and day of presentation in the final program.

Manuscript Publication

ECS Meeting Abstracts—All meeting abstracts will be published on the ECS website, copyrighted by ECS, and all abstracts become the property of ECS upon presentation.

ECS Transactions—All full papers and posters presented at ECS meetings are eligible for submission to the online proceedings publication, *ECS Transactions* (ECST). The degree of review to be given each paper is at the discretion of the symposium organizers.

Some symposia will publish an “enhanced” issue of ECST, which will be available for sale at the meeting and through the ECS Digital Library. Please see each individual symposium listing in the full Call for Papers to determine if there will be an “enhanced” ECST issue. In the case of symposia publishing “enhanced” issues, submission of a full-text manuscript to ECST is mandatory and required in advance of the meeting.

Some symposia will publish a “standard” issue of ECST for which all authors are encouraged to submit their full-text papers. Please see each individual symposium listing in the full Call for Papers to determine if there will be a “standard” ECST issue. Once published, papers will be available for sale through the ECS Digital Library.

Please visit the ECST website (ecsdl.org/ECST/) for additional information, including overall guidelines, deadlines for submissions and reviews, author and editor instructions, a manuscript template, and more.

ECS Journals—Authors presenting papers at ECS meetings, and submitting to ECST, are also encouraged to submit to the Society's technical journals: the *Journal of The Electrochemical Society*, *ECS Journal of Solid State Science and Technology*, *ECS Electrochemistry Letters*, or *ECS Solid State Letters*.

Although there is no hard deadline for the submission of these papers, it is considered that six months from the date of the symposium is sufficient time to revise a paper to meet the stricter criteria of the journals. “Instructions to Authors” are available from the ECS website.

If publication is desired elsewhere after presentation, written permission from ECS is required.

Financial Assistance

Many ECS divisions offer travel grants to undergraduates, graduate students, post-doctoral researchers and even some young professionals presenting papers at ECS meetings. Applications must be received no later than June 1 for fall meetings. All applications must be submitted online before the deadline. For rules, and to access the application, please visit: www.electrochem.org/travelgrants.

Please note, additional financial assistance is very limited and generally used by symposia organizers to support invited speakers. Individuals may inquire directly to the organizers of the symposium in which they are presenting to see if funding is available, but applying for travel grants is strongly recommended for those that need assistance.

Letter of Invitation

Individuals requiring an official letter of invitation should write to the ECS headquarters office; such letters will not imply any financial responsibility of ECS.

Hotel Reservations — Deadline September 11, 2015

The 228th ECS Meeting will be held at the Phoenix Convention Center and the Hyatt Regency Phoenix. Please refer to the meeting website for the most up-to-date information on hotel availability and information about the blocks of rooms where special rates have been reserved for participants attending the meeting. **The hotel reservation deadline is September 11, 2015.**

Meeting Registration

All participants—including authors and invited speakers—are required to pay the appropriate registration fees. Hotel and meeting registration information will be posted on the ECS website as it becomes available. **The deadline for discounted early-bird registration is September 11, 2015.**

Short Courses

A number of short courses will be offered on Sunday, October 11, 2015 from 0900h-1630h. Short Courses require advance registration and may be cancelled if enrollments are too low. As of press time, the following Short Courses are planned for the meeting: Basic Impedance Spectroscopy, Fundamentals of Electrochemistry, Basic Corrosion, Grid Scale Energy Storage, and PE Fuel Cells. Please check the ECS website for the final list of offerings.

Technical Exhibit

The 228th ECS Meeting in Phoenix will include a Technical Exhibit, featuring presentations and displays by over 40 manufacturers of instruments, materials, systems, publications, and software of interest to meeting attendees. Coffee breaks are scheduled in the exhibit hall along with evening poster sessions.

Sponsorship Opportunities

ECS biannual meetings offer a wonderful opportunity to market your organization through sponsorship. Sponsorship opportunities include unparalleled benefits and provide an extraordinary chance to present scientific products and services to key constituents from around the world. Sponsorship allows exposure to key industry decision makers, the development of collaborative partnerships, and potential business leads. ECS welcomes support in the form of general sponsorship at various levels: Platinum: \$10,000+, Gold: \$5,000, Silver: \$3,000, and Bronze: \$1,500.

Sponsors will be recognized by level in *Interface*, the Meeting Program, meeting signage, and on the ECS website. In addition, sponsorships are available for the plenary and keynote talks and other special events. These opportunities include additional recognition, and may be customized to create personalized packages. Special event sponsorships will be assigned by the Society on a first-come, first served basis. Advertising opportunities—in the Meeting Program as well as in *Interface*—are also available. Please contact Becca Jensen Compton at 1.609.737.1902, ext. 102 or becca.compton@electrochem.org for further details.

Contact Information

If you have any questions or require additional information, contact ECS, 65 South Main Street, Pennington, New Jersey, 08534-2839, USA, tel: 1.609.737.1902, fax: 1.609.737.2743, e-mail: meetings@electrochem.org; Web: www.electrochem.org.



SYMPOSIUM TOPICS

A — Batteries and Energy Storage

- A01—Joint General Session: Batteries and Energy Storage -and- Fuel Cells, Electrolytes, and Energy Conversion
- A02—Batteries - Theory, Modeling, and Simulation
- A03—Batteries Beyond Lithium-Ion
- A04—Battery Safety
- A05—Electrolytes and Electrochemical Interfaces in Energy Storage Systems
- A06—High-Energy Li-Ion Intercalation Materials
- A07—Intermetallic Anodes
- A08—Materials and Cell Designs for Flexible Energy Storage and Conversion Devices
- A09—Recent Advances in Supercapacitors

B — Carbon Nanostructures and Devices

- B01—Carbon Nanostructures: Fullerenes to Graphene

C — Corrosion Science and Technology

- C01—Corrosion General Poster Session
- C02—Coating and Surface Modification for Corrosion Protection
- C03—Contemporary Aspects of Corrosion and Protection of Magnesium and Its Alloys
- C04—Corrosion Numerical Modeling 2
- C05—Critical Factors in Localized Corrosion 8
- C06—Pits & Pores 6: Nanomaterials, In Memory of Yukio H. Ogata

D — Dielectric Science and Materials

- D01—Nanocrystal-embedded Dielectrics for Electronic and Photonic Devices
- D02—Nonvolatile Memories
- D03—Photovoltaics for the 21st Century 11
- D04—Semiconductors, Dielectrics, and Metals for Nanoelectronics 13
- D05—Processing Materials of 3D Interconnects, Damascene and Electronics Packaging 7

E — Electrochemical/Electroless Deposition

- E01—Current Trends in Electrodeposition - An Invited Symposium
- E02—Fundamentals of Electrochemical Growth and Surface Limited Deposition
- E03—Novel Design and Electrodeposition Modalities 2
- E04—Semiconductors, Metal Oxides, and Composites: Metallization and Electrodeposition of Thin Films and Nanostructures 3

F — Electrochemical Engineering

- F01—Electrochemical Engineering General Session
- F02—Industrial Opportunities and Challenges in Electrochemical Engineering
- F03—Membrane-based Electrochemical Separations

G — Electronic Materials and Processing

- G01—Atomic Layer Deposition Applications 11
- G02—Semiconductor Cleaning Science and Technology 14 (SCST 14)
- G03—Thermoelectric and Thermal Interface Materials 2
- G04—ULSI Process Integration 9
- G05—GaN & SiC Power Technologies 5

H — Electronic and Photonic Devices and Systems

- H01—Low-dimensional Nanoscale Electronic and Photonic Devices 8
- H02—Solid-State Electronics and Photonics in Biology and Medicine 2
- H03—State-of-the-Art Program on Compound Semiconductors 58 (SOTAPOCS 58)

I — Fuel Cells, Electrolyzers, and Energy Conversion

- I01—Concentrated Solar Energy Conversion & Storage
- I02—Harnessing Multi-Step Electrochemical Reactions for Energy Conversion and Storage
- I03—High Temperature Experimental Techniques and Measurements 2
- I04—Ionic Conducting Oxide Thin Films
- I05—Polymer Electrolyte Fuel Cells 15 (PEFC 15)

J — Luminescence and Display Materials, Devices, and Processing

- J01—Physics and Chemistry of Luminescent Materials

L — Physical and Analytical Electrochemistry, Electrocatalysis, and Photoelectrochemistry

- L01—Physical and Analytical Electrochemistry, Electrocatalysis, and Photoelectrochemistry General Session
- L02—Charge Transfer in Biological Systems 2
- L03—Electroactive and Redox Active Polymers
- L04—Electrode Processes 10
- L05—Nanoscale Electrochemistry
- L06—Photocatalysts, Photoelectrochemical Cells, and Solar Fuels 6
- L07—Physical and Analytical Electrochemistry in Ionic Liquids 4
- L08—Single Particle/Molecule Electrochemical Detection

M — Sensors

- M01—Sensors, Actuators, and Microsystems General Session
- M02—New Paradigms in Sensor Technology
- M03—Sensors for Agriculture

Z — General Topics

- Z01—General Society Student Poster Session
- Z02—Nanotechnology General Session
- Z03—Impedance Technologies, Diagnostics, and Sensing Applications

A—Batteries and Energy Storage

A01

Joint General Session: Batteries and Energy Storage -and- Fuel Cells, Electrolytes, and Energy Conversion Battery Division / Energy Technology Division

Papers are solicited on the fundamental and applied aspects of energy storage and energy conversion not covered by other symposia at this meeting. Of particular interest are new materials and designs, performance studies, and modeling of all types of batteries, supercapacitors and fuel cells, including aqueous, non-aqueous, polymer electrolytes, solid electrolytes, and flow systems.

A “standard” issue of ECS Transactions is planned for this symposium. All authors accepted for presentation are encouraged to submit their full text manuscript for the issue no later than October 25, 2015. All manuscripts will be submitted online, and must be in either MS Word or PDF format.

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Bor Yann Liaw**, University of Hawaii, email: bliaw@hawaii.edu; **K.M. Abraham**, Northeastern University, email: kmabraham@comcast.net; **Mani Manivannan**, NETL DOE, email: Ayyakkannu.Manivannan@NETL.DOE.GOV; **Sri Narayanan**, USC, email: srnaraya@dornsife.usc.edu; and **Donghai Wang**, Pennsylvania State University, email: dwang@psu.edu.

A02

Batteries—Theory, Modeling, and Simulation Battery Division

To accelerate the pace of materials discovery, development and optimization for electrochemical energy storage systems, it is necessary to apply a combined computational and experimental approach. In this symposium, we hope to gather many researchers around the world to discuss new advances in computational materials design and diagnosis of battery materials. The emphasis of the symposium will be on the new promising electrode materials and systems, their electrochemical properties and reaction mechanisms.

An “enhanced” edition of ECS Transactions is planned to be available at the meeting. All authors accepted for presentation are obligated to submit their full text manuscript for the issue no later than July 10, 2015. All manuscripts will be submitted online, and must be in either MS Word or PDF format.

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Yue Qi**, Yue Qi (Michigan State), email: yueqi@egr.msu.edu; **Anton Van der Ven**, UC Santa Barbara, email: avdv@engineering.ucsb.edu; and **Perla Balbuena**, Texas A&M, email: balbuena@tamu.edu.

A03

Batteries Beyond Lithium-Ion Battery Division / Energy Technology Division

While lithium ion batteries are renowned in energy storage applications, there is a cap in energy density due to the limited capacity inherent with intercalation electrodes. Research interest in battery

chemistries beyond lithium ion such as lithium-sulfur (Li/S), lithium-air (Li/air), multivalent (Mg, Al), and Na-ion systems are now gaining momentum. Na-ion batteries in particular are prominently developing at a rapid pace for immediate applications in energy storage. For this symposium, all subjects on these batteries are solicited. In particular, topics should include the discovery of new active materials and electrolytes, and the optimization and improvement of standard materials. Additionally, other areas of interest in cell and electrochemical engineering and designs and new electrochemical and cost modeling, physical and electrochemical characterization methods for these systems are sought. Finally we plan to have a special focus session on understanding the electrochemical mechanisms associated with these new battery chemistries.

A “standard” issue of ECS Transactions is planned for this symposium. All authors accepted for presentation are encouraged to submit their full text manuscript for the issue no later than October 25, 2015. All manuscripts will be submitted online, and must be in either MS Word or PDF format.

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Dan Steingart**, Princeton University, email: steingart@princeton.edu; **Venkataraman Thangadurai**, University of Calgary, email: vthangad@ucalgary.ca; **Vibha Kalra**, Drexel University, email: vk99@drexel.edu; **Yangchuan Xing**, University of Missouri, email: xingy@missouri.edu; and **Vito Di Noto**, University of Padova, email: vito.dinoto@unipd.it.

A04

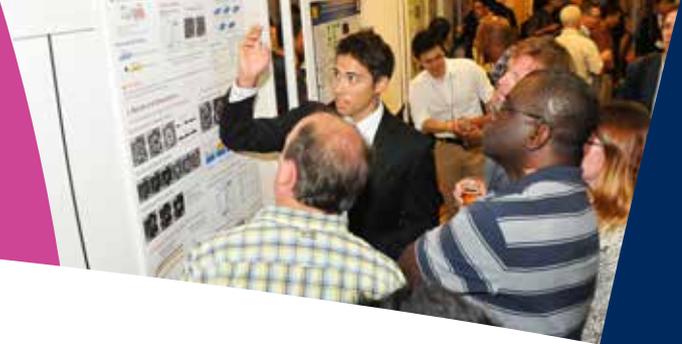
Battery Safety Battery Division / Industrial Electrochemistry and Electrochemical Engineering Division

Safety and abuse tolerance need to be improved to assure commercial acceptance of many advanced renewable energy storage systems. Safety lapses have caused higher scrutiny of advanced batteries by regulatory agencies. Higher energy content and high power capability of today’s batteries make achieving these goals more challenging.

This symposium invites papers that describe improved safety of materials, cell designs, and energy storage systems for all battery chemistries. A focus for the symposium will be on efforts to increase electrolyte stability and reduce electrolyte flammability. Cathodes that are more stable at high temperature, electrolytes and additives that exhibit reduced reactivity at the electrode surfaces as well as more stable anodes are topics on which this symposium will focus. Additionally, reviews of regulatory initiatives and test standard development, as well as reports of safety testing at the battery level, improved abuse tolerance due to cell and battery pack design and development are invited. Studies of battery control systems and algorithms that increase safety of energy storage systems are also welcome.

A “standard” issue of ECS Transactions is planned for this symposium. All authors accepted for presentation are encouraged to submit their full text manuscript for the issue no later than October 25, 2015. All manuscripts will be submitted online, and must be in either MS Word or PDF format.

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Daniel H. Doughty**, Battery Safety Consulting Inc., email: dhoughty@batterysafety.net; **Gerardine (Gerri) Botte**, Ohio Univ., email: botte@ohio.edu; and **Christopher J. Orendorff**, Sandia National Laboratories, email: corendo@sandia.gov.



A05

Electrolytes and Electrochemical Interfaces in Energy Storage Systems

Battery Division / Energy Technology Division

The electrolyte plays a vital role in the performance of advanced rechargeable batteries. A better understanding of the elementary processes involved in the formation of the electrolyte/electrode interface and charge transfer kinetics in relation to solvent, salt, additive and electrode material is crucial to the further optimization of Na, Mg, Li and Li ion batteries. This symposium will focus on both the fundamental and applied aspects of the electrolyte for Li and Li-ion batteries. Topics of interest include, but are not restricted to: understanding of structure-property relationships of electrolytes; development of new salts, solvents and additives; development of ionic liquid electrolytes; development of solid-state ceramic and polymeric electrolytes; development of electrolytes for 5 V Li and Li-ion batteries; development of electrolytes for Mg batteries; development of electrolytes for Na and Na ion batteries; studies and approaches leading to the understanding of electrode/electrolyte interfacial phenomena and the charge transfer processes; electrolytes with enhanced non-flammability; electrolytes for wide temperature range operations; and cell and battery performance improvement resulting from the advances in electrolyte materials.

A “standard” issue of ECS Transactions is planned for this symposium. All authors accepted for presentation are encouraged to submit their full text manuscript for the issue no later than October 25, 2015. All manuscripts will be submitted online, and must be in either MS Word or PDF format.

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Brett Lucht**, University of Rhode Island, email: blucht@chm.uri.edu; **Richard Jow**, ARL, email: t.r.jow.civ@mail.mil; **Robert Kosteck**, LBNL, email: r_kosteck@lbl.gov; **Dominique Guyomard**, University of Nantes, email: Dominique.Guyomard@cnsr-imm.fr; **Andrew Herring**, Colorado School of Mines, email: aherring@mines.edu; and **Vito Di Noto**, University of Padova, email: vito.dinoto@unipd.it.

A06

High-Energy Li-Ion Intercalation Materials

Battery Division

Lithium intercalation/deintercalation into/from host lattices is the basis of current lithium-ion battery technology. Lithium-ion batteries have revolutionized the portable electronics market, and they are being intensively pursued for vehicle and stationary storage applications. This symposium provides a forum for recent advances in intercalation compounds that serve as cathode or anode materials in lithium-ion batteries. Abstracts concerning other intercalation systems based on magnesium, aluminum, sodium, etc., are best directed to the Battery Chemistries Beyond Lithium Ion symposium (B2). The symposium focuses on new or improved intercalation materials as well as a fundamental understanding of the processes that control the electrochemical performances. Specific areas to be covered include but not limited to (1) design of cathode and anode materials, (2) novel chemical synthesis and processing, (3) advanced materials and electrode characterization including in-situ and ex-situ methods, (4) electrochemical properties and performances, (5) electrode-electrolyte interfacial chemistry including SEI layer, (6) computational modeling of intercalation compounds, and (7) redox processes, electronic and ionic transport, and reaction mechanisms.

A “standard” issue of ECS Transactions is planned for this symposium. All authors accepted for presentation are encouraged

to submit their full text manuscript for the issue no later than October 25, 2015. All manuscripts will be submitted online, and must be in either MS Word or PDF format.

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Shirley Meng**, University of California San Diego, email: shmeng@ucsd.edu; **Gary Koenig**, University of Virginia, email: gary.koenig@virginia.edu; and **Won-Sub Yoon**, Sungkyunkwan University, email: wsyoon@skku.edu.

A07

Intermetallic Anodes

Battery Division

Lithium-ion batteries have revolutionized the portable electronics market, and they are being intensively pursued for vehicle and stationary storage applications. Sodium-ion batteries are now actively being developed for large scale electrical energy storage, and magnesium- as well as other alkali- and alkaline earth-ions are considered for future applications. Intermetallic compounds for negative electrodes in lithium- and sodium- and magnesium-ion battery systems have the potential for to replace carbonaceous electrodes in future battery systems. This symposium provides a discussion forum for recent advances in development of intermetallic compounds that can serve as negative electrode active materials in batteries. The symposium focuses on new or improved alloying/intermetallic materials and electrode architectures as well as a fundamental understanding of the processes that control their electrochemical performance.

Specific areas covered by this Symposium include but are not limited to (1) design of intermetallic anode materials; (2) novel chemical synthesis and processing; (3) advanced in situ and ex situ characterization of materials and electrodes; (4) electrochemical testing and performance evaluation; (5) electrode-electrolyte interfacial chemistry; and (6) computational modeling of intermetallic compounds.

A “standard” issue of ECS Transactions is planned for this symposium. All authors accepted for presentation are encouraged to submit their full text manuscript for the issue no later than October 25, 2015. All manuscripts will be submitted online, and must be in either MS Word or PDF format.

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Kristina Edstrom**, University of Uppsala, email: kristina.edstrom@kemi.uu.se; **Donghai Wang**, Penn State, email: dwang@psu.edu; and **Vito Di Noto**, University of Padova, email: vito.dinoto@unipd.it.

A08

Materials and Cell Designs for Flexible Energy Storage and Conversion Devices

Battery Division / Energy Technology Division

High-energy density batteries have attracted extensive interests in the markets from portable electronics, electric vehicles to stationary applications. However, the adoption of battery chemistry and electrochemistry in flexible energy systems has not gained such popular attention, which is in fact a quickly growing area in many different fields including sensors, medical devices and advanced characterization techniques. In addition to the intrinsic materials properties, the appropriate design of the electrochemical cell for those flexible energy devices is very critical to largely utilize the



Photo by ©Visit Phoenix

B—Carbon Nanostructures and Devices

B01

Carbon Nanostructures: Fullerenes to Graphene

Nanocarbons Division / Dielectric Science and Technology Division / Physical and Analytical Electrochemistry Division

This broad symposium will focus on both fundamental and applied studies of carbon nanostructures: fullerenes, carbon nanotubes, graphene, and materials derived from them. Papers in chemistry, physics, and materials science are invited. Topics may include the synthesis and preparation of nanocarbon samples, or characterization of their mechanical, thermal, chemical, electrochemical, optical, or electronic properties. Also welcome are papers concerning nanocarbon applications in areas such as electrochemistry, electronic and opto-electronic devices, sensing, energy conversion and storage, and biomedicine.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **R. Bruce Weisman**, Rice University, email: weisman@rice.edu; **Pawel Kulesza**, University of Warsaw, email: pkulesza@chem.uw.edu.pl; and **Vito Di Noto**, Univ. Padova, email: vito.dinoto@unipd.it.

C—Corrosion Science and Technology

C01

Corrosion General Poster Session

Corrosion Division

Poster presentations concerning all aspects of corrosion and associated phenomena in liquid and gaseous phases are welcome. Theoretical analyses, experimental investigations, descriptions of new techniques for the study of corrosion, and analyses of corrosion products and films are of interest.

A “standard” issue of ECS Transactions is planned for this symposium. All authors accepted for presentation are encouraged to submit their full text manuscript for the issue no later than October 25, 2015. All manuscripts will be submitted online, and must be in either MS Word or PDF format.

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Rudolph G. Buchheit**, Ohio State University, email: buchheit.8@osu.edu; and **Sannakaisa Virtanen**, University of Erlangen-Nuremberg, email: virtanen@ww.uni-erlangen.de.

cell volume without sacrificing the energy and power density from the whole device. This symposium will provide a venue for scientist with different background to discuss the materials, electrochemistry, fabrication techniques and mechanical understanding associated in the flexible energy storage and conversion devices. Topics to be addressed in this symposium include but not limited to: 1) high-energy electrode materials for applications in flexible energy storage devices; 2) novel cell design for flexible energy storage and conversion devices; 3) polymer or solid state electrolytes suitable for flexible batteries; 4) 3D printing technique in flexible energy storage and conversion devices; 5) thin-film coating technique in flexible energy devices.

A “standard” issue of ECS Transactions is planned for this symposium. All authors accepted for presentation are encouraged to submit their full text manuscript for the issue no later than October 25, 2015. All manuscripts will be submitted online, and must be in either MS Word or PDF format.

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Jie Xiao**, PNNL, email: jie.xiao@pnnl.gov; **Mark Allen**, University of Maryland, email: allenm@umbc.edu; **Guihua Yu**, University of Texas, Austin, email: ghyu@austin.utexas.edu; **Jean St-Pierre**, Hawaii Natural Energy Inst., email: jsp7@hawaii.edu; and **James Wu**, NASA Glenn Research Center, email: james.j.wu@nasa.gov.

A09

Recent Advances in Supercapacitors

Energy Technology Division / Battery Division / Dielectric Science and Technology Division

Electrochemical capacitors (i.e., “supercapacitors” or “ultracapacitors”) are emerging as an attractive energy-storage solution for new technologies with challenging power/energy requirements. The goal of this symposium is to address all aspects of electrochemical capacitor research, development, and real-world applications, including: (1) double-layer and/or pseudocapacitance aspects of nanostructured carbons; (2) materials that exhibit primarily faradaic pseudocapacitance, including metal oxides, nitrides, other advanced inorganic materials, and conducting polymers; (3) characterization methods that elucidate the physical structures and fundamental electrochemical processes of new electrode materials and architectures; (4) optimization of practical electrochemical capacitor components, including current collectors, electrodes, electrolytes, separators and packaging; (5) performance of new device designs (symmetric and asymmetric), and hybrid systems that combine electrochemical capacitors with other power sources (e.g., batteries, fuel cells); (6) theory and modeling as tools for performance prediction and materials and device design; and (7) application tests of electrochemical capacitors in real-world conditions. The program will consist of both invited and contributed papers that address one or more of the above topics.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Vibha Kalra**, Drexel University, email: vk99@drexel.edu; **Oana Leonte**, Berkeley Polymer Technology, email: odleonte@comcast.net; **Mani Manivannan**, US DOE, email: manivana@netl.doe.gov; and **Robert Kostecki**, LBL, email: R_Kostecki@lbl.gov.



C02 Coating and Surface Modification for Corrosion Protection

Corrosion Division

Papers are invited on all topics related to advances in metallic, inorganic, organic and composite coatings for the corrosion protection of metallic substrates. Suitable topics would include: pretreatments, conversion coatings, chromate-replacement, sacrificial coatings, barrier coatings, adhesion promotion, self-healing coatings and smart-release inhibitor systems. Papers providing mechanistic insights into the action of functional coating components such as: novel galvanizing alloys, ion-exchange pigments, micro-encapsulated inhibitors and reagents, electrically conducting polymers and nano-pigments are particularly encouraged.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **H. Neil McMurray**, Swansea University, email: H.N.McMurray@swansea.ac.uk; and **Shinji Fujimoto**, Osaka University, email: fujimoto@mat.eng.osaka-u.ac.jp.

C03 Contemporary Aspects of Corrosion and Protection of Magnesium and Its Alloys

Corrosion Division

This symposium will cover all aspects of corrosion and corrosion protection of magnesium and its alloys. Alloys based on magnesium (Mg) offer great advantages due to their low density. There is increasing interest in the use of magnesium alloys several areas including: transportation, biodegradable implants, consumer electronics and electrode materials. Due to its low electrochemical potential, and the limited protectiveness of its native oxide/hydroxide surface film, magnesium alloys present a low corrosion resistance. Papers are invited that address all these issues, from the development of new alloys, advanced corrosion protection techniques of Mg alloys, or galvanic corrosion issues in structures consisting of Mg alloys in contact with other metals. Research concerned with the mechanistic understanding of Mg corrosion, passivation, advanced / modern electrochemical analysis, and coating processes of Mg alloys as a function of alloy composition and microstructure are of interest.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Sannakaisa Virtanen**, University of Erlangen-Nuremberg, email: virtanen@ww.uni-erlangen.de; and **Nick Birbilis**, Monash University, email: nick.birbilis@monash.edu.

C04 Corrosion Numerical Modeling 2

Corrosion Division

Corrosion modeling and numerical simulation continue to advance in terms of both the fidelity of the models and the coverage of the range of size scales. Engineering scale models have been constructed that combine inputs of measurable parameters with an abstracted

representation of smaller scales to predict future performance. Continuum level models have started to move from being mostly qualitative to being able to guide material design. Nanoscale models have benefited greatly from the increase in available computational power and the development of frameworks to begin to probe reaction rates and surface morphology development. Atomistic scale models of surfaces heretofore used only for vapor phase reactions have been extended to the case of metals immersed in solution and can simulate the effects of applied potential, providing a means to calculate the structure and energetics of the metal/solution interface from first principles. Improved experimental tools for both input data generation for the models and validation of the outputs of the models have also been developed.

This symposium will provide the second forum, previously held at 2010 Las Vegas Meeting as “Corrosion Modeling”, for the presentation and discussion of the state-of-the-art in the modeling of corrosion and dissolution processes.

Original papers of interest include, but are not restricted to, the following: (1.) processes and forms of corrosion: general corrosion, pitting, crevice corrosion, intergranular corrosion, environment-assisted cracking, coating failure; (2.) experimental validation of models; (3.) new modeling and simulation methods, including linking across spatial and temporal scales, and (4) experience with the use of models in engineering applications.

A “standard” issue of ECS Transactions is planned for this symposium. All authors accepted for presentation are encouraged to submit their full text manuscript for the issue no later than October 25, 2015. All manuscripts will be submitted online, and must be in either MS Word or PDF format.

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Christopher Taylor**, DNV GL, email: Christopher.Taylor@dnvgl.com; **Robert G. Kelly**, University of Virginia, email: rgk6y@virginia.edu; **John Harb**, Brigham Young University, email: john_harb@byu.edu; and **Shinji Fujimoto**, Osaka University, email: fujimoto@mat.eng.osaka-u.ac.jp.

C05 Critical Factors in Localized Corrosion 8

Corrosion Division

This symposium will deal with all aspects of localized corrosion. The purpose of the symposium is to provide a forum for the presentation and discussion of recent advances and research in one of the most active and challenging fields in corrosion science. Both experimental and theoretical contributed papers are being solicited in the topics including, but not limited to: passive films and passivity loss on metals, alloys, and semiconductors; characterization of localized corrosion, microstructure-corrosion relationships; kinetics, stability, and morphology of localized corrosion; cathodic process for initiation and maintaining localized corrosion: developments in understanding corrosion of engineering materials; and processes for the control of localized corrosion.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Shinji Fujimoto**, Osaka University, email: fujimoto@mat.



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eng.osaka-u.ac.jp; **Gerald S. Frankel**, Ohio State University, email: frankel.10@osu.edu; **Eiji Tada**, Tokyo Institute of Technology, email: tada.e.aa@m.titech.ac.jp; and **Joey R. Kish**, McMaster University, email: kishjr@mcmaster.ca.

C06 Pits & Pores 6: Nanomaterials - In Memory of Yukio H. Ogata

Corrosion Division / Luminescence and Display Materials Division

The symposium is aimed at a more detailed understanding of etching and growth mechanisms, and the physical and chemical properties of all types of porous structures.

The symposium is a continuous attempt to integrate the diverse research in different fields such as localized metal corrosion, semiconductor electrochemistry, deposition into pores, matrix materials and optical spectroscopy in order to develop a highly transdisciplinary approach to the topic. Emphasis will be on pit and pore formation, porous-structure/surface-property relations, work relevant to the formation of advanced materials and their characterization, and applications of these materials in different areas of science.

The symposium brings together scientists from various research fields such as material science, electrochemistry, physics, chemistry, engineering and biology.

Of special interest in this symposium is experimental as well as theoretical work dealing with:

1. Causes for the localized nature of attack (dissolution);
2. Kinetics (growth laws), stability and morphology of pit and pore growth and chemistry within pits, pores, and etch tunnels;
3. Critical factors (conditions, chemical environment) for maintaining pit and pore growth;
4. Selective dissolution (de-alloying);
5. Porous templates and material deposition into pores;
6. Self-organization and self-assembly;
7. Transport processes within pores and porous structures;
8. Analogies and differences between localized corrosion of metals and semiconductors;
9. Pore morphology and interface chemistry effects on optical properties;
10. Passivation of porous surfaces;
11. Optical characterization of porous materials, nanoparticles, and composites;
12. Magnetic characterization of nanoparticles and composites;
13. Porous cages, matrices and composites;
14. Work related to life sciences; and
15. Applications.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Petra Granitzer**, Institute of Physics, Karl-Franzens-University Graz, Austria, email: petra.granitzer@uni-graz.at; **Rabah Boukherroub**, Institute of Electronics, Microelectronics and Nanotechnology (IEMN), email: rabah.boukherroub@iemn.univ-lille1.fr; **David J. Lockwood**, Measurement Science and Standards,

D—Dielectric Science and Materials

D01 Nanocrystal-embedded Dielectrics for Electronic and Photonic Devices

Dielectric Science and Technology Division / Electronics and Photonics Division

This symposium will address the science and technology of nanocrystals – both of elemental and compound semiconductors – embedded in dielectric films and structures, with emphasis on applications in electronics and photonics. Research fields of interest are related but not necessarily limited to the following topics: 1. Fabrication of nanocrystalline structures: deposition processes, implantation protocols, annealing strategies; 2. Characterization of nanocrystals: optical and electrical characteristics, photo- and electroluminescence, size distributions, crystalline structure; 3. Charge trapping characteristics of nano-particles in a dielectric medium; 4. Device issues: contacts to n- and p-type structures, light extraction, breakdown issues; 5. Doping for photonic applications: doping concentrations, energy transfer, co-doping, multi-layer structures; and 6. Integration of photonic devices with existing silicon-based electronic platforms. Invited and contributed papers will discuss both the fundamental aspects underlying certain applications and the particular challenges regarding technology, fabrication processes, and reliability.

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D02 Nonvolatile Memories

Dielectric Science and Technology Division

Nonvolatile Flash memory has followed the scaling evolution of the semiconductor roadmap, however, there is increasing concern about scalability into the next decade. At the same time many new memory storage mechanisms and materials are showing promise as potential replacement of Flash. The symposium will address the recent developments in nonvolatile memory devices such as FeRAM, MRAM, ReRAM, PRAM, STTRAM, Flash memory and other emerging new nonvolatile memories such as atomic switching and nano-gap devices and their related materials and technologies. The program will consist of both invited and contributed papers. Papers will cover both practical issues and fundamental studies and are solicited in the following suggested areas: (1) advanced devices, device structures and performances, and device design; (2) memory related materials and their growth and deposition processes; (3)



device fabrication processing; (4) structure analyses, and material and process characterization; (5) device functional characterization, device physics, and modeling; (6) system applications; and (7) other related technologies.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **S. Shingubara**, Kansai University, email: shingu@kansai-u.ac.jp; **Kiyoteru Kobayashi**, Tokai University, email: kkbys@keyaki.cc.u-tokai.ac.jp; **Takasumi Ohyanagi**, LEAP, email: ohyanagi@leap.or.jp; **Gennadi Bersuker**, SEMATECH, email: Gennadi.Bersuker@sematech.org; **Blanka Magyari-Kope**, Stanford University, email: blankamk@stanford.edu; **Hitoshi Kubota**, AIST, email: hit-kubota@aist.go.jp; **Hisashi Shima**, AIST, email: shima-hisashi@aist.go.jp; **Abu Sebastian**, IBM Zurich, email: ASE@zurich.ibm.com; **Ludovic Goux**, IMEC, email: Ludovic.Goux@imec.be; **Jea Gun Park**, Hanyang University, email: parkjgl@hanyang.ac.kr; and **Z. Karim**, Aixtron, email: z.karim@aixtron.com.

D03 Photovoltaics for the 21st Century 11 Dielectric Science and Technology Division / Electrodeposition Division / Electronics and Photonics Division / Energy Technology Division / Industrial Electrochemistry and Electrochemical Engineering Division / Physical and Analytical Electrochemistry Division

This symposium provides a forum for solar-to-electrical conversion technologies which are terawatt-capable, i.e. they can reach a scale comparable to the global energy demand and have the potential to become an impactful source of energy in the 21st century. In addition to lowering the cost and improving the efficiency, major barriers to terawatt solar photovoltaics include availability of natural resources such as raw materials and electricity, recycling of end-of-life solar modules and cells, innovative approaches for solar electricity storage and transport, innovative applications for the less predictable solar electricity, among others.

Electrochemical and solid-state sciences have major roles to play in removing many of these barriers to terawatt solar photovoltaics. This symposium invites contributions in both current and emerging areas of solar photovoltaic research and covers a whole spectrum of cell technologies from 1st generation wafer-Si to 2nd thin-films to 3rd generation. Sample topics of interest include, but are not limited to:

1. Applications of electrochemistry in cell fabrication for lower cost and/or higher efficiency;
2. Emerging perovskite and Earth-abundant solar materials: their synthesis and properties;
3. Scalable and green solution-based processing technologies for cell fabrication;
4. Cost-effective approaches to recycle current and future solar cells and modules;
5. Sustainable practices in solar cell and module fabrication such as waste treatment;
6. Innovative applications which match the characteristics of solar electricity without storage.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Meng Tao**, Arizona State University, email: Meng.Tao@asu.edu; **Hiroki Hamada**, Kinki University, email: h.hamada@ele.kindai.ac.jp; **Theodore Druffel**, University of Louisville, email: thad.druffel@louisville.edu; **C. Claeys**, imec, email: claeys@imec.be; **L. Deligianni**, IBM, email: lili@us.ibm.com; **Jim Fenton**, University of Central Florida, email: jfenton@fsec.ucf.edu; **H. Hamada**, Kinki University, email: h.hamada@ele.kindai.ac.jp; **J.-G. Park**, Hanyang University, email: parkjgl@hanyang.ac.kr; and **K. Rajeshwar**, University of Texas-Arlington, email: rajeshwar@uta.edu.

D04 Semiconductors, Dielectrics, and Metals for Nanoelectronics 13 Dielectric Science and Technology Division / Electronics and Photonics Division

The following are indicative topical areas to be covered by the symposium:

SiGe, SiGe:C, Ge, GeSn, and III-V High Mobility Channels; SiC and GaN Channels: Surface/Interface Modeling; Band Offsets; Surface Cleaning, Surface Passivation; High-k Gate Dielectrics; Contact Engineering; Transistor Characteristics.

2-D Semiconductors and Applications: MoS₂, WSe₂, Other Metal Dichalcogenides, Graphene, Silicene, Germanene: Growth, Characterization, and Modeling; High-k Gate Dielectrics; Ohmic Contacts; Transistor Characteristics.

Volatile and Non-Volatile Memory: Resistive RAM; Ferroelectric RAM; Phase-Change RAM; Magnetic RAM; Conductive-Bridging RAM; Spin-Transfer Torque RAM; Flash Memories.

Interfaces, Traps, and Reliability: Semiconductor/Dielectric, Dielectric/Dielectric, Dielectric/Metal Interfaces; Interface and Bulk-Dielectric Defects/Traps; Electrical Characterization, Dielectric Wear-out, SILC; NBTI and PBTI; TDDB.

High-k Gate Dielectrics for High Mobility Channels: High-k Gate Dielectrics on Si, SiGe, Ge, III-V Compounds, SiC, etc. High-k Dielectrics on Nanowires, Nanotubes, and Graphene.

Nanoelectronics and Nanotechnology: FinFET, Multi-gate MOSFETs, Nanotubes, Nanowires, Quantum Dots, Spintronics, Plasmonics, Tunnel FETs.

Metal Gate Electrodes Metals and Ohmic Contacts: Threshold and Flat Band Voltage Control, Metal Gate Electrodes for Transistors with Alternative Substrates, Metal Contacts to Nanowires, Nanotubes, Graphene, MoS₂, etc.

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D05 Processing Materials of 3D Interconnects, Damascene and Electronics Packaging 7

Electronics and Photonics Division / Dielectric Science and Technology Division

This symposium focuses on issues pertinent to advances in traditional damascene interconnects and new materials and integration methods for 3D interconnects. An emerging technology or device architecture called 3D integration is based on the system performance gains that can be achieved by stacking and vertically interconnecting distinct device layers. The 3D concept of replacing long 2D interconnects with shorter vertical (3D) interconnects has; the potential to alleviate the well-known interconnect (RC) delay problem facing the semiconductor industry today. Additional benefits of the 3D process include reduced die size and the ability to optimize distinct technologies (analog, logic, RF, etc.) on separate vertically interconnected layers. Since electrochemical processes are the ultimate solution to create smaller size and lower cost devices, both practical and fundamental aspects of electrochemical processes are highly demanded in this area. Special interests are shape evolution and additive chemistry of high-aspect ratio, mathematical modelling of deposition.

Ideally, this symposium will bring together researchers to discuss the various merits of the presented 3D device architectures, materials, packaging, and fabrication methodologies. Topics of interest include, but are not limited to: (1) 3D process integration methodologies; (2) 3D design and architectures; (3) simulation and modeling of 3D integrated devices; (4) materials and techniques for die and wafer bonding; (5) processing and handling of thin wafers and dice; (6) materials for temporary die and wafer bonding; (7) vertical interconnect fabrication technology; (8) materials for vertical; interconnects: insulators, barriers, and metals; (9) reliability of 3D interconnects; (10) novel test and measurement of 3D integrated devices; (11) thermal management in 3D integrated devices damascene copper interconnects, introduced at the 0.25 μm node, have spanned six technology nodes, and are expected to be used for the foreseeable future; (12) advanced substrates and packaging, system in packaging (SIP), high speed and optical packaging, wireless and micro CSP; (13) chip interconnect metallization, damascene plating, copper, copper-alloys, silver, etc., seed/barrier layers, sputter seeding, metal migration and planarization and (14) chip-package interconnection flip-chip (C4) technology, Pb-free C4s, wire bonding, TAB, compliant chip-package interconnection and room temperature joint.

This symposium topic will bring together researchers to discuss; the challenges and solutions to extending damascene copper; interconnects, well beyond the 32 nm node. Suggested topics in; the area of interest include (but are not limited to): (1.) methods to; reduce increases in effective resistivity; (2.) methods to mitigate; electromigration and stress migration issues; (3.) advanced barrier /; seed processes including ALD and electroless films; (4.) porous low-k; ILDs and air gap processing (including deposition and etching); and; (5.) novel electrodeposition and CMP processes.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **K. Kondo**, Osaka Prefecture University, email: kondo@chemeng.osakafu-u.ac.jp; **G. S. Mathad**, S/C Technology Consulting, email:

swami_mathad@hotmail.com; **R. Akolkar**, Case Western Reserve University, email: rna3@case.edu; **W.-P. Dow**, National Chung Hsing University, email: dowwp@nchu.edu.tw; **Harold Philipsen**, imec, email: Harold.Philipsen@imec.be; **M. Hayase**, Tokyo Science University, email: mhayase@rs.noda.tus.ac.jp; **M. Koyanagi**, Tohoku University, email: koyanagi@bmi.niche.tohoku.ac.jp; **Yutaka Kaneko**, Kyoto University, email: kaneko@acs.i.kyoto-u.ac.jp; and **F. Roozeboom**, Eindhoven University of Technology, and TNO Eindhoven, email: f.roozeboom@tue.nl.

E—Electrochemical/ Electroless Deposition

E01 Current Trends in Electrodeposition - An Invited Symposium

Electrodeposition Division

The symposium will provide a forum for the presentation of new and exciting research of interest to the electrodeposition community. This will be a single half-day session comprised of 40-minute invited lectures. Our intent is to highlight the most recent and perhaps controversial research topics and to promote discussion in these areas.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizer: **C. Bonhote**, HGST, email: christian.bonhote@hitachigst.com.

E02 Fundamentals of Electrochemical Growth and Surface Limited Deposition

Electrodeposition Division / Physical and Analytical Electrochemistry Division

The underpotentially deposited layers represent a fascinating feature of electrochemical growth inherent to many heteroepitaxial systems. The UPD related phenomena and monolayer restricted deposition recently has been re-examined in a new light of different deposition protocols/methods which are gaining an increasing popularity in the extended areas of ultrathin film growth for catalysis, magnetics, photovoltaics, sensor and thermoelectric materials. This symposium invites fundamental and applied papers in general areas of:

- Kinetics and thermodynamics of underpotential deposition,
- UPD adlayer structure, 2D phase nucleation, 2D phase transition and effect of anions
- UPD process modeling and theory
- UPD related deposition methods/protocols: E-ALD, SLRR, E-ALE, monolayer restricted deposition,
- Noble metal on noble metal spontaneous deposition
- Kinetics and thermodynamics of underpotential Co-deposition (UPCD)
- UPCD modeling and theory

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **S. Brankovic**, University of Houston, email: srbranko@Central.UH.EDU; **J. Stickney**, University of Georgia, email: stickney@uga.edu; **Natasa Vasiljevic**, University of Bristol, email: N.Vasiljevic@bristol.ac.uk; and **Nikolay Dimitrov**, SUNY Binghamton, email: dimitrov@binghamton.edu.

E03 Novel Design and Electrodeposition Modalities 2

Electrodeposition Division

Experimental and theoretical aspects of novel electrodeposition processes, cell design and deposition methodologies are addressed. Papers of interest include, but are not limited to: pulse plating to affect deposit composition and morphology, current distribution of electrodes, analysis of high-throughput combinatorial data and materials informatics, impedance spectroscopy, and precision synthesis of materials by control of the process environment. Novel alloys, composites, biomaterials, thin film and earth abundant PV materials, and porous electrodes materials pertaining to novel design and electrodeposition modalities are welcome.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **E. Podlaha**, Northeastern University, email: e.podlaha-murphy@neu.edu; and **Q. Huang**, IBM, email: qhuang@us.ibm.com.

E04 Semiconductors, Metal Oxides, and Composites: Metallization and Electrodeposition of Thin Films and Nanostructures 3

Electrodeposition Division

Electrochemical deposition has evolved into a versatile method for the fabrication of functional coatings and nanomaterials. Not only control of size and architecture are central, but also the choices for substrate and deposited material have become more demanding, including semiconductors, oxides and composites with e.g. ceramic nanoparticles or nanotubes. To broaden the possibilities, combinations of chemical and electrochemical techniques are being exploited. This Symposium aims to provide a forum for current work on the deposition and characterization for functional coatings and nanostructures.

Specific topics of interest include, but are not limited to:

1. Metal electrodeposition onto semiconductors, metal oxides, electronic materials and resistive substrates: solar cell applications, Ohmic and Schottky contact formation, metal gates, electrical connections, direct plating, etc.
2. Electrochemical and electrophoretic deposition of nanoparticle coatings: electrochemical nucleation of high density metal islands, effect of additives, chemical solution deposition, colloid chemistry, etc.
3. Electrodeposition of metal oxides, semiconductors, and nanocomposites: solar cells, low-cost (thin film) transistors applications, particle reinforced composites, CNT/metal composites, etc.

4. Nanofabrication by electrodeposition: quantum dots, nanowires, nanorods, nanotubes and complex architectures, template-assisted deposition, structure - properties relations, etc.
5. Electrochemical modification and decoration of nanostructures: CNT with metal nanoparticles, surface selectivity, self assembled monolayers, etc.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **J. Fransaer**, KU Leuven, email: jan.fransaer@mtm.kuleuven.be; **P. M. Vereecken**, imec, email: Philippe.Vereecken@imec.be; and **G. Oskam**, Cinvestav, email: oskam@mda.cinvestav.mx.

F—Electrochemical Engineering

F01 Electrochemical Engineering General Session

Industrial Electrochemistry and Electrochemical Engineering Division

Papers are solicited in areas of industrial electrochemistry and electrochemical engineering that are not covered by other symposia at this meeting. Of particular interest are papers concerning: design, operation, testing, and/or modeling of industrial electrochemical systems; electrochemical waste treatment technologies; methods for electrosynthesis; electrolytic recovery of process materials; new electrode materials; new electrochemical cell designs; and electrocatalysis. Presentations on industrially significant areas, such as chlor-alkali and fluorine production; manufacture of aluminum and other metals; the use of electrochemical methods in pulp and paper bleaching; and generation of environmentally-friendly bleaching chemicals and other active oxidants are also encouraged. Papers may contain both theoretical and experimental work, and papers dealing with either area will be considered.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **V. Subramanian**, Washington University, email: vsubramanian@seas.wustl.edu; and **V. Ramani**, Illinois Institute of Technology, email: ramani@iit.edu.



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F02 Industrial Opportunities and Challenges in Electrochemical Engineering

Industrial Electrochemistry and Electrochemical Engineering Division / Electrodeposition Division

This symposium provides a forum for presentations concerning industrial applications of electrochemical engineering, with emphasis on existing industrial-academic collaboration and new problems that may best be addressed by collaborative efforts.

Contributions are expected to cover the breadth of electrochemical engineering, including energy technologies, medical devices, including surface finishing of medical materials, corrosion abatement, environmental remediation, chemical processing, metal refining, electrodeposition, and manufacturing. The symposium will consist of both invited and contributed papers.

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F03 Membrane-based Electrochemical Separations

Energy Technology Division / High Temperature Materials Division / Industrial Electrochemistry and Electrochemical Engineering Division / Physical and Analytical Electrochemistry Division

Electrochemical separations using membranes have recently attracted wide-spread attention due to their possible high efficiency, easy operations and capability of achieving ultra-pure chemical products. Some examples of their applications are hydrogen pump, oxygen pumps and carbon oxide separations. Despite a great perspective, this technology still face some grand challenges, which include membrane instability, poor catalyst activity, and high energy consumption, etc. Papers are sought that describe recent research and development efforts in ion exchange membranes based electrochemical separations, including electrodialysis, chlorine production, gas separations and other industrial processes. Both experimental and modeling efforts are of interest, especially related to novel industrial processes in which ion exchange membranes play a prominent role in separation processes. Particularly, topics related to this technology including membranes, catalysts, system design and process operations are welcomed.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **H. Xu**, Giner Inc., email: hxu@ginerinc.com; **J. Staser**, Ohio University, email: staser@ohio.edu; and **T. Gur**, Stanford Univ., email: turgut@stanford.edu.

G—Electronic Materials and Processing

G01 Atomic Layer Deposition Applications 11

Electronics and Photonics Division / Dielectric Science and Technology Division

Continued progress in nanotechnology and nanomanufacturing requires precise, conformal coatings of thin film materials. Atomic Layer Deposition (ALD) enables the deposition of ultra-thin, highly conformal coatings over complex, 3D topographies with precise control over both thickness and composition. Consequently, ALD has become the technology of choice for a large variety of applications beyond microelectronics. Over the last eight years, this symposium has earned a leading position among the meetings where ALD is discussed. This symposium offers an excellent forum for sharing cutting edge research on both existing and emerging ALD applications, as well as fundamental aspects of ALD technology.

Contributions are solicited in the following areas:

1. Semiconductor CMOS applications: development and integration of ALD high-k oxides and metal electrodes with conventional and high-mobility channel materials;
2. Volatile and non-volatile memory applications: extendibility, Flash, MIM, MIS, RF capacitors, etc.;
3. Interconnects and contacts: integration of ALD films with Cu and low-k materials;
4. Fundamentals of ALD processing: reaction mechanisms, in-situ measurement, modeling, theory;
5. New precursors and delivery systems;
6. Optical and photonic applications;
7. Coating of nanoporous materials by ALD;
8. MLD and hybrid ALD/MLD;
9. ALD for energy conversion applications such as fuel cells, photovoltaics, etc;
10. ALD for energy storage applications;
11. Productivity enhancement, scale-up and commercialization of ALD equipment and processes for rigid and flexible substrates, including roll-to-roll deposition.

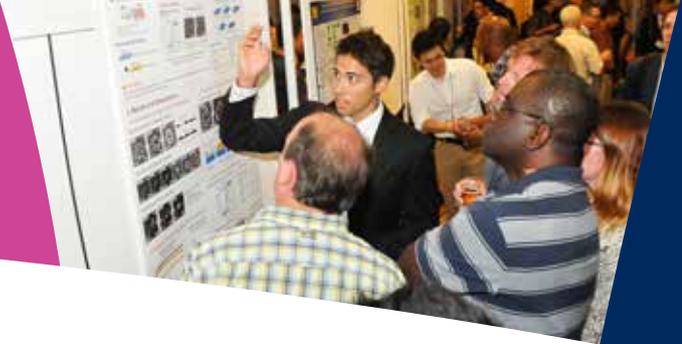
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G02 Semiconductor Cleaning Science and Technology 14 (SCST 14)

Electronics and Photonics Division

This symposium has been organized under the auspices of the Electrochemical Society every other year since 1989. The symposium continues to cover a wide range of topics related to the science



and technology of contaminants removal from and conditioning of Si(SOI), SiC, Ge, SiGe, III-V, II-VI semiconductor and non-semiconductor (e.g. sapphire, glass, ITO, plastic) surfaces; cleaning media, including non-aqueous cleaning methods and tools; FEOL and BEOL cleaning operations and pattern collapse prevention; integrated cleaning; cleaning of 3D structures and 3D stacked ICs, cleaning of MEMS; DUV and EUV masks; high-k and porous low-k dielectrics; post-CMP cleaning; wafer bevel cleaning/polishing; photoresist and residue removal, characterization, evaluation, and monitoring of cleaning; correlation with device performance; cleaning of equipment and storage/handling hardware; cleaning related issues specifically in the case of 450mm wafers; as well as other issues within the broadly understood scope of this symposium. Also, surface cleaning and conditioning topics involved in large-area electronics and photonics, both non-organic and organic TFT technology, compound semiconductor device processing, nanowire, nanotubes and nanodots cleaning, as well as surface conditioning related aspects of “self-assembly-monolayer” processing. Only original, non-commercial in nature contributions in any of the above listed topics will be accepted for presentation. Depending on the number of accepted papers a poster session may be scheduled in addition to oral presentations.

An “enhanced” edition of ECS Transactions is planned to be available at the meeting. All authors accepted for presentation are obligated to submit their full text manuscript for the issue no later than July 10, 2015. All manuscripts will be submitted online, and must be in either MS Word or PDF format.

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **J. Ruzyllo**, Pennsylvania State University, email: jruzylo@psu.edu; **T. Hattori**, Hattori Consulting International, email: x.hattori@gmail.com; **P. Mertens**, IMEC vzw, email: mertensp@imec.be; and **R. E. Novak**, 2000 Fountain Lane, Plymouth, MN 55447, email: richnovak@aol.com.

G03 **Thermoelectric and Thermal Interface Materials 2** Electronics and Photonics Division / High Temperature Materials Division

Today’s electronics are smaller and more powerful than ever, leading to ever increasing thermal challenges. Approximately 90% of the world’s electricity is generated by heat energy, typically operating at 30–40% efficiency, losing roughly 15 terawatts of power in the form of heat to the environment. Heat sinks and liquids can be used to provide cooling. Advances in thermoelectric materials and devices with high Seebeck coefficients and figures of merit offer possible routes for thermal management, but also waste heat harvesting and power generation. Thermal interface materials importantly help to transfer heat from hot spots to the cooling hardware, and advances in both thermoelectric materials and interface materials are required. This symposium will address the most recent developments in thermoelectric and thermal interface materials and strategies for modern devices and applications. Papers on both practical and fundamental issues are solicited on topics related to thermoelectric material growth, analysis, processing and applications, as well as thermal interface material applications and properties. The symposium will address basic and applied research and development, which will include the following areas of particular interest: (1.) Advances in bulk and nanoscale growth methods; (2.) Advances in device processing of thermoelectric and thermal interface materials; (3.) Power generation and energy harvesting and scavenging; (4.) Refrigeration and cooling; (5.) Semiconductor materials, growth and processing; (6.) Phonon engineering and transport; (7.) In situ and ex situ examination; (8.) Modelling of nanoscale effects in modern

thermoelectric materials; (9.) Bismuth chalcogenides; (10.) Inorganic clathrates; (11.) Group IV and related compounds; (12.) Oxide and transition metal silicides, properties and processing; (13.) Advanced thermoelectric materials; (14.) High ZT materials and devices.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Colm O’Dwyer**, University College Cork, email: c.odwyer@ucc.ie; **J. H. He**, National Taiwan University, email: jhhe@cc.ee.ntu.edu.tw; **Kafil M. Razeeb**, Tyndall National Institute, email: kafil.mahmood@tyndall.ie; and **Renkun Chen**, University of California San Diego, email: rkchen@ucsd.edu.

G04 **ULSI Process Integration 9** Electronics and Photonics Division

The ninth symposium on ULSI Process Integration will provide a forum for reviewing and discussing all aspects of process integration. Contributed papers are solicited in the following areas.

1) Device Technologies: Trends in nanoscaled technologies, 22 nm and beyond on DRAM, SRAM, flash memory, high density logic/low power, RF, mixed analog/digital, high voltage, process integration yield, 3D integration, advanced SOI single and multi-gate; 2) Front-end-of-line Integration : Gate dielectrics (ultra-thin, high-k) and dual gates, stacks (barriers) electrode/dielectrics for memory capacitors and transistors, source-drain and channel processing, rapid thermal processing, novel isolation schemes, ultra shallow junction, plasma processing aspects, sub 32 nm transistor process/device integration issues; 3) Back-end-of-line Integration: CMP issues, low-k dielectrics, multilevel integrated structures, copper interconnects and barriers, air-gap structures, metal fill technologies, optical interconnects, alternative metallization schemes, 3D integration novel packaging concepts for TSV based technologies and SIPs; 4. Alternative Channel Technologies: Ge, III-V technologies, alternative high mobility substrates (sSOI, sSi, SiGe, GeOI...), hybrid integration, new channel materials; 5) Emerging Technologies: Novel memory elements, emerging devices, carbon nanotubes, novel materials, vertical integration, grapheme devices, polymer electronics, spin and quantum devices.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **C. Claeys**, IMEC, Belgium, email: claeys@imec.be; **D. Hess**, Georgia Institute of Technology, email: dennis.hess@chbe.gatech.edu; and **C. Huffman**, Sematech, email: craig.huffman@sematech.org.



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G05 GaN & SiC Power Technologies 5

Electronics and Photonics Division / Dielectric Science and Technology Division

There is a great deal of interest in developing GaN and SiC material and device technologies for power switching and power amplifier applications. You are hereby invited to contribute a paper to this well-established symposium. The symposium will cover a wide range of topics related to these technologies and their applications: bulk and thin film growth and characterization of materials; defect characterization and reduction techniques; growth chamber design and modeling; doping and carrier lifetime control techniques; high-frequency low-loss power magnetic materials; novel power devices and device structures; power device fabrication technologies; chip-scale capacitor, inductor and transformer structures and fabrication technologies; novel physical mechanisms including micro plasma and current filamentation; short-term and long-term device degradation and failure mechanisms; novel accelerated stress testing and lifetime prediction methodologies; device characterization and modeling for performance and reliability; manufacturing cost and yield improvement approaches; homogeneous and heterogeneous chip-scale integration; power converters and power amplifiers; packaging and thermal management; and, cooling of power chips and modules. Poster sessions may be scheduled, and a panel discussion will cover the most critical issues on this topic. A whole session covering selected student papers will be organized and a Best Student Paper award is planned to be given at the symposium.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **K. Shenai**, Argonne National Laboratory, email: kshenai@anl.gov; **M. Dudley**, Stony Brook University, email: mdudley@notes.cc.sunysb.edu; **N. Ohtani**, Kwansai Gakuin University, email: ohtani.noboru@kwansai.ac.jp; and **M. Bakowski**, Acreo, email: mietek.bakowski@acreo.se.

H—Electronic and Photonic Devices and Systems

H01 Low-Dimensional Nanoscale Electronic and Photonic Devices 8

Electronics and Photonics Division / Dielectric Science and Technology Division / Sensor Division

The seventh LDEPD symposium will address the most recent developments in nanoscale transparent electronic, photonic materials, and devices. The symposium will encompass low dimensional and transparent novel materials and devices, processing, device fabrication, reliability, and other related topics. Papers on both practical issues and fundamental studies are solicited. The symposium will consist of both invited and contributed papers.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Yu-Lun Chueh**, National Tsing-Hua University, email: ylchueh@mx.nthu.edu.tw; **Colm O’Dwyer**, Tyndall National Institute, email: c.odwyer@ucc.ie; **Motofumi Suzuki**, Kyoto University, email: m-snki@me.kyoto-u.ac.jp; **Song Jin**, University of Wisconsin, Madison, email: jin@chem.wisc.edu; **Sang-Woo Kim**, Sungkwankwan University, email: kimswwl@skku.edu; **Jr-Hua He**, King Abdullah University of Science and Technology, email: jrhuah.he@kaust.edu.sa; **Johnny C. Ho**, City University of Hong Kong, email: johnnyho@cityu.edu.hk; **Zhiyong Fan**, Hong Kong University of Science and Technology, email: eezfan@ust.hk; **Qiliang Li**, George Mason University, email: qli6@gmu.edu; **Gary Hunter**, NASA Glenn, email: gary.w.hunter@nasa.gov; and **Kuniharu Takei**, Osaka Prefecture University, email: takei@pe.osakafu-u.ac.jp.

H02 Solid-State Electronics and Photonics in Biology and Medicine 2

Electronics and Photonics Division / Sensor Division

This symposium aimed to researchers utilizing the unique electronic and photonic properties of solid-state materials and devices to facilitate the understanding of biomolecular interactions, to study the integration of biomolecules and solid-state materials, and to promote the applications of solid-state devices in biology and medicine.

Topics of interest are categorized in two major parts: solid-state electronic and photonic sensors, and biomolecular electronics and photonics. Papers are solicited in the following areas, but not limited to: 1) Interaction between nanostructured materials (nanoparticles, nanowire, or graphene) and biomolecules (DNA, RNA, peptide, protein, metabolic molecules); 2) Solid-state electronic or photonic sensor design and fabrication; 3) Surface modification and immobilization; 4) Sensor characterization; 5) Sensor models and signal analysis; 6) Integrated sensor network and systems; 7) Various sensor types: field effect transistors, diodes, resistors, nanoparticles, surface plasma resonance, surface-enhanced Raman spectroscopy, surface acoustic wave devices, and quartz crystal microbalance; 8) Inter- and intra-biomolecular interactions studied with sensors; 9) Multiple sensor arrays; 10) Single molecule and single cell detection; 11) Bioelectronic systems for medical applications (detection, separation, purification, therapy, and imaging); 12) Biomolecular nanodevices; 13) Nanopore and nanoslit bioelectronics; 14) Inorganic-organic interface; 15) Charge/energy transfer; 16) Electric field effect on biomolecules and cells; 17) Biomolecular devices for energy harvesting.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Yu-Lin Wang**, National Tsing-Hua University, email: ylwang@mx.nthu.edu.tw; **A. Hoff**, University of South Florida, email: hoff@usf.edu; **M.J. Deen**, McMaster University, email: jamal@mcmaster.ca; **Zoraida Aguilar**, Covance Laboratories, email: zapaguilar@

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yahoo.com; **L. F. Marsal**, University Rovari i Virgili, email: lluis.marsal@urv.cat; and **Zong-Hong Lin**, National Tsing Hua University, email: linzh@mx.nthu.edu.tw.

H03

State-of-the-Art Program on Compound Semiconductors 58 (SOTAPOCS 58) Electronics and Photonics Division

Compound semiconductors are a significant enabler of numerous optoelectronic, high-speed, power, and sensor electronic materials, devices, and systems. The SOTAPOCS 58 symposium will address the most recent developments in inorganic compound semiconductor technology, including traditional III-V materials, III-nitrides, II-VI materials, silicon carbide, diamond, and other emerging materials. Papers on both practical and fundamental issues are solicited. The following areas are of particular interest: (1.) advances in bulk and epitaxial growth technologies; (2.) advances in device processing; (3.) novel electronic, optoelectronic, and sensor devices; (4.) Schottky and ohmic contact technology; (5.) dielectric properties and passivation; (6.) wafer bonding and packaging; (7.) in situ and ex situ process monitoring; (8.) material characterization and wafer level testing and mapping; (9.) process induced defects; (10.) reliability and device degradation mechanisms; and (11.) demonstration of state of art devices and applications.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **J. H. He**, King Abdullah University of Science and Technology, email: jrha.he@kaust.edu.sa; **Colm O’Dwyer**, University College Cork, email: c.odwyer@ucc.ie; **Fan Ren**, University of Florida, email: ren@che.ufl.edu; **Erica Douglas**, Sandia National Laboratories, email: edougla@sandia.gov; **Chennupati Jagadish**, The Australian National University, email: Chennupati.Jagadish@anu.edu.au; **Soohwan Jang**, Dankook University, email: jangmountain@dankook.ac.kr; **Yu-Lin Wang**, National Tsing-Hua University, email: ylwang@mx.nthu.edu.tw; **Robert Lynch**, University of Limerick, email: robert.lynch@ul.ie; **Travis Anderson**, Naval Research Laboratory, email: travis.anderson@nrl.navy.mil; and **Jennifer Hite**, Naval Research Laboratory, email: jennifer.hite@nrl.navy.mil.

I—Fuel Cells, Electrolyzers, and Energy Conversion

101

Concentrated Solar Energy Conversion & Storage High Temperature Materials Division

The use of concentrated solar for thermally driven power plants, for energy storage, and for high-temperature chemical processes has driven a lot of research and development throughout the world and demonstration plants in several countries. Concentrated solar energy conversion includes high-temperature thermal plants and concentrated photovoltaic and/or thermoelectric systems. The high temperature operation of concentrated solar plants offer the potential of integration with a wide-array of energy storage technologies including electrochemical, thermochemical, and direct thermal energy storage. However, challenges remain to develop cost-effective

materials and systems to enable commercially viable concentrated solar systems. This new symposium will focus on the broad spectrum of technologies for converting concentrated solar energy into electricity and/or chemicals and for storing concentrated solar in electrochemical, thermal, and/or chemical systems. Relevant topics for this symposia include concentrated solar power, solar-driven redox or electrochemical cycles for fuel and/or storage, high-temperature photovoltaic materials, high-temperature corrosion issues related to concentrated solar systems, solar-driven thermoelectric processes, and other relevant topics.

A “standard” issue of ECS Transactions is planned for this symposium. All authors accepted for presentation are encouraged to submit their full text manuscript for the issue no later than October 25, 2015. All manuscripts will be submitted online, and must be in either MS Word or PDF format.

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Greg Jackson**, Colorado School of Mines, email: gsjackso@mines.edu; **Fernando Garzon**, LANL, email: garzron@lanl.gov; **Elizabeth Opila**, University of Virginia, email: ejo4n@eservices.virginia.edu; and **Vaidyanathan (Ravi) Subramanian**, Univ. Nevada Reno, email: ravisv@unr.edu.

102

Harnessing Multi-Step Electrochemical Reactions for Energy Conversion and Storage

Energy Technology Division / Physical and Analytical Electrochemistry Division

Controlling a multi-step chemical reaction has remained a significant challenge from the perspective of chemical and biochemical reactions, and any success therein has the potential of disruptive changes on the way we convert and store energy. This symposium will explore the next frontiers in controlling such multistep catalytic processes via offering unprecedented ability to manipulate charge transfer and transport using confined structures and interfaces which enable complete control of the spatial and temporal pathways of precursors, intermediates and products. This symposium will explore this ambitious goal by effectively combining diverse groups and their expertise encompassing, use of array electrodes into structures containing micro-channels and ion and electron conducting element, with expertise in organic and bio-chemistry with intimate knowledge of specific molecular activations required for engendering such exquisite control and simulations & computational component juxtaposed with fundamental electrochemistry in diverse media ranging from aqueous to non-aqueous all from the perspective of inner and outer sphere charge transfer, mediated and un-mediated processes etc. Submissions are invited for oral and poster presentations.

A “standard” issue of ECS Transactions is planned for this symposium. All authors accepted for presentation are encouraged to submit their full text manuscript for the issue no later than October 25, 2015. All manuscripts will be submitted online, and must be in either MS Word or PDF format.

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Sri Narayan**, USC, email: srnaraya@dornsife.usc.edu; and **Sanjeev Mukerjee**, Northeastern, email: s.mukerjee@neu.edu.



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103 High Temperature Experimental Techniques and Measurements 2

High Temperature Materials Division

Exploring experimentally the behavior of materials at high temperatures for equilibrium- and non-equilibrium processes places enormous challenges on instrumentation design and analysis of data. However, the importance of high-temperature measurements to provide critical thermodynamic and kinetic data for understanding materials and processes at such extreme conditions attracts researchers from a wide range of fields including electrochemistry, materials science, physics, geology, and various engineering fields. The demand for high-temperature material properties has expanded with the continued development of advanced materials including complex oxides, metallic alloys, and cermet materials for high temperature applications such as combustion processes, high-temperature fuel cells, solar thermal processes, nuclear power generation, chemical production, and semiconductor processing. Advances in methods including but not limited to Knudsen effusive mass spectrometry, calorimetry, in situ spectroscopy (electronic and optical), and environmental electron microscopy are providing new tools to meet these demands. This sequel to a successful initial symposium in Fall 2013 focuses on the development and implementation of experimental techniques for characterizing material properties (including thermodynamic, mechanical, electrical, and chemical kinetic) at high temperatures. The use of experiments to validate computational modeling tools from atomistic to the continuum scales will also be considered. Contributions on the development of novel instruments and data analysis for high-temperature measurements as well as on the application of state-of-the-art techniques on advanced materials and/or chemical/energy conversion processes are encouraged. Focus topics include high-temperature techniques involving : 1) Optical spectroscopy, 2) electronic spectroscopy, 3) electronic microscopy, 4) X-ray diffraction, 5) Knudsen effusion mass spectrometry, 6) time-resolve mass spectrometry, 7) advanced thermogravimetric and calorimetric techniques, and 8) novel methods.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Torsten Markus**, Mannheim Univ. of Applied Sciences, email: t.markus@hs-mannheim.de; **Rob Walker**, Montana State University, email: rawalker@chemistry.montana.edu; and **Greg Jackson**, Colorado School of Mines, email: gsjackso@mines.edu.

104 Ionic Conducting Oxide Thin Films

High Temperature Materials Division / Energy Technology Division

There is an increasing interest in functional oxides fabricated as thin films, where functionalities can be modified/improved with respect to the counterpart bulk materials. Novel effects can be derived from interfacial effects between film and substrate or between films of different chemical compositions. In particular, enhanced conductivity and enhanced electrocatalytic properties have been reported. These characteristics, when fully understood, may be exploited to improve the performance of devices like miniaturized solid oxide fuel cells.

This symposium aims to provide a forum for the state-of-the-art activities on oxygen-ion and protonic oxide thin films and multilayers, including understanding of basic science and related applications/devices.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Enrico Traversa**, King Abdullah University of Science and Technology (KAUST), email: enrico.traversa@kaust.edu.sa; **Turgut Gur**, Stanford University, email: turgut@stanford.edu; **Cortney Kreller**, LANL, email: ckreller@lanl.gov; and **Venkataraman Thangadurai**, University of Calgary, email: vthangad@ucalgary.ca.

105 Polymer Electrolyte Fuel Cells 15 (PEFC 15)

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

This international symposium is devoted to all aspects of research, development, and engineering of polymer electrolyte fuel cells (PEFCs), as well as low-temperature direct-fuel cells using either anion or cation exchange membranes. The intention is to bring together the international community working on the subject and to enable effective interactions between research and engineering communities. The symposium is structured as five different sections covering diagnostic techniques and systems design/components for both acid and alkaline fuel cells; catalysts and membranes for acid fuel cells; catalysts and membranes for alkaline fuel cells; and direct-fuel acid fuel cells; included are also other polymer membrane based electrochemical devices like electrolyzers, electrochemical hydrogen pumps, etc. Abstracts for oral or poster contributions must be submitted to the Symposium via the ECS website.

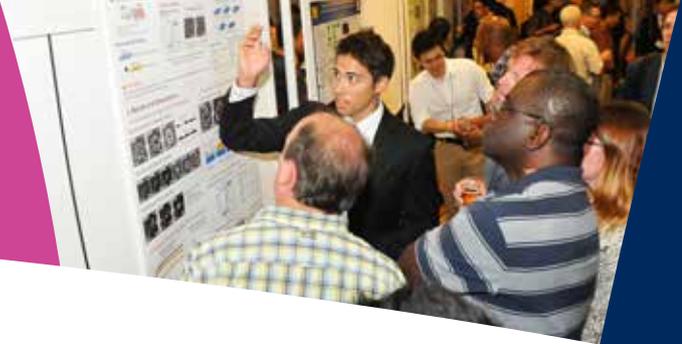
In order to encourage active participation of new and talented researchers in the field, we will award Student/Postdoc Travel Grants of at least \$600 plus free registration in support of outstanding graduate students and postdoctoral fellows. Awards will be made based on originality of the work and importance to the field. To be considered for the award, an abstract for an oral or poster presentation as well as a manuscript for the symposium proceedings must be submitted by the respective deadlines. If you would like to apply for the travel grant, please submit your abstract, your proceedings manuscript (required), your resume, your publication list, and a support letter from your advisor to Adam Weber (azweber@lbl.gov) before the deadline for the proceedings manuscript. Student Poster Prizes of a total of \$3000 will be awarded with a \$1000 top prize. Students who want to participate need to submit an abstract for a poster contribution to the ECS and send a copy of their abstract to Jim Fenton (jfenton@fsec.ucf.edu).

A Short Course on fundamental catalysis and how it can be applied to low-temperature fuel cell diagnostics and kinetic studies may be held the Sunday of the meeting (instructors: T. J. Schmidt and H. A. Gasteiger). Please check the ECS meeting website periodically for announcement of/details about this course.

Section A: Diagnostics/Characterization Methods, MEA Design/Model

Organizers: F. N. Büchi, H. A. Gasteiger, A. Weber

Presentations related to acid and alkaline fuel cells that discuss: 1. novel gas diffusion medium substrates and microporous layer designs; 2. modeling and diagnostic methods to



characterize mass- and heat-transport related phenomena (e.g., water flooding) in cells and membrane electrode assemblies; 3. CO₂ tolerance modeling of anion-exchange membrane fuel cells; 4. in-situ measurement or visualization (X-ray tomography, neutron scattering, etc.); 5. advanced ex-situ characterization methods (TEM, STM); 6. AC-impedance methods; and 7. Electrode and MEA electrochemical modeling.

Section B: Fuel Cell Systems, Stack/BOP Design, Gas

Processing

Organizers: J. Fenton, T. Fuller, Karen Swider-Lyons, K. Shinohara

Presentations related to acid and alkaline fuel cells and other electrochemical energy conversion devices that discuss: 1. hydrogen or hydrogen-reformate fuel cells; 2. direct-fuel fuel cells (DMFC, borohydride, etc.); 3. alkaline (membrane) fuel cells; 4. portable fuel cells; 5. new cell and stack structures, including new types of bipolar plates and flow fields; 6. degradation of fuel cell components and the influence of degradation products on component and system performance, including corrosion of bipolar plates and BOP, and degradation of sealing materials and other components; 7. hydrogen-reformate synthesis; 8. balance-of-plant (BOP) components; 9. design and specifications of complete power systems in the context of transportation and stationary power generation applications as well as for micro-fuel cell systems; and, 10. components and systems for other electrochemical energy conversion devices such as electrochemical hydrogen pumps, etc.

Section C: Cation-Exchange Membrane Performance & Durability

Organizers: M. Edmundson, D. Jones, K.A. Perry

Presentations related to acid fuel cells that discuss: 1. advanced cation-exchange membranes and ionomers (PFSA, hydrocarbon-based, etc.); 2. high-temperature membranes; 3. physico-chemical properties of fuel cell membranes; 4. structural characterization of membranes; 5. degradation/aging of membranes (chemical and mechanical); and, 6. molecular modeling of membrane properties.

Section D: Catalyst Activity/Durability for Hydrogen(-Reformate) Acidic Fuel Cells

Organizers: C. Coutanceau, S. Mitsushima, P. Strasser, H. Uchida

Presentations related to acidic fuel cells that discuss: 1. fuel cell electrocatalysts for hydrogen and hydrogen-reformate fuel cells (PEMFC, PAFC, etc.); 2. novel catalyst supports; 3. degradation of fuel cell electrocatalysts and catalyst supports; and, 4. ab-initio computational studies of catalytic mechanisms and for the design of novel catalysts.

Section E: Materials for Alkaline Fuel Cells and Direct-Fuel Fuel Cells

Organizers: R. Mantz, S.R. Narayanan, T.J. Schmidt, Vijay Ramani

Presentations related to alkaline fuel cells and direct-fuel acid fuel cells that discuss: 1. electrocatalysts for hydrogen oxidation and oxygen reduction in alkaline fuel cells; 2. catalysts for direct-borohydride applications; 3. novel anion-exchange membranes; 4. degradation mechanisms of anion-exchange membranes; and, 5. catalysts for the direct electrooxidation of alternative fuels (e.g., methanol, ethanol, ammonia, etc.) in both alkaline and acidic fuel cells.

Section F: Polymer-electrolyte electrolysis

Organizers: Bryan Pivovar, Kathy Ayers

Presentations related to low-temperature, polymer electrolyte water electrolysis for hydrogen production

(specifically precluding approaches that involve CO₂ electrochemical reduction, liquid alkaline fuel cells, or photoelectrochemical water splitting): 1. electrocatalysts for hydrogen reduction and oxygen oxidation including performance and durability; 2. polymers, membranes, and electrodes for electrolysis applications; 3. transport media and bipolar plates; 4. balance-of-plant (BOP) components; 5. degradation of electrolysis components and the influence of degradation products on system performance and lifetime; 6. design and specifications of complete electrolysis systems in the context of hydrogen generation applications as well as intermittent or load following applications.

Abstracts, suggestions, and inquiries should be sent electronically to the ECS headquarters office and to the appropriate Section Lead Organizer (see below). Note that the abstract submission deadline is May 1, 2015.

Since the number of time slots for oral presentations is limited, we would very much appreciate it if research groups that submit several abstracts could seek a reasonable balance between oral and poster contributions. If you are submitting multiple abstracts for oral contribution to the same Section, please be aware that we might have to limit the number of oral presentations to one per research group per Section, which means that we might have to move oral contributions into the Poster Session, depending on how closely the papers overlap. Therefore, if you are submitting more than one oral contribution to one Section, we will have to down-select and you should send a prioritized list of your contributions to the Section's Lead Section Organizer (underlined name given for each Section). We appreciate your cooperation in this regard.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **H.A. Gasteiger**, TUM, email: hubert.gasteiger@tum.de; **Adam Weber**, LBNL, email: azweber@lbl.gov; **Vijay Ramani**, IIT, email: ramani@iit.edu; **Thomas Fuller**, Georgia Tech, email: tom.fuller@gtri.gatech.edu; **R. Mantz**, U.S. Army Research Office, email: robert.a.mantz@us.army.mil; **Hiroyuki Uchida**, University of Yamanashi, email: h-uchida@yamanashi.ac.jp; **F.N. Büchi**, Paul Scherrer Institut, email: felix.buechi@psi.ch; **Mark Edmundson**, W. L. Gore & Associates, email: medmunds@wlgore.com; **C. Coutanceau**, Université de Poitiers, email: christophe.coutanceau@univ-poitiers.fr; **James Fenton**, Univ. of Central Florida, email: jfenton@fsec.ucf.edu; **S. Mitsushima**, Yokohama National University, email: mitsushi@ynu.ac.jp; **T.J. Schmidt**, PSI, email: ThomasJustus.Schmidt@psi.ch; **K. Shinohara**, Nissan Motor, email: k-shino@mail.nissan.co.jp; **Karen Swider-Lyons**, NRL, email: karen.lyons@nrl.navy.mil; **Deborah Jones**, CNRS Montpellier, email: Deborah.Jones@univ-montp2.fr; **Bryan Pivovar**, NREL, email: bryan.pivovar@nrel.gov; **Kathy Ayers**, ProtonOnSite, email: kayers@protononsite.com; **Kelly Perry**, Oakridge National Lab, email: perryka@ornl.gov; **S.R. Narayanan**, Univ. of Southern California, email: smaraya@college.usc.edu; and **Peter Strasser**, Technical University Berlin, email: pstrasser@tu-berlin.de.



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J—Luminescence and Display Materials, Devices, and Processing

J01 Physics and Chemistry of Luminescent Materials Luminescence and Display Materials Division

This symposium will focus on physical and chemical aspects of luminescence in both organic and inorganic materials and will address current and emerging technical and scientific issues in luminescence. Presentations at this meeting will include photoluminescent materials, cathodoluminescent materials, electroluminescent materials, scintillators, persistent phosphors, laser materials, and their applications. This can include fundamental studies, incorporating characterization techniques of advanced luminescent materials and theoretical studies on luminescent processes. Papers can also discuss the application of various luminescent materials in practical systems. This symposium will also feature sessions around luminescent materials for energy reduction and renewable energy sources. Such topics include, but are not limited to experimental and theoretical works on fluorescent lighting, OLEDs, white and colored LEDs, quantum cutting for solar cells, and related upconversion/downconversion processes.

A “standard” issue of ECS Transactions is planned for this symposium. All authors accepted for presentation are encouraged to submit their full text manuscript for the issue no later than October 25, 2015. All manuscripts will be submitted online, and must be in either MS Word or PDF format.

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Anant Setlur**, GE Global Research, email: setlur@ge.com; **Madis Raukas**, Osram Sylvania, email: madis.raukas@sylvania.com; **Rong-Jun Xie**, National Institute of Materials Science, email: XIE.rong-jun@nims.go.jp; **John Collins**, Wheaton College, email: jcollins@wheatoncollege.edu; and **Ru-Shi Liu**, National Taiwan University, email: rslu@ntu.tw.edu.

L—Physical and Analytical Electrochemistry, Electrocatalysis, and Photoelectrochemistry

L01 Physical and Analytical Electrochemistry, Electrocatalysis, and Photoelectrochemistry General Session Physical and Analytical Electrochemistry Division

In the general session topic areas of other specialized symposia at this meeting are welcome. Contributed papers will be programmed in some related order, depending on the titles and contents of the submitted abstracts.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizer: **Pawel J. Kulesza**, University of Warsaw, email: pkulesza@chem.uw.edu.pl.

L02 Charge Transfer in Biological Systems 2 Physical and Analytical Electrochemistry Division

This symposium will provide an international and interdisciplinary forum for researchers to present their recent research on electron transfer processes present in biological systems. Electron transfer is an important process in biology, but functions of electron transfer in proteins are still in need of elucidation. Both theoretical and experimental papers are invited in the following areas for both inter and intramolecular electron transfer: electron flow, electron transfer components, mechanism of electron transfer, energy coupling, mediation of electron transfer events, electron transfer kinetics, photo induced electron transfer, and thermally-induced electron transfer.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **David Cliffler**, Vanderbilt University, email: d.cliffler@vanderbilt.edu; and **Hugh De Long**, Air Force Office of Scientific Research, email: hugh.delong@us.af.mil.

L03 Electroactive and Redox Active Polymers Physical and Analytical Electrochemistry Division / Energy Technology Division

Electroactive and redox polymers have become an important area of electrochemistry in the past two decades. Electrochemistry provides a versatile green-chemistry approach for the preparation of these functional materials since various electrochemical techniques can be used to control the synthesis of the materials and to tune their redox state. Importantly, these materials have widely potential applications in the fields of energy storage, electrocatalysis, sensors, electrochromic displays, photovoltaics, flexible electronics, water purification, and corrosion protection. Numerous electroactive and redox polymers have been prepared, characterized, and evaluated for these applications. This effort is still on the foreground of research activity in electrochemistry. The development of high-performance and durable electroactive and redox polymers will promote their potential applications to meet our demand for improved sustainability of our energy and environments. Fundamentally, further research is still needed to deepen our understanding of the mechanism of charge transfer and charge transport processes occurring during redox reactions of the materials.

This symposium will focus on: (1) the discovery and development of novel or high performance electroactive and redox polymers and their nano-composites for energy storage (batteries, supercapacitors, fuel cells, and solar cells), (2) novel techniques to study electrode/polymer interfaces, redox kinetics and charge transport processes inside the polymers and nano-composites, (3) theoretical analysis and modelling of these processes; (4) chemistries involved in the charge transport, and materials synthesis and degradation; (5) other emerging applications of the materials to water purification, sensors and sustainable electronic devices; and (6) progress of engineering production and processing of the materials.



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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Junhua Jiang**, UIUC, email: junhua_j@yahoo.co.uk; and **Andrew Herring**, Colorado School of Mines, email: aherring@

L04 Electrode Processes 10

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

This symposium will provide an international and interdisciplinary forum on the fundamental and applied aspects of electrode processes. Topics of interest include: novel electrode processes that may lead to new technologies or unique materials; well-ordered systems (structure, adsorbates, and deposits on single-crystal surfaces); properties of electrodeposits, nanometer-scale structures, theory, modeling; dynamics, thermodynamics, heterogeneous reactions, e.g., inorganic and organic electrocatalysis; industrial processes, fuel cells, and batteries.

The symposium will include both invited and contributed papers on all facets of the chemistry, physics, physical chemistry, and electrochemistry of electrode processes.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Andrew Hillier**, Iowa State University, email: hillier@iastate.edu; **Luis Diaz**, Ohio University, email: ld156509@ohio.edu; and **Jean St-Pierre**, Hawaii Natural Energy Inst., email: jsp7@hawaii.edu.

L05 Nanoscale Electrochemistry

Physical and Analytical Electrochemistry Division / Energy Technology Division

Electrochemistry involving nanoscale materials and environments is an expanding research area that leads to development of novel materials and analytical methods. This symposium will provide an international and interdisciplinary forum for researchers to present their recent research on electrochemistry at nanoscale systems. The topics will include, but are not limited to: electrochemical synthesis and characterization of nanostructured materials, electrochemistry of nanoscale materials (such as nanoparticles, nanorods, nanopores, ultrathin films); electrochemistry at nanoscale electrodes and at solid-liquid and liquid-liquid interfaces; new electroanalytical techniques to study the nanoscale dimensions; and nanomaterials-based electroanalytical sensing and power sources.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Takashi Ito**, Kansas State University, email: ito@ksu.edu; and **Ahmet Kusoglu**, LBL, email: akusoglu@lbl.gov.

L06 Photocatalysts, Photoelectrochemical Cells, and Solar Fuels 6

Energy Technology Division / Physical and Analytical Electrochemistry Division / Sensor Division

This symposium will provide an international and interdisciplinary forum to present the latest research on production of fuels (e.g., hydrogen) and conversion CO₂ by utilizing solar energy. Topics of interest include but not limited to: (1) exploring novel methods for production of fuels such as hydrogen, ethanol and other fuels; (2) conversion of renewable energy resources such as biomass to fuels; (3) capture or conversion of CO₂ to fuels; (4) photocatalytic disinfection and environmental remediation; (5) synthesis and characterization of photocatalysts; (6) exploring new solar energy materials; (7) development of photoelectrochemical cells (PECs); (8) construction of solar thermal panels and solar reactors; (9) simulation and modeling of materials, devices and systems for solar energy applications; and (10) corrosion and durability of solar energy materials.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Nick Wu**, WVU, email: nick.wu@mail.wvu.edu; **Eric Miller**, DOE, email: Eric.Miller@ee.doe.gov; **Ravi Subramanian**, University of Nevada Reno, email: ravisv@unr.edu; **A. Manivannan**, NETL, email: Ayyakkannu.Manivannan@NETL.DOE.GOV; **Deryn Chu**, ARL, email: deryn.chu@us.army.mil; **Huyen Dinh**, NREL, email: huyen_dinh@nrel.gov; **P. J. Kulesza**, U Warsaw, email: pkulesza@chem.uw.edu.pl; **Heli Wang**, NREL, email: Heli.Wang@nrel.gov; and **J.-J. Lee**, Konkuk University, email: jjlee@kku.ac.kr.

L07 Physical and Analytical Electrochemistry in Ionic Liquids 4

Physical and Analytical Electrochemistry Division / Battery Division / Industrial Electrochemistry and Electrochemical Engineering Division / Sensor Division

This symposium will provide an international and interdisciplinary forum for researchers to present their latest research on topics involving physical and/or analytical electrochemistry in ionic liquids. Papers on both basic and applied research are encouraged. The topics will include, but are not limited to: (1.) electron transfer processes in ionic liquids; (2.) electrode kinetics in ionic liquids; (3.) the electrode/ionic liquid interface; (4.) electrochemical characterization of ionic liquids (e.g., conductivity, ion transport, electrochemical windows); (5.) experimental aspects of electrochemistry in ionic liquids; (6.) the electrochemistry of solutes in ionic liquids; (7.) electroanalytical determinations in ionic liquids; (8.) electrodeposition in ionic liquids (e.g., nucleation, deposition of alloys, characterization of electroactive



species, and surface characterization); and (9.) electrochemical aspects of biological materials and systems in ionic liquids.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **P. Trulove**, US Naval Academy, email: Trulove@usna.edu; **R. Mantz**, Army Research Office, email: Robert.a.mantz@us.army.mil; **H. De Long**, AFOSR, email: Hugh.delong@us.af.mil; **Mike Carter**, KWJ Engineering, email: mtcarter62@comcast.net; **Elizabeth Biddinger**, City College of New York, email: ebiddinger@che.cuny.cuny.edu; and **Wu Xu**, Pacific Northwest National Laboratory, email: wu.xu@pnnl.g

L08 Single Particle/Molecule Electrochemical Detection

Physical and Analytical Electrochemistry Division

The use of electrochemical methods for single particle or single molecule detection has expanded in recent years by a wealth of new approaches and techniques. The ability to directly observe and correlate the electrochemical response to single molecules and nanoparticles represents the ultimate detection limit. Research in this field can also help developing fundamental understanding of electrochemical behavior of single redox molecules and nanoparticles and their structure-function relationship, which may be useful in designing better sensors and new electrocatalysts with improved performance. The symposium will concentrate on improving the detection limits of electrochemical methods into the realm of stochastic event counting, sometimes all the way down to the single particle or single molecule event. Coupling electrochemical methods to fluorescence, scanning probe microscopy, and nanopores are just some of the approaches that enable these low detection limits.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **D. Cliffl**, Vanderbilt, email: D.cliffl@vanderbilt.edu; and **B. Zhang**, University of Washington, email: Zhang@chem.washington.edu.

M—Sensors

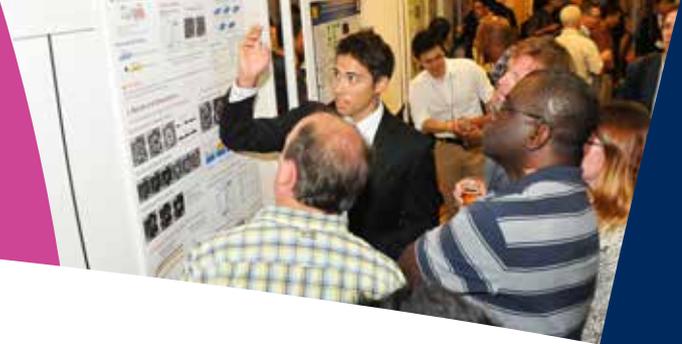
M01 Sensors, Actuators, and Microsystems General Session

Sensor Division

This symposium will address all aspects of chemical, biological and physical sensors, actuators and microsystems. Chemical, biological and physical sensors find extensive application in environmental monitoring, health care, food security, industrial quality assurance, safety and process control. Sensors and actuators are often integrated into “smart” microsystems: microfabricated sensors and/or actuators combined with electronics which enable, for example, signal conditioning and data processing. The need for multifunctional, smart technologies, which depend on sensors, actuators and electronics, is expected to increase in coming years as further demands and expectations are placed on systems and devices. This general session welcomes papers on all aspects of sensors, actuators and microsystems not covered in other sessions. This symposium intends to bring together a range of interdisciplinary topics and covers all materials and other aspects of sensors, actuators and microsystems. Primary emphasis will be placed upon applied aspects of the materials, synthesis, evaluation and development strategies of novel materials/device configurations for sensing and actuating functions as well as integrated microsystems. Papers are solicited in, but not limited to, the following areas: (1.) physics and chemistry of sensor and actuator materials, fabrication, and characterization of novel compositions; (2.) novel sensor and actuator concepts, design, modeling, and verification, system integration and actuating functions; (3.) sensing systems that include sampling systems and actuators, like sensor arrays, and electronic noses and tongues; (4.) chemical, biological and physical sensors and actuators based on various transduction mechanisms including electrochemical, resistive, fluorescence, surface plasmon resonance, surface-enhanced Raman scattering, fiber optics, radio frequency, microwave and surface acoustics; (5.) emerging technologies and applications including sensors based on nanotechnology, (6.) wireless integrations; and (7.) novel techniques to expand and ensure sensor stability and reliability.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Nick Wu**, University of West Virginia, email: Nick.Wu@mail.wvu.edu; **Michael Carter**, KWJ Engineering, email: mtcarter62@comcast.net; **Rangachary Mukundan**, Los Alamos National Laboratory, email: mukundan@lanl.gov; **Larry Nagahara**, NIH, email: nagahara@mail.nih.gov; **Gary Hunter**, NASA Glenn, email: gary.w.hunter@nasa.gov; and **Raluca Van Staden**, National Institute of Research for Electrochemistry and Condensed Matter, email: iustinavastaden@yahoo.com.



MO2 **New Paradigms in Sensor Technology**
Sensor Division / Physical and Analytical
Electrochemistry Division

New advancements in materials, micro/nanofabrication, photonics, electronics, communications, and power coupled with ability to handle “big data” have revolutionized sensor technology which has found applications in diverse areas related to energy, water, food, industrial applications, and public health. This symposium intends to bridge the gap between the advancements in the fundamental science and engineering related to sensor technology and its applications with a goal to demonstrate that new developments in this area can indeed create impact to the global challenges that are faced by communities and technology users around the world.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Sushanta Mitra**, York University, email: sushanta.mitra@lassonde.yorku.ca; **Michael Carter**, KWJ Engineering, Inc., email: mtcarter62@comcast.net; **Aleksandr Simonian**, Auburn University, email: simonal@auburn.edu; **Peter Hesketh**, Georgia Institute of Technology, email: peter.hesketh@me.gatech.edu; **Gary Hunter**, NASA Glenn, email: gary.w.hunter@nasa.gov; and **Robert Mantz**, Army Research Office, email: robert.a.mantz.civ@mail.mil.

MO3 **Sensors for Agriculture**
Sensor Division

The quality, safety and security of our food is of paramount importance to every man, woman and child of the United States. As many as 48 Million Americans become ill annually due to food borne illness. This symposium will provide a forum for the discussion of research and development in the field of sensors for the detection of food borne pathogens. Topics of interest include but are not limited to: (1) sensors for the detection of food borne pathogens on fresh produce; (2) sensors for the detection of food borne pathogens in food matrices such as peanut butter, pizza and other processed food; (3) sensors for food quality (bruises, smell, sugar content, residual pesticides); and (4) sensors for food safety (contamination detection by pathogenic bacteria, spores, viruses, pesticides). Both laboratory and in-the-field detection and sensing techniques are encouraged. All transduction methods are of interest in this symposium including optical imaging (visual, infrared, hyperspectral, fluorescent, luminescent, etc.), electrochemical (potentiometric, amperometric, conductometric), acoustic (microcantilever, quartz crystal microbalance, surface acoustic wave), gravimetric and combinations thereof.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Bryan A. Chin**, Auburn University, email: bchin@eng.auburn.edu; **Aleksandr Simonian**, Auburn University, email: simonal@auburn.edu;

edu; **Sushanta Mitra**, York University, email: sushanta.mitra@lassonde.yorku.ca; **Peter Hesketh**, Georgia Tech University, email: peter.hesketh@me.gatech; and **Yating Chai**, Auburn University, email: yzc0012@tigermail.auburn.edu.

Z—General Topics

Z01 **General Student Poster Session**
All Divisions

This poster session provides a forum for graduate and undergraduate students to present research results of general interest to ECS. The purpose of this session is to foster and promote work in both electrochemical and solid-state science and technology, and to stimulate active student interest and participation in ECS. A competition for the two best posters will be part of the session. Cash prizes will be given to the presenting student author on each winning paper; the amounts are awarded at the discretion of the organizers and judges.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Venkat Subramanian**, Washington University in St. Louis, email: vsbramanian@wustl.edu; **Vimal Chaitanya**, New Mexico State University, email: vimalc@ad.nmsu.edu; **Kalpathy Sundaram**, University of Central Florida, email: Kalpathy.Sundaram@ucf.edu; and **Pallavi Pharkaya**, Lam Research Corporation, email: pallavi.pharkaya@gmail.com.

Z02 **Nanotechnology General Session**
All Divisions / Interdisciplinary Science and
Technology Subcommittee

The emergence of nanotechnology as a major field of research has touched almost every scientific discipline. The number of applications for materials that are prepared on a nanometer scale has been expanding rapidly. The advancement of these applications is made possible by the new methods of preparation and characterization of materials and composites on a nanometer scale. Examples include catalysts for fuel cell, battery and supercapacitor applications, semiconductors for photovoltaic and photoelectrochemical solar energy conversion, and chemical and biological sensors.

This symposium will focus on critical issues and state-of-the-art developments in the science and technology of nanostructured materials for a broad spectrum of applications. Papers are solicited in all areas related to materials including metals, ceramics, semiconductors, composites, molecular electronics, and organic compounds and polymers, and to devices including fuel cells, batteries, photovoltaic cells, supercapacitors, molecular/nano electronics, chemical and biological sensors, actuators, etc.



Photo by ©Visit Phoenix

Areas of interest include: heterogeneous functional materials for energy systems; semiconductor and metal nanoparticles and metal/semiconductor nanocomposites; size quantization effects in semiconductor nanoparticles; fundamentals of nucleation and growth of nanoparticles/nanowires/nanotubes; novel synthesis methods of nanostructured materials; processing of nanostructured materials; advanced characterization techniques for nanostructured materials; modeling and tailoring of nanostructured materials; nanocomposites and interfacial phenomena; photo-induced charge separation and interfacial charge transfer; photoelectrochemistry of nanostructured films; photo-catalysis and environmental applications; nano-ionic; nanostructured catalysts for fuel cells, electrolyzers, batteries and supercapacitors; nanostructured sensor surfaces; and biological applications of nanomaterials.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **O. M. Leonte**, Berkeley Polymer Technology, email: odleonte@comcast.net; and **Mahendra K. Sunkara**, University of Louisville, email: mahendra@louisville.edu.

Z04 Impedance Technologies, Diagnostics, and Sensing Applications

Physical and Analytical Electrochemistry Division / Corrosion Division / Industrial Electrochemistry and Electrochemical Engineering Division / Sensor Division

This symposium will bring together leading experts who have a variety of different experimental and theoretical skills in areas of electrochemical impedance technology and analytical systems. Impedance can be used in analysis of materials and monitoring of state. Impedance can determine directly a number of variables such as motion, chemical composition, physicochemical properties or electromagnetic field and, indirectly, can sense many other variables that can be converted into motion or permittivity, such as pressure, acceleration, position, or fluid level, etc. Impedance spectroscopy-based measurements are used in a rich multi-discipline area of science and technology that has been applied to a large number of important areas of research, such as: corrosion studies and corrosion control; monitoring of properties of electronic and ionic conducting polymers and coatings; measurements in energy storage, batteries, and fuel cells-related systems; mechanical measurements; biological, biocellular, and biomedical sensors; measurements in semiconductors, solid electrolytes, and electronic conductors; and studies of electrochemical kinetics, reactions, and processes and their control.

The aim is to show the power of electrochemical impedance spectroscopy for understanding electrochemical systems: characterizing homogeneous and heterogeneous materials by their charge transport and dielectric properties, recognizing effects and signatures of surface layers, studying space charge regions at the interfaces or in the bulk solution, determining kinetics of electrochemical and chemical reactions. The symposium also welcomes papers dedicated to fundamental research in electrochemical impedance devices and recent advances in the impedance instrumentation, data collection and processing, and process monitoring where it relates to electrochemistry.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Petr Vanysek**, Northern Illinois University, email: petr.vanysek@gmail.com; **Vadim Lvovich**, NASA Glenn, email: vlvovich@ameritech.net; **Mark Orazem**, University of Florida, email: morazem@che.ufl.edu; and **Masayuki Itagaki**, Tokyo University of Science, email: itagaki@rs.noda.tus.ac.jp.