

229th ECS MEETING

San Diego Convention Center Corp.



SAN DIEGO



Call for Papers

May 29 – June 3, 2016

Hilton San Diego Bayfront & San Diego Convention Center

For all details about the 229th Meeting in San Diego, please visit www.electrochem.org.
For the full San Diego Call for Papers, see www.electrochem.org/meetings/biannual/229.



229th ECS MEETING

May 29 – June 3, 2016 • Hilton San Diego Bayfront & San Diego Convention Center

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General Information

The 229th ECS Meeting will be held from May 29 – June 3, 2016. 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 December 11, 2015.

Note: Some abstracts may be due earlier than December 11, 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/229/.

Abstract Submission and Deadlines

Submit one original meeting abstract electronically via the ECS website, no later than **December 11, 2015**. Faxed abstracts, e-mailed abstracts, and late abstracts will not be accepted. In February of 2016 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 February 2016.

Paper Presentation

All authors selected for either oral or poster presentations will be notified in February 2016. 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.** 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. Upon completion of the review process, papers from the “standard” issues will be published shortly after their acceptance. Once published, papers will be available for sale through the ECS Digital Library.

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

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*. 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 students, postdoctoral researchers, and young professionals to attend ECS biannual meetings. Applications are available online at www.electrochem.org/travel_grants and must be received no later than the submission deadline of Friday, February 12, 2016. Additional financial assistance is very limited and generally governed by the symposium organizers. Individuals may inquire directly to the organizers of the symposium in which they are presenting their paper to see if funding is available. For general travel grant questions, please contact travelgrant@electrochem.org.

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 April 25, 2016

The 229th ECS Meeting will be held at the San Diego Convention Center and the Hilton San Diego Bayfront. 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 April 25, 2016.**

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 April 25, 2016.**

Short Courses

A number of short courses will be offered on Sunday, May 29, 2016 from 9:00AM-4:30PM. Short courses require advance registration and may be cancelled if enrollments are too low. As of press time, the following short courses are tentatively planned for the meeting: Electrochemical Applications to Biotechnology, Advanced Impedance Spectroscopy, Hydrodynamic Electrochemistry Using Rotating Electrodes, and Nanobiosensors.

Technical Exhibit

The 229th ECS Meeting in San Diego 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 for further details.

Contact Information

If you have any questions or require additional information, contact ECS.



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Symposium Topics

A — Batteries and Energy Storage

A01—Joint General Session: Batteries and Energy Storage -and- Fuel Cells, Electrolytes, and Energy

A02—Future and Present Advanced Lithium Batteries and Beyond – a Symposium in the Honor of Prof. Bruno Scrosati

A03—Large-Scale Energy Storage 7

A04—Battery Modeling and Computation

A05—Electrochemistry and Batteries for Safe and Low-cost Energy Storage

B — Carbon Nanostructures and Devices

B01—Carbon Nanostructures for Energy Conversion

B02—Carbon Nanostructures in Medicine and Biology

B03—Carbon Nanotubes - From Fundamentals to Devices

B04—Endofullerenes and Carbon Nanocapsules

B05—Fullerenes - Chemical Functionalization, Electron Transfer, and Theory

B06—Graphene and Beyond: 2D Materials

B07—Inorganic/Organic Nanohybrids for Energy Conversion

B08—Porphyrins, Phthalocyanines, and Supramolecular Assemblies

B09—Engineering Carbon Hybrids - Carbon Electronics 2

C — Corrosion Science and Technology

C01—Corrosion General Session

D — Dielectric Science and Materials

D01—Dielectrics for Nanosystems 7: Materials Science, Processing, Reliability, and Manufacturing -and- Solid State Topics General Session

D02—Chemical Mechanical Polishing 14

D03—Dielectrics for Interconnect, Interposers, and Packaging

D04—Plasma and Thermal Processes for Materials Modification, Synthesis and Processing

E — Electrochemical/Electroless Deposition

E01—Electrophoretic Deposition

E02—Three-Dimensional Electrodeposition and Electroless Deposition

F — Electrochemical Engineering

F01—Industrial Electrochemistry and Electrochemical Engineering General Session

F02—Engineering the Interface between Catalysis and Electrocatalysis

G — Electronic Materials and Processing

G01—More-than-Moore 3

G02—Silicon Compatible Materials, Processes, and Technologies for Advanced Integrated Circuits and Emerging Applications 6

H — Electronic and Photonic Devices and Systems

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H02—Solid-State Electronics and Photonics in Biology and Medicine 3

H03—Properties and Applications of 2-Dimensional Layered Materials

I — Fuel Cells, Electrolyzers, and Energy Conversion

I01—State-of-the-Art Invited Tutorials on Model/Experiment Coupling in Low Temperature Fuel Cells

I02—Ionic and Mixed Conducting Ceramics 10

I03—Hydrogen and Oxygen Evolution Catalysis for Water Electrolysis 2

I04—Mechano-Electro-Chemical Coupling in Energy Related Materials and Devices 2

I05—Heterogeneous Functional Materials for Energy Conversion and Storage

K — Organic and Bioelectrochemistry

K01—12th Manual M. Baizer Memorial Symposium on Organic Electrochemistry

K02—Bioelectrochemistry: Analysis and Fundamental Studies

L — Physical and Analytical Electrochemistry, Electrocatalysis, and Photoelectrochemistry

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

L02—Electrocatalysis 8

L03—Biological Fuel Cells 7

L04—Convocation on Chemically Modified Electrodes and Electroactive Polymers

L05—Supramolecular Materials

L06—Ionic Liquids as Electrolytes

L07—Renewable Fuels via Artificial Photosynthesis or Electrolysis

L08—Electrochemistry in Geochemical Environments

M — Sensors

M01—Sensors, Actuators, and Microsystems General Session

M02—Medical and Point-of-Care Sensors

Z — General Topics

Z01—General Society Student Poster Session

Z02—Nanotechnology General Session featuring Nanoscale Luminescent Materials 4

Z03—Grand Challenges in Energy Conversion and Storage

Z04—Nature-inspired Electrochemical Systems 2

Z05—Sustainable Materials and Manufacturing

Z06—Modeling: From Elucidation of Physical Phenomena to Applications in Design

Z07—The Brain and Electrochemistry



A—Batteries and Energy Storage

A01 Joint General Session: Batteries and Energy Storage -and- Fuel Cells, Electrolytes, and Energy Conversion

Energy Technology Division / Battery Division

Papers are solicited on the fundamental and applied aspects of energy storage and conversion not covered by the other symposia in the Battery and Energy Technology Divisions. Of particular interest are new materials chemistries, materials structures, novel device designs, new insights from modeling and simulations, and performance studies. Energy storage and conversion systems include, but are not limited to, batteries, low-temperature fuel cells, and supercapacitors.

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 June 12, 2016. 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: **Robert Kostecki**, LBNL, email: r_kostecki@lbl.gov; **Mani Manivannan**, NETL DOE, email: Ayyakkannu.Manivannan@NETL.DOE.GOV; and **Sri Narayanan**, USC, email: smnaraya@dornsife.usc.edu.

A02 Future and Present Advanced Lithium Batteries and Beyond – a Symposium in the Honor of Prof. Bruno Scrosati

Battery Division / Physical and Analytical Electrochemistry Division

This symposium is organized in honor of one of the pioneers and most brilliant experts in the field of lithium secondary batteries, Prof. Bruno Scrosati. Secondary batteries based on alkaline and alkaline-earth ions are at the cutting edge of the science and technology of electrochemical energy storage systems. These batteries show an outstanding performance in terms of energy density and power capability; thus, they are ideal for a wide range of applications ranging from electric drive vehicles to portable electronic devices and power tools, among many others. Contributions will focus on the most innovative advancements in concepts, materials, and designs for the advancement of the science and engineering of secondary batteries. The latter comprise lithium ion battery technology and beyond, e.g. lithium-air, lithium-sulfur, Na-, Al- and Mg-based chemistries. The symposium is meant to cover the various aspects of materials synthesis, development of electrolytes and electrode configurations, battery assembly and testing, modeling and simulation, characterization and diagnosis. Contributions on safety issues, system integration and characterization techniques 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 June 12, 2016. 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: **Vito Di Noto**, University of Padova, email: vito.dinoto@unipd.it; **Stefano Passerini**, Karlsruhe Institute of Technology, email: stefano.passerini@kit.edu; and **Robert Kostecki**, LBNL, email: r_kostecki@lbl.gov.

A03 Large-Scale Energy Storage 7

Energy Technology Division / Battery Division

Electrical energy storage is critical for supporting the integration of renewable energy generation and increasing the capacity and reliability of the future electricity grid. Electrochemical energy storage systems have the potential to fulfill this need. This symposium seeks oral and poster presentations on advances in materials, technology and designs, results of performance demonstrations, and economics analysis. The technologies of interest include redox-flow battery systems, metal-air rechargeable batteries, electrolyzers, capacitors, and other rechargeable electrochemical energy storage systems that have the potential to meet the cost and efficiency requirements of large-scale deployment.

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 June 12, 2016. 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: **SR Narayan**, Univ. Southern California, email: sri.narayan@usc.edu; **Sanjeev Mukerjee**, Northeastern University, email: s.mukerjee@neu.edu; **Christopher Johnson**, Argonne National Lab, email: cjohnson@anl.gov; and **Jean St-Pierre**, Hawaii Natural Energy Inst., email: jsp7@hawaii.edu.

A04 Battery Modeling and Computation

Battery Division / Industrial Electrochemistry and Electrochemical Engineering 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 modeling approach. In this symposium, we hope to gather many researchers around the world to discuss new advances in computational materials design and modeling of battery systems. The emphasis of the symposium will be on the new promising electrode materials and battery systems, their electrochemical properties and reaction mechanisms.

The topics of the sessions will include (but not be limited to):

- New electrochemical systems, including lithium, sodium, magnesium chemistries.
- Electrode/electrolyte interfacial phenomena in new materials and new systems
- High throughput materials design by first principles
- Computational materials diagnostics
- Multi-scale modeling of energy storage materials and systems
- Mechanical - Electrochemical coupling in battery 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 June 12, 2016. 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**, UCSD, email: shmeng@ucsd.edu; **Shyue Ping Ong**, UCSD, email: s2ong@ucsd.edu; and **Yue Qi**, Michigan State University, email: yueqi@egr.msu.edu.



A05

Electrochemistry and Batteries for Safe and Low-cost Energy Storage

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

To reduce the dependence on imported petroleum and develop a new energy landscape, electrical vehicles powered by lithium ion batteries have attracted intensive interests in recent years. While much effort were pursued to increase the specific energy and energy density at the cell level, research focused on system-level energy density, cost and safety characteristics of advanced batteries is less investigated but urgently needed to facilitate the process of vehicle electrification. Materials barriers in safety, cost and/or robustness of the system need to be overcome for the adoption of electrical vehicles in a broad scale. The intent of this symposium is to provide a forum for scientists worldwide to discuss the strategies to improve the safety attribute and reduce the cost of the battery system. Moreover, this symposium is interested in multifunctional energy storage designs that can increase the final energy density at the vehicle system level.

Topics addressed in this symposium will include (but not be limited to):

- High-energy battery systems such as Li-ion, Li-air, Li-S and Na-ion batteries with inherent safety features.
- Batteries with aqueous electrolyte and solid-state electrolytes.
- Electrolyte and additive to improve safety such as solid-state separators and innovative electrolyte additives
- Characterization and modeling of aqueous and/or solid state electrolytes
- Cell design and system integration
- Robust design principles for energy storage systems
- Novel redox couples and materials for flow batteries
- Multifunctional designs where batteries can carry load or participate in mechanical energy dissipation at the material, cell, or vehicle system levels

A tutorial complementing this symposium is tentatively planned. Further information will be included in the ECS Program that will be available online in September.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Jie Xiao**, University of Arkansas, email: jiexiao@uark.edu; **Yan Yao**, University of Houston, email: yyao4@uh.edu; **Trung Van Nguyen**, Univ. Kansas, email: cptvn@ku.edu; **Vibha Kalra**, Drexel, email: vk99@drexel.edu; **Ping Liu**, Advanced Research Projects Agency-Energy (ARPA-E), email: Ping.Liu@hq.doe.gov; and **James Wu**, NASA Glenn Research Center, email: james.j.wu@nasa.gov.

B—Carbon Nanostructures and Devices

B01

Carbon Nanostructures for Energy Conversion

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

Papers are invited in the following areas related to energy conversion using nanocarbons: synthesis and characterization of relevant nanoparticles and nanostructures; functionalization with chromophores; inducing chemical reactions with strong photon-molecule coupling fields; size- and shape-dependent photocatalytic properties; photochemical solar cells; and photocatalysis and electron transfer studies relevant to energy conversion.

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 June 12, 2016. 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: **Jeffrey Blackburn**, National Renewable Energy Laboratory, email: jeffrey.blackburn@nrel.gov; **Michael Arnold**, University Of Wisconsin - Madison, email: msarnold@wisc.edu; and **Stephen Doorn**, Los Alamos National Laboratory, email: skdoorn@lanl.gov.

B02

Carbon Nanostructures in Medicine and Biology

Nanocarbons Division

Original papers are solicited on all aspects of biological, pharmaceutical, biotechnological, and medical applications of fullerenes, metallofullerenes, carbon nanotubes, graphene, and related nanocarbons

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 June 12, 2016. 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: **Tatiana Da Ros**, Univ. of Trieste, email: daros@units.it; **Lon Wilson**, Rice University, email: durango@rice.edu; and **Daniel Heller**, Memorial Sloan Kettering Cancer Center, email: hellerd@mskcc.org.

B03

Carbon Nanotubes - From Fundamentals to Devices

Nanocarbons Division / Physical and Analytical Electrochemistry Division

Papers are solicited on experimental and theoretical studies related to the basic chemistry, physics, and materials science of carbon nanotubes, as well as on novel nanotube applications in areas such as electronic devices, sensors, and materials development.

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 June 12, 2016. 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:



Stephen Doorn, Los Alamos National Laboratory, email: skdoorn@lanl.gov; **Yury Gogotsi**, Drexel University, email: gogotsi@drexel.edu; **Slava V. Rotkin**, Lehigh University, email: rotkin@lehigh.edu; **R. Bruce Weisman**, Rice University, email: weisman@rice.edu; **Ming Zheng**, National Institute of Standards and Technology, email: ming.zheng@nist.gov; and **Pawel J. Kulesza**, University of Warsaw, email: pkulesza@chem.uw.edu.pl.

B04 Endofullerenes and Carbon Nanocapsules Nanocarbons Division

Original papers are solicited on all aspects of endofullerenes, including endohedral metallofullerenes, endohedral rare-gas fullerenes, and related species. Papers on carbon nanocapsules and metal encapsulates are also welcome. Topics include the synthesis, characterization, properties, and applications of various endonanocarbons.

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 June 12, 2016. 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: **Shangfeng Yang**, University of Science & Technology of China, email: sfyang@ustc.edu.cn; **Takeshi Akasaka**, HuaZhong University of Science & Technology, email: akasaka@tara.tsukuba.ac.jp; **Alan L. Balch**, University of California-Davis, email: albalch@ucdavis.edu; and **Luis Echegoyen**, University of Texas-El Paso, email: echegoyen@utep.edu.

B05 Fullerenes - Chemical Functionalization, Electron Transfer, and Theory Nanocarbons Division

Papers are invited in the following areas of fullerene science: chemical functionalization, electrochemistry, photochemistry, photophysics, electron transfer chemistry, photoelectrochemistry, photovoltaic applications, catalysis, sensor studies, and theoretical studies.

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 June 12, 2016. 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: **Dirk Guldi**, Univ. of Erlangen, email: guldi@chemie.uni-erlangen.de; **Francis D’Souza**, University of North Texas, email: Francis.DSouza@unt.edu; and **Nazario Martin**, Universidad Complutense de Madrid, email: nazmar@quim.ucm.es.

B06 Graphene and Beyond: 2D Materials Nanocarbons Division / Dielectric Science and Technology Division / Physical and Analytical Electrochemistry Division

This symposium focuses on the synthesis, functionalization, characterization, and chemical and physical properties of graphene and graphene-based two-dimensional nanostructures. Papers dealing with optical, electrical, and electrochemical properties of such carbon nanostructures and their composites are welcomed.

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 June 12,

2016. 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: **Michael Arnold**, Univ. of Wisconsin, email: msarnold@wisc.edu; **Haim Grebel**, New Jersey Institute of Technology, email: grebel@njit.edu; **Andreas Hirsch**, University of Erlangen, email: andreas.hirsch@chemie.uni-erlangen.de; **Richard Martel**, Université de Montréal, email: r.martel@umontreal.ca; and **Yaw S. Obeng**, National Institute of Standards and Technology, email: yaw.obeng@nist.gov.

B07 Inorganic/Organic Nanohybrids for Energy Conversion Nanocarbons Division / Energy Technology Division

Metal and semiconductor nanoparticles play important roles in fuel cells, solar energy conversion, catalysis and hydrogen production. Recent advances in the area of inorganic/organic hybrid nanostructured materials have led to new understanding of their catalytic and photoelectrochemical properties. For example, optically functional nanostructures, which can collect and localize photon energy into an ultra-small space, can efficiently excite molecules using an extremely low number of photons. Papers are invited in the following areas: synthesis and characterization of metal nanoparticles and nanostructures; functionalization with chromophores, strong photon-molecule coupling fields for chemical reactions, bimetallic particle and semiconductor metal composites; size-dependent catalytic properties; hydrogen evolution reactions; photochemical solar cells; and photocatalysis and electron transfer processes that are relevant to energy conversions.

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 June 12, 2016. 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: **Hiroshi Imahori**, Kyoto University, email: imahori@kyoto-u.ac.jp; and **Prashant Kamat**, University of Notre Dame, email: pkamat@nd.edu.

B08 Porphyrins, Phthalocyanines, and Supramolecular Assemblies Nanocarbons Division

This symposium will highlight recent advances in porphyrin chemistry. A wide range of topics will be covered in order to generate interdisciplinary discussions between participants and encourage the exchange of new ideas. We therefore solicit high quality contributions in areas ranging from the synthesis of challenging porphyrinic devices to the characterization of electrochemical and physicochemical behavior of new porphyrinic materials. Submissions are encouraged on the following topics: (1) new challenging multiporphyrinic devices; (2) electronic properties of porphyrinic arrays; (3) photoinduced processes in molecular and supramolecular porphyrinic assemblies; and (4) novel porphyrin-modified electrodes.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Karl Kadish**, University of Houston, email: kkadish@uh.edu; **Roberto Paolesse**, University of Rome Tor Vergata, email: Roberto.paolesse@



uniroma2.it; **Nathalie Solladie**, LCC-CNRS, email: nathalie.solladie@lcc-toulouse.fr; and **Tomas Torres**, Universidad Autonoma de Madrid, email: tomas.torres@uam.es.

B09 Engineering Carbon Hybrids - Carbon Electronics 2

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

This symposium brings together a new community of carbon experts that does not see carbon-nanotubes or fullerenes in isolation but considers the construction of 3D carbon devices integrating one, two or more carbon allotropes as the application might demand. We are looking at Carbon in a holistic way in which different carbon allotropes, manufactured by different methods, are combined with each other in hybrid carbon functional devices.

Carbon, in many respects, is starting to challenge Si as the most important technological material. Besides the prominence of fullerenes, graphite, graphene and carbon nano tubes, glassy carbon 3D MEMS and NEMS-like devices are now being made by patterning polymeric precursors and carbonizing them. Other carbon allotropes like diamond, diamond-like carbon and amorphous carbon also are being studied intensively, allotrope by allotrope.

Thus the carbon allotropes, and most importantly the interfaces between them, have to be mastered to make the best devices in a number of applications such as batteries, fuel cells, MOS electronics, lab-on-a-chip, high speed switches and sensors, to name a few. This symposium welcomes innovative work and insights on the modeling, analysis, fabrication and applications of functional hybrid carbon structures and devices.

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 March 11, 2016. 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: **R. Martinez-Duarte**, Clemson University, email: drmartnz@gmail.com; **A. Hoff**, U. of South Florida, email: hoff@usf.edu; **M. Madou**, U. of California at Irvine, email: mmadou@uci.edu; **R. Martel**, U. of Montreal, email: r.martel@umontreal.ca; **C. Wang**, Florida International University, email: wangc@fiu.edu; **D. Landheer**, G-Camria LLP, email: dlandheer@gmail.com; **M. Carter**, KWJ Engineering, email: mcarter@kwjengineering.com; **R. Kostecki**, Lawrence Berkeley National Laboratory, email: r_kostecki@lbl.gov; and **Oana Leonte**, Berkeley Polymer Technology, email: Odleonte@comcast.net.

C—Corrosion Science and Technology

C01 Corrosion General Session Corrosion Division

Oral and 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.

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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.

D—Dielectric Science and Materials

D01 Dielectrics for Nanosystems 7: Materials Science, Processing, Reliability, and Manufacturing -and- Solid State Topics General Session

Dielectric Science and Technology Division / Electronics and Photonics Division / Energy Technology Division / Luminescence and Display Materials Division / Nanocarbons Division / Organic and Biological Electrochemistry Division / Sensor Division

JOINT SYMPOSIUM

Dielectrics for Nanosystems 7

(D. Misra, T. Chikyow, H. Iwai, Y. Obeng, Z. Chen, D. Bauza)

Advanced semiconductor products that are true representatives of nanoelectronics have reached below 30 nm. Depending on the application, the nanosystem may consist of one or more of the following types of functional components: electronic, optical, magnetic, mechanical, biological, chemical, energy sources, and various types of sensing devices. As long as one or more of these functional devices is in 1-100 nm dimensions, the resultant system can be defined as nanosystem. Papers are solicited in all areas of dielectric issues in nanosystems including gate dielectric materials for Si, SiC, SiGe, Ge, and III-V semiconductor devices, dielectric materials for devices based on nanowires, nanotubes, and graphene, 2D Semiconductors and dielectric materials for high temperature and energy savings applications, and dielectric materials for sensing devices. In addition to traditional areas of semiconductor processing, novel topological insulators are of interest, which may lead to new applications of nanosystems.

Authors must submit an abstract via the ECS website. The abstract should clearly indicate the purpose of the work, the approach, the manner and the degree to which the work advances the field, as well as specific results and their significance.

Solid State Topics General Session

(K. Sundaram, O.M. Leonte, and K. Shimamura, H. Iwai)

Original papers are solicited on all aspects of electronic materials, devices, and processing technologies not covered by specialized topical symposia at this meeting.

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 March 11, 2016. 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: **D. Misra**, New Jersey Institute of Technology, email: dmisra@njit.edu; **T. Chikyow**, Advanced Electronic Materials Center, NIMS, email: chikyow@nims.go.jp; **H. Iwai**, Tokyo Institute of Technology, email: iwai@ep.titech.ac.jp; **Y. Obeng**, NIST, email: yaw.obeng@nist.gov; **Zhi Chen**, University of Kentucky and University of Electronic Science & Technology of China, email: zhichen@engr.uky.edu; **Daniel Bauza**, Institut de Microélectronique, email: bauza@minatec.grenoble-inp.fr; **Kalpathy Sundaram**, University of Central Florida, email: sundaram@mail.ucf.edu; **O.M. Leonte**, Berkeley Polymer Technology, email: odleonte@comcast.net; and **K. Shimamura**, Waseda University, email: shimamura.kiyoshi@nims.go.jp.

D02 Chemical Mechanical Polishing 14 Dielectric Science and Technology Division

This symposium will address fundamentals and current research topics related to chemical mechanical planarization (CMP) for a wide range of materials (metals, dielectrics, semiconductor substrates, and more). The symposium will also discuss post CMP cleaning, new materials, and other relevant issues of this technology. Papers are being solicited in the following areas: (1.) CMP fundamental science and technology; (2.) CMP surface reactions and electrochemical effects; (3.) CMP of metals and composites; (4.) CMP of dielectrics and semiconductors; (5.) CMP repeatability and control; (6.) environmental aspects of CMP; (7.) CMP metrology and simulation; (8.) emerging applications of CMP.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **R. Rhoades**, Entrepix, email: rrhoades@entrepix.com; **G. Banerjee**, Air Products & Chemicals, Inc., email: banerjg@airproducts.com; **B. Basim**, Ozyegin University, email: bahar.basim@ozyegin.edu.tr; **L. Economikos**, IBM Corporation, email: econol@us.ibm.com; **D. Huang**, Praxair, email: david_huang@praxair.com; and **Y. Obeng**, National Institute of Standards & Technology, email: yaw.obeng@nist.gov.

D03 Dielectrics for Interconnect, Interposers, and Packaging Dielectric Science and Technology Division

Low dielectric constant materials have been critical to reducing the RC time constant for interconnect on-chip, on-interposers, and in electronic packages and boards. The ITRS calls for dramatic improvements in dielectric constant (both permittivity and loss) and other physical properties, such as thermal expansion, thermal conductivity and modulus, at all levels of interconnect including chips, interposers, packages and substrates. This symposium will focus on advances in dielectric materials, processing, characterization, and reliability for interconnect dielectrics. The application areas include (1.) on-chip; (2.) organic, silicon, and glass interposers, (3.) package substrates; (4.) printed circuit boards; and (5.) other interconnect media. The topics include new dielectric materials, patterning methods for dielectric materials, chemical/mechanical/electrical properties and their characterization, applications of dielectric materials in microelectronic devices, and reliability of dielectric materials.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Paul Kohl**, Georgia Tech, email: kohl@gatech.edu; **Oana Leonte**, Berkeley Polymer Technology, email: odleonte@comcast.net; **Kalpathy Sundaram**, University of Central Florida, email: sundaram@cees.ucf.edu; and **Charles Arvin**, IBM, email: Charlesa@us.ibm.com.

D04 Plasma and Thermal Processes for Materials Modification, Synthesis and Processing Dielectric Science and Technology Division / High Temperature Materials Division / Sensor Division

CVD, plasma-enhanced CVD, etching and related techniques have enjoyed extensive success in microelectronics processing. These techniques have also been applied to the synthesis and production of nanostructured elemental and compound semiconductor materials for electronics, optoelectronics, sensors, photovoltaics, thermoelectrics, nanowires, nanotubes, QDOTs and 2-D materials, and to 3D packaging, MEMS, artifact restoration and surface treatments in health care. The topics for this symposium include, but are not limited to the above mentioned processes and applications as well as surface functionalization, photoresist removal, atomic layer etching, difficult to etch materials, decontamination, pollution abatement, and displays. Papers focusing on material growth or etch mechanisms, modeling, reactor design, process diagnostics, materials characterization, and advances in novel applications are strongly encouraged.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Sreeram Vaddiraju**, Texas A&M University, email: sreeram.vaddiraju@chemail.tamu.edu; **Dennis Hess**, Georgia Tech, email: dennis.hess@chbe.gatech.edu; **Mike Carter**, Sensor KWJ Engineering, email: mtcarter62@comcast.net; **Manfred Engelhardt**, Infineon, email: Manfred.Engelhardt@infineon.com; **Uros Cvelbar**, Institute Jozef Stefan, email: uros.cvelbar@ijs.si; **Oana Leonte**, Berkeley Polymer Technology, email: odleonte@comcast.com; **Peter Mascher**, McMaster University, email: mascher@mcmaster.ca.

E—Electrochemical/Electroless Deposition

E01 Electrophoretic Deposition Electrodeposition Division

This symposium welcomes papers that address experimental and theoretical aspects of electrophoretic deposition; this includes studies in which particles migrate in the presence of an electric field to form films onto substrates. In addition, contributions will be considered that address the understanding of colloidal stability, deposition kinetics and transport, composite co-electrodeposition, deposition of electrophoretic biomaterials, as well as nanostructured materials deposition.



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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **J. Talbot**, University of California, San Diego, email: jtalbot@ucsd.edu; and **J. Dickerson**, Vanderbilt University, email: james.h.dickerson@vanderbilt.edu.

E02 Three-Dimensional Electrodeposition and Electroless Deposition

Electrodeposition Division / Industrial Electrochemistry and Electrochemical Engineering Division

Additive manufacturing methods, many of which are called “three-dimensional printing”, are undergoing rapid development due to their ability to create material forms that are not accessible to conventional machining or molding techniques, and due to their capacity for rapid prototyping and optimization when combined with powerful new design software. Electrodeposition and electroless deposition are additive manufacturing methods, but in most cases they are inherently two-dimensional. This symposium will focus on efforts to extend these deposition methods to three dimensions, and to find synergies with other additive manufacturing methods, such as deposition onto 3D-printed structures, high aspect ratio structures, or other high surface area substrates.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **D. Robinson**, Sandia National Laboratories, email: drobins@sandia.gov; and **Vijay Ramani**, Illinois Institute of Technology, email: ramani@iit.edu.

F—Electrochemical Engineering

F01 Industrial Electrochemistry and 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: **John Staser**, Ohio University, email: staser@ohio.edu; and **Douglas Riemer**, Hutchinson Technology Inc., email: Douglas.Riemer@hti.htch.com.

F02 Engineering the Interface between Catalysis and Electrocatalysis

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

Fundamentally, the difference between an electrocatalyst and a chemical catalyst is the presence of the electron as an additional “reactant” or “product” in the electrocatalyst case. Both are materials that lower activation energies for a given reaction and assist in directing the selectivity of a given reaction. However, researchers tend to approach these two sets of catalysts and the reaction systems they are utilized in from very different angles, depending upon their backgrounds. Much can be learned from each of these perspectives on both sides of the catalysis divide. The aim of this symposium is to bring together chemical catalysis and reaction engineering researchers with electrocatalysis and electrochemical engineering researchers. This symposium covers all areas of electrocatalysis and related chemical catalysis. Both homogeneous and heterogeneous systems are applicable. Of particular interest are the following: 1) the comparison of electrochemical and chemical routes for organic syntheses and CO₂ reduction, 2) the analysis of electrochemical and chemical kinetics for organic oxidation and reduction reactions, 3) the use of conventional chemical catalysts in electrochemical reactors, and 4) new reactor designs for electro-organic syntheses.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Peter Pintauro**, Vanderbilt University, email: peter.pintauro@vanderbilt.edu; **Sanjeev Mukerjee**, Northeastern University, email: s.mukerjee@neu.edu; **Elizabeth J. Biddinger**, City College of New York, email: ebiddinger@che.cuny.cuny.edu; and **Vito Di Noto**, Univ. Padova, email: vito.dinoto@unipd.it.

G—Electronic Materials and Processing

G01 More-than-Moore 3

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

The semiconductor industry is rapidly adopting the functional diversification approaches to adding value to integrated circuits. Dubbed ‘More than Moore’s, this strategy enhances value to devices by incorporating functionalities that do not necessarily scale according to ‘Moore’s Law’s. It often leverages the scaling capabilities derived from the ‘More Moore’s developments to incorporate digital and non-



digital functionality into compact systems. The ‘More-than-Moore’s approach particularly allows for the non-digital functionalities (e.g., RF communication, power control, passive components, sensors, actuators) to migrate from the system board level into package-level (SiP) or chip-level (SoC) implementation. The pervasion of ‘More-than-Moore’s technologies will impact the development of integration platforms, of innovative technologies (e.g. for 3D integration of multiple chips), manufacturing techniques and design & modeling tools capable of handling multifunctional heterogeneous subsystems.

From technology perspectives, More than Moore includes all technologies based upon or derived from silicon processing that will eventually be packaged or monolithically integrated in a semiconductor product, including functionalities that do not scale with Moore’s Law. Examples of such functionalities may include, not necessarily restricted to, sensing, communicating, energy harvesting and analog signal processing, while the application areas includes but not restricted to health care, transport, security, energy, communication and infotainment.

This symposium is aimed at providing a forum for discussing all aspects of this emerging technology trend. Thus papers will be solicited in all aspects of More-than-Moore, including but not limited to, materials, integration, performance, reliability 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: **Y. Obeng**, National Institute of Standards and Technology, email: yaw.obeng@nist.gov; **G. Banerjee**, Air Products and Chemicals, email: gbanerje@hotmail.com; **S. Datta**, Pennsylvania State University, email: sdatta@engr.psu.edu; **P. Hesketh**, Georgia Tech, email: peter.hesketh@me.gatech.edu; **T. Hiramoto**, University of Tokyo, email: hiramoto@nano.iis.u-tokyo.ac.jp; **P. Srinivasan**, GlobalFoundries-IBM NY, email: purushothaman.s@gmail.com; and **A. Hoff**, University of South Florida, email: hoff@usf.edu.

G02 Silicon Compatible Materials, Processes, and Technologies for Advanced Integrated Circuits and Emerging Applications 6 Electronics and Photonics Division

This symposium will focus on emerging materials, processes and technologies that can be applied to large area silicon wafers either to enhance the performance of analog and digital integrated circuits or to enable revolutionary device structures with entirely new functionalities.

Topics of particular interest include:

- 1) Materials and processes needed to realize advanced transistor structures with high mobility channels based on either strain engineering or emerging high-mobility channel materials such as strained Si, compound semiconductors and graphene that can be synthesized on large area silicon wafers by epitaxial or other innovative methods. Papers focusing on synthesis of the new channel materials as well as processes that are essential for the realization of successful device structures are of particular interest. Examples include high performance gate stacks and low-resistivity junctions and contacts formed on new, silicon compatible materials. The symposium also invites abstracts on new materials and processes for 3-D (TSV) integration.

- 2) Synthesis of nano-structures including wires, pores and membranes of silicon compatible materials as well as novel MEMS/NEMS structures and their integration with the mainstream silicon integrated circuit technology. Abstracts on applications of these new devices in all relevant fields including electronics, optics and biology are welcome.
- 3) New technologies and equipment for synthesis and characterization of the materials and processes listed above.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Fred Roozeboom**, Eindhoven Univ. of Technology, email: f.roozeboom@tue.nl; **Paul Timans**, Mattson Technology Inc., email: pjtman@gmail.com; **Evgeni Gusev**, Qualcomm Technologies, Inc., email: gusev@qti.qualcomm.com; **Vijay Narayanan**, IBM T. J Watson Research Center, email: vijayna@us.ibm.com; **Kuniyuki Kakushima**, Tokyo Institute of Technology, email: kakushima@ep.titech.ac.jp; **Zia Karim**, AIXTRON, email: z.karim@aixtron.com; and **Stefan De Gendt**, IMEC, email: Stefan.DeGendt@imec.be.

H—Electronic and Photonic Devices and Systems

H01 Wide Bandgap Semiconductor Materials and Devices 17 Electronics and Photonics Division

This symposium will focus on issues pertinent to the development of wide-bandgap and other compound semiconductor materials and devices. All semiconductor materials are of interest, including traditional III-V materials, III-nitrides, II-oxides, SiC, diamond, II-VI, inorganic compound semiconductors, and other emerging materials. Papers on both practical and fundamental issues are solicited. The following technical areas are of particular interest: (1) emitters: light emitting diodes, light emitting transistors, laser diodes, displays, and devices for solid state lighting; (2) detectors: including solar cells and avalanche photodiodes; (3) high temperature, high power, and high frequency electronics; (4) sensor applications; (5) substrates for material epitaxy; (6) material characterization: synthesis, defect structure and luminescence; (7) nanoscale materials; (8) transparent conducting oxide films and devices, including ZnO and IGZO thin film transistors. The goal of this symposium is to bring together the crystal growth, material processing, circuit design, process monitoring, reliability, and device application communities to review current issues and present state of the art developments in wide-bandgap and compound semiconductor technology. This symposium will consist of invited and contributed papers and posters.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **John Zavada**, National Science Foundation, email: jzavada@nsf.gov; **Vidhya Chakrapani**, Rensselaer Polytechnic Institute, email: chakrv@rpi.edu; **Soohwan Jang**, Dankook University, email: jangmountain@



dankook.ac.kr; **Travis Anderson**, Naval Research Laboratory, email: travis.anderson@nrl.navy.mil; and **Jennifer Hite**, Naval Research Laboratory, email: jennifer.hite@nrl.navy.mil.

H02 Solid-State Electronics and Photonics in Biology and Medicine 3

Electronics and Photonics Division / Sensor Division

This symposium is directed to research explorations utilizing the unique electronic and photonic properties of solid-state materials and devices to facilitate the understanding of bio-molecular interactions, to study the integration of bio-molecules and solid-state materials, and to promote the applications of solid-state devices in biology and in medicine.

Topics of interest are categorized into two major parts: Solid-state electronic and photonic sensors, and bio-molecular electronics and photonics. Papers are solicited with respect but not limited to: 1) Interaction between nano-structured materials; nano-particles, nano-wires, or graphene and Bio-molecules; DNA, RNA, peptide, protein, metabolic molecules. 2) Solid-state electronic or photonic sensor design and fabrication. 3) Surface modification and immobilization techniques. 4) Sensor characterization techniques. 5) Sensor models and signal analysis. 6) Integrated sensor network and systems. 7) Sensor types, including: Field effect transistors, diodes, resistors, nano-particles, surface plasma resonance, surface-enhanced Raman spectroscopy, surface acoustic wave devices and quartz crystal microbalance. 8) Multi-sensor arrays. 9) Portable bioelectronics system for medical applications; detection, separation, purification, therapy, and imaging. 10) Single molecule and single cell detection. 11) DNA sequencing. 12) Inter- and intra-bio-molecular interactions studied with biosensors. 13) Electro-kinetics in micro- or nano-fluidic systems and applications. 14) Bio-molecular nano-devices. 15) Nano-pore and nano-slit bio-electronics. 16) Electric field effects on bio-molecules and cells. 17) Electroporation. 18) Bio-molecular devices for energy harvesting.

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H03 Properties and Applications of 2-Dimensional Layered Materials

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

Two-dimensional layered materials have recently gained renewed interest due to their unique electronic, optoelectronic, mechanical and chemical properties and potential applications. The symposium will cover all 2D layered materials with the focus on graphene, boron nitrides, silicene and germanene, transition metal dichalcogenides/oxides, and group-IV and group-III metal chalcogenides. The scope of the symposium includes materials preparation, growth, processing, devices, chemistry, physics,

theory and applications. This Symposium aims to provide a forum for researchers, scientists and engineers from different countries worldwide, who are actively involved in the research on 2D layered materials to disseminate their latest research results and developments. Submissions are invited for oral and poster presentations.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Lain-Jong (Lance) Li**, King Abdullah University of Science and Technology (KAUST), email: lance.li@kaust.edu.sa; **Jr-Hau He**, King Abdullah University of Science and Technology (KAUST), email: jrheu@kaust.edu.sa; **Daniel S. P. Lau**, Hong Kong Polytechnic University, email: daniel.lau@polyu.edu.hk; **Joshua Robinson**, Pennsylvania State University, email: jrobinson@psu.edu; **Dolf Landheer**, G-Camria LLP, email: dlandheer@gmail.com; **R. Martel**, Université de Montréal, email: r.martel@umontreal.ca; and **Colm O’Dwyer**, University College Cork, email: c.odwyer@ucc.ie.

I—Fuel Cells, Electrolyzers, and Energy Conversion

I01 State-of-the-Art Invited Tutorials on Model/Experiment Coupling in Low Temperature Fuel Cells

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

This symposium will feature invited talks on a variety of issues related towards the interface between mathematical modeling and experimental diagnostics of fuel-cell components, stacks, and systems. Topics of interest include (1) ab-initio catalyst studies with model validation; (2) continuum modeling with experimental validation; (3) membrane nanoscale modeling with input and validation by multiscale experiments; (4) models associated with experimental diagnostics such as electrochemical impedance spectroscopy; and related studies.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Adam Weber**, LBNL, email: azweber@lbl.gov; **Tom Zawodzinski**, UTK, email: tzawodzi@utk.edu; **Vijay Ramani**, IIT, email: ramani@iit.edu; and **Plamen B. Atanassov**, University of New Mexico, email: plamen@unm.edu.

I02 Ionic and Mixed Conducting Ceramics 10

High Temperature Materials Division / Energy Technology Division

Ceramic materials that exhibit fast ionic transport or significant levels of concurrent ionic and electronic conduction continue to be of great interest among researchers worldwide for wide ranging uses including fuel cell



components, battery components, sensors, membranes, electrochemical reactors and electrosynthesis. This symposium will provide a forum to share both experimental data and theoretical and simulation studies, and discuss research activities and needs in this exciting field. Both fundamental and applied aspects of ionic transport and mixed conduction will be included.

Some of the topics that will be covered in this symposium are: Ionic Transport in Solid Electrolytes, Advances in Protonic Conductors, Lattice Strain Effects in Transport and Catalysis, Electrolysers for electrochemical fuel synthesis, Fuel Cells and Batteries, Mechanisms of Mixed Conduction in Ceramics, Role of Microstructure in Conduction, Dense Ceramic Membranes for Gas Separation and Production of Chemicals, Electrocatalytic Phenomena, Ceramic Sensors, Electrochemistry of Nanoceramics and Transport in Corrosion-resistant Ceramic Films.

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Hydrogen and Oxygen Evolution Catalysis for Water Electrolysis 2

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

Water electrolysis represents a clean and sustainable approach to producing hydrogen. However, the cost of hydrogen production from this process is still prohibitive due to significant electricity consumption. High-efficient electrocatalysts for either oxygen evolution reaction (OER) and hydrogen evolution reaction (HOR) may enable a lower the over-potential of electrochemical reactions so as to improve the overall energy efficiency of water electrolysis. The development of advanced catalysts may also help to reduce the loading of precious metal catalysts or to replace them with non-precious metal catalysts. This Symposium seeks novel or advanced water electrolysis catalysts that include but are not limited to the following categories: 1) catalyst supports with extremely high corrosion resistance (>1.5V vs. SHE); 2) OER catalysts for proton exchange membrane (PEM) based electrolysis; 3) OER catalysts for anion exchange membrane (AEM) based electrolysis; 4) HOR catalysts for AEM electrolysis; 5) bi-functional ORR/OER catalysts; 6) bi-functional HOR/HER catalysts; 7) electrocatalysts for artificial photosynthesis or photo-electrochemical cells; 8) others.

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Mechano-Electro-Chemical Coupling in Energy Related Materials and Devices 2

High Temperature Materials Division / Battery Division / Energy Technology Division

Significant coupling often exists between the electrical, chemical and mechanical responses of the materials used for batteries, fuel cells, chemical separators, and other high performance energy conversion/storage devices. In these systems, electrochemical reactions affect stress evolution, deformation, and fracture. Similarly, stress evolution, deformation, and fracture can also affect electrochemical properties, device performance, and durability. This symposium will provide a forum for the presentation of original research concerned with the interplay between mechanics and electrochemistry. Topics of interest include, but are not limited to, experimental and/or modeling studies of:

- the effect of stress and strain on: the surface and bulk atomic structure of electrochemically active materials; the defect thermodynamics (point defect concentrations, chemical expansion coefficients, etc.) of electrochemically active materials; diffusion kinetics (diffusion coefficients, surface exchange coefficients, etc.); catalytic activity; the electronic structure of electrochemically active materials; reaction pathways; phase transformations (phase-boundary shifting, ferroelastic domain switching, strain-induced self-assembly, etc.) in electrochemically active materials; the microstructural evolution of electrochemically active materials; and the performance and durability of electrochemically active materials and devices.
- stress, strain, and/or fracture resulting from: electrochemical insertion; intercalation; phase transformations; electrode reactions; and other electrochemical processes and/or device operation;
- new approaches to understand, model and and/or control mechano-chemical coupling and/or degradation in electrochemical systems;
- novel in-situ and ex-situ characterization tools;
- electrochemical actuation based on Faradaic and non-Faradaic interactions
- mesoscale perspective on mechano-electrochemical interplay.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Sean R. Bishop**, MIT, email: srbishop@mit.edu; **Partha Mukherjee**, Texas A&M University, email: pmukherjee@tamu.edu; **Yang-Tse (YT) Cheng**, University of Kentucky, email: yang.t.cheng@uky.edu; and **Jennifer Rupp**, ETH Zurich, email: jennifer.rupp@mat.ethz.ch.

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Heterogeneous Functional Materials for Energy Conversion and Storage

High Temperature Materials Division / Energy Technology Division / Physical and Analytical Electrochemistry Division

Heterogeneous functional materials (HeteroFoams) are pervasive in electrochemical devices. These devices consist of multiple materials combined at multiple scales (from atomic to macro) that actively interact during their functional history in a manner that controls their collective



performance as a system at the global level. Examples include composite mixed conductors, nano- or microstructured heterogeneous materials, mechanical alloys, nanostructured interfaces and heterostructures, and many other combinations that typically serve as the heart of devices such as fuel cells, electrolyzers, batteries, solar cells, capacitors, thermoelectrics, and separation membranes. The functional behavior of these materials occurs at multiple scales of length and time. The electrochemical science that makes such technologies work rests on our knowledge and understanding of the science that controls that functionality of such materials, and the design of new HeteroFoams to enable new devices, or improve the performance of existing devices.

The principal motivation for this symposium is to provide a forum to discuss the science that controls emergent properties in heterogeneous functional materials as a foundation for design of functional material devices with performance not bounded by constituent properties. The symposium will include invited speakers to present a general definition of the problem, the state-of-the-art on a few specific technology areas such as electrochemical conversion of energy to electricity, membranes for selective transport, and charge storage devices. Papers are solicited in the following topics of interest, but are not limited to: (1) Novel modeling approaches to elucidate fundamental phenomena in 3-D microstructures; (2) Advanced 3-D imaging and characterization techniques; (3) New constitutive theory to correlate material properties to performance; (4) Advanced material synthesis and manufacturing methods to create highly ordered microstructures; (5) New concepts for the design of novel materials for electrochemical applications; and (6) Applications of heterogeneous functional materials in devices for energy conversion and storage.

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 June 12, 2016. 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: **Wilson K. S. Chiu**, University of Connecticut, email: wchiu@engr.uconn.edu; **Fanglin (Frank) Chen**, University of South Carolina, email: chenfa@cec.sc.edu; **Andrew Herring**, Colorado School of Mines, email: aherring@Mines.EDU; **Deryn Chu**, U. S. Army Research Laboratory, email: deryn.d.chu.civ@mail.mil; **Srikanth Gopalan**, Boston University, email: sgopalan@bu.edu; **Torsten Markus**, Forschungszentrum Juelich, email: T.Markus@fz-juelich.de; and **Patrick J. Masset**, Fraunhofer UMSICHT, email: patrick.masset@umsicht.fraunhofer.de.

K—Organic and Bioelectrochemistry

K01 12th Manual M. Baizer Memorial Symposium on Organic Electrochemistry

Organic and Biological Electrochemistry Division

This is the premier international symposium in the area of organic electrochemistry. The symposium honors the 2016 winner of the Manual M. Baizer Award in Organic Electrochemistry. Submissions are invited in all areas of synthetic and mechanistic organic electrochemistry.

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 June 12, 2016. 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 organizer: **Dennis Peters**, Indiana University, email: peters@indiana.edu.

K02 Bioelectrochemistry : Analysis and Fundamental Studies

Organic and Biological Electrochemistry Division / Physical and Analytical Electrochemistry Division / Sensor Division

Contributions are sought that address barriers in achieving superior clinical electro-analysis. Work that couples analysis and diagnostics with biological control and disease state management is of particular interest. Fundamental studies characterizing electrode-supported structures and their function, ultimately aimed at biological analysis are welcomed. In vivo and in vitro applications of diagnostic platforms are also encouraged. The symposium will have a session for students in Bioelectrochemistry. The student session seeks contributions from graduate students and postdoctoral researchers working in the broad, general area of Bioelectrochemistry. Sensing and fundamental electrochemical studies centered on organic molecules of physiological relevance or origin that are early in development or at the application stage are encouraged. Work focusing on a particular facet of a long-term goal is 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 June 12, 2016. 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: **Mekki Bayachou**, Cleveland State University, email: m.bayachou@csuohio.edu; **Alex Simonian**, Auburn University, email: simonal@auburn.edu; and **Alice H. Suroviec**, Berry College, email: asuroviec@berry.edu.

L—Physical and Analytical Electrochemistry, Electrocatalysis, and Photoelectrochemistry

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

Physical and Analytical Electrochemistry Division

Papers concerning any aspect of physical electrochemistry not covered by topic areas of other specialized symposia at this meeting are welcome. Contributed papers will be programmed in related order, depending on the titles and contents of the submitted abstracts.

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 June 12, 2016. 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: **Alice H. Suroviec**, Berry College, email: asuroviec@berry.edu; and **Pawel J. Kulesza**, University of Warsaw, email: pkulesza@chem.uw.edu.pl.

**L02** **Electrocatalysis 8**
Physical and Analytical Electrochemistry Division

Electrocatalysis is critical for electrochemical energy conversion and storage technologies. This symposium will be focused on all areas of fundamental and applied electrocatalysis. Topics include but not limited to hydrogen oxidation and evolution, oxygen reduction and evolution, CO₂ reduction, photoelectrocatalysis, small organic molecule oxidation, electrocatalyst characterization and evaluation, theoretical modeling and simulation electrocatalysis process.

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 June 12, 2016. 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: **Minhua Shao**, The Hong Kong University of Science and Technology, email: minhua@gmail.com; and **Gessie Brisard**, Université de Sherbrooke, email: Gessie.Brisard@USherbrooke.ca.

L03 **Biological Fuel Cells 7**
Physical and Analytical Electrochemistry Division /
Energy Technology Division

The ability of biological species to facilitate the conversion of chemical and photochemical energy to electricity has inspired a growing field of bioelectrochemical energy research. This symposium will focus on fundamental and applied aspects of fuel cell and battery technology that incorporate enzymes, microbes, or other biological species as catalysts, fuel sources, transport agents, or other such roles. Of interest are fundamental studies focusing on heterogeneous electron transfer coupled with oxidation or reduction reactions, including direct or mediated electron transfer between electrodes and enzymes, organelles, or microbes; catalysis at electrode supported membranes, electrode modification chemistries for immobilization or stabilization of electrochemically addressable catalytic moieties, and engineered electrode systems facilitating mass transfer of fuels and wastes. Papers addressing practical issues of electrode reaction rate, operating potential, and electrode stability are welcome, as is work toward developing mechanistic and system-level models that elucidate aspects of biological fuel cells. Strategies aimed at utilization of biological materials in fuel cells for portable power, waste elimination, ambient power, or other novel applications are appropriate for this symposium. The goal is to bring together a multidisciplinary representation of research in this broad area to redefine the existing state-of-the-art, and address remaining challenges for practical implementation of these technologies.

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 June 12, 2016. 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: **Scott Calabrese Barton**, Michigan State University, email: scb@msu.edu; **Shelley Minter**, University of Utah, email: shelleyminter@gmail.com; and **Plamen Atanassov**, University of New Mexico, email: plamen@unm.edu.

L04 **Convocation on Chemically Modified Electrodes and Electroactive Polymers**
Physical and Analytical Electrochemistry Division /
Energy Technology Division

In the first Convocation of the Physical and Analytical Electrochemistry Division, topical areas with common elements are clustered to foster exchange ideas and to foment new research vectors. This PAED Convocation has two components:

PART 1: CHEMICALLY MODIFIED ELECTRODES**PART 2: ELECTROACTIVE POLYMERS**

Please identify either Part 1 or 2 on submission.

Part 1: Chemically Modified Electrodes

(David Cliffl and Alice Suroviec)

This symposium is focused on methods for preparing modified interfaces, applications of modified interfaces, and characterization of modified interfaces, particularly those used for heterogeneous redox processes. Topics of interest include (1) modification by molecular self-assembly, (2) modification by electrostatic assembly, (3) heterogeneous catalysis, (4) redox catalysis

Part 2: Electroactive Polymers

(Alice Suroviec and Pawel Kulesza)

Electroactive polymers are capable of changing their shape with an applied voltage. They have potential applications as actuators or sensors. This symposium will provide a forum for researchers to exchange information, stimulate discussions, and present recent advances.

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 June 12, 2016. 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: **David Cliffl**, Vanderbilt, email: d.cliffl@vanderbilt.edu; **Alice Suroviec**, Berry College, email: asuroviec@berry.edu; and **Pawel Kulesza**, University of Warsaw, email: pkulesza@chem.uw.edu.pl.

L05 **Supramolecular Materials**
Physical and Analytical Electrochemistry Division /
Nanocarbons Division

This symposium will provide an international and interdisciplinary forum to present the latest research on supramolecular or supermolecule materials that are made up of a discrete number of assembled molecular subunits or components using either weak (hydrogen bonding, electrostatic, van der Waals, etc) or strong (covalent bonding) forces. The study of non-covalent interactions is crucial to understanding many biological processes from cell structure to vision that rely on these forces for structure and function. Biological systems are often the inspiration for supramolecular research. Papers on basic and applied research in all areas of chemistry, biomolecular science, engineering, electrochemical systems, and physics related to supramolecular materials are solicited. The topics will include: (1.) Molecular recognition (2.) Directed or self assembly; (3.) Catalysis; (4.) Folding or mechanical architectures (5.) Template directed synthesis; (7.) Solute and Solvent Properties (e.g. structural investigations, melting behavior, dynamics, and stability of molten salts); (8.) Molecular Machines and (9.) New supramolecular systems that don't easily fit in the categories above.



Presenters are highly encouraged to submit a transaction on the content of their presentation. A poster session will be planned if have enough participation otherwise they will be placed in the society poster session. Student participation is highly encouraged, and it is anticipated that some funds will be available for student and young scientist support.

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 June 12, 2016. 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: **Hugh De Long**, Air Force Office of Scientific Research, email: hugh.delong@us.af.mil; **R.A. Mantz**, Army Research Office, email: Robert.A.Mantz@us.army.mil; and **Hiroshi Imahori**, Kyoto University, email: imahori@scl.kyoto-u.ac.jp.

L06 Ionic Liquids as Electrolytes Physical and Analytical Electrochemistry Division

Polymerized ionic liquids (PILs) are a subclass of polyelectrolytes that feature an ionic liquid species in each monomer repeating unit connected through a polymeric backbone to form a macromolecular architecture. Many of the unique properties of the ionic liquids may be incorporated into the polymer chains giving rise to the evaluation of this relatively new class of materials in a host of different applications. PILs have currently been developed for use in: actuators, alkaline fuel cells, dye-sensitized solar cells, electrochromic devices, field-effect transistors, light-emitting electrochemical cells, and lithium and magnesium batteries. This symposium is devoted to all aspects (synthesis, characterization, and modeling) of PILs for electrochemical 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 June 12, 2016. 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: **Stephen Paddison**, UT Knoxville, email: spaddison@utk.edu; and **Vito Di Noto**, University of Padova, email: vito.dinoto@unipd.it.

L07 Renewable Fuels via Artificial Photosynthesis or Electrolysis 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 or other gas/liquid hydrocarbon fuels) by solar energy or electrical energy. Topics of interest include but not limited to: (1) utilization of renewable energy resources such as water, carbon dioxide or biomass for fuel generation; (2) generation of fuels with photocatalysts or photoelectrochemical cells (PECs); (3) generation of fuels with electrocatalysts; (4) Sunlight-driven production of bio-fuels and bio-hydrogen with enzymes and photoautotrophic microorganisms; (5) synthesis and characterization of photocatalysts or electrocatalysts; (6) exploring new materials for solar energy conversion; (7) generation of fuels with solar-thermal processes; (8) simulation and modeling of materials, devices, and systems for solar energy conversion; and (9) durability of solar energy 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 June 12, 2016. 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: **Nick Wu**, West Virginia University, email: nick.wu@mail.wvu.edu; **Deryn Chu**, ARL, email: deryn.chu@us.army.mil; **Huyen Dinh**, NREL, email: huyen_dinh@nrel.gov; **Eric Miller**, USDOE, 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; **PJ Kulesza**, University of 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.

L08 Electrochemistry in Geochemical Environments Physical and Analytical Electrochemistry Division

This interdisciplinary symposium highlights research in all areas of geochemical applications of electrochemistry. In particular research in the area of the fundamentals of electron transfer at mineral interfaces are invited. Examples are: rates and mechanisms of electron transfer at hematite, clays, clays in nanocomposites, electron transfer processes aiding mining and or bioremediation of mining materials, and biological electron transfer at mineral interfaces. The interfaces may be either in an oxidized (surface) environment or a subsurface environment. Additional types of solicited papers include applications of novel electrochemistry used to aid understanding of geochemical processes: examples may include deep ocean sensors, etc. A very diverse array of research, which utilizes the concepts of physical and analytical chemistry in challenging geochemical environments, is invited.

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 June 12, 2016. 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 organizer: **A. Fitch**, Loyola, email: Afitch@luc.edu.

M—Sensors

M01 Sensors, Actuators, and Microsystems General Session Sensor Division

This symposium will address all aspects of physical sensors, actuators and microsystems. A companion symposium concerning the corresponding aspects of chemical and biological sensors and actuators may be found under Topic B. Physical sensors find extensive application in environmental monitoring, health care, food security and 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 physical sensors, actuators and microsystems not covered



in other sessions. This symposium intends to bring together a range of interdisciplinary topics and covers all materials 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/tongues; (4.) physical sensors and actuators based on various transduction mechanisms including electrochemical, resistive, optical, fiber optics, radio frequency, microwave and surface acoustics; (5.) emerging technologies and applications including physical sensors based on nanotechnology, (6.) wireless integrations; and (7.) novel techniques to expand and ensure sensor stability and reliability.

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 June 12, 2016. 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: **Nick Wu**, West Virginia University, email: nick.wu@mail.wvu.edu; **Michael Carter**, KWJ Engineering, email: mtcarter62@comcast.net; **Dong-Joo Kim**, Auburn University, email: kimdon2@auburn.edu; **Raluca Van Staden**, INCEMC and University Polytechnia Bucharest, email: ralucavanstaden@gmail.com; **Sushanta Mitra**, York University, email: mitras@yorku.ca; and **Leyla Soleymani**, McMaster University, email: soleym1@mcmaster.ca.

MO2 Medical and Point-of-Care Sensors Sensor Division

This symposium will provide a forum for the discussion of research and development in the field of sensors for medical and point of care applications. Point of care sensors are defined as sensors providing analysis at the site of patient care (home, physician’s office, hospital, etc). The objective of point of care sensors is to enable the physician and care team to obtain critical data early in the patient care cycle, improving the care provided. The following is a partial list of the topics of interest: (1) breathe analysis sensors; (2) blood testing including but not limited to typing, glucose, gas, electrolyte, drug and coagulation sensors; (3) pregnancy testing sensors; (4) sensors for invasive pathogens, bacterial and viral screening; 5) new biological monitoring sensors – heart, lung, nerve transmission sensors; and (6) sensors for cancer and disease detection. All transduction methods are of interest for this symposium. Presentations on point of care systems based on test strips, test cassettes and portable blood analysis systems are encouraged to submit.

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 June 12, 2016. 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: **Aleksandr Simonian**, Auburn University, email: simonal@auburn.edu; **Bryan Chin**, Auburn University, email: bchin@eng.auburn.edu; **Raluca Van Staden**, INCEMC and University Polytechnia Bucharest, email: ralucavanstaden@gmail.com; and **Mikito Yasuzawa**, Tokushima University, email: mik@chem.tokushima-u.ac.jp.

Z—General

Z01 General Society 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.

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 June 12, 2016. 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: **Venkat Subramanian**, University of Washington, email: vsubram@uw.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 featuring Nanoscale Luminescent Materials 4 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.

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; photocatalysis and environmental applications; nano-ionics; nanostructured



catalysts for fuel cells, electrolyzers, batteries and supercapacitors; nanostructured sensor surfaces; and biological applications of nanomaterials.

This symposium will also feature a special session on Nanoscale Luminescent Materials—the fourth in a bi-annual series – that focuses on those characteristics of nanoscale materials that relate to their luminescence properties. Relevant topics include: effects of quantum confinement, the role of surface states, loss mechanisms, methods to improve luminescence efficiency, bulk vs. nanoparticle luminescence, and the role of phonons in nanomaterials. Presentations at this meeting will cover: (1.) basic physical properties of luminescent nano-materials including insulators, semiconductors, organics, and polymers; (2.) nanophosphors for biophotonics and biomarkers; (3.) nanoparticles for light emitting diodes and next generation lighting applications; (4.) luminescent properties of fabricated nano-structures (nanowires, nanorods, nanodots, etc.); and (5.) nanophosphors for traditional phosphor applications such as X-ray and scintillator phosphors, phosphors for VUV excitation, and persistent phosphors.

Presentations should involve the physics, chemistry, and/or engineering of these materials. Selected abstracts will be also chosen by the organizers for longer invited talks. Upon submission, please note that you wish to present your abstract in this special session

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 June 12, 2016. 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: **O.M. Leonte**, Berkeley Polymer Technology, email: odleonte@comcast.net; **Christina Bock**, NRC, email: Christina.Bock@nrc-cnrc.gc.ca; **Jessica Koehne**, Sensor NASA, email: Jessica.e.koehne@nasa.gov; **Zhi Chen**, University of Electronic Science & Technology of China and University of Kentucky, email: zhichen@engr.uky.edu; **Peter Mascher**, McMaster University, email: mascher@mcmaster.ca; and **David J. Lockwood**, National Research Council - Canada, email: david.lockwood@nrc-cnrc.gc.ca.

Z03

Grand Challenges in Energy Conversion and Storage

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

This symposium is a continuation of our 1st symposium for the energy science, electrochemical, and materials chemistry communities that addressed global energy issues covered by many different fields including carbon-free generation of energy (photovoltaics and wind), affordable energy storage for automotive traction, scalable storage solutions for large stationary applications, and new electrochemical approaches to primary extraction or recycling of critical materials, e.g., silicon for PVs, hydrogen for PEM fuel cells, etc.

The motivation for this symposium is driven by the Fossil Fuel Economy which has enormous influence and is primarily controlled by oil majors. Nuclear power generation is seriously discussed especially in Japan. The electrical grid which to date has been based on conventional power generation methods must be modified to accommodate growing amounts of intermittent renewable energy systems. A Hydrogen Economy society must work through effective hydrogen energy transport with the electrical/mechanical engineers in electrical, automobile, steel, construction, and transportation sectors as well as environmental scientists and economists.

System energy efficiency is, moreover, a key point of the smart grid concept supported by rapid progress in informatics. Combination of the conventional energy technology hardware adjusted by new software technology might provide a kind of free market for energy, which allows people to choose a particular energy source as they want. Such might well be the trend for the future of our world.

Specific areas to be covered by invited keynote speakers, but not limited to, include the latest developments in batteries, fuel cells, photoelectrochemical cells, supercapacitors, and other innovative energy storage technologies that address (1) new materials and scalable process development; (2) new concepts of energy conversion and storage; (3) theoretical understanding of behavior at multiple length-scales and (4) systems design. “

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 June 12, 2016. 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: **D. R. Sadoway**, MIT, e-mail: dsadoway@mit.edu; **Y. Fukunaka**, Waseda University, e-mail: hirofukunaka@gmail.com; **R. Mukundan**, Los Alamos National Laboratory, e-mail: mukundan@lanl.gov; **T. Moffat**, NIST, e-mail: thomas.moffat@nist.gov; **S. Meng**, UCSD, e-mail: shirleymeng@ucsd.edu; **D. Scherson**, CWRU, e-mail: dxsl16@case.edu; **G. Zangari**, Univ. of Virginia, e-mail: gz3e@virginia.edu; **F. Prinz**, Stanford, e-mail: fprinz@stanford.edu; and **Mahendra Sunkara**, Univ. of Louisville, mahendra@louisville.edu.

Z04

Nature-inspired Electrochemical Systems 2

All Divisions / Interdisciplinary Science and Technology Subcommittee

In recent years, engineers and scientists have taken inspiration from the natural world to design new materials, algorithms and devices. Several successes have been realized in the fields of mathematics, robotics, polymer synthesis, new heterogeneous catalysts, etc. Some specific examples include the development of advanced algorithms that were able to predict Newton’s laws of motion from experimental data, synthesis of polystyrene in plants, catalyst for solar fuel conversion, and the emergence of microbial fuel cells that have good potential for industrial wastewater treatment applications. However, the realization of similar advances for electrodes, electrolytes and cell architecture have been slow and a concerted effort in this area has the potential to have a broad societal impact as electrochemical devices are expected play key roles in energy conversion and storage in the 21st century.

This symposium will focus on the invention and recent advances in electrochemically relevant materials and systems. Areas of interest include: 1) the use of biological agents to control the growth, size, shape or function of electrodes or electrolytes; 2) electrodes and electrolytes whose structure or function seek to mimic a naturally-occurring system; 3) devices that utilize electrochemical processes to mimic or re-create a microhabitat or naturally occurring system; 4) in-vivo or in-vitro use of electrochemical devices to treat disease or control of cells for disinfection/sterilization; and 5) direct use of biological materials in electrochemical devices as electrodes/electrolytes or promoters of electrochemical processes.

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 March 11, 2016. 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: **William Mustain**, Univ. Connecticut, email: mustain@engr.uconn.edu;



229th ECS MEETING

May 29 – June 3, 2016 • Hilton San Diego Bayfront & San Diego Convention Center

SAN DIEGO

Huyen Dinh, NREL, email: huyen.dinh@nrel.gov; **Plamen Atanassov**, Univ. New Mexico, email: plamen@unm.edu; **Mekki Bayachou**, Cleveland State Univ., email: M.BAYACHOU@csuohio.edu; and **Hui Xu**, Giner Inc., email: hxu@ginerinc.com.

Z05 Sustainable Materials and Manufacturing

All Divisions / Interdisciplinary Science and Technology Subcommittee

The chemical industry confronts the challenges of reliable energy supply, reducing carbon emissions, increasing the energy efficiency of manufacturing technologies, waste reduction, and water conservation that can hinder and jeopardize growth and global competitiveness. New transformational, disruptive, and enabling technologies are needed that will provide solutions to the chemical industry beyond incremental manufacturing improvements. Sustainable manufacturing aims at minimizing negative environmental impacts using economically-sound processes while conserving energy and natural resources. Electrochemistry has the potential to provide such a transformational solution to conventional manufacturing. This symposium will provide an international forum for the presentation and discussion of the most recent developments on the application of electrochemical processes to traditional chemical processes that had enable and/or could lead to sustainable materials processing and manufacturing. Oral and poster presentations will be featured. Topics of interest include, but are not limited to: (1) new electrochemical technologies for water (treatment, reuse), materials synthesis and/or recycling (2) production of various industrially relevant chemical substances (3) sustainable advanced electrode materials and structures, (4) life-cycle analysis demonstrating the impact of electrochemistry in sustainable manufacturing, (5) advances cell and system design, including reactant and product flow, heat transfer, and stack level materials corrosion; (6) materials of construction of electrochemical plants (7) modeling and simulation of electrochemical phenomena and processes; and (8) techno-economic analysis of sustainable manufacturing techniques.

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 June 12, 2016. 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: **G. Botte**, Ohio University, email: botte@ohio.edu; **Sri Naryan**, USC, email: snaraya@dornsife.usc.edu; **E.J. Taylor**, Faraday Technology, Inc., email: jenningtaylor@faradaytechnology.com; **Arumugam Manthiram**, University of Texas, Austin, email: rmanth@mail.utexas.edu; **John Stickney**, University of Georgia, email: stickney@uga.edu; **Katherine Ayers**, Proton OnSite, email: kayers@protononsite.com; and **Gautam Banerjee**, Air Products and Chemicals, Inc, email: banerjg@airproducts.com.

Z06

Modeling: From Elucidation of Physical Phenomena to Applications in Design

All Divisions / International Society of Electrochemistry



This symposium is jointly sponsored by the International Society of Electrochemistry and the Electrochemical Society. The symposium explores all aspects of modeling electrochemical phenomena and physical effects in electrochemical systems. The domain ranges from the most fundamental theory through modeling of electrochemical technologies 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: **Mark Orazem**, University of Florida, email: meo@che.ufl.edu; **Johna Leddy**, University of Iowa, email: johna-leddy@uiowa.edu; **Trung Van Nguyen**, U. Kansas, email: cptvn@ku.edu; and **John N. Harb**, Brigham Young University, email: john_harb@byu.edu.

Z07

The Brain and Electrochemistry

All Divisions

A Society-wide Symposium is convened at the juncture of electrochemistry and the brain and nervous system. How can the brain be viewed and studied in terms of circuits and electrochemical reactions and methods? Topics include but are not limited to unresolved questions in brain function and neurological dysfunction; memory and sleep; electrochemical measurements and methods; materials stability and biocompatibility of implantable electronics; brain monitoring and stimulation; simulation and modeling of neurological systems; and sensors.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Lili Deligianni**, IBM, email: lili@us.ibm.com; **Christina Bock**, National Research Council of Canada, email: christina.bock@nrc.ca; **Shelley Minter**, University of Utah, email: minter@chem.utah.edu; **Johna Leddy**, University of Iowa, email: johna-leddy@uiowa.edu; **Larry Nagahara**, Sensor NIH, email: larry.nagahara@nih.gov; **Oana Leonte**, Berkeley Polymer Technology, email: odleonte@comcast.net; and **Diane Smith**, San Diego State University, email: dksmith@mail.sdsu.edu.