



# 2014 ECS and SMEQ Joint International Meeting

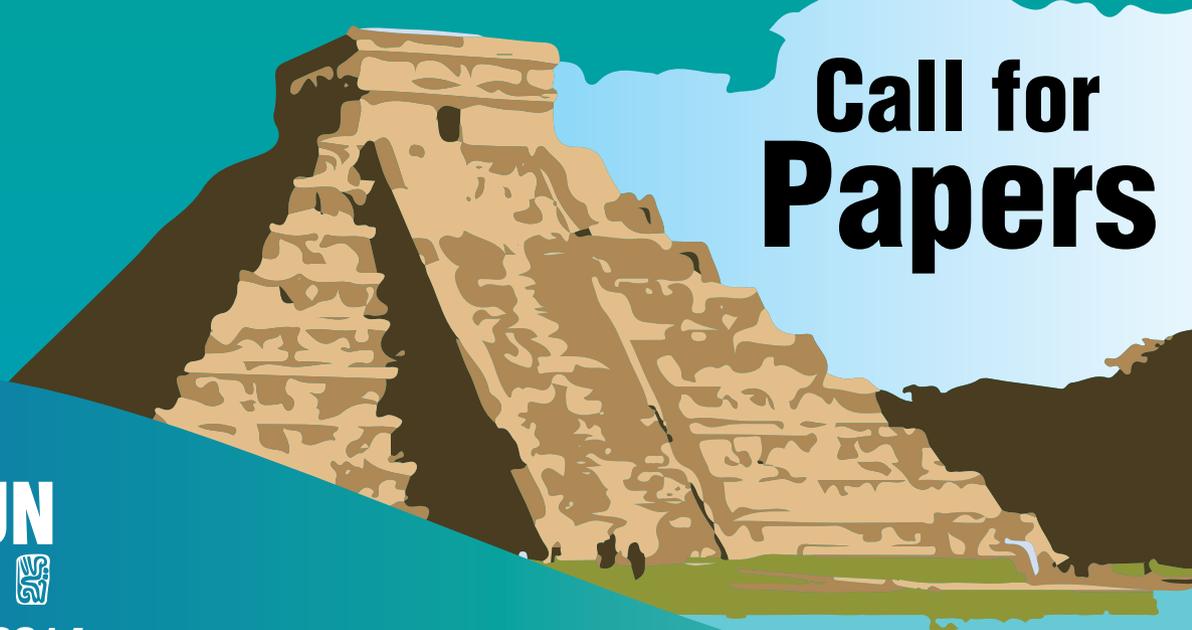


226<sup>th</sup> Meeting of  
The Electrochemical Society

XXIX Congreso de la Sociedad  
Mexicana de Electroquímica



7<sup>th</sup> Meeting of the Mexico Section of The Electrochemical Society



# Call for Papers

## CANCUN



October 5-11, 2014

Moon Palace Resort



For the full Cancun, Mexico, Call for Papers, see the ECS website: [www.electrochem.org/meetings/biannual/226/](http://www.electrochem.org/meetings/biannual/226/).

## General Information

The 2014 ECS and SMEQ (Sociedad Mexicana de Electroquímica) Joint International Meeting will be held from October 5-10, 2014. 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.

## Abstract Submission and Deadlines

**Abstracts are due no later than March 28, 2014.**

Note: Some abstracts may be due earlier than March 28, 2014. Please carefully check the symposium listings for any alternate abstract submission deadlines. For complete details on abstract submission and symposia topics, please see [www.electrochem.org](http://www.electrochem.org).

Submit one original meeting abstract electronically via [www.electrochem.org](http://www.electrochem.org), no later than **March 28, 2014**. Faxed abstracts, e-mailed abstracts, and late abstracts will not be accepted. In June 2014, all presenting authors will receive an e-mail from ECS headquarters office 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](mailto: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 April-May 2014. Check the ECS website for further program details.

## Paper Presentation

All authors selected for either oral or poster presentations will be notified in June 2014. Oral presentations must be in English. Both LCD projectors and laptops will be provided for oral presentations. **Presenting authors MUST bring their presentation on a USB flash drive to be used with the laptop that will be provided in each technical session room.** If a presenting author would like to use his/her own laptop for presentation, we strongly suggest that the author verify laptop/projector compatibility in the presentation room prior to the start of the session or all other presentations. Speakers requiring additional equipment must make written request to the ECS headquarters office at least one month prior to the meeting and appropriate arrangements will be worked out, subject to availability, and at the expense of the author. Poster presentations should be displayed in English, on a board approximately 3 feet 10 inches high by 3 feet 10 inches wide (1.17 meters high by 1.17 meters wide), corresponding to the abstract number and day of presentation in the final program.

## Manuscript Publication

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

*ECS Transactions*—all full papers presented at ECS meetings are eligible for submission to the online proceedings publication, *ECS Transactions* (ECST). Each meeting is represented by a "volume" of ECST, and each symposium is represented by an "issue." Some symposia will publish their issue to be available for sale "AT" the meeting. Please see each individual symposium listing in this Call for Papers to determine if there will be an "AT" meeting issue. In the case of "AT" meeting symposia, submission to ECST is mandatory, and required in advance of the meeting.

Some symposia will publish their issue to be available "AFTER" the meeting, and all authors are encouraged to submit their full papers. To determine acceptance in ECST, all submitted manuscripts will be reviewed, either by the symposium organizers or by the ECST Editorial Board. After the meeting, all accepted papers in ECST will be available for sale, either individually, or by issue. Please visit the ECST website ([ecsdl.org/ECST/](http://ecsdl.org/ECST/)) for additional information, including overall guidelines, deadlines for submissions and reviews, author and editor instructions, a manuscript template, and much more.

Authors presenting papers at ECS meetings, and submitting to ECST, are encouraged to submit to the Society's technical journals: the *Journal of The Electrochemical Society*, *ECS Journal of Solid State Science and Technology*, *ECS Electrochemistry Letters*, or *ECS Solid State Letters*. Although there is no hard deadline for the submission of these papers, it is considered that six

months from the date of the symposium is sufficient time to revise a paper to meet the stricter deadlines of the journals. "Instructions to Authors" are available from the ECS headquarters office, the journals, or the ECS website.

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

## Financial Assistance

Financial assistance is very limited and generally governed by the symposium organizers. Individuals may inquire directly to the symposium organizers of the symposium in which they are presenting their paper to see if funding is available.

## 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. Students seeking financial assistance should consider awarded travel grants listed elsewhere in this Call for Papers.

## Hotel Reservations • Deadline September 5, 2014

The 2014 ECS and SMEQ Joint International Meeting will be held at the all-inclusive Moon Palace Resort, Carretera Cancun-Chetumal Km. 340, Cancun, Quintana Roo, CP. 77500, Mexico. Please refer to the meeting website for the most up-to-date information on hotel availability and information about the block of rooms where special rates have been reserved for participants attending the meeting. **The hotel reservation deadline is September 5, 2014.** Please refer to the ECS website ([www.electrochem.org](http://www.electrochem.org)) for rates and reservations.

## 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 ([www.electrochem.org](http://www.electrochem.org)) as it becomes available. **The deadline for discounted early-bird registration is September 5, 2014.**

## Short Courses

A number of short courses will be offered on Sunday, October 5, 2014 from 8:30 AM-4:30 PM. Short Courses **require advance registration** and may be cancelled if enrollments are too low. As of press time, the following Short Courses are planned for the meeting: Basic Impedance Spectroscopy; Fundamentals of Electrochemistry: Basic Theory and Thermodynamic Methods; Grid Scale Energy Storage; and More than Moore Technologies: Device, Circuit, and System Perspectives. Please check the ECS website for the final list of offerings.

## Technical Exhibit

The 2014 ECS and SMEQ Joint International Meeting will also 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. Please see the ECS website for further details.

## 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, on the ECS website, and in the mobile app. 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 Christie Knep at 1.609.737.1902, ext. 121, or see the ECS website for further details.

## Contact Information

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

# Symposium Topics

## A — Batteries and Energy Storage

- A1 — Batteries and Energy Technology Joint General Session
- A2 — Batteries Beyond Lithium Ion
- A3 — Electrochemical Capacitors: Fundamentals to Applications
- A4 — Electrochemical Interfaces in Energy Storage Systems
- A5 — Lithium-Ion Batteries
- A6 — Nano-architectures for Next-Generation Energy Storage Technologies
- A7 — Nonaqueous Electrolytes
- A8 — Solar Fuels and Photocatalysts 4
- A9 — Stationary and Large-Scale Electrical Energy Storage Systems 4

## B — Chemical and Biological Sensors

- B1 — Chemical Sensors 11. Chemical and Biological Sensors and Analytical Systems
- B2 — Microfabricated and Nanofabricated Systems for MEMS/NEMS 11 (Chemical and Biological Sensors)

## C — Corrosion Science and Technology

- C1 — Corrosion General Session
- C2 — Electrochemical Techniques and Corrosion Monitoring
- C3 — High Resolution Characterization of Corrosion Processes 4
- C4 — High Temperature Corrosion

## D — Electrochemical/Electroless Deposition

- D1 — Electrodeposition for Energy Applications 3
- D2 — Electrochemical Science and Technology: Challenges and Opportunities in the Path from Invention to Product
- D3 — Magnetic Materials, Processes, and Devices 13
- D4 — Surface Treatments for Biomedical Applications 4

## E — Electrochemical Engineering

- E1 — Characterization of Electrochemical Reactors: Fluid Dynamics and Current Distribution
- E2 — Electrochemical Treatments for Organic Pollutant Degradation in Water and Soils
- E3 — Symposium in Honor of Professor Ralph E. White

## F — Fuel Cells, Electrolyzers, and Energy Conversion

- F1 — Thermal Energy Harvesting
- F2 — Solid State Ionic Devices 10
- F3 — Polymer Electrolyte Fuel Cells 14 (PEFC 14)

## G — Organic and Bioelectrochemistry

- G1 — Bioelectroanalysis and Bioelectrocatalysis 2

## H — Physical and Analytical Electrochemistry, Electrocatalysis, and Photoelectrochemistry

- H1 — Physical and Analytical Electrochemistry General Session
- H2 — Chemically Modified Electrodes
- H3 — Electrochemistry in Nanospaces 2

- H4 — Electrode Processes 9

- H5 — Liquid-Liquid Electrochemical Interfaces

- H6 — Molten Salts and Ionic Liquids 19

- H7 — Oxygen Reduction Reactions

- H8 — Systems Electrochemistry

## M — Carbon Nanostructures and Devices

- M1 — Nanocarbon Fundamentals and Applications: From Fullerenes to Graphene

## N — Dielectric Science and Materials

- N1 — Thermal and Plasma CVD of Nanostructures and Their Applications

## P — Electronic Materials and Processing

- P1 — Atomic Layer Deposition Applications 10
- P2 — Electrochemistry in Organic Electronic Materials: Synthesis, Analysis, and Applications
- P3 — High Purity and High Mobility Semiconductors 13
- P4 — Plasma Processing 20
- P5 — Processing Materials of 3D Interconnects, Damascene, and Electronics Packaging 6
- P6 — Semiconductor Wafer Bonding 13: Science, Technology, and Applications
- P7 — SiGe, Ge, and Related Compounds: Materials, Processing, and Devices 6
- P8 — Thermoelectric and Thermal Interface Materials
- P9 — Transparent Conducting Materials for Electronic and Photonics

## Q — Electronic and Photonic Devices and Systems

- Q1 — Emerging Nanomaterials and Devices
- Q2 — Fundamentals and Applications of Microfluidic and Nanofluidic Devices 2
- Q3 — GaN and SiC Power Technologies 4
- Q4 — Low-Dimensional Nanoscale Electronic and Photonic Devices 7
- Q5 — Nonvolatile Memories
- Q6 — Photovoltaics for the 21<sup>st</sup> Century 10
- Q7 — Semiconductors, Dielectrics, and Metals for Nanoelectronics 12
- Q8 — Solid-State Electronics and Photonics in Biology and Medicine
- Q9 — State-of-the-Art Program on Compound Semiconductors 56 (SOTAPOCS 56)
- Q10 — Thin Film Transistors 12 (TFT 12)

## R — Luminescence and Display Materials, Devices, and Processing

- R1 — Luminescence and Display Materials: Fundamentals and Applications (in Honor of Hajime Yamamoto)

## S — Physical Sensors

- S1 — Microfabricated and Nanofabricated Systems for MEMS/NEMS 11 (Physical Sensors)

## Z — General

- Z1 — Student Poster Session
- Z2 — Energy Water Nexus
- Z3 — Nanotechnology General Session

## A—Batteries and Energy Storage

### A1

#### Batteries and Energy Technology Joint General Session

Battery Division / Energy Technology Division

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

**An issue of *ECS Transactions* is planned to be published “AFTER” the meeting. All authors accepted for presentation are encouraged to submit their full text manuscript for the issue no later than November 14, 2014. 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: **A. Manivannan**, NETL, e-mail: manivana@netl.doe.gov; **M. M. Doeff**, Lawrence Berkeley National Laboratory, e-mail: mmdoeff@lbl.gov; **J. Xiao**, Pacific Northwest National Laboratory, e-mail: jie.xiao@pnl.gov; **B. Y. Liaw**, University of Hawaii, e-mail: bliaw@hawaii.edu; **S. Mukerjee**, Northeastern University, e-mail: s.mukerjee@neu.edu; and **D. Wang**, Penn State University, dwang@psu.edu.

### A2

#### Batteries Beyond Lithium Ion

Battery Division / Energy Technology Division

This symposium solicits papers on most recent discoveries and breakthrough studies in battery systems beyond Li-ion batteries. Topics include, but are not limited to, metal-air (oxygen) (e.g., Li-air, Mg-air, Al-air), metal-sulfur (e.g., Li-S), other Li metal batteries (e.g., Li-metal oxides), and other metal ion systems (e.g., Na-ion). Of particular interests are new battery chemistries, new electrode materials and electrolytes, new electrode structures, and new battery designs that would enable to achieve high energy density, high power density, and/or safety. Also of interests are modeling and simulation studies that provide new insights in better understanding of batteries beyond Li ion.

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### A3

#### Electrochemical Capacitors: Fundamentals to Applications

Battery Division / Physical and Analytical  
Electrochemistry Division

Electrochemical capacitors (i.e., “supercapacitors” or “ultracapacitors”) are emerging as an attractive energy-storage solution for new technologies with challenging power/energy

requirements. The goal of this symposium is to address all aspects of electrochemical capacitor research, development, and real-world applications, including: (1) double-layer and/or pseudocapacitance aspects of nanostructured carbons; (2) materials that exhibit primarily faradaic pseudocapacitance, including metal oxides, nitrides, other advanced inorganic materials, and conducting polymers; (3) characterization methods that elucidate the physical structures and fundamental electrochemical processes of new electrode materials and architectures; (4) optimization of practical electrochemical capacitor components, including current collectors, electrodes, electrolytes, separators and packaging; (5) performance of new device designs (symmetric and asymmetric), and hybrid systems that combine electrochemical capacitors with other power sources (e.g., batteries, fuel cells); (6) theory and modeling as tools for performance prediction and materials and device design; and (7) application tests of electrochemical capacitors in real-world conditions. The program will consist of both invited and contributed papers that address one or more of the above topics. A special session for young investigators (tenured faculties with no more than five years after PhD, non-tenured young faculties, postdocs, etc.) to present their newest studies is also planned.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **W. Sugimoto**, Shinshu University, Japan, e-mail: wsugi@shinshu-u.ac.jp; **D. Bélanger**, l'Université du Québec à Montréal, e-mail: belanger.daniel@uqam.ca; **T. Brousse**, Institut des Matériaux Jean Rouxel, CNRS/University of Nantes, France, e-mail: thierry.brousse@univ-nantes.fr; **P. Kumta**, University of Pittsburgh, e-mail: pkumta@pitt.edu; **J. W. Long**, US Naval Research Laboratory, e-mail: jeffrey.long@nrl.navy.mil; **P. Simon**, Université Paul Sabatier, LCMIE/CIRIMAT, France, e-mail: simon@chimie.ups-tlse.fr; **D. Qu**, University of Massachusetts at Boston, e-mail: Deyang.Qu@umb.edu; **O. Leonte**, Berkeley Polymer Technology, e-mail: odleonte@comcast.net; and **D. Landheer**, National Research Council Canada, e-mail: dolf.landheer@nrc.ca.

### A4

#### Electrochemical Interfaces in Energy Storage Systems

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

The organizers would like to invite contributions that provide better understanding of the mechanism of electronic and ionic transport phenomena across electrode-electrolyte interfaces and solid-state interphases in energy storage systems. A better understanding of the underlying principles that govern these phenomena is inextricably linked to our ability to sense and monitor electrode surface processes *in situ*, in real time, and with adequate spatial and temporal resolution. Papers that leverage advances in experimental and theoretical modeling approaches to characterize and describe the mechanism of interfacial phenomena and their impact on the electrochemical performance of the materials, composite electrodes, and energy storage systems are welcome.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **K. Edstrom**, Uppsala University, e-mail: kristina.edstrom@mkem.uu.se; **R. Kostecki**, Lawrence Berkeley National

Laboratory, e-mail: r\_kostecki@lbl.gov; **P. Atanasov**, University of New Mexico, e-mail: plamen@unm.edu; **Jean St-Pierre**, University of Hawaii, e-mail: jsp7@hawaii.edu; and **D. Guyomard**, University of Nantes, e-mail: Dominique.Guyomard@cnrns-immn.fr.

## A5 Lithium-Ion Batteries

### Battery Division

Lithium-ion batteries have been the workhorses in portable electronic devices such as cellular phones, laptop computers, and digital cameras. In recent years, lithium-ion batteries are being used for plug-in hybrid electric vehicle (PHEV) and full electric vehicle (EV) applications. This symposium is a forum for discussion on both fundamental and applied aspects of rechargeable lithium-ion batteries. Specific areas to be covered include but not limited to: (1) anode design, characterization, and performance; (2) cathode design, characterization and performance; (3) electrolyte development and characterization; (4) novel electrode processing and cell design; (5) electrode interfacial studies and diagnostic techniques; (6) Materials, electrode, and cell modeling; (7) elucidation of aging and failure modes and mechanisms; and (8) performance and safety of cells and battery packs.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **S. Meng**, University of California, San Diego, e-mail: shirleymeng@ucsd.edu; **K. Amine**, Argonne National Laboratory, e-mail: Amine@anl.gov; and **J. J. Wu**, NASA Glenn Research Center, e-mail: james.j.wu@nasa.gov.

## A6 Nano-architectures for Next-Generation Energy Storage Technologies

### Battery Division / Energy Technology Division

Nanostructured materials play an important role in energy storage and conversion spanning from batteries, flow cells, fuel cells to natural gas conversion. The microstructural properties of electrodes with nano-architectures have been promoted to facilitate reaction mechanisms during the electrochemical process. Control of phase nucleation and growth, accelerated charge transfer, minimum structural mismatch and enhanced electrode mechanical strength during repeated cycling have also been demonstrated in different electrochemical devices. Additionally, nanostructures provide a unique platform to investigate the nanoscale phenomena from atomic level and promote the fundamental understanding from different perspectives. This symposium will be the venue to discuss the design and application of novel nano-architectures used in next-generation energy storage technologies including but not limited to (1) battery technologies such as lithium-sulfur, lithium-oxygen, sodium-ion, magnesium batteries, and flow batteries; (2) natural gas conversion techniques; (3) advanced characterization tools to capture nanoscale phenomena; and (4) theoretical simulation to understand the roles of nano-architectures from the electrochemical point of view.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **J. Xiao**, Pacific Northwest National Laboratory, e-mail: jie.xiao@pnnl.gov; **S. Meng**, University of California, San Diego,

e-mail: shirleymeng@ucsd.edu; **K. Edstrom**, Uppsala University, e-mail: kristina.edstrom@mkem.uu.se; **K.-Y. Chan**, University of Hong Kong, e-mail: hrscecky@hku.hk; and **V. Kalra**, Drexel University, e-mail: vk99@drexel.edu.

## A7 Nonaqueous Electrolytes

### Battery Division

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

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **B. Lucht**, University of Rhode Island, e-mail: blucht@chm.uri.edu; **R. Jow**, Army Research Laboratory, e-mail: t.r.jow.civ@mail.mil; **R. V. Bugga**, Jet Propulsion Laboratory, e-mail: Ratnakumar.V.Bugga@jpl.nasa.gov; **M. Smart**, Jet Propulsion Laboratory, e-mail: Marshall.C.Smart@jpl.nasa.gov; and **W. Henderson**, North Carolina State University, e-mail: whender@ncsu.edu.

## A8 Solar Fuels and Photocatalysts 4

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

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

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## **A9** Stationary and Large-Scale Electrical Energy Storage Systems 4

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

Renewable energy sources, such as wind and solar, can supply a significant amount of electrical energy in the United States and around the world. However, their intermittent nature is a major issue to grid stability and reliability and therefore a major obstacle to their broader use. The full potential of these renewable energy sources can be exploited only if a suitable energy storage system is provided. This symposium is a forum for discussions on energy conversion and storage systems for future applications in renewable energy-based grid distribution and electrification of transportation. Papers related to topics from fundamental studies to practical applications are welcome. Areas of interest include: (1) issues dealing with the intermittency of solar and wind power generation, (2) large-scale battery/fuel cell systems for electrical energy storage, (3) hydrogen storage, and (4) other storage systems and related topics (e.g., smart grids, microgrids, energy management and distribution management, and so forth).

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## **B—Chemical and Biological Sensors**

### **B1** Chemical Sensors 11. Chemical and Biological Sensors and Analytical Systems Sensor Division

This symposium will provide a forum for the broad discussion of research and development in the field of chemical sensors (gas, liquid, and other types), including molecular recognition surfaces, transduction methods, and integrated and microsensor systems. Topics of interest include, but are not limited to: (1) development of new selective molecular recognition surfaces and materials; (2) sensor and analytical systems for safety and security; (3) novel methods for signal amplification and detection; (4) sensor arrays for the simultaneous detection of multiple analytes; (5) micro total analysis systems; (6) physics and chemistry of sensors and sensor

materials, synthesis/fabrication, and characterization of novel compositions; (7) novel sensor concepts, design, modeling, and verification; (8) sensor arrays, and electronic noses and tongues; (9) physical, chemical, and biological/biomedical sensors and actuators, such as gas, humidity, ion, and molecular sensors, their system integration and actuating functions; (10) optical sensors and fiber optic sensors; (11) wireless sensors; (12) emerging technologies and applications including nanosensors and sensors leveraging nanotechnology; (13) harsh environment sensors; and (14) ultralow power sensors. All transduction methods are of interest for this symposium (e.g., electrochemical, resistive, capacitive, optical, acoustic, gravimetric, thermal). The goal of this symposium is to present the broadest possible coverage of modern chemical sensing progress and to highlight the present state of the art relative to basic and applied areas.

In order to encourage participation of new and talented researchers in the field, we anticipate awarding Student Travel Grants in support of outstanding graduate students. Awards will be made based on originality of the work and importance to the field. To be considered for the award, an abstract for an oral or poster presentation, as well as a manuscript for the symposium proceedings volume must be submitted by the respective deadlines. If you would like to apply for the travel grant, please submit your abstract, proceedings manuscript, résumé, publication list, and a support letter from your advisor to Praveen Sekhar (praveen.sekhar@vancouver.wsu.edu) before the deadline for manuscript submission, in addition to the usual travel grant application process. Student Poster Prizes will also be awarded, totaling \$300, with a \$200 top prize. Students wishing to participate should submit an abstract for a poster contribution to the ECS and send a copy of their abstract to Peter Hesketh (peter.hesketh@me.gatech.edu) before the deadline for the proceedings manuscript.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Z. Aguilar**, Zystein, LLC, e-mail: zapaguilar@yahoo.com; **M. Carter**, KWJ Engineering, Inc., e-mail: mtcarter62@comcast.net; **R. Mukundan**, Los Alamos National Laboratory, e-mail: mukundan@lanl.gov; **J. Li**, NASA Ames, e-mail: jingli@mail.arc.nasa.gov; **G. Hunter**, NASA Glenn, e-mail: Gary.W.Hunter@nasa.gov; **B. Chin**, Auburn University, e-mail: bchin@eng.auburn.edu; **P. Sekhar**, Washington State University, e-mail: praveen.sekhar@vancouver.wsu.edu; **L. Nagahara**, NIH NCI, e-mail: nagaharl@mail.nih.gov; and **A. Simonian**, Auburn University, e-mail: als@eng.auburn.edu.

### **B2** Microfabricated and Nanofabricated Systems for MEMS/NEMS 11 (Chemical and Biological Sensors)

Sensor Division / Physical and Analytical Electrochemistry Division

This symposium continues the series of symposia that focus on all chemical sensor and biosensor aspects of MEMS/NEMS technology including micro/nanomachining, fabrication processes, packaging, and the application of these structures and processes to the miniaturization of chemical sensors, biosensors, miniature chemical analysis systems, and other devices. Particular emphasis should be placed on processes and potential applications of these devices. The following is a partial list of topics to be solicited: (1) fabrication and processing of nano/microsystems; (2) nanomaterials for sensors and actuators; (3) novel methods of processing at the nano/microscale; (4) use of nano/microstructures applicable to environmental and biological studies; (5) chemical, electrical and

physical testing of devices; (6) integrated microfabricated sensors into arrays; (7) reliability of micro/nanomechanical structures; (8) new materials for NEMS/MEMS. The chemical/bio sensor (B2) and companion physical sensor (S1) symposia will be scheduled such that the speakers and attendees have convenient access to both sessions.

In order to encourage participation of new and talented researchers in the field, we anticipate awarding Student Travel Grants in support of outstanding graduate students. Awards will be made based on originality of the work and importance to the field. To be considered for the award, an abstract for an oral or poster presentation, as well as a manuscript for the symposium proceedings volume must be submitted by the respective deadlines. If you would like to apply for the travel grant, please submit your abstract, proceedings manuscript, résumé, publication list, and a support letter from your advisor to Praveen Sekhar (praveen.sekhar@vancouver.wsu.edu) before the deadline for manuscript submission, in addition to the usual travel grant application process. Student Poster Prizes will also be awarded, totaling \$300, with a \$200 top prize. Students wishing to participate should submit an abstract for a poster contribution to the ECS and send a copy of their abstract to Peter Hesketh (peter.hesketh@me.gatech.edu) before the deadline for the proceedings manuscript.

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## C—Corrosion Science and Technology

### C1 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: **R. G. Buchheit**, The Ohio State University, e-mail: buchheit.8@osu.edu; and **S. Fujimoto**, Osaka University, e-mail: fujimoto@mat.eng.osaka-u.ac.jp.

### C2 Electrochemical Techniques and Corrosion Monitoring Corrosion Division / SMEQ

The purpose of this symposium is to bring together leading experts with a variety of different experimental and theoretical skills working in areas of electrochemical techniques and corrosion monitoring. The electrochemical techniques can be employed to large number of important areas of research, such as: corrosion studies; corrosion control; corrosion monitoring; studies of electrochemical kinetics, reactions, and processes and their control; and surface treatments. This symposium is aimed to serve as a forum for the understanding of corrosion fundamentals and damage evolution mechanisms at the interface level by discussion on fundamentals, applied aspects, and the latest advances in electrochemical techniques. For experimental aspects for metallic corrosion as applied to mechanistic studies, real time monitoring, rate control step process, corrosion rate estimation, and new test methods will also participate in this call. Papers are requested on corrosion science aspects of bare, organic, and inorganic based coated metallic substrates, classical, and special alloys. Papers on electrochemical fundamentals on kinetics, degradation mechanisms, coupled multi-electrode array sensors and accelerated testing, are also encouraged.

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### C3 High Resolution Characterization of Corrosion Process 4 Corrosion Division / SMEQ

The aim of this symposium is to highlight research focused on the characterization of both metals and alloys for commonly used engineering metals; and alloys and new alloys, composites, and magnetic materials used in aeronautics and electronic industries at microscopic scales; the design of new methods and techniques to investigate and characterize corrosion processes at microscopic levels or with a high resolution; and the development of novel applications, such as molecular friction and molecular wearing are welcomed. Research works which involves localized techniques, such as, confocal microscope, SRE, SVET, SECM, SPECM, STM, AFM, NFM, microcell, and others will be presented and discussed.

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C4

## High Temperature Corrosion

Corrosion Division / High Temperature Materials Division / SMEQ

Scope: To provide a forum for information exchange and discussion of high-temperature corrosion and protection of metallic, ceramic, and composite materials in industrial processes such as chemical, petrochemical, pulp, and paper, energy conversion, aerospace, cement, and incinerator of chemical, municipal, industrial, and toxic wastes. It will cover all aspects of the topic, from fundamental research to service behavior in complex systems, with emphasis on mechanisms of degradation and methods of surface protection.

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## D—Electrochemical/Electroless Deposition

D1

### Electrodeposition for Energy Applications 3

Electrodeposition Division / Energy Technology Division

The symposium will provide a forum for discussions of the original research concerned with the use of electrodeposition as a materials synthesis and processing approach for energy storage and conversion applications. Fundamental and applied papers are solicited on all aspects of electrodeposition including anodic and cathodic approaches, light-induced deposition, electroless deposition, and other novel approaches as they apply to energy conversion and storage systems. Topics include but are not limited to the preparation of semiconductor, metal, and superconductor thin films and nanostructures; magnetic materials; multi-layered systems; photovoltaic materials and nanostructures; and materials and systems for solar-assisted water splitting. Topics of interest include: (1) deposition of the semiconductor thin films; (2) epitaxial growth and superlattices; (3) semiconductor and metal nanodots; (4) electrochemical insertion and intercalation reactions; (5) light-induced deposition processes; (6) template-assisted deposition; (7) deposition of solar cell window materials and anti-reflection coatings; (8) semiconductor, metal, and superconductor nucleation and growth, and other mechanistic aspects; (9) *in situ* and *ex situ* experimental methods for monitoring the deposition process; (10) post-deposition electrochemical or photoelectrochemical etching and processing; (11) catalyst preparation and modification for energy conversion devices such as fuel cells; (12) design of new energy storage devices (e.g., batteries, hydrogen storage); and (13) electrodeposition in energy transducer and sensor assemblies/systems.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **S. Brankovic**, University of Houston, e-mail: SRBrankovic@uh.edu; **H. Deligianni**, IBM T.J. Watson Research Center, e-mail: lili@us.ibm.com; **N. Dimitrov**, SUNY Binghamton, e-mail: dimitrov@

binghamton.edu; **L. Magagnin**, Politecnico di Milano, e-mail: luca.magagnin@polimi.it; **S. Calabrese Barton**, Michigan State University, e-mail: scb@msu.edu; **M. Shao**, Ford Motor Company, e-mail: minhua@gmail.com; **M. Innocenti**, Università di Firenze, e-mail: minnocenti@unifi.it; and **A. Lavacchi**, ICCOM-CNR, e-mail: alessandro.lavacchi@iccom.cnr.it.

D2

### Electrochemical Science and Technology: Challenges and Opportunities in the Path from Invention to Product

Electrodeposition Division / Industrial Electrochemistry and Electrochemical Engineering Division / Physical and Analytical Electrochemistry Division

The path from discovery, invention, and scientific understanding to well-engineered products and processes is complex, and involves integration of a wide range of skills and perspectives. This is particularly true in electrochemical engineering, where the development of viable processes in energy, environment, health care, or information technology requires understanding molecular mechanisms, tailoring new materials, and integrating data over a wide range of scales in order to scale-up, design, and develop manufacturing methods to produce reliable devices and products at low cost. A clear understanding and creative application of the fundamentals are essential to successfully address these challenges.

The goal of this symposium is to draw together the collective interests of scientists and engineers involved in electrochemical education and skilled in moving along the path from ideas to profits, who will articulate the best practices leading from invention to a technologically and commercially successful product. This path is only possible by also emphasizing transformative educational opportunities and defining challenges to equip students and practitioners with the skills and perspectives emerging from these activities. The reduction to routine use of the approaches discussed here will define essential engineering methods for emerging electrochemical applications for which increased predictability is of high importance.

Of interest are reusable engineering methods that have emerged from diverse applications such as nano-bio-micro-devices, photovoltaic converters, batteries, biomedical devices, etc. Such methods might include examples of exploratory work that target the need for detailed fundamental understanding, perhaps at the molecular level; methods for early establishment of engineering goals for a proposed product; examples of manipulating solution chemistry and cell materials to meet production realities; methods for guiding discovery of novel materials and predicting their interactions with other cell components; development of process control methods for insuring quality at the atomic scale; mathematical modeling of continuum and/or stochastic behavior of cell components as well as entire systems including prediction of behavior at multiple scales; estimating unknown parameters, quantifying uncertainty, and linking the pieces to optimize an overall system.

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**D3****Magnetic Materials, Processes, and Devices 13**

Electrodeposition Division

Magnetic thin films play important roles in data recording systems, sensors, microelectromechanical systems (MEMS), and other devices. New knowledge continues to be acquired in magnetic film processing including: film nucleation and growth, structure of deposits, stress and micromagnetics of films, thermal and magnetic annealing, electrochemical and electroless plating systems, etching, process chemistry, tool design, process control, etc. Our understanding of the correlations between deposition parameters, film composition, structure, properties and device performance also continues to improve. The purpose of the symposium is to bring together electrochemists, physicists, engineers, and device designers who are working in the area of magnetic thin-film technology to review the present state of the field and to point out fruitful new areas for research. Materials of interest include Fe, Co, Ni and their alloys, as well as laterally patterned, laminated, or compositionally modulated structures, including nanowires and self-organized films. The symposium will further cover subjects specific to the fabrication of thin-film heads, microelectromechanical systems, micromotors, and other magnetic devices as well as magnetic materials for inductors and transformers in RF devices, magnetic oxides, and ferroelectrics. The symposium will include invited review or tutorial papers and contributed papers.

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**D4****Surface Treatments for Biomedical Applications 4**

Electrodeposition Division / Corrosion Division / Industrial Electrochemistry and Electrochemical Engineering Division

Understanding and manipulating the physical and chemical properties of various surfaces is very important for a variety of applications in the biomedical field. Applications may include various implants, dressings for wound healing and different skin diseases, surfaces for immunodiagnostic devices, patches for a continuous drug release, and surfaces used for the prevention of biofilm formation or corrosion inhibition. The aim of this symposium is to bring together scientists, researchers, and engineers with a multidisciplinary approach of the treatments of surfaces which may increase our knowledge related to various biomedical applications. Treatments of interest include, but are not limited to: (1) all methods of electrodeposition of thin films of various metals (Ag, Au, Cu, Pd, Pt, etc.), oxides, polymers, or salts which are used for implants and devices for wound healing applications, treatment of various skin diseases or the inhibition of corrosion processes; (2) production of composite coatings (metallic, polymeric, or oxide matrices containing biologically active ingredients) via electrodeposition, electroless deposition, or other available methods (e.g. PVD or CVD), which may be useful in devices

for a continuous drug release, implants, catheters, immunodiagnostic devices, or surfaces for biofilm or corrosion prevention; (3) production of thin films via electrochemical or chemical oxidation, which may have unusual properties (antimicrobial, adsorption, high surface area to allow a continued release of desired chemicals or biologicals etc.), and as such may be useful in the production of various biomedical devices or surfaces for the prevention of biofilm formation or corrosion. Substrates of interests may include metals, textile materials (natural or synthetic), foams, polymers, ceramics, etc. Devices of interest are wound dressings, catheters, implants, and devices for the continuous drug release, surgical instruments, immunodiagnostic devices, etc. Papers dealing with the behavior both *in vitro* and *in vivo* are very much encouraged.

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**E—Electrochemical Engineering****E1****Characterization of Electrochemical Reactors: Fluid Dynamics and Current Distribution**

Industrial Electrochemistry and Electrochemical Engineering Division / SMEQ

Electrochemical engineering is of great academic and industrial importance and requires efficient and well characterized and designed purpose built reactors and cells; this includes components such as electrodes, electrolyte compartments, and stacks. Special emphasis has been focused on the design of green electrochemical engineering processes that minimizes environmental impact and promotes long term sustainability. This symposium addresses the most relevant progress made in electrode manufacturing and cell design as well as their characterization in terms of flow dispersion, mass transport, and current and potential distribution. It aims to cover areas from traditional fundamental concepts to cutting edge technologies and cell design, linking world class leading research from the electrochemical community. Of particular interest are the studies of novel green catalytic process and materials able to use low energy and the construction of efficient electrochemical cells with high space-time yield.

Topics include but are not limited to: basic principles and mathematical models for electrochemical process; electrode materials; electrode manufacturing; electrochemical cell and reactor stack design; models of flow dynamics within the electrochemical reactor; mass transport processes; current and potential distribution; theory and practice; electrochemical reactors and their performance; and case studies.

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## **E2** Electrochemical Treatments for Organic Pollutant Degradation in Water and Soils

Industrial Electrochemistry and Electrochemical Engineering Division / SMEQ

The objective of the conference is to bring together scientists, engineers and other professionals to present findings and discuss future trends and directions concerning various electrochemical treatments for organic pollutants degradation in water and soils. The presentations will focus on the scientific and technological advances of electrochemical treatments for organic pollutants degradation in water and soils for the remediation of surface and ground water and drinking water; municipal, industrial, and agro-industrial wastewater, air, and soil contaminated with various recalcitrant compounds, either alone or in conjunction with other processes. Topics include: electrocoagulation; electro-oxidation; electro-Fenton; photoelectro-Fenton; ozonation; ferrate ion; pilot and control process performance; and new technology trends.

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## **E3** Symposium in Honor of Professor Ralph E. White

Industrial Electrochemistry and Electrochemical Engineering Division / Energy Technology Division

This symposium will be held in honor of Ralph E. White, in recognition of his significant contributions to electrochemical engineering, the advancement of mathematical modeling and modeling of electrochemical systems, and the interaction of modeling with improvements in industrial electrochemistry. Mathematical modeling of electrochemical systems has played and continues to play a significant role in understanding industrial electrochemical systems, process optimization and control, and improvement in efficiency and reduction in cost and waste. Submissions will be accepted for papers related to electrochemical systems including applications for batteries, fuel cells, electrodeposition, capacitors, sensors, corrosion, and electro-organic synthesis, as well as modeling and simulation methods and techniques.

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## **F—Fuel Cells, Electrolyzers, and Energy Conversion**

### **F1** Thermal Energy Harvesting

High Temperature Materials Division

Energy harvesting as the use of available ambient thermal energy to provide electricity for small and or mobile equipment, whether electrical or electronic, is important. In 2011, \$700 million was spent on the energy harvesting component itself, and expected to rise to just under \$5 billion in 2021. The objective of this symposium is to bring together researchers working on thermal energy harvesting. Papers are solicited in all areas of energy harvesting including: thermo-electrochemical converter systems, solid-state engines, electrochemical heat engines, temperature-dependent chemical reactions and cycles for converting thermal to electrical energy, thermal energy conversion to chemical energy through metal/metal oxide pairs, thermo-electric couples, concentrated solar power, and other concepts for converting waste and other un-utilized thermal energy to other energy forms.

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### **F2** Solid State Ionic Devices 10

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

Solid-state electrochemical devices, such as batteries, fuel cells, membranes, and sensors are critical components of technologically advanced societies in the 21<sup>st</sup> century and beyond. The development of these devices involves common research themes such as ion transport, interfacial phenomena, and device design and performance, regardless of the class of materials or whether the solid state is amorphous or crystalline. The intent of this symposium is to provide a forum for recent advances in solid-state ion conducting materials and the design, fabrication, and performance of devices that utilize them.

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F3

## Polymer Electrolyte Fuel Cells 14 (PEFC 14)

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

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

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

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

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

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

Presentations related to acid and alkaline fuel cells that discuss: 1. novel gas diffusion medium substrates and micro-porous layer designs; 2. modeling and diagnostic methods to characterize mass- and heat-transport related phenomena (e.g., water flooding) in cells and membrane electrode assemblies; 3. CO<sub>2</sub> tolerance modeling of anion-exchange membrane fuel cells; 4. in-situ measurement or visualization (X-ray tomography, neutron scattering, etc.); 5. advanced ex-situ characterization methods (TEM, STM); 6. AC-impedance methods; and 7. Electrode and MEA electrochemical modeling.

Section B: Fuel Cell Systems, Stack/BOP Design, Gas Processing  
Organizers: J. Fenton, T. Fuller, D.C. Hansen, Y. Meas, Karen Swider-Lyons, K. Shinohara

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

other electrochemical energy conversion devices such as electrolyzers, electrochemical hydrogen pumps, etc.

Section C: Cation-Exchange Membrane Performance & Durability  
Organizers: M. Edmundson, D. Jones, K.A. Perry

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

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

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

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

Section E: Materials for Alkaline Fuel Cells and Direct-Fuel Fuel Cells  
Organizers: R. Mantz, S.R. Narayanan, T.J. Schmidt, Vijay Ramani

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

Abstracts, suggestions, and inquiries should be sent electronically to the ECS headquarters office and to the appropriate Section Lead Organizer (see below). Note that the abstract submission deadline is March 28, 2014.

Publication of an ECS Transactions issue is planned to be available at the meeting. Papers will be accepted for oral presentation only with the submission of both a camera-ready manuscript and the abstract. Papers without a camera-ready manuscript may be submitted for a poster presentation. The full ECS Transactions manuscripts should be submitted no later than June 27, 2014.

Organizers: Section A: F.N. Büchi (Section Lead Organizer), Paul Scherrer Institut, Switzerland, e mail: felix.buechi@psi.ch; H.A. Gasteiger (Lead Editor), Technische Universität München, Germany, e mail: hubert.gasteiger@tum.de; A. Weber, Lawrence Berkeley National Laboratory, USA, e mail: azweber@lbl.gov.

Section B: J. Fenton Univ. of Central Florida, Cocoa, FL, USA, e mail: jfenton@fsec.ucf.edu; T. Fuller, Georgia Institute of Technology, Atlanta, USA, e mail: tom.fuller@gtri.gatech.edu; D.C. Hansen, Univ. of Dayton Research Inst., OH, USA, e mail: Douglas.Hansen@udri.udayton.edu; Y. Meas, Center for Research and Technological Development in Electrochemistry, Parque Tecnológico Queretaro, Pedro Escobedo, Mexico, e mail: yunymeas@cideteq.mx; K. Swider-Lyons (Section Lead Organizer), Navy Research Laboratory, USA, e mail: karen.lyons@nrl.navy.mil; K. Shinohara, Nissan Motor, Japan, e mail: k-shino@mail.nissan.co.jp.

Section C: M. Edmundson, W. L. Gore & Associates, Elkton, MD USA, e-mail: medmunds@wlgore.com; D. Jones (Section Lead Organizer), Université Montpellier, France, e mail: Deborah.Jones@univ-montp2.fr; K.A. Perry, Oakridge National Laboratory, USA, e-mail: perryka@ornl.gov.

Section D: C. Coutanceau, Université de Poitiers, France, e mail: christophe.coutanceau@univ-poitiers.fr; S. Mitsushima, Yokohama National University, Japan, e mail: mitsushi@ynu.ac.jp; P. Strasser, Technical University Berlin, USA, e mail: pstrasser@tu-berlin.de; H. Uchida (Section Lead Organizer), University of Yamanashi, e mail: h-uchida@yamanashi.ac.jp.

Section E: R. Mantz, U.S. Army Research Office, USA, e mail: robert.a.mantz@us.army.mil; S.R. Narayanan, Univ. of Southern California, Los Angeles, California, USA, e-mail: srnaraya@college.usc.edu; T.J. Schmidt, Paul Scherrer Institut, Villigen, Switzerland, e mail: ThomasJustus.Schmidt@psi.ch; V. Ramani (Section Lead

Organizer), Illinois Institute of Technology, Chicago, USA, e-mail: ramani@iit.edu.

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

A hard-cover issue 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 June 27, 2014. 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: **H. A. Gasteiger**, TU-Munich, email: hubert.gasteiger@tum.de; **Yunmy Meas**, CIDETEQ, email: yunnymeas@cideteq.mx; **F. N. Büchi**, Paul Scherrer Institut, email: felix.buechi@psi.ch; **C. Coutanceau**, Université de Poitiers, email: christophe.coutanceau@univ-poitiers.fr; **M. Edmundson**, W. L. Gore & Associates, email: medmunds@wlgore.com; **J. Fenton**, Univ. of Central Florida, email: jfenton@fsec.ucf.edu; **T. Fuller**, Georgia Institute of Technology, email: tom.fuller@gtri.gatech.edu; **D. C. Hansen**, Univ. of Dayton Research Inst, email: Douglas.Hansen@udri.udayton.edu; **D. Jones**, Université Montpellier, email: Deborah.Jones@univ-montp2.fr; **R. Mantz**, U.S. Army Research Office, email: robert.a.mantz@us.army.mil; **Y. Meas**, Parque Tecnológico Querétaro, email: yunnymeas@cideteq.mx; **S. Mitsushima**, Yokohama National University, email: mitsushi@ynu.ac.jp; **S. R. Narayanan**, Univ. of Southern California, email: srnaraya@college.usc.edu; **K. A. Perry**, Oakridge National Laboratory, email: perryka@ornl.gov; **V. Ramani**, Illinois Institute of Technology, email: ramani@iit.edu; **T. J. Schmidt**, Paul Scherrer Institut, email: ThomasJustus.Schmidt@psi.ch; **K. Shinohara**, Nissan Motor, email: k-shino@mail.nissan.co.jp; **P. Strasser**, Technical University Berlin, email: pstrasser@tu-berlin.de; **K. Swider-Lyons**, Navy Research Laboratory, email: karen.lyons@nrl.navy.mil; **H. Uchida**, University of Yamanashi, email: h-uchida@yamanashi.ac.jp; and **Adam Weber**, LBNL, email: azweber@lbl.gov.

## G—Organic and Bioelectrochemistry

### G1 Bioelectroanalysis and Bioelectrocatalysis 2 Physical and Analytical Electrochemistry Division / SMEQ

Papers are solicited on fundamental and applied aspects of bioelectroanalysis and bioelectrocatalysis: including the design, fabrication, and evaluation of biosensors, biofuel cells, and bioprobes, as well as electrochemical lab-on-a-chip devices for bioanalysis and biomedical applications. All papers in electroanalytical techniques for biological molecules are invited, as well as papers focused on fundamental bioelectrocatalysis for sensing and analysis applications. Direct and mediated bioelectrocatalysis for energy conversion devices are of particular interest. Microbial, organelle, protein, and nucleic acid biocatalysts are of interest.

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later than November 14, 2014. 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: **S. Minter**, University of Utah, e-mail: minter@chem.utah.edu; **P. Atanasov**, University of New Mexico, e-mail: plamen@unm.edu; **L. V. González-Gutiérrez**, CIDETEQ, e-mail: lgonzalez@cideteq.mx; and **D. Fox**, American University, e-mail: dfox@american.edu.

## H—Physical and Analytical Electrochemistry, Electrocatalysis, and Photoelectrochemistry

### H1 Physical and Analytical Electrochemistry 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 some related order, depending on the titles and contents of the submitted abstracts.

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

### H2 Chemically Modified Electrodes Physical and Analytical Electrochemistry Division / Electrodeposition Division

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, and (4) redox catalysis.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **M. Anderson**, Kennesaw State University, e-mail: mark\_anderson@kennesaw.edu; **A. Fitch**, Loyola University Chicago, e-mail: afitch@luc.edu; and **J. Stickney**, University of Georgia, e-mail: stickney@chem.uga.edu.

### H3 Electrochemistry in Nanospaces 2 Physical and Analytical Electrochemistry Division

This symposium will provide an international and interdisciplinary forum for researchers to present their recent research on electrochemical studies in nanospace (nanopores, nanoholes) having well-defined structures. The topics will include, but are not limited

to: electrochemical approaches to synthesize novel nanoporous materials, electrochemical studies on mass/electron/charge transport behavior within nanospace, and applications of nanoporous materials for electroanalytical sensing and power sources.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **T. Ito**, Kansas State University, e-mail: ito@ksu.edu; and **L. Baker**, Indiana University, e-mail: lanbaker@indiana.edu.

## H4 Electrode Processes 9

### Physical and Analytical Electrochemistry Division / Energy Technology Division / SMEQ

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

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **A. Hillier**, Iowa State University, e-mail: hillier@iastate.edu; **R. Larios-Durán**, University of Guadalajara, e-mail: roxana.larios@red.cucei.udg.mx; and **J. St-Pierre**, Hawaii Natural Energy Institute, e-mail: jsp7@hawaii.edu.

## H5 Liquid-Liquid Electrochemical Interfaces

### Physical and Analytical Electrochemistry Division

This symposium is dedicated to various aspects of electrochemistry at the interface between two immiscible electrolyte solutions (ITIES). Within this broad field, the emphasis will be on fundamental studies of the interfacial structure, on the dynamics of charge transfer reactions and interfacial partitioning, and on interfacial processes involving nanoparticles and biomolecules (e.g., proteins and DNA). The methods exploring these interfaces can be electrochemical, optical (including x-ray), or theoretical (e.g., molecular dynamic modeling). Topics of special interest include: (1) modeling and experimental studies of the ITIES structure, (2) biomolecules at liquid interfaces, (3) nanoparticles at liquid interfaces, (4) dynamics of electron and ion transfers, (5) analytical applications of the ITIES, (6) technological or industrial applications of such interfaces, and (7) new techniques and novel interfaces (e.g., ionic liquids).

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizer: **P. Vanýsek**, Northern Illinois University, e-mail: pvanýsek@gmail.com.

## H6 Molten Salts and Ionic Liquids 19

### Physical and Analytical Electrochemistry Division / Electrodeposition Division / Energy Technology Division

This symposium will provide an international and interdisciplinary forum to present the latest research on systems involving molten salts and ionic liquids. Papers on basic and applied research in all areas of chemistry, engineering, electrochemical systems, and physics related to molten salts and ionic liquids are solicited. The topics will include: (1) power & energy applications (e.g., batteries, fuel cells, semiconductors, photovoltaics, and phase change energy storage); (2) rare earth and nuclear chemistry (e.g., lanthanides, actinides, radioisotopes, nuclear reprocessing); (3) electrodeposition (e.g., deposition of alloys, characterization of electroactive species, and surface characterization); (4) reactions (e.g., catalysis, synthesis, oligomerizations, and polymerizations); (5) separations (e.g., selective extractions and biphasic systems); (6) solute and solvent properties (e.g. structural investigations, thermal properties, dynamics, and stability of ionic liquids and molten salts); (7) biomass applications (e.g., dissolution, modification, and/or reactions utilizing biomass), (8) materials (e.g., polymer blends, active coatings, and corrosion studies); and (9) new ionic liquids and molten salt mixtures (e.g., liquid clathrates, binary and ternary melts, and task specific ionic liquids). Keynote lectures will be presented by invited speakers. A poster session will be planned. Student participation is highly encouraged, and it is anticipated that some funds will be available for student and young scientist support.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **M. Reichert**, University of South Alabama, e-mail: reichert@southalabama.edu; **P. Trulove**, United States Naval Academy, e-mail: trulove@usna.edu; **R. A. Mantz**, Army Research Office, e-mail: robert.a.mantz@us.army.mil; **S. Mukerjee**, Northeastern University, e-mail: s.mukerjee@neu.edu; **H. De Long**, AFOSR, e-mail: hugh.delong@afosr.af.mil; **F. Endres**, TU Clausthal, e-mail: frank.endres@tu-clausthal.de; **A. Bund**, TU Ilmenau, e-mail: Andreas.Bund@tu-ilmenau.de; and **A. Ispas**, TU Ilmenau, e-mail: Adriana.Ispas@tu-ilmenau.de.

## H7 Oxygen Reduction Reactions

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

The oxygen reduction reactions are a major focus of research in electrocatalysis and related to numerous scientific disciplines. Examples include development of catalysts for low-temperature proton exchange membrane fuel cells, enzymatic biofuel cells, air batteries or high temperature fuel cells as well as chemical, biological and biomedical sensors. This symposium will feature presentations on research dealing with the fundamental and applied aspects of oxygen reduction reactions of relevance various aspects of science and existing technologies. Papers are solicited in all areas of analytical, kinetic and mechanistic studies (also at molecular level), development of novel catalytic materials (utilizing noble metals, alloys, surface-decorated and nanostructured systems, ceramic materials, nanostructured metal oxides and various carbon supports, molecular or metallo-organic materials including N4-transition metal microcycles, metal-Nx type catalysts, enzymes or their combinations,

microbial biofilm-based layers and various hybrid systems), modeling, simulation and evaluation of electrode systems for oxygen reduction as well as discussion of related interfacial phenomena.

Special attention will be paid to new techniques to probe oxygen reduction electrocatalytic reactions, formation and decomposition of hydrogen peroxide as the reaction intermediate and biomedical and other applications of oxygen electrochemistry. Specific areas of interest also include development of non-precious metals for oxygen reduction under various conditions, attempts to reduce the amounts of precious metals, possible applications in hydrogen-air and direct alcohol fuel cells. The symposium will include both invited and contributed papers on all aspects of the oxygen reduction chemistry, physics and materials chemistry and engineering of electrocatalytic systems. The goal is to bring together scientists and engineers of different backgrounds that are active in the areas mentioned above.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **P. J. Kulesza**, University of Warsaw, Poland; e-mail: pkulesza@chem.uw.edu.pl; **R. Mantz**, US Army Research Office, e-mail: robert.a.mantz@us.army.mil; **P. Zelenay**, Los Alamos National Laboratory, e-mail: zelenay@lanl.gov; **J. W. Fergus**, Auburn University, email: jwfergus@eng.auburn.edu; **P. Atanassov**, University of New Mexico, e-mail: plamen@unm.edu; **P. Gannon**, Montana State University, e-mail: pgannon@coe.montana.edu; **X.-D. Zhou**, University of South Carolina, e-mail: ZHOX@cec.sc.edu; **Y. Shao-Horn**, Massachusetts Institute of Technology, e-mail: shaohorn@mit.edu; **H. Xu**, Giner Inc., e-mail: hxu@ginerinc.com; and **M. Shao**, Ford Motor Company, e-mail: minhua@gmail.com.

## **H8** Systems Electrochemistry

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

An electrochemical reaction provides a prototype example of a complex system where interactions of chemical reactions and physical processes (mass transfer, electrostatics) produce non-trivial, emergent temporal and spatial dependences of reaction rates. The integrative experimental and modeling techniques are the common denominators in systems electrochemistry: the main objective is to advance the understanding of emergent properties of electrochemical systems in which many variables are handled simultaneously. A wide range of, typically far-from-equilibrium, systems are considered in electrocatalysis, corrosion, bioelectrochemistry, electrodeposition, batteries, fuel cells, and semiconductor systems. Concrete examples include multistability, periodic and chaotic oscillations, and pattern formation in electrochemical reactions, whole-cell bioelectrochemistry, stability of single and cascaded fuel cells, reaction dynamics coupled with mass transfer, and stochastic corrosion phenomena. The symposium aims to break down the traditional disciplinary barriers between electrochemists by bringing together experts in various fields who use mathematical and experimental approaches for the characterization of dynamical responses in temporal and spatial domains. The adoption of systems approaches in various fields will expand considerably the understanding of complex electrochemical processes. We foresee conference papers about novel methods developed in testbed academic systems as well as applications of systems engineering in actual electrochemical devices used in industry.

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**encouraged to submit their full text manuscript for the issue no later than November 14, 2014. 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: **I. Z. Kiss**, Saint Louis University, e-mail: izkiss@slu.edu; **Scott Calabrese Barton**, MSU, e-mail: scb@msu.edu; **V. Subramanian**, Washington University in St. Louis, e-mail: vsubramanian@wustl.edu; **R. Hanke-Rauschenbach**, Max Planck Institute for Dynamics of Complex Technical Systems, e-mail: hanke-rauschenbach@mpi-magdeburg.mpg.de; **H. Varela**, Universitat de Sao Paulo, e-mail: hamiltonvarela@usp.br; and **S. Nakanishi**, University of Tokyo, e-mail: nakanishi@light.t.u-tokyo.ac.jp.

## **M—Carbon Nanostructures and Devices**

### **M1** Nanocarbon Fundamentals and Applications— from Fullerenes to Graphene

Fullerenes, Nanotubes, and Carbon Nanostructures  
Division / Dielectric Science and Technology  
Division / Physical and Analytical Electrochemistry  
Division / SMEQ

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

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **R. B. Weisman**, Rice University, e-mail: weisman@rice.edu; **M. E. Rincón-González**, CIIE-UNAM, e-mail: merg@cie.unam.mx; **D. Clifffel**, Vanderbilt Univ., e-mail: d.clifffel@vanderbilt.edu; and **Y. Obeng**, NIST, e-mail: yaw.obeng@nist.gov.

## **N—Dielectric Science and Materials**

### **N1** Thermal and Plasma CVD of Nanostructures and Their Applications

Dielectric Science and Technology Division / High  
Temperature Materials Division / Sensor Division

CVD, plasma enhanced CVD, and various related deposition techniques have enjoyed success in the microelectronics industry. Based on their advantages for materials processing, these techniques have emerged for the preparation of nanostructured materials. Some examples include growth of inorganic nanowires such as silicon, germanium, various oxides (titania, zinc oxide, etc), nitrides (GaN), etc. Vapor-liquid-solid (VLS) and related techniques, template assisted techniques (CVD, electrodeposition), and planar deposition are some of the popular approaches in nanowire/nanotube growth

for applications in electronics, sensors, and thermoelectrics. Carbon nanotube preparation is now widely done using CVD and PECVD for patterned growth for applications in nanoelectronics, nanodevices, sensors, and field emission. A variety of other nanostructured materials such as nanopowders and nanowire arrays are also prepared by these versatile techniques. Recently, CVD is being explored for growth of graphene and other two-dimensional materials. The topics for this symposium include, but are not limited to, the above-mentioned materials and applications. Papers focusing on growth mechanisms, modeling, process diagnostics, materials characterization, and advances in applications are strongly encouraged. A special focus of this symposium is on nanomaterials for energy applications including fuel cells, water splitting, photovoltaics, and batteries.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **M. K. Sunkara**, University of Louisville, e-mail: mahendra@louisville.edu; **M. Sankaran**, Case Western Reserve University, e-mail: mahendra@louisville.edu; **U. Cvelvar**, Jozef Stefan Inst, e-mail: uros.cvelbar@ijs.si; **M. Meyyappan**, NASA Ames Research Center, e-mail: m.meyyappan@nasa.gov; and **B. Chin**, Auburn University, e-mail: bchin@eng.auburn.edu.

## P—Electronic Materials and Processing

### P1 Atomic Layer Deposition Applications 10 Dielectric Science and Technology Division / Electronics and Photonics Division

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

This symposium offers an excellent forum for sharing cutting edge research on both existing and emerging ALD applications, as well as fundamental aspects of ALD technology. Contributions are solicited in the following areas: (1) semiconductor CMOS applications: development and integration of ALD high-k oxides and metal electrodes with conventional and high-mobility channel materials; (2) volatile and non-volatile memory applications: extendibility, Flash, MIM, MIS, RF capacitors, etc.; (3) interconnects and contacts: integration of ALD films with Cu and low-k materials; (4) fundamentals of ALD processing: reaction mechanisms, *in situ* measurement, modeling, theory; (5) new precursors and delivery systems; (6) optical and photonic applications; (7) coating of nanoporous materials by ALD; (8) MLD and hybrid ALD/MLD; (9) ALD for energy conversion applications such as fuel cells, photovoltaics, etc; (10) ALD for energy storage applications; and (11) productivity enhancement, scale-up, and commercialization of ALD equipment and processes for rigid and flexible substrates, including roll-to-roll deposition.

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### P2 Electrochemistry in Organic Electronic Materials: Synthesis, Analysis, and Applications

Organic and Biological Electrochemistry Division /  
SMEQ

Organic electronic devices have shown a rapid increase in performance in the last decades thanks to new developments and research in organic materials. Nowadays the possibility of making deposits of organic semiconductors on flexible and low-cost substrates has opened the way to new applications such as driving circuits for electronic paper, flexible microelectronics, or printed radio frequency identification (RFID) tags. Light emitting diodes (OLEDs), thin film transistors (OTFT), photovoltaic cells (OPVC) or solar cells (OSC), organic field-effect transistors (OFET), electrochromic devices, sensors, flexible microelectronics, memories, and others are among the important electronic devices that will be discussed. Specific areas to be covered in this symposium include but not limited to (1) use of electrochemistry in the preparation of organic semiconductor or conducting materials useful in organic electronic devices, (2) electrochemical analysis techniques for characterizing the properties of the organic materials, and (3) the performance study of the organic electronic devices prepared.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **B. A. Frontana-Urbe**, CCIQS-UNAM, e-mail: bafrontu@unam.mx; and **N. A. Macías-Ruvalcaba**, FQ-UNAM, e-mail: nmaciasr@gmail.com.

### P3 High Purity and High Mobility Semiconductors 13 Electronics and Photonics Division

The 13<sup>th</sup> High Purity and High Mobility Semiconductor symposium, which is an extension of the previous High Purity Silicon symposium, provides a forum for discussion of the latest developments in the growth, characterization, device processing, and applications of high purity and high mobility semiconductor materials in either bulk or epitaxial form. The emphasis is on the control and prevention of impurity incorporation, characterization and detection of defects and impurity states in high purity and high mobility semiconductors for superior device performances. Device and circuit aspects related to the use of devices on high quality and advanced silicon wafers will also be addressed. Special attention will be given to alternative and high-mobility substrates and their material and device aspects.

Contributed papers are solicited in the following main areas: (1) high purity bulk growth techniques: Czochralski (Cz), float zone, magnetic Cz, and other novel growth techniques; progress in polysilicon manufacturing, influence of poly quality on the purity of monocrystals; impact of auxiliaries like *e.g.* quartz, graphite, furnace parts, and gas media purity on crystal properties; (2) impurity related and intrinsic bulk defects: point defect mechanisms and clustering,

influence of doping concentrations, carrier lifetime behavior; oxygen, nitrogen, carbon, hydrogen, transition metals and their gettering; defect engineering and control, denuded zone (DZ) formation, gettering in thin wafers; group IV doping effects; (3) diagnostic techniques: lifetime and impurity level studies, spectroscopic techniques, spreading resistance probing, Hall-effect; contamination detection and monitoring in handling and packaging high purity semiconductor materials; characterization techniques relevant to the assessment of impurities and defects; (4) advanced and alternative substrates and materials: epitaxial fabrication techniques, epi layer processing, interaction with substrate properties; bulk and interface defect control and characterization; Silicon-on-Insulator (SOI), Germanium-on-Insulator (GeOI), III-V-on-Insulator, wafer bonding, and Ge condensation; strained layers on silicon and high-mobility substrates; (5) device and integration aspects: radiation and high energy particle detectors, avalanche photodiodes, strip- and pixel detectors, infrared components, power devices, radiation hardening of materials and devices; photonic components; flexible electronics and 3D integration; device physics, noise performance, low temperature operation, reliability aspects.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **E. Simoen**, IMEC, Belgium, e-mail: simoen@imec.be; **R. Falster**, MEMC Italy, e-mail: rfalster@memc.it; **O. Nakatsuka**, Nagoya University, Japan, e-mail: nakatuka@alice.xtal.nagoya-u.ac.jp; **C. Mazure**, SOITEC, France, e-mail: Carlos.Mazure@soitec.fr; and **C. Claeys**, IMEC, Belgium, e-mail: claeys@imec.be.

## **P4** Plasma Processing 20 Dielectric Science and Technology Division / Electronics and Photonics Division

Due to the propagation of plasma applications into almost all areas of science and technology, the scope of this symposium has been expanded to all applications of low temperature plasmas. As always, papers will be solicited on recent advances of the traditional plasma applications of etching and patterning electronic materials in microelectronics, optoelectronics, MEMS, and 3D packaging targeting homogeneous and heterogeneous integration by chip stacking. The symposium will also cover plasmas applied to modification of functional surfaces. This will include but will not be limited to surface conditioning, cleaning, activation, and passivation of both organic and inorganic semiconductor and non-semiconductor materials, such as auto parts and textiles. In addition, papers will now be solicited in non-semiconductor applications of plasmas such as those used in mechanical engineering, health care, surgery, densification of nuclear waste, underwater welding, and decontamination of materials after exposure to chemical-biological weapons, etc. The new scope of this symposium will cover all aspects of the use of plasmas including diverse applications, plasma chemical reactions and processes, plasma reactor design and materials, reaction mechanisms, plasma damage, and environmental aspects such as process gas abatement. Renowned experts will be invited to provide insight into their exciting work in the various fields of plasma applications in traditional and non-traditional areas.

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hotmail.com; **M. Engelhardt**, Infineon Technologies, e-mail: manfred.engelhardt@infineon.com; **D. W. Hess**, Georgia Institute of Tech., e-mail: dennis.hess@chbe.gatech.edu; and **O. M. Leonte**, Berkeley Polymer Technology, e-mail: odleonte@comcast.net.

## **P5** Processing Materials of 3D Interconnects, Damascene, and Electronics Packaging 6 Electronics and Photonics Division / Dielectric Science and Technology Division / Electrodeposition Division

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

Topics of interest include, but are not limited to: (1) 3D process integration methodologies; (2) 3D design and architectures; (3) simulation and modeling of 3D integrated devices; (4) materials and techniques for die and wafer bonding; (5) processing and handling of thin wafers and dice; (6) materials for temporary die and wafer bonding; (7) vertical interconnect fabrication technology; (8) materials for vertical interconnects: insulators, barriers, and metals; (9) reliability of 3D interconnects; (10) novel test and measurement of 3D integrated devices; (11) thermal management in 3D integrated devices; (12) advanced substrates and packaging, system in packaging (SiP), high speed and optical packaging, wireless and micro CSP; (13) chip interconnect metallization; damascene plating, copper, copper-alloys, silver etc., seed/barrier layers, sputter seeding, metal migration and planarization; and (14) chip-package interconnection; flip-chip (C4) technology, Pb-free C4s, wire bonding, TAB, compliant chip-package interconnection and room temperature joint.

This symposium also aims at discussing the challenges and solutions to extend traditional interconnects beyond the 25-nm node. Suggested topics in the area of interest include (but are not limited to): (1) methods to reduce increases in effective resistivity; (2) methods to mitigate electromigration and stress migration issues; (3) advanced barrier/seed processes including ALD and electroless films; (4) porous low-k ILDs and air gap processing (including deposition and etching); and (5) novel electrodeposition and CMP processes.

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mhayase@rs.noda.tus.ac.jp; **M. Koyanagi**, Tohoku University, e-mail: koyanagi@bmi.niche.tohoku.ac.jp; **G. S. Mathad**, S/C Technology Consulting, e-mail: swami\_mathad@hotmail.com; **P. Ramm**, Fraunhofer Research Institution for Modular Solid State Technologies EMFT Munich, e-mail: peter.ramm@emft.fraunhofer.de; **F. Roozeboom**, Eindhoven University of Technology, e-mail: f.roozeboom@tue.nl; and **S. Shingubara**, Kansai University, e-mail: shingu@kansai-u.ac.jp.

## **P6** Semiconductor Wafer Bonding 13: Science, Technology, and Applications Electronics and Photonics Division

Semiconductor wafer bonding continues to evolve as a crucial technology extending new integration schemes and disseminating new product architectures in such diverse areas as high quality silicon-on-insulator (SOI) materials for microelectronics device applications (high performance CMOS logic platforms, bipolar, BiCMOS, power), strained Si layers by process-induced methodologies as well as built in strain in the bonded wafer, Si-Ge, germanium-on-insulator (GeOI), three-dimensional (3D) device integration, Si on quartz and Si on glass for active matrix addressed thin film displays, III-V compound semiconductor heterostructures, bonding to flexible substrates, and bonded heterostructures for microtechnologies, micro-electro-mechanical systems (MEMS), biotechnologies, optronics, photovoltaic... During recent years layer transfer by wafer bonding and exfoliation techniques have sufficiently matured not only to make their mark on the commercial semiconductor substrate market but also to extend to 3D integration of various materials and devices. Besides new techniques of transfers (laser lift off, spallation...) have been developed. This symposium, sponsored by the Electronics Division of the Society, brings together materials, device and process engineers from these and related interdisciplinary areas.

The thirteenth symposium solicits original theoretical and experimental papers that document new developments and cover the full range of basic science, process technologies, and product applications of semiconductor wafer bonding (direct, anodic, thermo-compression, eutectic, adhesive... bonding). Besides permanent bonding, temporary wafer bonding technique deserves also to be discussed regarding all the recent development in many 3D applications. Fundamental aspects of interest include surface preparations for bonding, film transferring, low temperature bonding, surface activation at bonding interfaces, bonding techniques, novel material composites to synthesize heterostructures. Presentations characterizing currently utilized materials and processes, as well as novel approaches to new materials systems and modeling and process simulations are encouraged. Practical aspects of interest include innovative developments in product architecture and new integration and processing schemes for microelectronics, photonics, MEMS, microtechnologies, nanotechnologies and other relevant applications.

All papers will be grouped into topical sessions which will be preceded by a selection of invited review papers. A poster session will be held as well as the normal oral sessions. Best regular and student papers and posters will be awarded.

Sessions will include the following topics: Physics, Chemistry and Mechanics of Wafer Bonding, Characterization of Bonding Interfaces, Bonding Techniques and Equipment, Generalized Bonding (heterostructures, bonding via deposited films...), Layer Transfer Methods, Electronic Device Applications (bipolar, high voltage and power, CMOS, microwave...), 3D Integration, Packaging, Photonic, Micro-Electro-Mechanical, Biotechnologies and Other Applications.

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## **P7** SiGe, Ge, and Related Compounds: Materials, Processing, and Devices 6 Electronics and Photonics Division

This symposium will provide a forum for reviewing and discussing all materials and device related aspects of SiGe, Ge, and related compounds (SiC, SiGeC, etc). There are nine areas of interest for the symposium: (1) heterojunction bipolar transistors: device physics, process technology, modeling issues, reliability, and circuit applications (analog, digital, and RF to mm-wave); (2) FET technology: SSCMOS, SiGe FET structures, SiGe HEMTs, SiGe MODFETs, SiGe FET structures on SOI, RTD, Ge-FETs, low voltage and low power; (3) optoelectronics: detectors, waveguides, quantum cascade structures, photovoltaic cells, photoluminescence, electroluminescence, integration with CMOS electronics, Ge buffers for III-V optoelectronics on Si, monolithic optoelectronic integrated circuits (OEICs); (4) epitaxy: all aspects of surface preparation and growth of epitaxial Si, SiGe, SiGe:C, and Ge layers; novel growth techniques and tools; selective growth; high Ge content growth; novel *in situ* doping approaches; growth of SiC or III-V on SiGe layers or Ge; quantum wire/dot growth; (5) processing: all aspects of processing including diffusion, oxidation, strain, thermal mixing, and defects; impurity diffusion and diffusion suppression, Si and Ge intermixing, oxidation and nitridation, cleaning and etching of SiGe, Ge, and SiGeC films; (6) strain engineering: relaxed SiGe buffer layers, pseudomorphic SiGe, superlattices, embedded SiGe, Ge condensation, SSOI, SGOI substrates, global strain, local/process-induced strain, strain characterization, strain modeling and simulation, defects, manufacturing issues; (7) surfaces and interfaces: high k interface, metal contact, interfacial electrical properties and its characterization; electromechanical properties of SiGe layers, MEMs, TFTs; (8) germanium and related compounds: novel structures growth (Si:C, III-V on Ge/SiGe), strain, devices, defects, diffusion, dielectric deposition, surface effects; and (9) emerging applications: nanostructured devices, quantum computing, THz devices, electromechanical properties of SiGe layers, MEMs, TFTs, and amorphous SiGe layer applications. This symposium will also feature a special evening workshop on a key SiGe, Ge, and related compounds topic: a panel of experts will discuss issues related to a current key topic and answer questions from the audience. Poster contributions will be exhibited in a dedicated evening session.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **D. Harame**, IBM Corp., e-mail: dharame@us.ibm.com; **J. Boquet**, IBM Corp., e-mail: boquet@us.ibm.com; and **J. Murota**, Tohoku University, e-mail: murota@riec.tohoku.ac.jp.

P8

**Thermoelectric and Thermal Interface Materials**

Electronics and Photonics Division

Today's electronics are smaller and more powerful than ever, leading to ever increasing thermal challenges. Approximately 90% of the world's electricity is generated by heat energy, typically operating at 30-40% efficiency, losing roughly 15 terawatts of power in the form of heat to the environment. Heat sinks and liquids can be used to provide cooling. Advances in thermoelectric materials and devices with high Seebeck coefficients and figures of merit offer possible routes for thermal management, but also waste heat harvesting and power generation. Thermal interface materials importantly help to transfer heat from hot spots to the cooling hardware, and advances in both thermoelectric materials and interface materials are required.

This symposium will address the most recent developments in thermoelectric and thermal interface materials and strategies for modern devices and applications. Papers on both practical and fundamental issues are solicited on topics related to thermoelectric material growth, analysis, processing, and applications, as well as thermal interface material applications and properties. The symposium will address basic and applied research and development, which will include the following areas of particular interest: (1) advances in bulk and nanoscale growth methods; (2) advances in device processing of thermoelectric and thermal interface materials; (3) power generation and energy harvesting and scavenging; (4) refrigeration and cooling; (5) semiconductor materials, growth, and processing; (6) phonon engineering and transport; (7) *in situ* and *ex situ* examination; (8) modeling of nanoscale effects in modern thermoelectric materials; (9) bismuth chalcogenides; (10) inorganic clathrates; (11) group IV and related compounds; (12) oxide and transition metal silicides, properties, and processing; (13) advanced thermoelectric materials; and (14) high ZT materials and devices.

**An issue of *ECS Transactions* is planned to be published "AFTER" the meeting. All authors accepted for presentation are obligated to submit their full text manuscript for the issue no later than November 14, 2014. 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: **C. O'Dwyer**, University College Cork, e-mail: c.odwyer@ucc.ie; and **J. H. He**, National Taiwan University, e-mail: jhhe@cc.ee.ntu.edu.tw.

P9

**Transparent Conducting Materials for Electronic and Photonics**

Electronics and Photonics Division / Dielectric Science and Technology Division

Transparent conducting materials are critical for many optoelectronic, photonic, sensor, and smart display devices and systems. The TCMAT symposium will address the most recent developments in transparent conducting materials, oxides, and emerging alternative materials and strategies for modern devices and applications. Papers on both practical and fundamental issues are solicited based on new nanoscale investigations of nanowire networks (oxides and metals), graded index layers, and alternative porous assemblies, smart displays, and self-cleaning materials. The symposium will address basic research into transparency and conductivity in materials and also their processing and application in devices, displays, and related systems.

The following areas are of particular interest: (1) advances in bulk, epitaxial, and nanoscale growth technologies; (2) advances in device processing; (3) transparent conducting materials for electronic, optoelectronic, and sensor devices; (4) Schottky and ohmic contact technology; (5) dielectric and optical properties

of porous and transparent material assemblies; (6) alternative materials and transparent nanowire networks; (7) *in situ* and *ex situ* spectroscopic examination; (8) material characterization and processing; (9) transparent conducting oxides; (10) plasmonic effects in TCOs and related materials; (11) growth and characterization of semiconductor and metallic nanoscale transparent materials; (12) graded index material deposition; (13) antireflection coatings; (14) smart transparent display technologies; and (15) transparent self-cleaning materials.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **C. O'Dwyer**, University College Cork, e-mail: c.odwyer@ucc.ie; **J. H. He**, National Taiwan University, e-mail: jhhe@cc.ee.ntu.edu.tw; **J. K. Kim**, Pohang University of Science and Technology, e-mail: kimjk@postech.ac.kr; and **O. Leonte**, Berkeley Polymer Technology, e-mail: odleonte@comcast.net.

**Q—Electronic and Photonic Devices and Systems**

Q1

**Emerging Nanomaterials and Devices**

Electronics and Photonics Division / Dielectric Science and Technology Division

As CMOS scaling is reaching its limit, emerging nanomaterials and devices are being intensively studied for extending or replacing conventional microelectronics and technology. Study of new functional materials and devices at nanoscale will enable a wide range of novel electronics and photonics with extraordinary properties for future technologies. This symposium will feature oral and poster presentations on the research of emerging nanomaterials and devices for electronic, photonic, spintronic, and electrochemical applications. Contributions are solicited in the following areas: (1) two-dimensional (2D) atomic crystals (such as graphene, MoS<sub>2</sub>, and WSe<sub>2</sub>); (2) 2D atomic crystal for photonics applications; (3) three-dimensional (3D) topological insulators (TIs) and TI nanowires/nanotubes; (4) topological insulator devices and applications; (5) one-dimensional (1D) nanowires/nanotubes and devices; (6) molecular electronics and applications; (7) nanomaterials for chemical and biological sensing; and (8) nanomaterials for renewable energy and energy storage. To encourage active student participation we anticipate covering the registration fee for all students who are the presenting authors of accepted presentations, both oral and posters, provided that the manuscript is submitted by the deadline.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Q. Li**, George Mason University, e-mail: qli6@gmu.edu; **H. Baumgart**, Old Dominion University, e-mail: hbaumgar@odu.edu; **J.-H. He**, National Taiwan University, e-mail: jhhe@ntu.edu.tw; **C. A. Richter**, National Institute of Standards and Technology, e-mail: curt.richter@nist.gov; **H. Wang**, SARI Chinese Academy of Sciences, e-mail: wanghui@sari.ac.cn; and **O. D. Jurchescu**, Wake Forest University, e-mail: jurcheod@wfu.edu.

## Q2 Fundamentals and Applications of Microfluidic and Nanofluidic Devices 2

Electronics and Photonics Division / Physical and Analytical Electrochemistry Division

Research on microfluidic and nanofluidic devices has increased tremendously over the past decade. These systems are finding potential technological applications ranging from biomedical devices to chemical and biological reactors, environmental monitoring and micro-cooling systems. This symposium brings together researchers in materials, devices, and process engineers, and related interdisciplinary areas, and seeks to capture the state-of-the-art in the microfluidics and nanofluidics technologies. This symposium offers a new interdisciplinary and international platform, and aims to contribute toward advancing the fundamental understanding of the challenges and issues. Original contributions are solicited that cover all fundamental and applied aspects including the transport phenomena, device/system fabrication and integration, and the applications of microfluidic and nanofluidic systems. All oral presentations will be grouped into topical sessions. Invited keynote speakers will present critical perspectives covering recent advances and future directions in the diverse field of microfluidic and nanofluidic devices.

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## Q3 GaN and SiC Power Technologies 4

Electronics and Photonics Division / Dielectric Science and Technology Division

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

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

## Q4 Low-Dimensional Nanoscale Electronic and Photonic Devices 7

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

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

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## Q5 Nonvolatile Memories

Dielectric Science and Technology Division / Electronics and Photonics Division

Nonvolatile flash memory has followed the scaling evolution of the semiconductor roadmap, however, there is increasing concern about scalability into the next decade. At the same time, many new memory storage mechanisms and materials are showing promise as potential replacement of flash. The symposium will address the recent developments in nonvolatile memory devices such as FeRAM, MRAM, ReRAM, PRAM, STTRAM, flash memory and other emerging new nonvolatile memories such as atomic switching and nano-gap devices and their related materials and technologies. The program will consist of both invited and contributed papers. Papers will cover both practical issues and fundamental studies and are solicited in the following suggested areas: (1) advanced devices, device structures and performances, and device design; (2) memory related materials and their growth and deposition processes; (3) device fabrication processing; (4) structure analyses, and material and process characterization; (5) device functional characterization, device physics, and modeling; (6) system applications; and (7) other related technologies.

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kansai-u.ac.jp; **Z. Karim**, Aixtron, email: z.karim@aixtron.com; **B. Magyari-Kope**, Stanford University, email: blankamk@stanford.edu; **T. Ohyanagi**, LEAP, email: ohyanagi@leap.or.jp; **A. Sebastian**, IBM Zurich, email: ASE@zurich.ibm.com; **K. Kobayashi**, Tokai University, email: kkbys@keyaki.cc.u-tokai.ac.jp; **K. Rhie**, Korea University, email: krhie@korea.ac.kr; **L. Goux**, IMEC, email: Ludovic.Goux@imec.be; **G. Bersuker**, SEMATECH, email: Gennadi.Bersuker@sematech.org; and **H. Shima**, AIST, email: shima-hisashi@aist.go.jp.

Q6

## Photovoltaics for the 21<sup>st</sup> Century 10

Dielectric Science and Technology Division / Electrodeposition Division / Electronics and Photonics Division / Energy Technology Division / Industrial Electrochemistry and Electrochemical Engineering Division

With the current global energy consumption at 15 TW and projected demand of 46 TW by 2100, photovoltaic solar cells have to be deployed at a scale of tens of peak terawatts or they will have little impact on our future energy mix. Almost all of the current cell technologies suffer from natural resource limitations, which prevent them from reaching terawatt scales. These limitations include high energy input for wafer-Si cells and material scarcity for CdTe, CIGS, wafer-Si, and thin-film Si cells. Scarce photovoltaic materials include well-known Te, In, Ga, as well as Ag. These limitations have to be removed or new cell technologies, which do not suffer from resource limitations, have to be developed, for solar electricity to become a significant source of energy in our future. Fundamental and applied research is needed to make breakthroughs in wafer-Si technologies, thin-film technologies, as well as totally new photovoltaic concepts. This symposium will focus on conventional and non-conventional technologies for photovoltaic conversion that could be deployed to a terawatt scale in the 21<sup>st</sup> century. Contributions of both fundamental and applied nature leading to low-cost high-efficiency photovoltaic conversion are solicited. Topics of interest include but not limited to: (1) solar-grade Si; (2) wafer-Si cells; (3) thin-film Si cells; (4) CdTe cells; (5) CIGS cells; (5) new earth-abundant photovoltaic materials; (6) non-conventional photovoltaic structures or concepts; and (7) cross-cutting issues in cells, modules, and systems.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **M. Tao**, Arizona State University, e-mail: meng.tao@asu.edu; **C. Claeys**, IMEC, e-mail: claeys@imec.be; **H. Deligianni**, IBM Watson Research Center, e-mail: lili@us.ibm.edu; **J. M. Fenton**, University of Florida Solar Energy Center / University of Central Florida, e-mail: jfenton@fsec.ucf.edu; **J.-G. Park**, Hanyang University, e-mail: parkjgl@hanyang.ac.kr; **K. Rajeshwar**, University of Texas at Arlington, e-mail: rajeshwar@uta.edu; **T. Druffel**, University of Louisville, e-mail: thad.druffel@louisville.edu; and **H. Hamada**, Kinki University, e-mail: h.hamada@ele.kindai.ac.jp.

Q7

## Semiconductors, Dielectrics, and Metals for Nanoelectronics 12

Dielectric Science and Technology Division / Electronics and Photonics Division

Presentations at this symposium will cover but not restricted to the following topical areas: (1) Germanium channels: surface/interface modeling; band offsets; interface trap control; suitable high-k gate stacks, C-V and G-V characteristics; CMOSFET characteristics. GaAs, InGaAs, InGaSb, InP, GaSb, InSb, GaN, and SiC channels: defect free growth, surface/interface modeling; band offsets; surface cleaning and surface preparation; interface passivation techniques; contact engineering, suitable high-k gate stacks; integration on silicon; C-V and G-V characteristics; CMOSFET characteristics. (2) Semiconductor nanowire technology: synthesis strategies for Si/Ge and III-V nanowires; growth, properties, and device applications of Si/Ge, III-nitride, III-phosphide, III-arsenide, III-antimonide, and III-V ternary nanowires; III-V nanowire transistors; III-V nanowire LEDs, lasers, and solar cells. (3) Nanowire heterostructures, structure/property correlation and surface passivation; influence of defects on transport. (4) 2D semiconductors: synthesis strategies for carbon nanomaterials; growth, properties, and device applications of graphene and carbon nanotubes; interfacing nanocarbons with inorganic and organic semiconductors; graphene transistors; carbon nanotube transistors; growth of MoS<sub>2</sub> and other 2D transition metal dichalcogenides. (5) Gate dielectric deposition on MoS<sub>2</sub> and related dichalcogenides; MoS<sub>2</sub>-based devices; silicene and germanene—growth, characterization, and modeling. (6) Novel transistor structures: multi-gate MOSFETs; organic FET and thin film transistors with high-k dielectrics; transistor structures incorporating strain enhancement. (7) Gate electrode metals and work function tuning: dipoles at high-k/SiO<sub>2</sub> interface and cap layers at high-k/metal interfaces; role of oxygen vacancies; gate first integration; gate last integration; dual metal, dual gate dielectric options. (8) Nanoscale contact issues: 1D and 2D contacts, new contact materials, alloyed contacts, contact engineering at nanoscale, new methods for nanoscale contact characterization, theory and simulations of novel contact architectures. (9) Defects, traps, and reliability: defect generation mechanisms and models; fast transient trapping; slow trapping; new reliability testing techniques; SILC; NBTI, and PBTI; TDDB. (10) Novel dielectric materials and oxide interfaces: dielectrics with  $k > 30$ ; EOT-scaling below 0.7 nm; epitaxial gate insulators; low temperature, conformal dielectrics, e.g. spacer materials; ferroelectric materials; 2DEG at oxide interfaces. (11) Sub-stoichiometric oxides and its manufacturing, e.g., for resistive memory applications. (12) Volatile and non-volatile memory: phase-change RAM; magnetic RAM; ferroelectric RAM; resistive RAM; floating body RAM; conductive-bridging RAM; spin-transfer torque RAM. (13) Challenges for process development: low temperature processing; 3D integration; morphology and phase control of materials; post deposition treatment; surface cleaning technology; etch ability. (14) Integration of dissimilar materials: monolithic and hybrid integration; novel growth techniques; reduction of transition/buffer layer thicknesses; aspect ratio trapping; compliant substrates; superlattices; heterointerfaces; structural characterization; electronic, photonic, and phononic engineered heterostructures.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **S. Kar**, Indian Institute of Technology, e-mail: skar@iitk.ac.in; **M. Houssa**, University of Leuven, e-mail: michel.houssa@fys.kuleuven.be; **H. Jagannathan**, IBM Research, e-mail: jhemanth@us.ibm.com; **K. Kita**, University of Tokyo, e-mail: kita@adam.t.u-

tokyo.ac.jp; **D. Landheer**, National Research Council Canada, e-mail: [dolf.landheer@nrc.ca](mailto:dolf.landheer@nrc.ca); **D. Misra**, New Jersey Institute of Technology, e-mail: [dmisra@njit.edu](mailto:dmisra@njit.edu); and **S. Van Elshocht**, IMEC, e-mail: [sven.vanelshocht@imec.be](mailto:sven.vanelshocht@imec.be).

Q8

## Solid-State Electronics and Photonics in Biology and Medicine

Electronics and Photonics Division / Sensor Division

This symposium aimed to researchers utilizing the unique electronic and photonic properties of solid-state materials and devices to facilitate the understanding of biomolecular interactions, to study the integration of biomolecules and solid-state materials, and to promote the applications of solid-state devices in biology and medicine. Topics of interest are categorized in two major parts: solid-state electronic and photonic sensors, and biomolecular electronics and photonics. Papers are solicited in the following areas, but not limited to: (1) interaction between nanostructured materials (nanoparticles, nanowire, or graphene) and biomolecules (DNA, RNA, peptide, protein, metabolic molecules); (2) solid-state electronic or photonic sensor design and fabrication; (3) surface modification and immobilization; (4) sensor characterization; (5) sensor models and signal analysis; (6) integrated sensor network and systems; (7) various sensor types: field effect transistors, diodes, resistors, nanoparticles, surface plasma resonance, surface-enhanced Raman spectroscopy, surface acoustic wave devices, and quartz crystal microbalance; (8) inter- and intra-biomolecular interactions studied with sensors; (9) multiple sensor arrays; (10) single molecule and single cell detection; (11) bioelectronic systems for medical applications (detection, separation, purification, therapy, and imaging); (12) biomolecular nanodevices; (13) nanopore and nanoslit bioelectronics; (14) inorganic-organic interface; (15) charge/energy transfer; (16) electric field effect on biomolecules and cells; and (17) biomolecular devices for energy harvesting.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Y.-L. Wang**, National Tsing-Hua University, e-mail: [ylwang@mx.nthu.edu.tw](mailto:ylwang@mx.nthu.edu.tw); **A. Hoff**, University of South Florida, e-mail: [hoff@usf.edu](mailto:hoff@usf.edu); **L. Marsal**, University Rovari i Virgili, e-mail: [lluis.marsal@urv.cat](mailto:lluis.marsal@urv.cat); **M. J. Deen**, McMaster University, e-mail: [jamal@mcmaster.ca](mailto:jamal@mcmaster.ca); and **Z. Aguilar**, Covance Laboratories, e-mail: [zapaguilar@yahoo.com](mailto:zapaguilar@yahoo.com).

Q9

## State-of-the-Art Program on Compound Semiconductors 56 (SOTAPOCS 56)

Electronics and Photonics Division

Compound semiconductors are a significant enabler of numerous optoelectronic, high-speed, power, and sensor electronic materials, devices, and systems. The SOTAPOCS 54 symposium will address the most recent developments in inorganic compound semiconductor technology, including traditional III-V materials, III-nitrides, II-VI materials, silicon carbide, diamond, and other emerging materials. Papers on both practical and fundamental issues are solicited. The following areas are of particular interest: (1) advances in bulk and epitaxial growth technologies; (2) advances in device processing; (3) novel electronic, optoelectronic, and sensor devices; (4) Schottky and ohmic contact technology; (5) dielectric properties and passivation; (6) wafer bonding and packaging; (7) *in situ* and *ex situ* process monitoring; (8) material characterization and wafer level testing and

mapping; (9) process induced defects; (10) reliability and device degradation mechanisms; and (11) demonstration of state of art devices and applications.

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Q10

## Thin Film Transistors 12 (TFT 12)

Electronics and Photonics Division

This symposium will continue the tradition of providing a forum for the presentation and discussion of the latest developments in TFTs and related fields. The symposium is a forum for synergistic interactions among those working in TFTs, those working in related high-tech fields, and those applying TFTs to products or research areas. Papers which deal with all aspects of fabrication processes, materials, devices, structures, and applications are solicited. Topics to be addressed in this symposium are: (1) new TFT structures; (2) novel or new processes; (3) Si, organic, inorganic, oxide, nano, and thin film materials; (4) device physics, modeling, characterization, and reliability; (5) applications in LCDs, imagers, sensors, biochips, memories, MEMS, circuits, etc.; and (6) integration of TFTs to large area displays, VLSIC, and other complicated systems.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Y. Kuo**, Texas A&M University, e-mail: [yuekuo@tamu.edu](mailto:yuekuo@tamu.edu); **O. Bonnaud**, Univ. de Rennes 1, e-mail: [bonnaud@univ-rennes1.fr](mailto:bonnaud@univ-rennes1.fr); **J. Jang**, Kyung Hee University, e-mail: [jjang@khu.ac.kr](mailto:jjang@khu.ac.kr); **W. Milne**, Cambridge University, e-mail: [wim1@hermes.cam.ac.uk](mailto:wim1@hermes.cam.ac.uk); **M. Shur**, RPI, e-mail: [shurm@rpi.edu](mailto:shurm@rpi.edu); and **H. Hamada**, Kinki University, e-mail: [h.hamada@ele.kindai.ac.jp](mailto:h.hamada@ele.kindai.ac.jp).

## R—Luminescence and Display Materials, Devices, and Processing

R1

### Luminescence and Display Materials: Fundamentals and Applications (in Honor of Hajime Yamamoto)

Luminescence and Display Materials Division

This symposium will be conducted in memory of Professor Hajime Yamamoto, whose technical contributions and spirit helped to maintain the vitality of the LDM division. This symposium will focus on physical and chemical aspects of luminescence in both organic and inorganic materials and will address current and emerging technical and scientific issues in luminescence. Presentations at this

meeting will include photoluminescent materials, cathodoluminescent materials, electroluminescent materials, scintillators, persistent phosphors, laser materials, and their applications. This can include fundamental studies, incorporating characterization techniques of advanced luminescent materials and theoretical studies on luminescent processes. Papers can also discuss the application of various luminescent materials in practical systems. This symposium will also feature sessions around luminescent materials for energy reduction and renewable energy sources. Such topics include, but are not limited to experimental and theoretical works on fluorescent lighting, OLEDs, white LEDs, quantum cutting for solar cells, and related upconversion/downconversion processes.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **U. Happek**, University of Georgia, e-mail: uhapek@physast.uga.edu; **A. Setlur**, GE Global Research, e-mail: setlur@ge.com; and **J. Collins**, Wheaton College, e-mail: jcollins@wheatonma.edu.

## S—Physical Sensors

### S1 Microfabricated and Nanofabricated Systems for MEMS/NEMS 11 (Physical Sensors) Sensor Division / Physical and Analytical Electrochemistry Division

This symposium continues the series of symposia that focus on all aspects of MEMS/NEMS technology for physical sensors including micro/nanomachining, fabrication processes, packaging, and the application of these structures and processes to the miniaturization of chemical sensors, physical sensors, biosensors, miniature chemical analysis systems, and other devices. Particular emphasis should be placed on processes and potential applications of these devices. The following is a partial list of topics to be solicited: (1) fabrication and processing of nano/microsystems; (2) nanomaterials for sensors and actuators; (3) novel methods of processing at the nano/microscale; (4) use of nano/microstructures applicable to environmental and biological studies; (5) chemical, electrical, and physical testing of devices; (6) integrated microfabricated sensors into arrays; (7) reliability of micro/nanomechanical structures; (8) new materials for NEMS/MEMS including aluminum nitride and silicon carbide films.

In order to encourage participation of new and talented researchers in the field, we anticipate awarding Student Travel Grants in support of outstanding graduate students. Awards will be made based on originality of the work and importance to the field. To be considered for the award, an abstract for an oral or poster presentation, as well as a manuscript for the symposium proceedings volume must be submitted by the respective deadlines. If you would like to apply for the travel grant, please submit your abstract, proceedings manuscript, résumé, publication list, and a support letter from your advisor to Praveen Sekhar (praveen.sekhar@vancouver.wsu.edu) before the deadline for manuscript submission, in addition to the usual travel grant application process. Student Poster Prizes will also be awarded, totaling \$300, with a \$200 top prize. Students wishing to participate should submit an abstract for a poster contribution to the ECS and send a copy of their abstract to Peter Hesketh (peter.hesketh@me.gatech.edu) before the deadline for the proceedings manuscript.

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## Z—General

### Z1 Student Poster Session All Divisions / SMEQ

This poster session provides a forum for graduate and undergraduate students to present research results of general interest to ECS and SMEQ. 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 and SMEQ. A competition for the two best posters will be part of the session. Cash prizes will be given to the presenting student author of each winning paper; the amounts are awarded at the discretion of the organizers and judges. The awards will be made without regard to gender, citizenship, race, or financial need.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **V. Subramanian**, Washington University in St. Louis, e-mail: vsubramanian@wustl.edu; **C. Johnson**, Argonne National Laboratory, e-mail: cjohnson@anl.gov; **R. H. Lara-Castro**, UJED, e-mail: lcrh75@hotmail.com; **K. Sundaram**, University of Central Florida, e-mail: Kalpathy.Sundaram@ucf.edu; **V. Chaitanya**, New Mexico State University, e-mail: vimalc@ad.nmsu.edu; **P. Pharkaya**, Lam Research Corporation, e-mail: pallavi.pharkaya@gmail.com; **M. Foley**, USNA, e-mail: foley@usna.edu; and **A. Khosla**, Concordia University, e-mail: khosla@gmail.com.

### Z2 Energy Water Nexus All Divisions / New Technology Subcommittee

The development of clean, affordable energy is one of society's greatest grand challenges. There is a direct correlation between energy use, productivity, and the standard of living. If the world population is to stabilize, the standard of living in developing nations must rise, which, in turn, implies that energy use must also rise. The cost of energy is a significant fraction of the total cost of the gross domestic product (GDP); an increase in the cost of energy correspondingly leads to a reduction in other GDP factors and, therefore, a loss in standard of living. This effect is particularly harmful in developing nations that already have an undesirably low GDP. However, energy production

and use also directly impacts the environment and the availability of safe and affordable water, the latter of which is also one of society's greatest grand challenges.

With respect to this energy-water nexus, the near future offers unattractive possible outcomes for basic sustenance of human populations. Thermoelectric power generation alone consumes approximately 40% of the freshwater withdrawal in the United States. Similarly, the U.S. water infrastructure consumes 13-18% of total municipal electricity usage; that portion is projected to increase with increasing water scarcity, population growth, and corresponding contamination of water resources. In addition, cleaner energy alternatives (e.g., biofuels) will significantly increase water demands thus adversely affecting food supplies. Future water supplies will rely increasingly on nontraditional sources and water reuse (e.g., impaired water, brackish water, and desalinated sea water), the treatment of which will demand significantly more energy and increased attention to public assurance of safety. As currently managed, domestic wastes and wastewaters require high energy expenditures for treatment and disposal. Moreover, increased stresses on fresh water tend to lead to greater water pollution, creating an unsustainable feedback loop. Therefore, the increasing global demands for both energy and water pose formidable challenges to these interconnected infrastructure systems.

Furthermore, global utilization of energy has been demonstrated to be responsible for the majority of anthropogenic greenhouse gas (GHG) emissions and, thereby, the changing climate, adversely affecting global environment. Moreover, climate change is a critical factor driving enhanced weather extremes, resulting in less water availability in arid regions that can least afford it. It has been predicted that this energy-water-climate negative trifecta will have a severe impact on water and food availability for most of Africa and central Asia—almost half the world's population—by 2025. This, combined with the fact that 2.6 billion people lack access to safe and effective forms of sanitation; more children die each year from diarrhea than AIDS and malaria combined; should make energy efficient solutions to safe and effective sanitation a global priority.

Papers are requested on the role of electrochemistry in addressing the energy-water nexus, from policy considerations to scientific and technology driven breakthroughs. Emphasis is on technologies that cogenerate energy and clean water or provide low-energy solutions to water treatment or disinfection, such as microbial fuel cells and photocatalytic water purification; scaling of technology from micro-sensors to determine water purity to municipal water treatment; and the fundamentals of electrochemistry at the nano-bio interface, electro dialysis, and ion exchange membranes.

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## Nanotechnology General Session

All Divisions / New 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; photo-catalysis and environmental applications; nano-ionics; nanostructured catalysts for fuel cells, electrolyzers, batteries and supercapacitors; nanostructured sensor surfaces; and biological applications of nanomaterials.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **O. M. Leonte**, Berkeley Polymer Technology, e-mail: odleonte@comcast.net; and **W. Mustain**, University of Connecticut, e-mail: mustain@enr.uconn.edu.

# Student Travel Grant Application Cancun, Mexico

The Society's, Battery, Corrosion, Dielectric Science & Technology, Electrodeposition, Electronics and Photonics, Energy Technology, High Temperature Materials (HTM), Industrial Electrochemistry & Electrochemical Engineering (IE&EE), Nanocarbons, Organic and Biological Electrochemistry (O&BE), Physical and Analytical Electrochemistry, and Sensor Divisions offer travel grants to students presenting papers at the Society's next meeting in Cancun, Mexico, October 5-10, 2014. **To apply, complete this application and send it along with a copy of your transcript and a letter from an involved faculty member attesting both to the quality of the student's work and financial needs, and a copy of the student's meeting abstract.** For additional information please send an email to [travelgrant@electrochem.org](mailto:travelgrant@electrochem.org). Please note the specific division in your inquiry, as requirements might differ between Divisions.

Meeting Site: \_\_\_\_\_

Name: \_\_\_\_\_

School Address: \_\_\_\_\_

Email: \_\_\_\_\_ Phone #: \_\_\_\_\_

Undergraduate Year (U) or Graduate Year (G) - circle one:    U3      U4      G1      G2      G3      G4      G5

Major Subject: \_\_\_\_\_ Grade point average: \_\_\_\_\_ out of possible: \_\_\_\_\_

(please provide a letter of recommendation from your faculty advisor and a copy of your transcript)

Symposium Title (#): \_\_\_\_\_

\_\_\_\_\_

Title of paper to be presented at the meeting: \_\_\_\_\_

\_\_\_\_\_

Are you an ECS Student Member of the Society?                       yes                       no

(if not, please additionally submit the Awarded Student Membership application)

Estimated meeting expenditures: \$ \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Check only one Division. (*Applications made to multiple Divisions will be rejected.*)

- Battery
- Corrosion
- Dielectric Science & Technology
- Electrodeposition
- Electronics & Photonics
- Energy Technology
- High Temperature Materials
- Industrial Electrochemistry and Electrochemical Engineering
- Nanocarbons
- Organic and Biological Electrochemistry
- Physical and Analytical Electrochemistry
- Sensor

Please send materials to: Attn: (*Division Name*) Student Travel Grant, c/o The Electrochemical Society, 65 S. Main Street, Building D, Pennington, NJ 08534; Phone: 609-737-1902; Fax: 609-737-2743; e-mail: [travelgrant@electrochem.org](mailto:travelgrant@electrochem.org). Electronic submission of nomination packets is preferred.

**Applications for Travel Grants for the Cancun, Mexico, meeting must be received no later than July 1, 2014.**

[www.electrochem.org/sponsorship/travel\\_grants.htm](http://www.electrochem.org/sponsorship/travel_grants.htm)

# Young Professionals Travel Grant Application Cancun, Mexico

The Society's Battery, Energy Technology, High Temperature Materials (HTM), and Physical and Analytical Electrochemistry Divisions offer travel grants to postdoctoral associates, junior faculty, and other young investigators presenting papers at the Society's meeting in Cancun, Mexico, October 5-10, 2014. To apply, complete this application and send it along with a copy of your CV and a letter of recommendation from an established researcher attesting both to the quality of the applicant's work and financial needs, and a copy of the applicant's meeting abstract. For additional information please send an email to [travelgrant@electrochem.org](mailto:travelgrant@electrochem.org). Please note the specific division in your inquiry, as requirements might differ between Divisions.

Meeting Site: \_\_\_\_\_

Name: \_\_\_\_\_

Organization: \_\_\_\_\_

Address: \_\_\_\_\_

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Email: \_\_\_\_\_ Phone #: \_\_\_\_\_

Symposium Title (#): \_\_\_\_\_

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Title of paper to be presented at the meeting: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Estimated meeting expenditures: \$ \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Check only one Division. (*Applications made to multiple Divisions will be rejected.*)

- Battery
- Energy Technology
- High Temperature Materials
- Physical and Analytical Electrochemistry

Please send materials to: Attn: (*Division Name*) Young Professionals Travel Grant, c/o The Electrochemical Society, 65 S. Main Street, Building D, Pennington, NJ 08534; Phone: 609-737-1902; Fax: 609-737-2743; e-mail: [travelgrant@electrochem.org](mailto:travelgrant@electrochem.org). Electronic submission of nomination packets is preferred.

**Applications for Travel Grants for the Cancun, Mexico, meeting must be received no later than July 1, 2014.**

[www.electrochem.org/sponsorship/travel\\_grants.htm](http://www.electrochem.org/sponsorship/travel_grants.htm)