PRIME™
PACIFIC RIM MEETING
ON ELECTROCHEMICAL
AND SOLID-STATE SCIENCE

# Call for Papers

## Honolulu, HI, October 7-12, 2012

Hilton Hawaiian Village Hotel and Hawaii Convention Center


The joint international meeting of:

## 222nd ECS Meeting
## The Electrochemical Society of Japan—2012 Fall Meeting

**with the technical co-sponsoring of:**

Chinese Society of Electrochemistry

**Japan Society of Applied Physics**
**Korean Electrochemical Society**
**Electrochemistry Division of the Royal Australian Institute**
**Chinese Society of Electrochemistry**

# PRiME 2012—Honolulu, HI—October 7-12, 2012

## General Information

The PRiME 2012 Meeting will be held October 7-12, 2012. 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 April 13, 2012.**

Note: Some abstracts may be due earlier than April 13, 2012. 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.

Submit one original meeting abstract electronically via www.electrochem.org, no later than **April 13, 2012**. Faxed abstracts, late abstracts, and abstracts more than one page in length will not be accepted. In June 2012, all presenting authors will receive an email from ECS headquarters office notifying them of the date, time and location of their presentation. Only authors with non-U.S. addresses will receive a hardcopy acceptance letter. Other hardcopy letters will be sent only upon request.

Meeting abstracts should explicitly state objectives, new results, and conclusions or significance of the work. Abstracts must be properly formatted and no more than one page in length. Please use the ideal preformatted two column template located at: http://www.electrochem.org/meetings/assets/abs_template.doc. Programming for this meeting will occur in May 2012, with some papers scheduled for poster presentation. Check the ECS website for further program details.

## Paper Presentation

All authors selected for either oral or poster presentations will be notified in June 2012. Oral presentations must be in English. Both LCD projectors and laptops will be provided for oral presentations. **Presenting authors are no longer required to bring their own laptops to the meeting for presentation; however, you MUST bring your presentation on a USB flash drive to be used with the laptop that will be provided in each technical session room.** If presenting authors would like to use their own laptops for presentation, we strongly suggest that authors 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

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

*ECS Transactions* — All full papers presented at ECS meetings are eligible for submission to the online 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; some of these issues will also be available in a hard-cover edition. Please see each individual symposium listing in this Call to determine if there will be an "AT" meeting issue. In this case, submission to ECST is mandatory, and required in advance of the meeting.

Some symposia will publish their issue to be available "AFTER" the meeting. Even if an individual symposium listing does not specify publication of an ECST issue, all authors are still 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.

Papers presented at the meeting, and papers submitted to ECST, may also be submitted to the Society's technical journals. Full manuscripts must be submitted within six months of the symposium date. "Instructions to Authors" are available from the ECS headquarters office, the journals, or the ECS website.

Please visit the ECST website (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.

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. 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 and young faculty seeking financial assistance should consider awarded travel grants (see pages 98 and 99).

## Hotel Reservations

The PRiME 2012 Meeting will be held at the Hawaii Convention Center and the Hilton Hawaiian Village located at 2005 Kalia Road, Honolulu, HI, 96815, USA. Please refer to the PRiME 2012 Meeting site for the most up to date information on hotel availability and a block of rooms where special rates have been reserved for participants attending the PRiME 2012 Meeting. **The hotel reservation deadline is September 7, 2012**. Please refer to ECS website for rates and reservations.

## Meeting Registration

**All participants, including authors and invited speakers of the PRiME 2012 Meeting, are required to pay the appropriate registration fees.** Hotel and meeting registration information will be posted on the ECS website (www.electrochem.org) as it becomes available. **The deadline for early bird registration is September 7, 2012.**

## Short Courses

A number of short courses will be offered on Sunday, October 7, 2012 from 9:00 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: Advanced Impedance Spectroscopy; Scientific Writing for Scientists and Engineers; Photovoltaics; Operation and Exploitation of Electrochemical Capacitor Technology; and Grid Scale Energy Storage. Please check the ECS website for the final list of offerings.

## Technical Exhibit

The PRiME 2012 Meeting will also include a Technical Exhibit, featuring presentations and displays by over 30 manufacturers of instruments, materials, systems, publications, and software of interest to meeting attendees. Coffee breaks are scheduled each day in the exhibit hall along with evening poster sessions to increase traffic. Please see the ECS website for further details.

## Sponsorship Opportunities

ECS biannual meetings are wonderful chances to market your company through sponsorship. Sponsors will be recognized by level in Interface, the Meeting Program, the Exhibit Guide, Meeting Signage, and on the ECS website. The Levels are: Platinum: $5,000+, Gold: $2,500+, Silver: $1,000+, and Bronze: $500.

In addition, sponsorships are available for the plenary talks and other special events. These opportunities include the recognition stated above along with additional 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 available. Please see the ECS website for further details.

## Contact Information

If you have any questions or require additional information, contact The Electrochemical Society, 65 South Main Street, Pennington, New Jersey, 08534-2839, USA, tel: 609.737.1902, fax: 609.737.2743, e-mail: ecs@electrochem.org; Web: www.electrochem.org.

# SYMPOSIUM TOPICS

**A — General Topics**

A1 — General Student Poster Session

A2 — Nanotechnology General Session

A3 — Contemporary Issues and Case Studies in Electrochemical Innovation

A4 — Tutorials in Nanotechnology: Disruptive Innovation

**B — Batteries, Fuel Cells, and Energy Conversion**

B1 — Batteries and Energy Technology Joint General Session - In Honor of James McBreen

B2 — Electrochemical Capacitors

B3 — Grand Challenges for Energy Conversion and Large Scale Energy Storage

B4 — Intercalation Compounds for Rechargeable Batteries

B5 — Interfaces and Interphases in Battery Systems

B6 — Lithium-Ion Batteries

B7 — Metal-Air Batteries

B8 — Non-Aqueous Electrolytes for Lithium Batteries

B9 — Polymer Electrolyte Fuel Cells 12 (PEFC 12)

B10 — Renewable Fuels from Sunlight and Electricity

B11 — Sodium Batteries

B12 — Solid State Ionic Devices 9 - Ion Conducting Thin Films and Multilayers

**C — Biomedical Applications and Organic Electrochemistry**

C1 — Organic and Biological Electrochemistry General Poster Session

C2 — Bioengineering Based on Electrochemistry

C3 — Electrochemistry and Artificial Sight

C4 — New Synthetic and Mechanistic Approaches to Molecular Electroorganic Chemistry

**D — Corrosion, Passivation, and Anodic Films**

D1 — Corrosion General Poster Session

D2 — Materials Degradation in Energy Systems: Corrosion and Hydrogen-Material Interactions

D3 — Corrosion, Passivity, and Energy: A Symposium in Honor of Digby Macdonald

D4 — High Resolution Characterization of Corrosion Processes 3

D5 — High Temperature Corrosion and Materials Chemistry 10

D6 — Light Alloys 4

D7 — Pits and Pores 5: A Symposium in Honor of David Lockwood

**E — Dielectric and Semiconductor Materials, Devices, and Processing**

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E2 — Atomic Layer Deposition Applications 8

E3 — Chemical Mechanical Polishing 12

E4 — Gallium Nitride and Silicon Carbide Power Technologies 2

E5 — Dielectric Materials and Metals for Nanoelectronics and Photonics - 10

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**F — Electrochemical / Chemical Deposition and Etching**

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F4 — Emerging Materials and Processes for Energy Conversion and Storage

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**H — Fullerenes, Nanotubes, and Carbon Nanostructures**

H1 — Carbon Nanotubes and Graphene: From Fundamental Properties and Processes to Applications and Devices

**I — Physical and Analytical Electrochemistry**

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I2 — Bioelectroanalysis and Bioelectrocatalysis

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I5 — Electrochemical Atomic Layer Epitaxy and Quantum Confinement

I6 — Electrochemistry in Geochemical Environments

**J — Sensors and Displays: Principles, Materials, and Processing**

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J2 — Luminescence and Display Materials: Fundamentals and Applications

J3 — Materials for Solid State Lighting

J4 — Microfabricated and Nanofabricated Systems for MEMS/NEMS 10

J5 — Sensor Applications: Nuclear and Radiation Sensors

# A — General Topics

## A1 General Student Poster Session
All ECS Divisions / ECSJ

This poster session provides a forum for graduate and undergraduate students to present research results of general interest to ECS. The purpose of this session is to foster and promote work in both electrochemical and solid-state science and technology, and to stimulate active student interest and participation in ECS. A competition for the two best posters will be part of the session. Cash prizes will be given to the presenting student author on each winning paper; the amounts are awarded at the discretion of the organizers and judges. The awards will be made without regard to gender, citizenship, race, or financial need.

**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 16, 2012. 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: **V. R. Subramanian**, Washington University, e-mail: vsubramanian@seas.wustl.edu; **V. Chaitanya**, New Mexico State University, e-mail: vimalc@nmsu.edu; **M. P. Foley**, U. S. Naval Academy, foley@usna.edu; **Y. Katayama**, Keio University, e-mail: katayama@apple.keio.ac.jp; and **K. Sundaram**, Univ. of Central Florida, e-mail: sundaram@mail.ucf.edu.

## A2 Nanotechnology General Session
All ECS Divisions / New Technology Subcommittee / ECSJ /CSE

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: **F. Chen**, University of South Carolina, e-mail: chenfa@cec.sc.edu; **J. Chen**, Nankai University, e-mail: chenabc@nankai.edu.cn; **N. Kobayashi**, Chiba University, e-mail: koban@faculty.chiba-u.ac.jp; **O. M. Leonte**, Berkeley Polymer Technologies, Inc., e-mail: odleonte@comcast.net; and **W. Mustain**, University of Connecticut, e-mail: mustain@engr.uconn.edu.

## A3 Contemporary Issues and Case Studies in Electrochemical Innovation
All ECS Divisions / New Technology Subcommittee

For the purposes of this symposium, innovation is generally considered to be the acceptance of improved or more effective products or processes by commercial or government customers. Invited and submitted presentations related to innovation process, contemporary issues, and case studies in electrochemical innovation will provide perspectives from; (1.) government; (2.) academia; (3.) large companies; and (4.) small businesses.

Topics of interest include, but are not limited to: (1.) "bridging the valley of death"; (2.) accelerating technology transfer from university and government laboratories; (3.) challenges and opportunities related to partnerships between universities and small businesses, universities and large companies, and small businesses and large companies; (4.) managing intellectual properties; and (5.) fundamentals and models of "open innovation". In addition, the policy perspective of Federal, State or regional, and local government entities are of interest. Finally, case studies related to the commercialization of specific electrochemical technologies with an emphasis on the non-technical issues are sought.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **E. J. Taylor**, Faraday Technology Inc., e-mail: JenningsTaylor@FaradayTechnology.com; **C. Bock**, National Research Council, e-mail: Christina.Bock@nrc.ca, **M. Inman**, Faraday Technology, Inc., e-mail: MariaInman@FaradayTechnology.com; **K. Malek**, NRC Institute for Fuel Cell Innovation, e-mail: Kourosh.Malek@nrc-cnrc.gc.ca.

## A4 Tutorials in Nanotechnology: Disruptive Innovation
Dielectric Science and Technology / Electronics and Photonics / New Technology Subcommittee / ECSJ

This symposium will feature invited talks from Industry and Academia looking beyond conventional CMOS, nanodevices and nanosystems with an emphasis on emerging devices with added functionality that may not necessarily scale. Presentations at this meeting will cover: (1.) Non-conventional CMOS; (2.) Nanotechnology applications in information technology, biotechnology and renewable energy; (3.) Beyond CMOS device structures and properties of semiconductor nanoelectronics; (4.) Nanosystem fabrication and processing with new technologies; (5.) nanostructures in chemical and biological sensing system for healthcare and security; (6.) Characterization of nanodevices and nanosystems; (7.) Nanosystem modeling; and (8,) Any and all disruptive and creative ideas.

**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 22, 2012. All manuscripts will be submitted online, and must be in either MS Word or PDF format.**

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **R. Todi**, IBM Microelectronics, rmtodi@us.ibm.com; and **A. M. Leonte**, Berkeley Polymer Technologies, Inc., e-mail: odleonte@comcast.net.

# B — Batteries, Fuel Cells, and Energy Conversion

## B1 Batteries and Energy Technology Joint General Session - In Honor of James McBreen

Battery / Energy Technology / ECSJ Battery / CSE

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

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **A. Manivannan**, U. S. Department of Energy, e-mail: amanivana@netl.doe.gov; **H. Arai**, Kyoto University, e-mail: h-arai@saci.kyoto-u.ac.jp; **Y. Guo**, Institute of Chemistry, Chinese Academy of Sciences (CAS), e-mail: ygguo@iccas.ac.cn; **P. Kumta**, University of Pittsburgh, e-mail: pkumta@pitt.edu; **A. Manthiram**, University of Texas at Austin, e-mail: rmanth@mail.utexas.edu; **M. Minakshi**, Murdoch University, e-mail: minakshi@murdoch.edu.au; **S. Mukerjee**, Northeastern University, e-mail: s.mukerjee@neu.edu; **S. R. Narayan**, University of Southern California, e-mail: srnaraya@usc.edu.; and **Y-K. Sun**, Hanyang University, e-mail: yksun7804@gmail.com.

## B2 Electrochemical Capacitors

Battery / Physical and Analytical Electrochemistry / ECSJ Capacitor Technology / CSE / KECS

Electrochemical capacitors (i.e., "supercapacitors" or "ultracapacitors") are becoming an increasingly popular subject of interest as an energy-storage solution where challenging combinations of power and energy are required. This symposium seeks to capture the state-of-the art in the electrochemical capacitor field and solicits papers that cover a broad range of fundamental and applied aspects including: (1.) double-layer and/or pseudocapacitance aspects of nanostructured carbons; (2.) materials that exhibit primarily redox pseudocapacitance, including metal oxides and other advanced inorganic materials, and conducting polymers; (3.) mechanistic studies of the operational charge-storage processes in electrochemical capacitors; (4.) development and optimization of practical electrochemical capacitor components, including current collectors, electrodes, electrolytes, separators and packaging; (5.) performance of new device designs (including hybrid devices) and configurations using symmetric and asymmetric electrode constructions; (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.

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## B3 Grand Challenges for Energy Conversion and Large Scale Energy Storage

High Temperature Materials / Battery / Energy Technology / Industrial Electrochemistry and Electrochemical Engineering / ECSJ Energy Technology

Renewable energy, such as solar and wind, are perceived as sustainable resources for our societies. On the other hand, the intermittency of power generation from solar and wind is a major issue in grid stability and reliability, therefore it is an obstacle in the widespread use of such renewable resources. In order to solve this problem, it is critical to introduce adequate energy storage, especially at large scale. This symposium is intended to provide a forum for discussions on large-scale energy 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 all welcome. Areas of interest include: (1) Issues dealing with the intermittency of solar and wind power generation (2) large-scale battery systems for electrical energy storage, (e.g., Na-S batteries, redox flow batteries and so on) (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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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **X.-D. Zhou**, University of South Carolina, e-mail: zhox@cec.sc.edu; **C. Bock**, NRC, e-mail: Christina.Bock@nrc-cnrc.gc.ca; **T. Kato**, AIST, e-mail: to-kato@aist.go.jp; **B. Y. Liaw**, University of Hawaii, e-mail: bliaw@hawaii.edu; **S. Mitsushima**, Yokohama National University, e-mail: mitsushi@ynu.ac.jp; **T. V. Nguyen**, University of Kansas, e-mail: cptvn@ku.edu; **B. Savinell**, Case Western Reserve University, e-mail: rfs2@po.cwru.edu.

## B4 Intercalation Compounds for Rechargeable Batteries

Battery / ECSJ Battery / KECS

Lithium intercalation/deintercalation into/from host lattices is the basis of current lithium-ion battery technology. Lithium-ion batteries have revolutionized the portable electronics market, and they are being intensively pursued for vehicle and stationary storage applications. This symposium provides a forum for recent advances in intercalation compounds that serve as cathode or anode materials in lithium-ion batteries or other rechargeable systems such as magnesium-ion and

aluminum-ion batteries. The symposium focuses on new or improved intercalation materials as well as a fundamental understanding of the processes that control the electrochemical performances. Specific areas to be covered include but not limited to (1) design of cathode and anode materials, (2) novel chemical synthesis and processing, (3) advanced materials and electrode characterization including in-situ and ex-situ methods, (4) electrochemical properties and performances, (5) electrode-electrolyte interfacial chemistry including SEI layer, (6) computational modeling of intercalation compounds, and (7) redox processes, electronic and ionic transport, and reaction mechanisms.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **S. H. Meng**, University of California, San Diego, e-mail: shmeng@ucsd.edu; **C. M. Julien**, Université Pierre et Marie Curie, e-mail: Christian.julien@upmc.fr; **R. Kanno**, Tokyo Institute of Technology, e-mail: kanno@echem.titech.ac.jp; **A. Manthiram**, University of Texas at Austin, e-mail: rmanth@mail.utexas.edu; **A. Yamada**, University of Tokyo, e-mail: yamada@chemsys.t.u-tokyo.ac.jp; **W.-S. Yoon**, Sungkyunkwan University, e-mail: wsyoon@skku.edu; and **K. Zaghib**, Hydro-Quebec, zaghib.karim@ireq.ca.

## B5 Interfaces and Interphases in Battery Systems

Battery / Energy Technology / ECSJ Battery

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 battery 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 battery 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: **R. Kostecki**, Lawrence Berkeley National Laboratory, e-mail: R_Kostecki@lbl.gov; **T. Abe**, Kyoto University, e-mail: abe@elech.kuic.kyoto-u.ac.jp; **B. Y. Liaw**, University of Hawaii, e-mail: bliaw@hawaii.edu.

## B6 Lithium-Ion Batteries

Battery / Energy Technology / ECSJ Battery / CSE / KECS

Lithium-ion batteries are utilized for a large number of applications, most prominently in portable electronic devices such as cell phones, laptop computers, and digital cameras. In recent years, lithium-ion batteries are also being actively considered for hybrid electric vehicles (HEVs) and plug-in hybrid electric vehicles (PHEVs). This symposium provides a forum for research involving both the fundamental and the applied aspects of lithium metal and lithium-ion batteries. Papers are solicited in a number of technical areas, including (but not limited to): (1.) anode design, characterization, and performance; (2.) cathode design, characterization and performance; (3.) research involving electrolyte development and characterization; (4.) electrode processing and cell design aspects; (5.) electrode interfacial studies and diagnostic techniques; (6.) materials and cell modeling; (7.) elucidation of failure modes and mechanisms; and (8.) performance and safety aspects of cells 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. Smart**, Jet Propulsion Laboratory, e-mail: marshall.c.smart@jpl.nasa.gov; **R. Bugga**, Jet Propulsion Laboratory, e-mail: Ratnakumar.V.Bugga-103068@jpl.nasa.gov; **D. H. Doughty**, Battery Safety Consulting, Inc., e-mail: dhdoughty@batterysafety.net; **M. Inaba**, Doshisha University, e-mail: minaba@mail.doshisha.ac.jp; **Y. C. Kim**, Samsung, e-mail: yc_kim@samsung.com; **K. Tatsumi**, AIST, e-mail: Tatsumi-kuniaki@aist.go.jp; and **J. Zhao**, Xiamen University, e-mail: jbzhao@xmu.edu.cn.

## B7 Metal-Air Batteries

Battery / Energy Technology / Fullerenes, Nanotubes, and Carbon Nanostructures / ECSJ Battery

Metal air batteries are attracting extensive attentions and now being considered for vehicular and stationary energy storage because of their potentially high energy densities. In metal air batteries the cathode, oxygen, is stored in the environment and consumed on demand differentiating this system from traditional batteries in which the active materials are usually fixed in the devices. This symposium will focus on the state-of-art developments of metal air batteries from fundamental researches to the practical applications. Papers are solicited in all areas related to metal air batteries including: (1.) the choice of carbon materials such as carbon nanotubes, fullerenes etc; (2.) construction of air electrode with microstructures that benefit oxygen diffusion; (3.) reaction mechanisms in different electrolytes; (4.) design of air-breath membranes; (5.) catalyst identification; and (6.) metal anode technologies for improved performances.

**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 16, 2012. All manuscripts will be submitted online, and must be in either MS Word or PDF format.**

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **J. Xiao**, Pacific Northwest National Laboratory, e-mail: jie.xiao@pnnl.gov; **N. Imanishi**, Mie University, e-mail: Imanishi@chem.mie-u.ac.jp; **Y. Shao-Horn**, MIT, shaohorn@mit.edu; **V. Thangadurai**, Calgary University, e-mail: vthangad@ucalgary.com; and **Y. Xing**, Missouri University of Science and Technology, e-mail: xingy@mst.edu.

## B8 Non-Aqueous Electrolytes for Lithium Batteries

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

The electrolyte plays a vital role in the performance of rechargeable lithium 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 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, the theoretical and experimental understandings 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; 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 lithium and lithium-ion cells and batteries 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: **M. Ue**, Mitsubishi Chemical Corporation, e-mail: 3707052@cc.m-kagaku.co.jp; **W. Henderson**, North Carolina State University, e-mail: whender@ncsu.edu; **M. Ishikawa**, Kansai University, e-mail: masaishi@kansai-u.ac.jp; **T. R. Jow**, Army Research Laboratory, e-mail: t.r.jow.civ@mail.mil; **B. Lucht**, University of Rhode Island, e-mail: blucht@chm.uri.edu; and **P. C. Trulove**, US Naval Academy, e-mail: trulove@usna.edu.

## B9 Polymer Electrolyte Fuel Cells 12 (PEFC 12)

Energy Technology / Corrosion / Physical and Analytical Electrochemistry / Battery / Industrial Electrochemistry and Electrochemical Engineering / ECSJ Fuel Cells / CSE / KECS

(**Hubert Gasteiger**, F. N. Buchi, E. Cho, C. Coutanceau, M. Edmundson, J. Fenton, T. Fuller, D. Hansen, D. Jones, C. Lamy, R. Mantz, S. Mitsushima, H. Nakagawa, R. Narayanan, Vijay Ramani, T. J. Schmidt, K. Shinohara, P. Shirvanian, P. Strasser, K. Swider-Lyons, Y. Tak, H. Uchida, A. Weber, W. Xing, and L. Zhuang.)

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: 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.

Abstracts for oral or poster contributions must be submitted to the Symposium via the ECS website; please send a copy of your abstract to the respective Section Lead Organizer (see underlined name in each Section). Since the number of time slots for oral presentations is limited, we would 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). As in prior years, we will be awarding Student/Postdoc Travel Grants as well as Student Poster Awards, and if you are interested, please see below.

**Section A:** Diagnostics/Characterization Methods, MEA Design/Model
Organizers: H. A. Gasteiger, F. N. Büchi, V. Ramani, A. Weber, and Y. Tak.
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. $CO_2$ 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: P. Shirvanian, T. Fuller, S. R. Narayanan, D. C. Hansen, and 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 influene 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 electolyzers, electrochemical hydrogen pumps, etc.

**Section C:** Cation-Exchange Membrane Performance & Durability
Organizers: H. Nakagawa, M. Edmundson, and D. Jones.
Presentations related to acid fuel cells that discuss: 1. advanced cation-exchange membranes and ionomers (PFSAs, hydrocarbon-based, etc.); 2. high-temperature membranes; 3. physical-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: H. Uchida, C. Coutanceau, S. Mitsushima, and P. Strasser.
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, K. Swider-Lyons, T. J. Schmidt, E. Cho, W. Xing, and L. Zhuang.
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.

**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 22, 2012. 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 listed by section as follows:

**Section A: H. A. Gasteiger** (Lead Editor), Technische Universität München, Germany, email: hubert.gasteiger@tum.de; **V. Ramani** (Section Lead Organizer), Illinois Institute of Technology, Chicago, USA, email: ramani@iit.edu; **F. N. Büchi**, Paul Scherrer Institut, Switzerland, email: felix.buechi@psi.ch; **A. Weber**, Lawrence Berkeley National Laboratory, USA, email: azweber@lbl.gov; and **Y. Tak**, INHA University, e-mail: ystak@inha.ac.kr.

**Section B: P. Shirvanian** (Section Lead Organizer), Ford Motor Co., USA, e-mail: ashirvan@ford.com; **T. Fuller**, Georgia Institute of Technology, Atlanta, USA, email: tom.fuller@gtri.gatech.edu; **S. R. Narayanan**, Univ. of Southern California, Los Angeles, CA, USA, email: sri.narayan@usc.edu; **D. C. Hansen**, Univ. of Dayton Research Inst., OH, USA, email: Douglas.Hansen@udri.udayton.edu; and **K. Shinohara**, Nissan Motor, Japan, email: k-shino@mail.nissan.co.jp.

**Section C: D. Jones** (Section Lead Organizer), Université Montpellier, France, email: Deborah.Jones@univ-montp2.fr.; **H. Nakagawa**, AGC America, Inc., Mountain View, CA, USA, email: hnakagawa@agcamerica.com; and **M. Edmundson**, W. L. Gore & Associates, Elkton, MD USA, e-mail: medmunds@wlgore.com.
**Section D: H. Uchida** (Section Lead Organizer), University of Yamanashi, email: huchida@yamanashi.ac.jp; **C. Coutanceau**, Université de Poitiers, France, email: christophe.coutanceau@univ-poitiers.fr; **P. Strasser**, Technical University Berlin , USA, email: pstrasser@tu-berlin.de; and **S. Mitsushima**, Yokohama National University, Japan, email: mitsushi@ynu.ac.jp.
**Section E: K. Swider-Lyons** (Section Lead Organizer), Navy Research Laboratory, USA, email: karen.lyons@nrl.navy.mil; **R. Mantz**, U.S. Army Research Office, USA, email: robert.a.mantz@us.army.mil; **T. J. Schmidt**, Paul Scherrer Institut, Villigen, Switzerland, email: ThomasJustus.Schmidt@psi.ch; **E. Cho**, Korean Institute of Science and Technology, Korea, email: eacho@kist.re.kr; **W. Xing**, Changchun Institute of Applied Chemistry, e-mail: xingwei@ciac.jl.cn; and **L. Zhuang**, Wuhan University, e-mail: lzhuang@whu.edu.cn.

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** (Univ. of Central Florida, Cocoa, FL, USA; email: 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 will be held the Sunday of the meeting (instructors: T. J. Schmidt and H. A. Gasteiger).

## B10 Renewable Fuels from Sunlight and Electricity

Energy Technology / High Temperature Materials / Physical and Analytical Electrochemistry / New Technology Subcommittee / ECSJ / KECS

This symposium will provide an international and interdisciplinary forum to present the latest research and prospective R&D activities on production of fuels (e.g., hydrogen and ethanol) from renewable sources such as H2O, CO2 and biomass by utilizing solar energy or electricity. The symposium will address latest advances in fundamental understanding and development of new technology for renewable fuel production. Topics of interest include but not limited to: (1.) novel methods for production of fuels such as hydrogen, ethanol and other fuels by solar or electrical energy; (2.) CO2 capture and conversion; (3.) electrolysis materials including electrolytes, electrodes, seals, and interconnects; (4.) photocatalysts; (5.) solar energy materials; (6.) photoelectrochemical cells (PECs); (7.) solid oxide electrolysis cells (SOECs), solid oxide fuel cells (SOFCs), proton conductor electrolysis cells (PCECs) and fuel cells (PCFC); (8.) portable power sources; (9.) solar thermal panels and solar reactors; (10.) simulation and modeling of materials, devices and systems for fuel production; and (11.) corrosion and durability of materials and devices during fuel production and processing.

**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 16, 2012. 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: **N. Wu**, West Virginia University, e-mail: nick.wu@mail.wvu.edu; **W. Chiu**, University of Connecticut, e-mail: wchiu@engr.uconn.edu; **D. Chu**, US Army Research Laboratory, e-mail: deryn.chu@us.army.mil; **H. Dinh**, National Renewable Energy Laboratory, e-mail: huyen_dinh@nrel.gov; **K. Domen**, The University of Tokyo, e-mail: domen@chemsys.t.u-tokyo.ac.jp; **P. J. Kulesza**, University of Warsaw, e-mail: pkulesza@chem.uw.edu.pl; **J.-J. Lee**, Konkuk University, e-mail: jjlee@kku.ac.kr; **A. Manivannan**, Department of Energy, e-mail: amanivana@netl.doe.gov; **S. R. Narayan**, University of Southern California, srnaraya@usc.edu; **R. Subramanian**, University of Nevada – Reno, e-mail: ravisv@unr.edu; **H. Wang**, National Renewable Energy Laboratory, e-mail: Heli.Wang@nrel.gov; **X.-D. Zhou**, University of South Carolina, e-mail: zhox@cec.sc.edu; and **Z. Zou**, Nanjing University, China, e-mail: zgzou@nju.edu.cn.

## B11 Sodium Batteries

Battery / Energy Technology / High Temperature Materials / ECSJ Battery

A rapid growth in the interest in Na batteries is taking place in the energy storage field. The growth is driven, in part, to the lower cost and greater worldwide abundance of Na relative to the Li used in Li-ion batteries. Challenges to enable this technology on a large scale, however, include increasing the cell energy density, improving the safety, and extending the cycle life. This symposium will provide an opportunity and forum for the presentation of new research and development of both high- and ambient- temperature sodium, and sodium-ion batteries. Papers are solicited in the following topics: Na battery chemistries, materials, electrodes, electrolytes, battery performance, and abuse testing. In addition, this symposium also seeks papers that present Na battery technology cost and resource modeling.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **C. S. Johnson**, Argonne National Laboratory, e-mail: cjohnson@anl.gov; **M. Doeff**, Lawrence Berkeley National Laboratory, e-mail: mmdoef@lbnl.gov; **J. Fergus**, Auburn University, e-mail: jwfergus@eng.auburn.edu; **D. B. Hall**, GE Global Research, e-mail: halldb@ge.com; **R. Kanno**, Tokyo Institute of Technology, e-mail: kanno@echem.titech.ac.jp; and **S. Okada**, Kyushu University, e-mail: s-okada@cm.kyushu-u.ac.jp.

## B12 Solid State Ionic Devices 9 - Ion Conducting Thin Films and Multilayers

High Temperature Materials / ECSJ Solid-State Chemistry

Solid-state electrochemical devices, such as batteries, fuel cells, membranes, and sensors, are critical components of technologically advanced societies in the 21st 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 international symposia series 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.

For this, the ninth in the series of international symposia, emphasis will be given to ionic conducting thin films and multilayers. Recently, there is an increasing interest in the investigation of ionic conductivity of oxygen-ion and proton conducting thin film electrolytes for the miniaturization of solid oxide fuel cells, and the role of strain and

hetero-interfaces in enhancing their performance. Thus, papers on the fabrication and characterization of ionic conducting thin film single layers, multilayers, superlattices, and on the modelling of ion transport phenomena at interfaces in these structures are particularly encouraged.

In addition, papers are solicited in such topics as modelling and characterization of defect equilibria, ionic and electronic transport; novel synthesis and processing of membranes; permeation studies; heterogeneous electrocatalysis at electrode interfaces; materials characterization and crystallographic investigations; and the design, and performance of solid state ionic devices: fuel cells, thermal energy converters, solid-state batteries and microbatteries, chemical sensors, supercapacitors, membranes, and electrochromic devices.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **E. D. Wachsman**, University of Maryland, e-mail: ewach@umd.edu; **J. A. Kilner**, Imperial College, London, e-mail: j.kilner@imperial.ac.uk; **E. Traversa**, National Institute for Materials Science (NIMS), e-mail: traversa.enrico@nims.go.jp; and **S. Yamaguchi**, The University of Tokyo, e-mail: yamaguchi@material.t.u-tokyo.ac.jp.

# C — Biomedical Applications and Organic Electrochemistry

## C1 Organic and Biological Electrochemistry General Poster Session

All Divisions / ECSJ Organic and Biological Electrochemistry

Submissions are solicited in all area of organic, organometallic, and biological electrochemistry. Areas of interest include synthetic and mechanistic electrochemistry with industrial and educational applications involving fuel cells, batteries, sensing, and fundamental studies.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizer: **A. Fry**, Wesleyan University, afry@wesleyan.edu.

## C2 Bioengineering Based on Electrochemistry

Organic and Biological Electrochemistry / Sensor / ECSJ Bioengineering

The symposium will target bioengineering research based on electrochemistry and research focusing on future electrochemical applications. Presentations are solicited that describe biodevices (including nano/micro biodevices, biosensors, and bioinspired actuators), biochips, biomechanics, biomedical engineering, bioimaging, bioprobe, biomolecular engineering and bioinspired designed molecules. Topics of interest include diagnostic and environmental analyses, therapeutic approaches (including drug delivery system and theranostics), bioenergy generation, bioremediation, bioconversion and related topics. Researches from both academic and industrial aspects are welcomed.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **K. Sode**, Tokyo University of Agriculture and Technology, e-mail: sode@cc.tuat.ac.jp; **A. Simonian**, Auburn University, e-mail: als@eng.auburn.edu; and **E. Tamiya**, Osaka University, e-mail: tamiya@ap.enj.osaka-u.ac.jp.

## C3 Electrochemistry and Artificial Sight

All Divisions / Electronics and Photonics / Sensor / New Technology Subcommittee

Normal vision begins when light enters and moves through the eye to strike specialized photoreceptor cells in the retina called rods and cones. These cells convert light signals to electric impulses that are sent to the optic nerve and the brain. Retinal diseases like age-related macular degeneration and retinitis pigmentosa destroy vision by annihilating these cells. The science and technology focus of the artificial retina device is to bypass defunct photoreceptor cells and to transmit electrical signals directly to the retina's remaining viable cells. The pulses, originating from surgically implanted soft conformable patterned electrodes, travel to the optic nerve and, ultimately, to the brain, which perceives patterns of light and dark spots corresponding to the electrodes stimulated. Patients learn to interpret these visual patterns. Given the advances that are currently being made in basic research and clinical applications, PRiME and the Electrochemical Society have a unique opportunity to provide an international forum for the presentation of original research and clinical results that are impacting the progress and future direction of artificial sight.

This symposium will focus on critical issues related to the field of artificial sight with an emphasis on the basic science that underpins our understanding of the principles of extracellular electrode stimulation and the practical challenges that arise in transitioning from laboratory science to real-world technological devices. Papers are solicited in all areas related to basic science, materials, devices, methodologies, and systems that contribute to the field of artificial sight.

Areas of interest include: fundamental interactions at the electrode/electrolyte interface, propagation and mapping of electric fields, bioelectrochemical considerations for the intraocular retinal prosthesis, wireless power and telemetry, corrosion issues, hermetic packaging and sealing, information content and spatial resolution of multielectrode fields, molecular and nanoscale photovoltaic structures, computational modelling of electromagnetic and thermal effects, tissue change and chronically implanted electrodes.

**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 22, 2012. 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: **Z. Aguilar**, Ocean NanoTech, e-mail: gracefulldance@yahoo.com; and **M. S. Humayun**, USC Keck School of Medicine and Doheny Eye Institute, e-mail: humayun@usc.edu.

## C4 New Synthetic and Mechanistic Approaches to Molecular Electroorganic Chemistry

Organic and Biological Electrochemistry / ECSJ Electroorganic Chemistry

This symposium will cover all area of molecular electroorganic chemistry. Contributions from a wide range of mechanistic and synthetic methodologies including industrial applications will be encouraged.

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**encouraged to submit their full text manuscript for the issue no later than November 16, 2012. 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. Nishiyama**, Keio University, e-mail: nisiyama@chem.keio.ac.jp; **A. M. Atobe**, Tokyo Institute of Technology, e-mail: atobe@echem.titech.ac.jp; and **A. Fry**, Wesleyan University, e-mail: afry@wesleyan.edu.

# D — Corrosion, Passivation, and Anodic Films

## D1 Corrosion General Poster Session
All Divisions / ECSJ Corrosion

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 organizer: **S. Fujimoto**, Osaka University, email: fujimoto@mat.eng.osaka-u.ac.jp.

## D2 Materials Degradation in Energy Systems: Corrosion and Hydrogen-Material Interactions
Corrosion / Battery / Energy Technology / ECSJ Corrosion

Current global energy needs require high performance materials to enable long-term and cost-effective solutions to issues in production, conversion, storage and distribution systems. Aggressive working environments, coupled with nanoscale materials structure and morphology, can make meeting these goals particularly challenging. In fact, materials degradation is often the most important factor limiting widespread use of new technologies. This symposium will focus on understanding the role of the environment and/or material structure on degradation mechanisms and mitigation strategies. Our aim is to bring together researchers focused on understanding corrosion and hydrogen interaction issues in a wide variety of energy-related technologies, including, but not limited to: batteries, fuel cells, solar cells, nuclear reactors and waste storage, catalysts, hydrogen production and storage, fossil fuels and biofuels. The organizers encourage experimental and theoretical papers that explore the fundamental aspects of: degradation at the electrode/electrolyte interface in battery cathodes, current collector corrosion, corrosion at three-phase boundaries (e.g. at carbon membranes and bipolar plates in fuel cells, in nuclear waste and fuel storage materials), corrosion at high temperature and in extreme environments (e.g. solid oxide fuel cells, nuclear energy). This symposium also encourages submissions dealing with the electrochemical aspects of hydrogen production, adsorption, transport, interactions with defects, storage and subsequent effects on functional and structural materials. Effects of interest include mechanisms of hydride formation, hydrogenation/dehydrogenation, as well as crack initiation and growth.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **N. Missert**, Sandia National Laboratories, namisse@sandia.gov, **S. Fujimoto**, Osaka University, fujimoto@mat.eng.osaka-u.ac.jp, **K. Hebert**, Iowa State University, krhebert@iastate.edu, **R. S. Lillard**, University of Akron, lillard@uakron.edu, **J. P. Meyers**, University of Texas at Austin, meyers@me.utexas.edu, **A. Nishikata**, nishikata.a.aa@m.titech.ac.jp, **J. Noel**, University of Western Ontario, jjnoel@uwo.ca, and **J. Scully**, University of Virginia, jrs8d@virginia.edu

## D3 Corrosion, Passivity, and Energy: A Symposium in Honor of Digby Macdonald
Corrosion

We all know that close to Digby's heart is the Point Defect Model (PDM) for passivity and passivity breakdown, stress corrosion cracking and corrosion fatigue, particularly theoretical models for estimating crack growth rate, such as the Coupled Environment Fracture Model (CEFM), and Damage Function Analysis (DFA), in order to predict corrosion damage in industrial systems deterministically. Those subjects touch many other areas that are integral parts of Corrosion and Electrochemistry, and are of capital importance to various energy topics (nuclear power, fuel cells, batteries, hydrogen storage, corrosion in pipeline and industrial systems, damage prediction, etc., all of which have been investigated by Digby, his graduate students, postdoctoral fellows, research associated, and colleagues to greater or lesser extents during Digby's career.

Papers in these areas would be particularly welcome for oral or poster presentation in the "D3 - Corrosion, Passivity, and Energy: A Symposium in Honor of Digby D. Macdonald", but other topics would also be appropriate.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **M. Urquidi-McDonald**, Pennsylvania State University, e-mail: mumesm@engr.psu.edu; **C. Taylor**, Los Alamos National Laboratory, e-mail: cdtaylor@lanl.gov; and **T. Haruna**, Kansai University, e-mail: haruna@kansai-u.ac.jp.

## D4 High Resolution Characterization of Corrosion Processes 3
Corrosion / ECSJ Corrosion

The symposium on High Resolution Characterization of Corrosion Processes will provide a forum for the presentation and discussion of corrosion research emphasizing high spatial and/or temporal resolution applied to elucidate corrosion kinetics and mechanisms. Particular interest will be directed towards techniques and methods that provide new insight into the localization and/or time-dependence of corrosion phenomena as they occur on metal surfaces in an uncoated or coated state in the presence or absence of corrosion inhibitors. Techniques of interest include, but are not limited to: x-ray synchrotron spectroscopy and tomography, in-situ electron microscopy (environmental TEM, SEM), in situ optical imaging/microscopy, laser scanning microscopy, confocal microscopy, acoustic (ultrasound) microscopy, magnetic imaging techniques, the scanning Kelvin probe (SKP), Kelvin force microscopy (KFM), atomic force microscopy (AFM), scanning electrochemical microscopy (SECM), the scanning reference electrode technique (SRET), the scanning vibrating electrode technique (SVET) and localized electrochemical impedance spectroscopy (LEIS). The organizers encourage papers dealing with: metastable and stable pitting, crevice

corrosion, differential aeration effects, intergranular corrosion, dealloying, re-plating, galvanic corrosion, erosion corrosion, stress-corrosion cracking, and corrosion fatigue. Also, papers dealing with corrosion-driven processes affecting coated metals such as cathodic disbondment, anodic undercutting and filiform corrosion are of interest. The organizers extend the call to those who wish to report high resolution studies of etching, nanostructure evolution and MEM (microelectromechanical machine) development.

**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 16, 2012. 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: **K. Zavadil**, Sandia National Laboratories, e-mail: krzavad@sandia.gov; **K. Azumi**, Hokkaido University, Japan, e-mail: azumi@eng.hokudai.ac.jp; and **P. Schmutz**, EMPA Materials Science & Technology, Switzerland, e-mail: Patrik.Schmutz@empa.ch.

## D5 High Temperature Corrosion and Materials Chemistry 10

High Temperature Materials / Corrosion

This symposium will focus on the fundamental thermodynamic and kinetic aspects of high temperature oxidation and corrosion, as well as other chemical reactions involving inorganic materials at high temperatures. Both theoretical and experimental papers are encouraged. Specifically, contributions on the following topics in the area of oxidation/corrosion are solicited: (1.) fundamental mechanisms of high temperature oxidation; (2.) reactions in complex environments and/or ultra high temperatures (>1500°C); and (3.) response of protective coatings in high temperature environments. In the area of high temperature chemistry, papers on the following topics are solicited: (4.) thermodynamic property determination; (5.) phase equilibria and phase transformations; (6.) solid state diffusion; and (7.) volatilization reactions.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **E. Opila**, University of Virginia, e-mail: opila@virginia.edu; **J. W. Fergus**, Auburn University, jwfergus@eng.auburn.edu; **P. Gannon**, Montana State University, e-mail: pgannon@coe.montana.edu; **D. Helmick**, Carpenter Technology Corporation, e-mail: dhelmick@cartech.com; **T. Markus**, Institute for Energy Research (IEF-2), e-mail: T.Markus@fz-juelich.de; **T. Maruyama**, Tokyo Institute of Technology, e-mail: maruyama@mtl.titech.ac.jp; **P. Masset**, TU Bergakademie Freiberg, e-mail: Patrick.Masset@vtc.tu-freiberg.de; **D. Shifler**, Office of Naval Research, e-mail: david.shifler@navy.mil; **E. Wuchina**, Naval Surface Warfare Center, e-mail: eric.wuchina@navy.mil; and **S. Yamaguchi**, University of Tokyo, e-mail: yamaguchi@material.t.u-tokyo.ac.jp.

## D6 Light Alloys 4

Corrosion / ECSJ Corrosion

The symposium is the third in a successful series of symposia covering all aspects of corrosion and surface treatment of light alloys. Alloys based on aluminum, magnesium, and titanium offer advantages due to their low weight in a wide range of applications such as those related to transport in aerospace, marine, and automotive sectors. Titanium alloys are the choice of metallic materials for many biomedical applications, due to their excellent corrosion resistance and good biocompatibility. There is also increasing interest in the use of magnesium alloys in biodegradable implants. Papers are invited that address all these issues through the development of new alloys, improved surface finishing technologies including conversion coatings and anodizing (especially by environmentally non-hazardous routes), or joining technologies including welding and adhesive bonding. Research concerned with the mechanistic understanding of corrosion and passivation processes of light metal alloys at both the microstructural and atomistic scale are also 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: **S. Virtanen**, University of Erlangen-Nuremberg, e-mail: virtanen@ww.uni-erlangen.de; **R. Buchheit**, The Ohio State University, e-mail: buchheit.8@osu.edu; **S. Hiromoto**, National Institute for Materials Science, e-mail: HIROMOTO.Sachiko@nims.go.jp**; Y. Kojima**, Furukawa-Sky Aluminum Corp., e-mail: kojima.yoichi@furukawa-sky.co.jp; and **B. Shaw**, Penn State University, e-mail: bashaw@engr.psu.edu.

## D7 Pits and Pores 5: A Symposium in Honor of David Lockwood

Corrosion / Luminescence and Display Materials / ECSJ Corrosion

The symposium is aimed at a more detailed understanding of growth mechanisms and the physical and chemical properties of all types of porous structures. The symposium is a continuous attempt to integrate the diverse research in different fields such as localized metal corrosion, semiconductor electrochemistry, deposition into pores, matrix materials and optical spectroscopy in order to develop a highly transdisciplinary approach to the topic. Emphasis will be on pit and pore formation, porous structure/surface property relations, work relevant to the formation of advanced materials and applications of these materials in different areas of science.

Of special interest in this symposium is experimental as well as theoretical work dealing with: (1.) causes for the localized nature of attack (dissolution); (2.) kinetics (growth laws), stability and morphology of pit and pore growth and chemistry within pits, pores, and etch tunnels; (3.) critical factors (conditions, chemical environment) for maintaining pit and pore growth; (4.) selective dissolution (dealloying); (5.) porous templates and material deposition into pores; (6.) transport processes within pores and porous structures; (7.) analogies and differences between localized corrosion of metals and semiconductors; (8.) pore morphology and interface chemistry effects on optical properties; (9.) passivation of porous surfaces; (10.) optical characterization of porous materials, nanoparticles, and composites; (11.) porous cages, matrices and composites; (12.) work related to life sciences; and (13.) applications.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **R. Boukherroub**, Institut de Recherche Interdisciplinaire (IRI), e-mail: rabah.boukherroub@iri.univ-lille1.fr; **P. Granitzer**, Karl-Franzens-University Graz, e-mail: petra.granitzer@uni-graz.at; **H. Masuda**, Tokyo Metropolitan University, e-mail: masuda-hideki@c.metro-u.ac.jp; and **P. Schmuki**, University of Erlangen-Nuremberg, e-mail: schmuki@ww.uni-erlangen.de.

# E — Dielectric and Semiconductor Materials, Devices, and Processing

## E1 Solid State Topics General Session
Dielectric Science and Technology / Electronics and Photonics / Energy Technology / ECSJ Solid-State Chemistry / ECSJ Functional Ceramics

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

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **R. Todi**, IBM Corp, e-mail: rmtodi@us.ibm.com; **N. Ichinose**, Waseda University, e-mail: ichinose@waseda.jp; **H. Iwai**, Tokyo University of Technology, e-mail: iwai@ep.titech.ac.jp; **O. M. Leonte**, Berkeley Polymer Technologies, Inc., e-mail: odleonte@comcast.net; **K. Shimamura**, NIMS / Waseda University, e-mail: SHIMAMURA.Kiyoshi@nims.go.jp; **K. Sundaram**, University of Central Florida, e-mail: Kalpathy.Sundaram@ucf.edu; and **X. Wang**, Georgia Southern University, e-mail: xwang@georgiasouthern.edu.

## E2 Atomic Layer Deposition Applications 8
Dielectric Science and Technology / Electronics and Photonics

Recent advances in nanotechnology have created the need for 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 seven years, this symposium has earned a leading position among the meetings where ALD is discussed. This symposium offers an excellent forum for sharing cutting edge research on both existing and emerging ALD applications, as well as fundamental aspects of ALD technology.

Contributions are solicited in the following areas: (1.) semiconductor CMOS applications: development and integration of ALD high-k oxides and metal electrodes with conventional and high-mobility channel materials; (2.) volatile and non-volatile memory applications: extendibility, Flash, MIM, MIS, RF capacitors, etc.; (3.) interconnects and contacts: integration of ALD films with Cu and low-k materials; (4.) fundamentals of ALD processing: reaction mechanisms, modeling, theory; (5.) productivity enhancement of ALD equipment and processes, high-throughput ALD; (6.) new precursors and delivery systems; (7.) optical and photonic applications; (8.) coating of nanoporous materials by ALD; (9.) MLD and hybrid ALD/MLD; (10.) ALD for energy applications such as fuel cells, photovoltaics, and batteries; and (11.) Scale-up and commercialization of ALD processes.

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: **J. W. Elam**, Argonne National Laboratory, e-mail: jelam@anl.gov; **S. F. Bent**, Stanford University, e-mail: sbent@stanford.edu; **S. De Gendt**, IMEC, e-mail: Stefan.Degendt@imec.be; **A. Delabie**, IMEC, e-mail: Annelies.Delabie@imec.be; **A. Londergan,** Qualcomm MEMS Technologies, e-mail: alondergan@qualcomm.com; **F. Roozeboom**, Eindhoven University of Technology, e-mail: f.roozeboom@tue.nl; and **O. van der Straten**, IBM Research, e-mail: ovander@us.ibm.com.

## E3 Chemical Mechanical Polishing 12
Dielectric Science and Technology

This symposium will address fundamentals and applications of chemical mechanical planarization (CMP) in a wide range of materials (metals, dielectrics, semiconductor substrates, and more). The symposium will also discuss post CMP cleaning, advances in consumables, new materials, process integration, and other relevant issues of this technology. Papers are being solicited in the following areas: (1.) CMP fundamental science and technology; (2.) surface and electrochemical aspects of CMP; (3.) CMP of metals and composites; (4.) CMP of dielectrics and semiconductors; (5.) CMP process integration and control; (6.) advances in CMP consumables; (7.) operational and environmental aspects of CMP; (8.) CMP for 3D integration and packaging; and (9.) CMP for emerging materials.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **R. Rhoades**, Entrepix, Inc., rrhoades@entrepix.com; **G. Banerjee**, Air Products and Chemicals, e-email: BANERJG@airproducts.com; **B. Basim**, Ozyegin University, Turkey, e-mail: bahar.basim@ozyegin.edu.tr; **L. Economikos**, Unit Process Dev., IBM, e-mail: econol@us.ibm.com; **D. Huang**, Praxair, e-mail: david_huang@praxair.com; and **Y. Obeng**, NIST, e-mail: yaw.obeng@nist.gov.

## E4 Gallium Nitride and Silicon Carbide Power Technologies 2
Electronics and Photonics / Dielectric Science and Technology

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. Some topics include: 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; capacitor, inductor and transformer structures and fabrication technologies; novel physical mechanisms such as 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 and thermal management techniques. Poster sessions will be scheduled, and panel discussions 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** will 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**, University of Toledo, e-mail: krishna.shenai@utoledo.edu; **M. Bakowski**, ACREO, Sweden, e-mail: mietek.bakowski@acreo.se; **M. Dudley**, Stony Brook University, e-mail: mdudley@notes.cc.sunysb.edu; **R. Garg**, International Rectifier Corporation, e-mail: rgarg1@irf.com; and **N. Ohtani**, Kwansei Gakuin University, Hyogo Japan, e-mail: ohtani.noboru@kwansei.ac.jp.

## E5 Dielectric Materials and Metals for Nanoelectronics and Photonics - 10

Dielectric Science and Technology/ Electronics and Photonics Division

Presentations at this symposium will cover the following topical areas: (1.) Germanium and GeSi Channels: Surface/Interface Modeling; Band Offsets; Interface Passivation Techniques; Suitable High-k Gate Stacks, C-V and G-V Characteristics; CMOSFET Characteristics; (2.) GaAs, InGaAs, InP, GaSb, InSb, and GaN Channels: Surface/Interface Modeling; Band Offsets; Interface Passivation Techniques; Suitable High-k Gate Stacks, C-V and G-V Characteristics; CMOSFET Characteristics; (3.) Novel CMOS Materials, Processing, and Devices: Graphene: Growth and Processing, Material Characterization, and Devices; Carbon Nanotubes; Nanowire Transistors; Use of High-k Nanosheets; Organic FET and TFT with High-k Dielectrics; New Concepts in Transistors, Memory, and Switching; New Transistor Concepts, Structures, and Configurations; (4) New Gate Dielectric Materials: Future Generation Higher-k Materials; New Gate Insulators: e.g. $Sc_2O_3$, $Lu_2O_3$, NdON, YON, $Er_2O_3$, $ErTiO_5$, $SrTiO_3$; Epitaxial Gate Insulators: e.g. $Sm_2O_3$, $Sc_2O_3$, $LaScO_3$, $Gd_2O_3$, $SrHfO_3$; (5.) Alternative Metals: Metals for MIM capacitors; Metals for work function tuning; Metals compatible with alternative channel materials; Deposition and characterization; (6.) Novel Materials for Volatile and Non-Volatile Memory applications (DRAM, RRAM, FBRAM, CBRAM, Flash, ...): e.g. $BaHfO_3$, BaNiWTiO, $Y_2TiO_5$, $SrTiO_3$, $Nb_2O_5$, $BiTaO_x$, $HfTiO_4$, $TiO_2$, $AlTiO_x$, $SrTaO_3$, $BaZrO_3$, NiO; use of Nano-Crystal Embedded Gate Insulator and Nano Particles; (7.) Flat-Band/Threshold Voltage Control: Anomalous Flat-Band Voltage Shift; Dipoles at High-k/$SiO_2$ and High-k/Metal Interfaces; Dipole Formation Models; Role of Oxygen Vacancies; Schottky Barrier Modeling; (8.) Defects, Traps, and Reliability: Defect Generation Mechanisms and Models; Process-Induced Defects; Stress-Induced Defects; Fast Transient Trapping; Slow Trapping; New Reliability Testing Techniques; Bias Temperature Instability; Mechanisms of Mobility Degradation; (9.) Characterization: Diverse Electron Microscope, X-Ray, and AFM Characterization; Determination of layer Composition and Depth Profiles; Novel Electrical Characterization Techniques; (10.) Challenges for process development: e.g. Precursor Interactions; Low Temperature Processing; Deposition in and on high aspect ratio structures; Surface Sensitivity; Post Deposition Treatments; Surface Preparations; Cleaning; Etch Ability; (11.) High-k Materials for Photonics: Oxides and Insulators for Active Layers, Passivation, Photon Capture, and Anti-Reflection Coating in Solar Cells, Photo-Transistors, Lasers, and LEDs; and (12.) Oxides and Metals for Energy Applications: Manufacturing, optimization and characterization of e.g. supercapacitors.

**A hard-cover issue of *ECS Transactions* entitled "Physics and Technology of High-k Materials X" 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 22, 2012. 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. Kar**, Indian Institute of Technology, Kanpur, e-mail: skar@iitk.ac.in; **M. Houssa**, University of Leuven, e-mail: michel.houssa@fys.kuleuven.be; **K. Kita**, The University of Tokyo, e-mail: kita@adam.t.u-tokyo.ac.jp; **D. Misra**, New Jersey Institute of Technology, e-mail: dmisra@njit.edu; and **S. Van Elschocht**, imec, e-mail: sven.vanelshocht@imec.be.

## E6 High Purity Silicon 12

Electronics and Photonics

This 12th High Purity Silicon symposium provides a forum for discussion of the latest developments in the growth, characterization, device processing, and applications of high purity silicon and silicon-based 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 resistivity silicon 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) and Germanium-on-Insulator (GeOI), wafer bonding and Ge condensation; Strained layers on silicon and high-mobility substrates; and (5.) Device and integration aspects: radiation and high energy particle detectors, avalanche photodiodes, strip- and pixel detectors, infrared components, power devices, radiation hardening of silicon materials and devices; optoelectronic 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; **C. Claeys**, IMEC, e-mail: claeys@imec.be; **R. Falster**, MEMC, Italy, e-mail: rfalster@memc.it; **C. Mazure**, SOITEC, France, Carlos.Mazure@soitec.fr; and **P. Stallhofer**, Siltronic, Germany, e-mail: peter.stallhofer@siltronic.com.

## E7 Low-Dimensional Nanoscale Electronic and Photonic Devices 5

Electronics and Photonics / Dielectric Science and Technology / Sensor

The fifth 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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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **L.-J. Chou**, National Tsing-Hua University, e-mail: ljchou@mx.nthu.edu.tw; **M. Carter**, KWJ Engineering, Inc., e-mail: mtcarter62@comcast.net; **S. Jin**, University of Wisconsin-Madison, e-mail: jin@chem.wisc.edu; **M.-H. Jo**, Pohang University of Science and Technology, e-mail: mhjo@postech.ac.kr; and **M. Suzuki**, Kyoto University, m-snki@me.kyoto-u.ac.jp.

## E8 Processing Materials of 3D Interconnects, Damascene and Electronics Packaging 4

Dielectric Science and Technology / Electrodeposition / Electronics and Photonics / ECSJ Electronics

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

Ideally, this symposium will bring together researchers to discuss the various merits of the presented 3D device architectures, materials, packaging, and fabrication methodologies. Topics of interest include, but are not limited to: (1.) 3D process integration methodologies; (2.) 3D design and architectures; (3.) simulation and modeling of 3D integrated devices; (4.) materials and techniques for die and wafer bonding; (5.) processing and handling of thin wafers and dice; (6.) materials for temporary die and wafer bonding; (7.) vertical interconnect fabrication technology; (8.) materials for vertical interconnects: insulators, barriers, and metals; (9.) reliability of 3D interconnects; (10.) novel test and measurement of 3D integrated devices; (11.) thermal management in 3D integrated devices; damascene copper interconnects, introduced at the 0.25 Î¼m node, have spanned six technology nodes, and are expected to be used for the foreseeable future; (12.) advanced substrates and packaging, system in packaging (SIP), high speed and optical packaging, wireless and micro CSP; (13.) chip interconnect metallization; damascene plating, copper, copper-alloys, silver etc., seed/barrier layers, sputter seeding, metal migration and planarization; and (14.) chip-package interconnection; flip-chip (C4) technology, Pb-free C4s, wire bonding, TAB, compliant chip-package interconnection and room temperature joint.

This symposium topic will bring together researchers to discuss the challenges and solutions to extending damascene copper interconnects, well beyond the 45 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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## E9 Fundamentals and Applications of Microfluidic and Nanofluidic Devices

Electronics and Photonics / Physical and Analytical Electrochemistry / Sensor

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. The 1st International Symposium sponsored by the Electronics and Photonicsof the Electrochemical Society 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 towards 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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## E10 More than Moore

Dielectric Science and Technology / Electronics and Photonics / Sensor / New Technology Subcommittee

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

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

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

This symposium is aimed at providing a forum for discussing all aspects of this emerging technology trend. Thus papers will be solicited in all aspects of More-than-Moore, including but not limited to, materials, integration, performance, reliability and applications.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Y. Obeng**, National Institute of Standards and Technology, e-mail: yaw.obeng@nist.gov; **G. Banerjee**, Air Products and Chemicals, e-mail: gbanerje@hotmail.com; **S. Datta**, Pennsylvania State University, e-mail: sdatta@engr.psu.edu; **P. Hesketh**, Georgia Tech, e-mail: peter.hesketh@me.gatech.edu; **T. Hiramoto**, University of Tokyo, e-mail: hiramoto@nano.iis.u-tokyo.ac.jp; **A. Ionescu**, Ecole Polytechnique Federal de Lausanne, Switzerland, e-mail: Adrian.ionescu@epfl.ch; and **P. Srinivasan**, Texas Instruments, e-mail: psrinivasan@ti.com.

## E11 Nonvolatile Memories

Dielectric Science and Technology / Electronics and Photonics / ECSJ Electronics

Although Flash memory has followed the scaling evolution of the semiconductor roadmap, there is increasing concern about scalability into the next generation. On the other hand, various new nonvolatile memory devices based on different mechanisms have been proposed recently. The symposium will address the recent developments in nonvolatile memory devices such as FeRAM, MRAM, STTRAM, ReRAM, PRAM, 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. The program will be organized into Oral and Poster sessions.

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## E12 Photovoltaics for the 21st Century 8

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

Today's terrestrial solar cells are based largely on various forms of crystalline silicon wafers. Thin-film technologies, with an expanding market share in recent years, are based on chalcogenide or silicon films. With the current global energy consumption at 15 TW and projected demand of 46 TW by 2100, solar cells need to be deployed at tens of TWp or they will have no noticeable impact on our future energy mix. Almost all of the current solar cell technologies are not capable of TWp-scale deployment due to natural resource limitations. For example, the huge electricity input for fabricating wafersilicon solar cells makes it difficult to deploy wafer-silicon cells to a TWp scale. The known reserves of silver, which is used in wafer-silicon solar cells, will likely limit wafersilicon cells to probably 1-2 TWp of maximum deployment. Other scarce materials in current solar cells include indium, tellurium, ruthenium, to name a few. These limitations have to be removed or new solar 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. On the other hand, the installation of solar cells reached ~20 GWp by the end of 2009. Compared to the tens of TWp required, both the potential and gap for solar cells are enormous.

Fundamental and applied research is needed to make breakthroughs in wafer-silicon technologies, thin-film technologies, as well as totally new photovoltaic concepts. This symposium will focus on conventional and non-conventional technologies for solar-to-electric conversion that could be deployed to a TWp scale in the 21st century. Contributions of both fundamental and applied nature leading to low-cost high-efficiency solar-to-electric conversion are solicited. Topics of interest include but not limited to: (1.) solar-grade silicon: purification, ingot growth, wafering, defects, and energy efficient processing; (2.) wafer-silicon cells: multi- and monocrystalline cells, processing, substitute for silver, and surface/grain boundary passivation; (3.) thin-film silicon cells: high-throughput deposition, micro- and poly-crystalline films, layer transfer, multi-junction cells, and light trapping; (4.) chalcogenide cells: processing, device structures, and substitutes for scarce materials; (5.) new materials that are abundant, low cost, and non-toxic: inorganic, nanoscale, biomimetic, organic, and composite materials; (6.) non-conventional structures or concepts that promise a much higher efficiency/cost ratio: 3-dimensional, nanostructured, and multi-junction devices; (6.) mild synthesis methods for semiconductor thin films such as electrodeposition and chemical bath deposition; (7.) 3-G device concepts including multiple-exciton generation and dye sensitization; (8.) scalable manufacturing methods; and (9.) cross-cutting issues: substrates, antireflective coatings, modeling/simulation, and module or alternative packaging.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **M. Sunkara**, University of Louisville, e-mail: Mahendra@louisville.edu; **C. Claeys**, IMEC, e-mail: claeys@imec.be; **L. Deligianni**, IBM Corp., e-mail: lili@us.ibm.com; **T. Druffel**, University of Louisville, e-mail: thad.druffel@louisville.edu; **T. Miyasaka**, Toin University of Yokohama, e-mail: miyasaka@cc.toin.

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## E13 Plasma Processing 19
Dielectric Science and Technology / Electronics and Photonics

Due to the propagation of plasma applications into almost all areas of science and technology, the scope of the 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 integration approaches 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 plasmas 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 the Plasma Symposium will cover all aspects of the use of plasmas including diverse applications, plasma chemistries and processes, plasma reactor design and materials, reaction mechanisms, plasma damage, and environmental aspects such as process gas abatement. The Plasma Processing Symposium 19 that includes the extended scope will be at the Honolulu Meeting. 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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## E14 Semiconductor Wafer Bonding 12: Science, Technology, and Applications
Electronics and Photonics

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 electronic 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 bonding 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, compound semiconductor-on-Si heterostructures and Micro-Electro-Mechanical Systems (MEMS). 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. This symposium, sponsored by the Electronicsof the Society, brings together materials, device and process engineers from these and related interdisciplinary areas.

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## E15 State-of-the-Art Program on Compound Semiconductors 54 (SOTAPOCS 54)
Electronics and Photonics / Luminescence and Display Materials

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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## E16 Thin Film Transistors 11 (TFT 11)
Electronics and Photonics

The TFT 11 is celebrating its 22th year anniversary. This is the world's first and longest technical conference dedicated to the TFT technology. The symposium will continue its 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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## E17 SiGe, Ge, and Related Compounds: Materials, Processing, and Devices 6

Electronics and Photonics

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; electro-mechanical 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, electro-mechanical 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

There are two steps to submit a paper for this symposium.

**Step 1.** Abstract Paper Submission (abstract submission deadline: March 26, 2012): authors should submit an abstract (using the ECS provided template) via the ECS website. For the SiGe, Ge, and Related Compounds Symposium, the website will be open for abstract submission from January 12, 2012 until the final abstract submission deadline of March 26, 2012. Please note that this deadline is earlier than the general ECS abstract submission deadline of April 13, 2012. All authors will receive a confirmation from ECS with the disposition of the paper in the symposium (invited 30 minute oral presentations, contributed 20 minute oral presentations, or poster). Note that each of the symposium topics above will be designated in the abstract submission system as if it were a separate symposium. Please submit your abstract to your intended topic designation.

**Step 2.** Proceedings Manuscript Submission (proceedings manuscript submission deadline: June 22, 2012): the symposium proceedings will be available at the time of the symposium and will serve as the digest of technical papers. All regular and invited paper authors must submit a full-length manuscript for review before June 22. Authors are required to follow detailed instructions and templates for the preparation of the manuscript which may be found at the ECS website.

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Abstracts should be submitted electronically to the ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **D. Harame**, General Chair, IBM Systems and Technology Group, Essex Junction, VT USA, e-mail: dharame@us.ibm.com; **J. Boquet**, Publications Chair, IBM Systems and Technology Group, Essex Junction, VT, USA, e-mail: boquet@us.ibm.com; **G. Niu**, HBT Committee Chair, Auburn University; **A. Reznicek**, Related Compounds Committee Chair, IBM TJ Watson Research Center; **M. Caymax**, Epitaxy Committee Chair, FPS/WEA, imec; **Y. C Yeo**, FET Committee Chair, National University of Singapore; **B. Tillack**, Processing Committee Chair, IHP and TU Berlin; **G. Masini**, Optoelectronics Committee Chair, Luxtera, Inc; **S. Miyazaki**, Surfaces and Interfaces Committee Chair, Nagoya University; T. Krishnamohan, Emerging Applications Chair, Intel, and **S. Koester**, Workshop Committee Chair, University of Minnesota.

# F — Electrochemical/Chemical Deposition and Etching

## F1 Bio-Enabled Materials, Processes and Devices

Electrodeposition / Physical and Analytical Electrochemistry / Sensor/ ECSJ

The combination of biology and electrochemistry can be used to enable a variety of materials, processes and devices. The opportunities seem endless and are perhaps limited only by our imagination and our understanding of the basic phenomena that govern the behavior of these bioelectrochemical systems. Applications range from biosensors and devices for personalized medicine to self-assembled systems for bioelectronics, biophotonics or energy production, and include a host of new materials, processes and devices that are derived from or inspired by complex biological systems.

This symposium will consider papers related to a variety of bio-enabled material synthesis, processes and devices as reflected in the following topics: 1) Biological templates for device fabrication including self-assembled biological templates, material deposition on biological templates and the influence of the template on the deposition processes, and studies and characterization of the interfacial region between inorganic material and biological templates; 2) Bio-enabled reactions including the influence of biological molecules/layers on the reaction rate and product distribution of electrochemical reactions, bio-enhanced delivery of reactants to electrode surfaces, and electrochemical behavior at biofilm/metal surfaces; 3) Bio-enabled materials including materials that enable electrochemical sensing of biological and other systems, bio-inspired channels for investigating transport and for molecular characterization via electrochemical methods (e.g., DNA sequencing), and electrochemical enhancement of biological processes; and 4) Biomimetic electrochemical systems that include biologically inspired hierarchical structures with interesting and useful material properties, and biologically inspired approaches to the development of systems that can be used to pattern, build, and grow heterogeneous, multi-element devices.

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## F2 Electrodeposition General Session: Fundamentals and New Materials – Dieter M. Kolb Memorial Symposium

Electrodeposition / ECSJ Nano-Micro Fabrication

Papers are solicited for this memorial general symposium in honor of Prof. Dieter M. Kolb in areas of electrodeposition fundamentals and new materials that are not covered by other symposia at this meeting. The symposium will provide a platform for presenting novel and non-traditional approaches to research on electrodeposition. Of interest are contributions that advance understanding of fundamental phenomena such as the role of surface defects, additives, solvent effects, nanoscale phenomena, surface films, and mechanisms of lattice formation. Papers are solicited on *in situ* and *ex situ* experimental methods that provide observations of dynamic behavior at the solid-liquid interface; time- and frequency-domain modulation, surface microscopies, linear and nonlinear surface spectroscopies. Numerical methods of interest include continuum as well as non-continuum scales, as well as multi-scale methods. Methods may arise from activities such as predicting force fields associated with the interface including self-assembly, analysis of high-throughput combinatorial data and materials informatics; and precision synthesis of materials by control of the process environment. Contributed papers will be programmed in a related order, depending on the titles and content of the abstracts.

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## F3 Electroless Deposition: Principles, Activation and Applications 2

Electrodeposition / ECSJ / CSE

The research achievements in the area of electroless deposition have contributed to numerous developments and applications for variety of industries. Applications of electroless deposition are found in the electronics, energy conversion, aerospace, biomedical, automotive and aerospace industries. In addition, new applications in the area of metallization of polymers, ceramics and fabrics, production of various powders, corrosion and wear resistant coatings, decorative and catalytic surfaces etc. are being developed. Electroless deposition is also very attractive for the field of nanotechnology.

The aim of this symposium is to bring together scientists, researchers and engineers in order to review and discuss the latest developments and to suggest the future directions in the field of electroless deposition. The papers of interest include, but are not limited to: (1.) Galvanic or displacement deposition; (2.) Autocatalytic deposition; (3.) Mechanistic aspects and kinetics of electroless deposition; (4.) Surface activation for electroless deposition; (5.) Metallization of non-conductive surfaces via electroless deposition; (6.) Applications for electronics, energy device, aerospace, automotive etc. industries; (7.) Deposition of semiconductors from chemical baths; and (8.) Electroless deposition and nanotechnology.

Materials of interest include thin or thick films and powders of metals, alloys or compounds (e.g. oxides, salts, polymers).

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## F4 Emerging Materials and Processes for Energy Conversion and Storage

Electrodeposition / Battery / Energy Technology / ECSJ

The symposium will provide a forum for the presentation of new and exciting research in emerging and nano-structured materials that are of interest to energy science, electrochemical and materials chemistry communities. The global energy issues cover many interdisciplinary fields including carbon-free generation of energy using photovoltaics, affordable energy storage for automotives, and scalable storage solutions for large stationary applications (including grid-level needs as well dealing with the intermittency of solar). New electrochemical approaches to emerging materials, for example new contact materials for silicon solar cells, thin film and earth abundant PV materials, thin film catalysts for PEM fuel cells, are also of interest. Nano-structured materials exhibit greatly altered interface, bulk, and surface properties compared to micron materials. Some of these properties include electrochemical catalysis, bulk and inter-granular diffusion, electronic and ionic conductivity nano-structured materials manipulation to produce desirable enhancement in performance of photovoltaic cells, batteries, fuel cells and other energy storage concepts.

This symposium will focus on emerging and nano-structured materials and processes in the area of photovoltaics and solar cells, electrochemical, energy storage with batteries (Li-ion, Metal-air, Metal-water) and super capacitors, intercalation anode and cathode, nanocomposites polymers, metal hydrides, and nanowire concepts for photovoltaics. Topics of interest in the general area of fuel cells including catalyst of electro-oxidation of hydrogen, reformat and organic fuels, catalysts for oxygen reduction, supported and unsupported materials, polymer electrolyte for PEM and solid oxide fuel cells.

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## F5 Magnetic Materials and Devices 12
Electrodeposition / ECSJ Magnetic Materials Processes and Devices

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, Ni, Co, and their alloys, as well as laterally patterned, laminated or compositionally modulated structures, including nanowires and self-organized films

The symposium will further cover subject's specific to the fabrication of thin-film heads, microelectromechanical systems, micromotors, and other magnetic devices. The symposium will include invited review or tutorial papers and contributed papers.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **C. Bonhote**, Hitachi Global Storage Technologies, Christian.bonhote@hitachigst.com; **S. R. Brankovic**, University of Houston, e-mail: Stanko.Brankovic@mail.uh.edu; **H. H. Gatzen**, University of Hanover, e-mail: gatzen@imt.uni-hannover.de; **P. Hesketh**, Georgia Institute of Technology, e-mail: peter.hesketh@me.gatech.edu; **Y. Kitamo**, Tokyo Institute of Technology, e-mail: kitamoto.y.aa@iem.titech.ac.jp; **T. Osaka**, Waseda University, e-mail: osakatets@waseda.jp; **W. Schwarzacher**, University of Bristol, e-mail: w.schwarzacher@bristol.ac.uk; and **G. Zangari**, University of Virginia, e-mail: gz3e@virginia.edu.

# G — Electrochemical Synthesis and Engineering

## G1 Tutorials in Electrochemical Engineering: Energy Conversion and Storage
Industrial Electrochemistry and Electrochemical Engineering / Electrodeposition / Energy Technology

This symposium, through tutorial lectures, will present the wide spectrum of research, development, and engineering aspects of all types of electrochemical energy conversion and storage technologies, all their possible applications, and their complete system design and operation. Electrochemical energy conversion and storage devices will be commercially viable not only through technical innovation in material improvements in the cell or device development, but through complete systems analysis, modeling and control, fuel production, fuel infrastructure, manufacturing processes, and educational development. Tutorials on all the technologies needed to help make photovoltaics, fuel cells, batteries and electrochemical capacitors commercially viable will be presented by invited speakers. Tutorials will also be presented on new materials, designs and electrolytes, performance studies, and modeling of all types of cells or devices. The tutorials should be useful for students and for professionals seeking to diversify their background or break into new technological areas. The symposium will consist of both invited and contributed papers.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **G. G. Botte**, Ohio University, e-mail: botte@ohil.edu; **J. M. Fenton**, University of Central Florida, e-mail: jfenton@fsec.ucf.edu; **V. Ramani**, Illinois Institute of Technology, e-mail: ramani@iit.edu; and **M. Tao**, Arizona State University, e-mail: Meng.Tao@asu.edu.

## G2 Synthesis and Engineering General Session
Industrial Electrochemistry and Electrochemical Engineering / ECSJ Industrial Electrolysis and Electrochemical Engineering

Papers are solicited in areas of industrial electrochemistry and electrochemical engineering that are not covered by other symposia at this meeting. The following themes are listed for general session: (1.) Novel electrode, ion-exchange membrane and design for Chlor-alkali electrolysis; (2.) Design of gas-diffusion electrode for depolarized oxygen cathode; (3.) Modeling of electrolyzer and electrochemical synthesis; (4.) Electrochemical synthesis using paired electrochemical reactions and indirect electrolysis; (5.) Electrochemically generated nano-bubbles; (6.) Electrochemical reactor for waste water treatment, electro-flotation and electro-coagulation; (7.) Boron-doped diamond (BDD) electrode for cleaner environment and electrochemical synthesis; (8.) Electrochemical generation of ozone, peroxides and oxidative agents; and (9.) Design and characterization of novel electrode for fuel cell, air battery and electrochemical systems. Papers may contain both theoretical and experimental work, and papers dealing with either area will be considered. Contributed papers will be programmed in a related order, depending on the titles and content of the abstracts.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **M. Sudoh**, Shizuoka University, e-mail: tcmsudoh@ipc.shizuoka.ac.jp; and **V. Ramani**, Illinois Institute of Technology, e-mail: ramani@itt.edu.

# H — Fullerenes, Nanotubes, and Carbon Nanostructures

## H1 Carbon Nanotubes and Graphene: From Fundamental Properties and Processes to Applications and Devices

Fullerenes, Nanotubes, and Carbon Nanostructures / Dielectric Science and Technology / Energy Technology / Sensor / CSE

This symposium will be focused on fundamental properties and processes in physics, chemistry, and materials science of carbon nanostructures. Topics may include methods for sample preparation and characterization; mechanical, thermal, optical, and electronic properties; chemical and electrochemical behavior; and theoretical studies. It also covers applications of carbon nanomaterials. In this context, topics may include novel applications in the areas of electronic devices, sensors, materials development, solar energy harvesting, catalysis, nano- mechanical devices, biomedicine, environmental remediation, etc.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **D. M. Guldi**, Institute for Physical Chemistry, e-mail: guldi@chemie.uni-erlangen.de; **T. Akasaka**, Tsukuba University, e-mail: takasaka04@yahoo.com; **M. Carter**, KWJ Engineering, Inc., e-mail: mtcarter62@comcast.net; **F. D'Souza**, Wichita University, e-mail: Francis.DSouza@wichita.edu; **S. De Gendt**, IMEC, Belgium, degendt@imec.be; **S. Fukuzumi**, Osaka University, e-mail: fukuzumi@chem.eng.osaka-u.ac.jp; **H. Klauk**, Max-Planck-Institute for Solid State Research, e-mail: H.Klauk@fkf.mpg.de; **Z. Liu**, Peking University, e-mail: zfliu@pku.edu.cn; **R. B. Weisman**, Rice University, e-mail: weisman@rice.edu; **K. Worhoff**, University of Twente, e-mail: k.worhoff@el.utwente.nl; and **K. Zaghib**, Hydro-Quebec, e-mail: Zaghib.Karim@ireq.ca

# I — Physical and Analytical Electrochemistry

## I1 Physical and Analytical Electrochemistry General Session

Physical and Analytical Electrochemistry / ECSJ / CSE / KECS

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 organizers: **R. Mantz**, Army Research Office, e-mail: Robert.a.mantz@us.army.mil; **S. Chen**, Wuhan University, e-mail: slchen@whu.edu.cn.; and **T. D. Chung**, Seoul National University, e-mail: tdchung@snu.ac.kr.

## I2 Bioelectroanalysis and Bioelectrocatalysis

Physical and Analytical Electrochemistry / ECSJ Bioengineering / CSE

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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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **S. Minteer**, University of Utah, e-mail: minteer@chem.utah.edu; **L. Mao**, Institute of Chemistry, Chinese Academy of Sciences (CAS), e-mail: lqmao@iccas.ac.cn; **N. Nakamura**, Tokyo University of Agriculture & Technology, e-mail: nobu1@cc.tuat.ac.jp; and **K. Sode**, Tokyo University of Agriculture & Technology, e-mail: sode@cc.tuat.ac.jp.

## I3 Molten Salts and Ionic Liquids 18

Physical and Analytical Electrochemistry / Electrodeposition / Energy Technology / ECSJ Molten Salt

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.) Extractive metallurgy (e.g., electrolytic deoxidation); (3.) Rare Earth and Nuclear chemistry (e.g. lanthanides, actinides, radioisotopes, nuclear reprocessing); (4.) Electrodeposition (e.g. deposition of alloys, characterization of electroactive species, and surface characterization); (5.) Reactions (e.g. catalysis, synthesis, oligomerizations, and polymerizations); (6.) Separations (e.g. selective extractions and biphasic systems); (7.) Solute and Solvent Properties (e.g. structural investigations, melting behavior, dynamics, and stability of molten salts); (8.) Biochemical and biomedical applications (e.g. dissolution of biopolymers, enzymatic reactions, and bioelectrocatalysis); and (9.) New ionic liquids and molten salt mixtures (e.g. liquid clathrates, binary and ternary melts, and task specific ionic liquids).

There will be a special session dedicated to the 2012 Max Bredig award winner, Prof. Derek Fray. 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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e-mail: adriana.ispas@tu-ilmenau.de; **R. Mantz**, Army Research Office, e-mail: Robert.a.mantz@us.army.mil; **M. Mizuhata**, Kobe University, e-mail: mizuhata@kobe-u.ac.jp; and **P. C. Trulove**, US Naval Academy, e-mail: trulove@usna.edu.

## I4 Electrocatalysis 6

Physical and Analytical Electrochemistry / Energy Technology / ECSJ Interfacial Electrochemistry / CSE

The symposium will provide an interdisciplinary forum to discuss new results, concepts and methodologies in the field of Electrocatalysis. True revolution put in force in recent years is due to the application of high-level theoretical tools and computational methods for increasing understanding of surface reactions involved in electrocatalysis, and new in situ techniques with atomic-level specificity. The primary objective of these approaches is to help with synthesizing new catalytic materials, as well as to enhance the significance of electrocatalysis in fuel cell science & technology. A continuous addition of new experimental tools for investigations of surface processes on fuel cell catalysts, and on model surfaces supports a rapid growth of the field. The progress in theory and experiment is intimately connected to surface science and heterogeneous catalysis where the demand for theory is likewise overwhelming.

The following topics will be highlighted: (1.) PEM electrocatalysis, ligand (electronic) and ensemble effects, bifunctional mechanism, structure and composition of reaction site on bimetallic and ternary electrocatalysts (also: islands, defects and surface clusters, etc.); (2.) theoretical description: accuracy and predictability; (3.) surface diffusion; (4.) intermediates: stable vs. transient; (5.) single crystal electrodes (adsorbates and deposits); (6.) nanotechnology and/or the application of nanoparticles; (7.) new trends in the applications of vibrational methods, methods from UHV surface science and synchrotron X-ray methods in studies of electrochemical interfaces; (8.) other non-electrochemical techniques for the study of interfacial structure; and (9.) electrical double layer measurements and modeling in situ, and in UHV.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **G. Brissard**, University of Sherbrooke, e-mail: Gessie.Brisard@USherbrooke.ca; **N. Hoshi**, Department of Applied Chemistry, e-mail: hoshi@faculty.chiba-u.ac.jp; **T. Ohsaka**, Tokyo Institute of Technology, e-mail: ohsaka.t.aa@m.titech.ac.jp; **V. Ramani**, Illinois Institute of Technology, e-mail: ramani@itt.edu; **P. Shen**, Sun Yat-sen University, e-mail: stsspk@mail.sysu.edu.cn; and **A. Wieckowski**, University of Illinois, e-mail: Andrzej@scs.uiuc.edu.

## I5 Electrochemical Atomic Layer Epitaxy and Quantum Confinement

Physical and Analytical Electrochemistry / Electrodeposition

With the need to form materials, structures and devices at the nano scale with atomic level control, electrochemistry is finding an increasing number of applications. The lower temperatures, absence and cost of vacuum based equipment, the ability to bottom up fill or conformally grow deposits is creating opportunities for electrochemical materials formation. This symposium will be a show case for the chemistry and science directed towards that end, whether it is the actual formation of materials with atomic level control or their characterization. Anticipated contributions may include the formation of metals, semiconductors or insulators. Topics may concern the formation of films, superlattices, nanowires, or nano-dots, as well as the formation of device structures, in the areas of magnetic materials, catalysis, photo-voltaics, thermoelectrics, phase change materials, optoelectronics, microelectronics or sensors. Many obvious applications are in the area of energy science, with fuel and solar cells, batteries, and supercapacitors coming directly to mind. Abstracts concerned with the characterization of electrochemically formed materials at the nanoscale will be welcome as well.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **N. Dimitrov**, Binghamton University, e-mail: dimitrov@binghamton.edu; and **J. Stickney**, University of Georgia, e-mail: Stickney@chem.uga.edu.

## I6 Electrochemistry in Geochemical Environments

Physical and Analytical Electrochemistry

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

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizer: **A. Fitch**, Loyola University, e-mail: afitch@luc.edu.

# J — Sensors and Displays: Principles, Materials, and Processing

## J1 Chemical Sensors 10 - Chemical and Biological Sensors and Analytical Systems

Sensor / ECSJ Chemical Sensor

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; and (13.) harsh environment 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, resume, publication list, and a support letter from your advisor to Y.-L. Chang (ylchang@kiwylight.com), before the deadline for manuscript submission.

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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## J2 Luminescence and Display Materials: Fundamentals and Applications

Luminescence and Display Materials / ECSJ Phosphor Research

This symposium will focus on physical and chemical aspects of luminescence in both organic and inorganic solids, and will address current and emerging technical and scientific issues in luminescence and display materials. Presentations at this meeting will include photoluminescent materials, cathodoluminescent materials, electroluminescent materials, scintillators, persistent phosphors, lasers, and their applications. This symposium will also feature the role of 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, LEDs, displays, quantum cutting for solar cells, and related upconversion/downconversion processes.

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## J3 Materials for Solid State Lighting

Luminescence and Display Materials / New Technology Subcommittee / ECSJ Phosphor Research

Solid state lighting based on inorganic and organic light emitting diodes (LEDs and OLEDs) is demonstrating the potential to revolutionize both the display and lighting industries. Both materials and system advances are required to optimize the performance of lighting and display systems using these new technologies. In this symposium, presentations will discuss various aspects of materials development and their integration into solid-state lighting or display systems. Both theoretical and experimental works on optical properties including structure and defects of inorganic LED materials and devices, LED phosphor composition development and optimization, OLED materials and device designs, novel forms (e.g. ceramic or glass-ceramic) for LED phosphors, integration of phosphors or other downconverting materials into lighting and display systems, reliability concerns for LED and OLED materials, and larger-scale synthesis/manufacturing of OLED/LED devices/materials will be covered.

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## J4 Microfabricated and Nanofabricated Systems for MEMS/NEMS 10

Sensor / Dielectric Science and Technology / Electronics and Photonics / Physical and Analytical Electrochemistry / ECSJ Bioengineering / CSE

This symposium continues the series of symposia that focus on all 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, 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.

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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## J5 Sensor Applications: Nuclear and Radiation Sensors
Sensor

The current worldwide geopolitical situation requires automated tools for quick and effective assessments of potential threats to human lives. Nuclear and radiation threats are subtle, ephemeral, easily hidden, and can be focused across large areas. Aside from nuclear or radiation threat, improved un-manned sensors are necessary during nuclear plant accidents and meltdown to protect human responders from exposure on site as well as to hasten the remediation and repair. Current methods of searching for radiation sources is usually done manually, by human operators waving radiation counters as they walk across a large area. This method does not provide any visual or radiation data map of the area in question. To quickly characterize the severity of nuclear leak situation, an efficient way of obtaining this radiation map is needed. Furthermore, when searching for a weak radiation source as in a small leak from a nuclear power plant which may in time lead to an enormous nuclear disaster, manual methods are unlikely to yield results. Presentations that deal with the development of nuclear and radiation sensors, improved un-manned sensors, and all other aspects of nuclear and radiation sensors are invited to submit their abstracts to this symposium.

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