call for papers


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224th ECS MEETING

San Francisco, CA

October 27—November 1, 2013

Hilton San Francisco

224th ECS Meeting—Call for Papers—October 27-November 1, 2013

General Information

The 224th ECS Meeting will be held from **October 27-November 1, 2013**. This major international conference offers a unique blend of electrochemical and solid-state science and technology; and serves as a major forum for the discussion of interdisciplinary research from around the world through a variety of formats, such as oral presentations, poster sessions, exhibits, and tutorial sessions.

Abstracts are due no later than May 17, 2013.

Note: Some abstracts may be due earlier than May 17, 2013. 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 **May 17, 2013**. Faxed abstracts, emailed abstracts, late abstracts, and abstracts more than one page in length will not be accepted. In June 2013, 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 June 2013, 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 2013. 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 a presenting author would like to use his/her own laptop for presentation, we strongly suggest that the author verify laptop/projector compatibility in the presentation room prior to the start of the session or all other presentations. Speakers requiring additional equipment must make written request to the ECS headquarters office at least one month prior to the meeting and appropriate arrangements will be worked out, subject to availability, and at the expense of the author. Poster presentations should be displayed in English, on a board approximately 3 feet 10 inches high by 3 feet 10 inches wide (1.17 meters high by 1.17 meters wide), corresponding to the abstract number and day of presentation in the final program.

Manuscript Publication

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

ECS Transactions—All full papers presented at ECS meetings are eligible for submission to the online proceedings publication, *ECS Transactions* (ECST). Each meeting is represented by a "volume" of ECST, and each symposium is represented by an "issue."

Some symposia will publish their issue to be available for sale "AT" the meeting. Please see each individual symposium listing in this Call 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, and all authors are encouraged to submit their full papers. To determine acceptance in ECST, all submitted manuscripts will be reviewed, either by the symposium organizers or by the ECST Editorial Board. After the meeting, all accepted papers in ECST will be available for sale, either individually, or by issue.

Please visit the ECST website (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.

Papers presented at ECS meetings and manuscripts submitted to ECST may also be submitted to the Society's technical journals: the *Journal of The Electrochemical Society, ECS Journal of Solid State Science and Technology, ECS Electrochemistry Letters*, or *ECS Solid State Letters*. Although there is no hard deadline for the submission of these papers, it is considered that six months from the date of the symposium is sufficient time to revise a paper to meet the stricter deadlines of the journals. "Instructions to Authors" are available from the ECS headquarters office, the journals, or the ECS website.

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

Financial Assistance

Financial assistance is very limited and generally governed by the symposium organizers. Individuals may inquire directly to the symposium organizers of the symposium in which they are presenting their paper to see if funding is available. Individuals requiring an official letter of invitation should write to the ECS headquarters office; such letters will not imply any financial responsibility of ECS. Students seeking financial assistance should consider awarded travel grants (see page 126).

Hotel Reservations

The 224th ECS Meeting will be held at the Hilton San Francisco located at 333 O'Farrell Street, San Francisco, CA 94102. Please refer to the 224th ECS Meeting website 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 224th ECS Meeting. **The hotel reservation deadline is September 27, 2013.** Please refer to ECS website for rates and reservations.

Meeting Registration

All participants—including authors and invited speakers of the 224th ECS 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 27, 2013.**

Short Courses

A number of short courses will be offered on Sunday, October 27, 2013 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 tentatively planned for the meeting: Advanced Impedance Spectroscopy, Semiconductor Processing, Fundamentals of Electrochemistry, Polymer Electrolyte Fuel Cells, Solid Oxide Fuel Cells, and Operation and Exploitation of Electrochemical Capacitor Technology. Please check the ECS website for the final list of offerings.

Technical Exhibit

The 224th ECS Meeting will also include a Technical Exhibit, featuring presentations and displays by over 40 manufacturers of instruments, materials, systems, publications, and software of interest to meeting attendees. Coffee breaks are scheduled 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, meeting signage, Mobile App, and on the ECS website. The levels are: Platinum: $5,000+, Gold: $3,000, Silver: $1,500, and Bronze: $1,000.

In addition, sponsorships are available for the plenary (an exclusive sponsorship) as well as 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 — The Energy Water Nexus

B — Batteries, Fuel Cells, and Energy Conversion

B1 — Energy Technology/Battery Joint General Session

B2 — Battery Chemistries Beyond Lithium Ion

B3 — Battery Safety

B4 — Computational Science of Battery Materials

B5 — Electrochemical Capacitors: Fundamentals to Applications

B6 — Electrochemical Synthesis of Fuels 2

B7 — High Temperature Experimental Techniques and Measurements

B8 — Intercalation Compounds for Rechargeable Batteries

B9 — Interfacial Phenomena in Battery Systems

B10— Lithium-Ion Batteries

B11— Polymer Electrolyte Fuel Cells 13

B12— Stationary and Large Scale Electrical Energy Storage Systems 3

D — Corrosion, Passivation, and Anodic Films

D1 — Corrosion General Poster Session

D2 — Atmospheric Corrosion

D3 — Degradation of Carbon Structural Materials

D4 — Mass Transport Phenomena in Localized Corrosion

D5 — Oxide Films: A Symposium in Honor of Clive Clayton on his 65th Birthday

D6 — Biodegradable and Bioabsorbable Metals and Materials

E — Dielectric and Semiconductor Materials, Devices, and Processing

E1 — Solid State Topics General Session

E2 — Atomic Layer Deposition Applications 9

E3 — GaN and SiC Power Technologies 3

E4 — Low-Dimensional Nanoscale Electronics and Photonic Devices 6

E5 — Nonvolatile Memories

E6 — Photovoltaics for the 21st Century 9

E7 — Processing, Materials, and Integration of Damascene and 3D Interconnects 5

E8 — Semiconductor Cleaning Science and Technology 13 (SCST 13)

E9 — Semiconductor Nanostructures and Plasmonics for Photonic Device Engineering 2

E10— Semiconductors, Dielectrics, and Metals for Nanoelectronics 11

E11 — State-of-the-Art Program on Compound Semiconductors (SOTAPOCS) 55

E12— ULSI Process Integration 8

F — Electrochemical / Chemical Deposition and Etching

F1 — Current Trends in Electrodeposition - An Invited Symposium

F2 — Emerging Materials and Processes for Energy Conversion and Storage

F3 — Fundamentals and Applications of Electrophoretic Deposition

F4 — Fundamentals of Electrochemical Growth: From UPD to Microstructures 3

F5 — Emerging Opportunities in Electrochemical Deposition for Nanofabrication

G — Electrochemical Synthesis and Engineering

G1 — Alkaline Electrolyzers

G2 — Synthesis and Electrochemical Engineering General Session

H — Fullerenes, Nanotubes, and Carbon Nanostructures

H1 — Carbon Nanostructures 4 - Fullerenes to Graphene

I — Physical and Analytical Electrochemistry

I1 — Physical and Analytical Electrochemistry Division General Session

I2 — Invitational Symposium in Honor of Adam Heller on his 80th Birthday

I3 — Photoelectrochemistry and Photoassisted Electrocatalysis

I4 — Physical and Analytical Electrochemistry in Ionic Liquids 3

I5 — Processes 8

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

J1 — Sensors, Actuators, and Microsystems General Session

J2 — Impedance Techniques, Diagnostics, and Sensing Applications

J3 — Luminescence and Display Materials: Fundamentals and Applications

J4 — Microfluidic MEMS/NEMS, Sensors and Devices

J5 — Sensors and Imaging Techniques Based on Fluorescence, SPR, SERS, and Photoelectrochemistry

J6 — Sensors for Agriculture

A — General Topics

A1 General Student Poster Session
All Divisions

This poster session provides a forum for graduate and undergraduate students to present research results of general interest to ECS. The purpose of this session is to foster and promote work in both electrochemical and solid-state science and technology, and to stimulate active student interest and participation in ECS. A competition for the two best posters will be part of the session. Cash prizes will be given to the presenting student author on each winning paper; the amounts are awarded at the discretion of the organizers and judges. 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 December 06, 2013. 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. Subramanian**, Washington University in Saint Louis, e-mail: vsubramanian@seas.wustl.edu; **V. Chaitanya**, New Mexico State University, e-mail: vimalc@nmsu.edu; **M. P. Foley**, United States Naval Academy, e-mail: foley@usna.edu; and **K. B. Sundaram**, University of Central Florida, e-mail: sundaram@mail.ucf.edu.

A2 Nanotechnology General Session
All Divisions / New Technology Subcommittee

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

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

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

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **O. M. Leonte**, Berkeley Polymer Technology, e-mail: odleonte@comcast.net; **Z. Aguilar**, Ocean Nanotech, e-mail: zapaguilar@yahoo.com; **F. Chen**, University of South Carolina, e-mail: chenfa@cec.sc.edu; **J. Li**, NASA Ames Research Center, e-mail: jing.li-1@nasa.gov; and **W. Mustain**, University of Connecticut, e-mail: mustain@engr.uconn.edu.

A3 The Energy-Water Nexus
All Divisions / New Technology Subcommittee

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

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

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

Papers are requested on the role of electrochemistry in addressing the energy-water nexus, from policy considerations to scientific and technology driven breakthroughs. Emphasis is on technologies that cogenerate energy and clean water or provide low-energy solutions to water treatment or disinfection, such as microbial fuel cells and

photocatalytic water purification; scaling of technology from micro-sensors to determine water purity to municipal water treatment; and the fundamentals of electrochemistry at the nano-bio interface, electrodialysis, and ion exchange membranes.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Eric Wachsman**, University Of Maryland , e-mail: ewach@umd.edu; **J. Burgess**, Case Western Reserve University, e-mail: jdb22@case.edu; **M. Carter**, KWJ Engineering Inc, e-mail: mtcarter62@comcast.net; **C. Hensman**, The Bill & Melinda Gates Foundation, e-mail: carl.hensman@gatesfoundation.org; **B. Y. Liaw**, University of Hawaii, e-mail: bliaw@hawaii.edu; **S. Minteer**, University of Utah, e-mail: minteer@chem.utah.edu; **W. Mustain**, University of Connecticut, e-mail: mustain@engr.uconn.edu; **P. Natishan**, Naval Research Lab, e-mail: natishan@nrl.navy.mil; and **B. Stoner**, RTI International, e-mail: stoner@rti.org.

B — Batteries, Fuel Cells, and Energy Conversion

B1 Energy Technology / Battery–Joint General Session
Battery Division / Energy Technology Division

Papers are solicited on the fundamental and applied aspects of energy storage and energy conversion not covered by other symposia at this meeting. Of particular interest are new materials and designs, performance studies, and modeling of all types of batteries, supercapacitors and fuel cells including aqueous, non-aqueous, polymer electrolyte, solid electrolyte, and flow systems. Emerging energy storage technologies based on Sodium, Magnesium, Aluminum, etc. will also be featured. The symposium will include a session on batteries for medical applications that will include battery chemistries, delivering high energy and power in miniature packaging, testing and modeling for ensuring reliability and long-life.

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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**, US DOE/ NETL, e-mail: manivana@netl.doe.gov; **G. Amatucci**, Rutgers, the State University of New Jersey, e-mail: gamatucc@rci.rutgers.edu; **G. Jain**, Medtronic Energy and Component Center, e-mail: gaurav.jain@medtronic.com; **B. Y. Liaw** , University of Hawaii, e-mail: bliaw@hawaii.edu; and **S. R. Narayanan**, University of Southern California, e-mail: srnaraya@dornsife.usc.edu.

B2 Battery Chemistries Beyond Lithium Ion
Battery Division / Energy Technology Division

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

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **C. Johnson**, Argonne National Laboratory, e-mail: cjohnson@anl.gov; **M. Doeff**, Lawrence Berkeley National Laboratory, e-mail: mmdoeff@lbl.gov; **A. Manthiram**, University of Texas at Austin, e-mail: rmanth@mail.utexas.edu; **S. Mukerjee**, Northeastern University, e-mail: s.mukerjee@neu.edu; **J. Muldoon**, Toyota Research Institute North America, e-mail: john.muldoon@tema.toyota.com; and **K. Zaghib**, IREQ, e-mail: Zaghib.karim@ireq.ca.

B3 Battery Safety
Battery Division / Industrial Electrochemistry and Electrochemical Engineering Division

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

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

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **D. H. Doughty**, Battery Safety Consulting Inc., e-mail: dhdoughty@gmail.com; **G. Botte**, Ohio University, e-mail: botte@ohio.edu; and **C. J. Orendorff**, Sandia National Laboratories , e-mail: corendo@sandia.gov.

B4 Computational Science of Battery Materials
Battery Division / Industrial Electrochemistry and Electrochemical Engineering Division / Physical and Analytical Electrochemistry Division

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

The topics of the sessions will include (but not be limited to): (1.) New electrochemical systems, including lithium, sodium, magnesium chemistries; (2.) Electrode/electrolyte interfacial phenomena in new materials and new systems; (3.) High throughput materials design by first principles; (4.) Computational materials diagnostics; and (5.) Mutli-scale modeling of energy storage materials and systems.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Shirley Meng**, University of California, San Diego, e-mail: shirleymeng@ucsd.edu; **D. Bedrov**, University of Utah, e-mail: d.bedrov@utah.edu; **L. Chen**, Pennsylvania State University, e-mail: lqc3@ems.psu.edu; **K. Persson** , Lawrence Berkeley National Laboratory, e-mail: kapersson@lbl.gov; **M. Saiful Islam**, University of Bath, e-mail: M.S.Islam@bath.ac.uk; and **V. Subramanian**, Washington University, e-mail: vsubramanian@wustl.edu.

B5 Electrochemical Capacitors: Fundamentals to Applications

Battery Division / Energy Technology Division

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

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **T. Brousse**, Institut des Materiaux Jean Rouxel, CNRS/ University of Nantes, e-mail: thierry.brousse@univ-nantes.fr; **D. Bélanger**, l'Université du Québec à Montréal, e-mail: belanger.daniel@uqam.ca; **P. Kumta**, University of Pittsburg, e-mail: pkumta@pitt.edu; **J. Long**, U.S. Naval Research Laboratory, e-mail: jeffrey.long@nrl.navy.mil; **P. Simon**, Universite Paul Sabatier, LCMIE/CIRIMAT, France, e-mail: simon@chimie.ups-tlse.fr; and **W. Sugimoto** , Shinshu University, e-mail: wsugi@shinshu-u.ac.jp.

B6 Electrochemical Synthesis of Fuels 2

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

Sustainable economic growth and high quality of life require an abundant supply of clean and affordable energy. Future energy sources include solar, wind, and nuclear energy - all of which can produce electricity as the primary form of energy. The conversion of this electrical energy to fuels (e.g. hydrocarbon or hydrogen) using common chemicals such as carbon dioxide and water though electrochemical processes (e.g. electrolysis reactions), provides an opportunity to remove the temporal variation in the energy supply from solar and wind energy. Electrolysis reactions may involve protons, hydroxide, oxide or other ions. This "Electrochemical Synthesis for Fuels 2" symposium will provide an international forum for the presentation and discussion of the latest developments on electrolysis and related topics. The emphasis of this symposium is on recent advances relevant to the conversion and utilization of CO_2 and/or H_2O for synthesis of fuels and other chemicals. The application of the same cells as fuel cells is of special interest, because reversible cells that may be couple with renewable or nuclear electric power production in order to increase efficiency through energy storage are of particular importance.

Papers are solicited on the topics as follows: (1.) Materials for solid oxide electrolysis cells (SOECs) and solid oxide fuel cells (SOFCs), including electrolytes, electrodes, seals, and interconnects as well as proton conductor electrolysis cell (PCEC) and fuel cell (PCFC). Also contributions about cells with immobilized liquid electrolytes at elevated temperatures are solicited; (2.) Electrochemical performance and stability of SOECs/SOFCs, PCEC/PCFC and other relevant cells; (3.) Electrocatalytic phenomena in oxygen electrodes and fuel electrodes; (4.) Photoelectrochemical approaches for conversion of CO_2 and/or H_2O; (5.) Electrochemical and chemical technologies for CO_2 separation; and (6.) Novel materials or concepts for CO_2 conversion and capture. **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 July 19, 2013. 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: **Xiao-Dong Zhou**, University of South Carolina, e-mail: xiao-dong.zhou@sc.edu; **G. Brisard**, University de Sherbrooke, e-mail: gessie.brisard@usherbrooke.ca; **M. Mogensen**, Risoe, e-mail: MOMO@risoe.dtu.dk; **W. Mustain**, University of Connecticut, e-mail: mustain@engr.uconn.edu; **J. Staser**, university of South Carolina, e-mail: staser.john@gmail.com; and **M. C. Williams**, NETL, e-mail: Mark.Williams@UR.NETL.DOE.GOV.

B7 High Temperature Experimental Techniques and Measurements

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

Experiments to explore the behavior of materials at high temperatures for equilibrium- and non-equilibrium processes places enormous challenges on instrumentation design and analysis of data. However, the importance of high-temperature measurements to provide critical thermodynamic and kinetic data for understanding materials and processes at such extreme conditions has attracted researchers from a wide range of fields including electrochemistry, materials science, physics, geology, and various engineering fields.

The demand for high-temperature material properties has expanded with the continued development of advanced materials including complex oxides, metallic alloys, and cermet materials for high temperature applications such as combustion processes,

high-temperature fuel cells, solar thermal processes, nuclear power generation, chemical production, and semiconductor processing. This demand is being met in part by advances in methods including but not limited to Knudsen effusive mass spectrometry, calorimetry, *in situ* spectroscopies (electronic and optical), and high-temperature electron microscopy.

This symposium focuses on the development and implementation of experimental techniques for characterizing material properties (including thermodynamic, mechanical, electrical, and chemical kinetic) at high temperatures. The use of experiments to validate computational modeling tools from atomistic to the continuum scales will also be considered. Contributions on the development of novel instruments and data analysis for high-temperature measurements as well as on the application of state-of-the-art techniques on advanced materials and/or chemical/energy conversion processes are encouraged. Focus topics include high-temperature techniques involving: 1) Optical spectroscopy, 2) electronic spectroscopy, 3) electronic microscopy, 4) X-ray diffraction, 5) Knudsen effusion mass spectrometry, 6) time-resolve mass spectrometry, 7) advanced thermogravimetric and calorimetric techniques, and 8) novel methods.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **G. Jackson**, University of Maryland, e-mail: gsjackso@mines.edu; **A. Manivanan**, NETL, e-mail: manivana@netl.doe.gov; **T. Markus**, Research Center Juelich, e-mail: t.markus@fz-juelich.de; **E. Opila**, University of Virginia, e-mail: ejo4n@virginia.edu; **P. Trulove**, US Naval Academy, e-mail: trulove@usna.edu; and **R. Walker**, Montana State University, e-mail: rawalker@chemistry.montana.edu.

B8 Intercalation Compounds for Rechargeable Batteries

Battery Division / Industrial Electrochemistry and Electrochemical Engineering Division

Lithium intercalation/deintercalation into/from host lattices is the basis of current lithium-ion battery technology. Lithium-ion batteries have revolutionized the portable electronics market, and they are being intensively pursued for vehicle and stationary storage applications. This symposium provides a forum for recent advances in intercalation compounds that serve as cathode or anode materials in lithium-ion batteries. Abstracts concerning other intercalation systems based on magnesium, aluminum, sodium, etc., are best directed to the Battery Chemistries Beyond Lithium Ion symposium (B2). The symposium focuses on new or improved intercalation materials as well as a fundamental understanding of the processes that control the electrochemical performances.

Specific areas to be covered include but not limited to (1.) design of cathode and anode materials; (2.) novel chemical synthesis and processing; (3.) advanced materials and electrode characterization including *in-situ* and *ex-situ* methods; (4.) electrochemical properties and performances; (5.) electrode-electrolyte interfacial chemistry including SEI layer; (6.) computational modeling of intercalation compounds; and (7.) redox processes, electronic and ionic transport, and reaction mechanisms.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **M.M. Doeff**, Lawrence Berkeley National Laboratory, e-mail: mmdoeff@lbl.gov; **Shirley Meng**, University of California, San Diego, e-mail: shmeng@ucsd.edu; **Christian Masquelier**, Universite Picardie Jules Verne, e-mail: Christian.masquelier@sc.u-picardie.fr; **Atsuo Yamada**, University of Tokyo, e-mail: yamada@chemsys.t.u-tokyo.ac.jp; **Karim Zaghib**, Institut de recherche en électricité d'Hydro-Québec, e-mail: zaghib.karim@ireq.ca; and **Gerardine G. Botte**, Ohio University, e-mail: botte@ohio.edu.

B9 Interfacial Phenomena in Battery Systems

Battery Division / Physical and Analytical Electrochemistry Division

Interfacial phenomena dominate the behavior and performance of electrochemical systems in a dominated fashion. It is therefore critical to understand the fundamental mechanisms and processes involved at the interface between electrodes and electrolytes. This symposium is seeking papers that can contribute to the advancements of the knowledge in this area.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Robert Kostecki**, Lawrence Berkeley Nationasl Laboratory, e-mail: r_kostecki@lbl.gov; **Yangchuan Xing**, University of Missouri, e-mail: xingy@missouri.edu; and **Nina Balke**, ORNL, e-mail: balken@ornl.gov.

B10 Lithium-Ion Batteries

Battery Division

Lithium-ion batteries are utilized for a number of applications, most prominently in portable electronic devices such as cellular phones, laptop computers, and digital cameras. In recent years, lithium-ion batteries are also being considered for hybrid electric vehicle (HEV) and plug-in hybrid electric vehicle (PHEV) applications. This symposium is a forum for discussion on both fundamental and applied aspects of rechargeable lithium 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.) electrolyte development and characterization; (4.) electrode processing and cell design; (5.) electrode interfacial studies and diagnostic techniques; (6.) material, electrode, and cell modeling; (7.) elucidation of aging and failure modes and mechanisms; and (8.) performance and safety 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: **Ratnakumar V. Bugga**, Jet Propulsion Laboratory, e-mail: Ratnakumar.V.Bugga@jpl.nasa.gov; **Marshall Smart**, Jet Propulsion Laboratory, e-mail: Marshall.C.Smart@jpl.nasa.gov; and **Arumugam Manthiram**, University of Texas at Austin, e-mail: rmanth@mail.utexas.edu.

B11 Polymer Electrolyte Fuel Cells 13

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

This international symposium is devoted to all aspects of research, development, and engineering of polymer electrolyte fuel cells (PEFCs), as well as low-temperature direct-fuel cells using either

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

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

A Short Course on fundamental catalysis and how it can be applied to low-temperature fuel cell diagnostics and kinetic studies will be held the Sunday of the meeting (instructors: T. J. Schmidt and H. A. Gasteiger).

Section A: Diagnostics/Characterization Methods, MEA Design/Model
Organizers: F.N. Büchi, H.A. Gasteiger, A. Weber
Presentations related to acid and alkaline fuel cells that discuss: 1. novel gas diffusion medium substrates and micro-porous layer designs; 2. modeling and diagnostic methods to characterize mass- and heat-transport related phenomena (e.g., water flooding) in cells and membrane electrode assemblies; 3. CO_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: J. Fenton, T. Fuller, D.C. Hansen, V. Ramani, K. Shinohara
Presentations related to acid and alkaline fuel cells and 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: M. Edmundson, D. Jones, K.A. Perry
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: C. Coutanceau, S. Mitsushima, P. Strasser, H. Uchida
Presentations related to acidic fuel cells that discuss: 1. fuel cell electrocatalysts for hydrogen and hydrogen-reformate fuel cells (PEMFC, PAFC, etc.); 2. novel catalyst supports; 3. degradation of fuel cell electrocatalysts and catalyst supports; and, 4. ab-initio computational studies of catalytic mechanisms and for the design of novel catalysts.

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

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).

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karen.lyons@nrl.navy.mil; **H. Uchida**, University of Yamanashi, e-mail: h-uchida@yamanashi.ac.jp; and **A. Weber**, LBNL, e-mail: azweber@lbl.gov.

B12 Stationary and Large Scale Electrical Energy Storage Systems 3
Battery Division / Energy Technology Division / Industrial Electrochemistry and Electrochemical Engineering Division

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 systems for a cost-effective solution. This symposium is a forum for discussions on energy conversion and storage systems for future applications in renewable energy-based grid distribution and electrification of transportation. Papers related to topics from fundamental studies to practical applications are 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: **Trung Van Nguyen**, University of Kansas, e-mail: cptvn@ku.edu; **Sanjeev Mukerjee**, Northeastern University, e-mail: s.mukerjee@neu.edu; **Vito Di Noto**, University of Padova, e-mail: vito.dinoto@unipd.it; and **Bor Yann Liaw**, University of Hawaii, e-mail: bliaw@hawaii.edu.

D — Corrosion, Passivation, and Anodic Films

D1 Corrosion General Poster Session Corrosion Division
Corrosion Division

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: **R. Buchheit**, The Ohio State University, e-mail: buchheit.8@osu.edu.

D2 Atmospheric Corrosion
Corrosion Division / Physical and Analytical Electrochemistry Division

Atmospheric corrosion involves a complex set of phenomena which are affected by interactions among the electrochemical reactions on the metal surface, the thin electrolyte layer that is present, and environmental and climatic factors. Processes involved include chemical reactions and their equilibria, ionic transport, and electrochemical thermodynamics and kinetics. Nonetheless, the tremendous fraction of the world's infrastructure that is exposed to atmospheric corrosion motivates continued study. Many investigations have been performed in order to clarify the role of environmental and climatic factors in the atmospheric corrosion of commonly used structural metals and coatings as well as to simulate in the laboratory their observed corrosion behavior in the field. Over the last several decades, improved analytical characterization of the corrosion products and surfaces has resulted in a more complete understanding and consideration of environmental parameters, corrosion layers, and degradation of polymeric coatings. Various corrosion products, specific to the metallic (or polymeric) substrates in the system, and the corrosive species present (anions, cations, acidic and basic salts, particulates, etc.) which interact with each other all vary in amounts and residence time.

This symposium will focus on all aspects pertaining to atmospheric corrosion as it relates to bare and coated metals, polymeric coatings, kinetics, degradation mechanisms, accelerated testing, and mathematical modeling. Papers pertaining to the role of environmental parameters and their interaction with the substrates of interest are particularly encouraged.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **D.C. Hansen**, Corrosion Division, e-mail: douglas.hansen@udri.udayton.edu; **R. Calhoun**, U. S. Naval Academy, e-mail: calhoun@usna.edu; **R. Kelly**, University of Virginia, e-mail: rgk6y@virginia.edu; **C. Leygraf**, KTH, e-mail: chrisl@kth.se; and **A. Nishikata**, Tokyo Institute of Technology , e-mail: atsushi@mtl.titech.ac.jp.

D3 Degradation of Carbon Structural Materials
Corrosion Division / New Technology Subcommittee

There is a developing trend in that traditional metals in structural applications are being replaced by composites with higher strength/weight ratios; indeed, in one specific case in the aerospace industry, it has been reported that aluminum usage has dropped to 20% (versus 50% in previous aircraft designs). Ever since the 1950s, when "engineering materials" mainly meant metals, the share of metals in engineering materials has been diminishing. Due to this shift away from metals as structural materials, it is becoming more compelling to understand the various modes of degradation that carbon composite materials can undergo.

The topic of this symposium will be oriented towards all types of carbon composite materials in use today for all types of structural applications in aerospace, automotive, industrial, defense and residential structures such as carbon reinforced metal matrix composites, carbon reinforced light metal composites, mechanically alloyed carbon-metal composites, carbon fiber metal laminates, etc. and the various modes of degradation that they undergo, with particular attention on electrochemical phenomena such as, but not limited to, oxidation, galvanic corrosion, interphase formation and defects, and inorganic and organic coatings for corrosion inhibition.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **D. C. Hansen**, Corrosion Division, e-mail: douglas.hansen@udri.udayton.edu; and **L. Hihara**, University of Hawaii HCL, e-mail: hihara@wiliki.eng.hawaii.edu.

D4 Mass Transport Phenomena in Localized Corrosion
Corrosion Division

While many passive alloys such as stainless steels, super nickel alloys and aluminum alloys have wide engineering applications in environments that would be otherwise too corrosive for some alloys, when exposed to halides these alloys suffer from localized attack in the form of pitting and crevice corrosion. One clear aspect of the localized corrosion mechanism is the development of a critical chemistry often referred to as the critical pitting solution or the critical crevice solution. This symposium will focus on experimental and theoretical methods for characterizing and modeling the reaction kinetics, transport phenomena, salt film formation and solution reactions necessary for the initiation and propagation of localized corrosion. The effects of the reduction reaction are also considered. This may included but is not limited to the role of the mass transport limited oxygen reduction during atmospheric corrosion or reduction reactions inside pits. Sate-of-the-art methods for assessing local chemistry using spectroscopic or electrochemical methods are encouraged as are novel models of pitting and crevice corrosion.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **S. Lillard**, University of Akron, e-mail: lillard@uakron.edu; and **R. Kelly**, University of Virginia, e-mail: rgk6y@virginia.edu.

D5 Oxide Films: A Symposium in Honor of Clive Clayton on his 65th Birthday.
Corrosion Division

This symposium will be focused on the State of the art application of surface and interface analysis methods to environmental material interactions: in honor of Clive R. Clayton's 65th year.

Papers are solicited involving the current or potential application of *in situ* and *ex situ* surface or interface sensitive analysis methods to studies of surface oxides, thin films and environmental/materials interactions. The symposium will focus on both fundamental aspects of the methods and practical applications, especially those involving new or advanced materials. An important aspect of this series will be new methods, instrument or analysis advances, and current experimental limitations. Papers concerned with liquid or gaseous interactions with metals, semiconductors, ceramics, protective coatings, and composites at macro, micro, and nano-scales are requested.

Keynote speakers will present tutorials covering the recent advances, advantages and limitations of both new and well-established techniques as well as relating these to important scientific and technological questions. The symposium will address issues related to probe and environmental effects as well as important experimental and analytical considerations.

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D6 Biodegradable and Bioabsorbable Metals and Materials
Corrosion Division

The development and utilization of metals and other materials for essential but temporary functionality with little or no remnant impact is a frontier of materials science. It is also an interesting and creative outgrowth of corrosion science. This symposium aims to create a venue for presentation and discussion of materials that must possess or impart structural or functional utility *in vivo* or *in natura* for a short time and then degrade, primarily by electrochemical reactions, without deleterious effects on the surroundings. Specific areas of focus include, but are not limited to tailoring degradation or absorption rates, degradation mechanisms, environmental effects on kinetics, bio- and environmental compatibility, and applications. Application areas extend towards medical devices and implants, novel ideas in degradable products, and methods for electrochemical stimulation of bioabsorption and biodegradation.

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E — Dielectric and Semiconductor Materials, Devices, and Processing

E1 Solid State Topics General Session
Dielectric Science and Technology Division / Electronics and Photonics Division / Energy Technology Division

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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E2 Atomic Layer Deposition Applications 9
Dielectric Science and Technology Division / Electronics and Photonics Division

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

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

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E3 GaN and SiC Power Technologies 3
Electronics and Photonics Division / Dielectric Science and Technology Division

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

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E4 Low-Dimensional Nanoscale Electronics and Photonic Devices 6
Electronics and Photonics Division / Dielectric Science and Technology Division / Sensor Division

The sixth 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.

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 July 19, 2013. 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: **M. Suzuki**, Kyoto University, e-mail: snki@me.kyoto-u.ac.jp; **S. Albin**, Norfolk State University, e-mail: salbin@usu.edu; **M. Carter**, KWJ Engineering, e-mail: mtcarter62@comcast.net; **L.-J. Chou**, National Tsing-Hua University, e-mail: ljchou@mx.nthu.edu.tw; **Y-L Chueh**, National Tsing-Hua University, e-mail: ylchueh@mx.nthu.edu.tw; **S. Jin**, University of Wisconsin-Madison, e-mail: jin@chem.wisc.edu; **M.-H. Jo**, Yonsei University, e-mail: mhjo@yonsei.ac.kr; and **R. J. Martín-Palma**, Universidad Autónoma de Madrid, e-mail: rauljose.martin@uam.es.

E5 Nonvolatile Memories
Dielectric Science and Technology Division / Electronics and Photonics Division

Nonvolatile Flash memory has followed the scaling evolution of the semiconductor roadmap, however, there is increasing concern about scalability into the next decade. At the same time many new memory storage mechanisms and materials are showing promise as potential replacement of Flash. The symposium will address the recent developments in nonvolatile memory devices such as FeRAM, MRAM, ReRAM, PRAM, STTRAM, Flash memory and other emerging new nonvolatile memories such as atomic switching and nano-gap devices and their related materials and technologies. The program will consist of both invited and contributed papers. Papers will cover both practical issues and fundamental studies' and are solicited in the following suggested areas: (1.) advanced devices, device structures and performances, and device design; (2.) memory related materials and their growth and deposition processes; (3.) device fabrication processing; (4.) structure analyses, and material and process characterization; (5.) device functional characterization, device physics, and modeling; (6.) system applications; and (7.) other related technologies. **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 July 19, 2013. 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. Shingubara**, Kansai University, e-mail: shingu@kansai-u.ac.jp; **H. Akinaga**, AIST, e-mail: akinaga.hiro@aist.go.jp; **Z. Karim**, Aixtron, e-mail: z.karim@aixtron.com; **Y. B. Kim**, Samsung Advanced Institute, e-mail: yb305.kim@samsung.com; **K. Kobayashi**, Tokai University, e-mail: kkbys@keyaki.cc.u-tokai.ac.jp; **K-J. Lee**, Korea University, e-mail: kj_lee@korea.ac.kr; **B. Magyari-Kope**, Stanford University, e-mail: blankamk@stanford.edu; **T. Ohyanagi**, LEAP, e-mail: ohyanagi@leap.or.jp; **A. Sebastian**, IBM Zurich, e-mail: ASE@zurich.ibm.com; **Y. Suzuki**, Osaka University, e-mail: Suzuki-y@mp.es.osaka-u.ac.jp; and **N. Takaura**, LEAP, e-mail: takaura@leap.or.jp.

E6 Photovoltaics for the 21st Century 9

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

With the current global energy consumption at 15 TW and projected demand of 46 TW by 2100, photovoltaic solar cells have to be deployed at a scale of tens of peak terawatts or they will have little impact on our future energy mix. Almost all of the current cell technologies suffer from natural resource limitations which prevent them from reaching terawatt scales. These limitations include high energy input for wafer-Si cells and material scarcity for CdTe, CIGS, dye-sensitized, wafer-Si and thin-film Si cells. Scarce photovoltaic materials include well-known Te, In, Ga, as well as Ag and Ru. These limitations have to be removed or new cell technologies which do not suffer from resource limitations have to be developed, for solar electricity to become a significant source of energy in our future.

Fundamental and applied research is needed to make breakthroughs in wafer-Si technologies, thin-film technologies, as well as totally new photovoltaic concepts. This symposium will focus on conventional and non-conventional technologies for photovoltaic conversion that could be deployed to a terawatt scale in the 21st century. Contributions of both fundamental and applied nature leading to low-cost high-efficiency photovoltaic conversion are solicited. Topics of interest include but not limited to: 1. Solar-grade Si; 2. Wafer-Si cells; 3. Thin-film Si cells; 4. CdTe cells; 5. CIGS cells; 5. New earth-abundant photovoltaic materials; 6. Non-conventional photovoltaic structures or concepts; 7. Cross-cutting issues in cells, modules and systems.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **M. Tao**, Arizona State University, e-mail: meng.tao@asu.edu; **C. Claeys**, IMEC, e-mail: claeys@imec.be; **H. (Lili) Deligianni**, IBM Watson Research Center, e-mail: lili@us.ibm.edu; **J. M. Fenton**, UniversFlorida Solar Energy Center / University of Central Florida, e-mail: jfenton@fsec.ucf.edu; **M. E. Overberg**, Sandia National Laboratory, e-mail: meoverb@sandia.gov; **J.-G. Park**, Hanyang University, e-mail: parkjgl@hanyang.ac.kr; **K. Rajeshwar**, University of Texas at Arlington, e-mail: rajeshwar@uta.edu; and **M. Sunkara**, University of Louisville, e-mail: mahendra@louisville.edu.

E7 Processing, Materials, and Integration of Damascene and 3D Interconnects 5

Dielectric Science and Technology Division / Electrodeposition Division / Electronics and Photonics Division / High Temperature Materials Division

This symposium focuses on issues pertinent to advances in materials, processing and integration methods for 3D interconnects and packaging technologies. An emerging technology or device architecture called 3D integration is based on the system performance gains that can be achieved by stacking and vertically interconnecting distinct device layers. The 3D concept of replacing long 2D interconnects with shorter vertical (3D) interconnects has the potential to alleviate the well-known interconnect (RC) delay problem facing the semiconductor industry today. Additional benefits of the 3D process include reduced die size and the ability to optimize distinct technologies (analog, logic, RF, etc.) on separate vertically interconnected layers. 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 TSVs, and mathematical models of deposition and growth.

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

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

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **K. Kondo**, Chemical Engineering, Osaka Prefecture University, e-mail: kkondo@chemeng.osakafu-u.ac.jp; **R. Akolkar**, Case Western Reserve University, e-mail: rohan.akolkar@case.edu; **D. P. Barkey**, University of New Hampshire, e-mail: dpb@cisunix.unh.edu; **W. P. Dow**, National Chung Hsing University, e-mail: dowwp@dragon.nchu.edu.tw; **M. Hayase**, Tokyo Science University, e-mail: mhayase@rs.noda.tus.ac.jp; **M. Koyanagi**, Tohoku University, e-mail: koyanagi@bmi.niche.tohoku.ac.jp; **G. S. Mathad**, S/C Technology Consulting, e-mail: swami_mathad@hotmail.com; **P. Ramm**, Fraunhofer Research Institution for Modular

Solid State Technologies EMFT Munich, e-mail: peter.ramm@emft.fraunhofer.de; **F. Roozeboom**, Eindhoven University of Technology, e-mail: f.roozeboom@tue.nl; and **S. Shingubara**, Kansai University, e-mail: shingu@kansai-u.ac.jp.

E8 Semiconductor Cleaning Science and Technology 13 (SCST 13)
Electronics and Photonics Division

This symposium has been organized under the auspices of the Electrochemical Society every other year since 1989. The symposium continues to cover a wide range of topics related to the science and technology of contaminants removal from and conditioning of Si(SOI), SiC, Ge, SiGe, III-V, II-VI semiconductor and non-semiconductor (e.g. sapphire, glass, ITO, plastic) surfaces; cleaning media, including non-aqueous cleaning methods and tools; FEOL and BEOL cleaning operations and pattern collapse prevention; integrated cleaning; cleaning of 3D structures and 3D stacked ICs, cleaning of MEMS; DUV and EUV masks; high-k and porous low-k dielectrics; post-CMP cleaning; wafer bevel cleaning/polishing; photoresist and residue removal, characterization, evaluation, and monitoring of cleaning; correlation with device performance; cleaning of equipment and storage/handling hardware; cleaning related issues specifically in the case of 450mm wafers; as well as other issues within the broadly understood scope of this symposium. Also, surface cleaning and conditioning topics involved in large-area electronics and photonics, both non-organic and organic TFT technology, compound semiconductor device processing, nanowire, nanotubes and nanodots cleaning, as well as surface conditioning related aspects of "self-assembly-monolayer" processing. Only original, non-commercial in nature contributions in any of the above listed topics will be accepted for presentation. Depending on the number of accepted papers a poster session may be scheduled in addition to oral presentations.

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

E9 Semiconductor Nanostructures and Plasmonics for Photonic Device Engineering 2
Electronics and Photonics Division

This is the second time this symposium has been organized under the auspices of the Electrochemical Society. It's 2nd edition will cover a wide range of topics related to engineering photonic functionality with nanostructures of metals and semiconductors. Semiconductor nanostructures include layered heterostructures including superlattices and metamaterials, quantum dots, and nanowires. Emphasis will be on enhancements enabled through quantum confinement and enhanced optical properties in nanostructures and cavities. Plasmonics field enhancements will also be a part of the program due to their tie to a number of nanostructured devices. Metallic nanostructures based on electron beam lithography and colloidal nanoparticles are being used for plasmonics enhancement of luminescence and photodetection in sensing and communications. Enhanced capabilities for solar cells, light emitting diodes and lasers are subjects of interest. Sensing based on plasmonics enhancement of luminenscence or surface enhanced Raman scatterriing could also be considered. Light trapping and enhancement in solar cells through nanostructures, plasmonics and photonic crystals are topics for consideration. Plasmonics enhancement of sensors due to regimes for localized surface plasmons effects for resonance shifts and localized electromagnetic field enhancements as well as for two-photon or microcavity sensors are sought. Depending on the number of accepted papers a poster session may be scheduled in addition to oral presentations.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **J. Xu**, Pennsylvania State University, e-mail: jianxu@engr.psu.edu; and **J. S. Kwak**, Sunchon National University, e-mail: jskwak@sunchon.ac.kr.

E10 Semiconductors, Dielectrics, and Metals for Nanoelectronics 11
Dielectric Science and Technology Division / Electronics and Photonics Division

Presentations at this symposium will cover but not restricted to the following topical areas:
Germanium Channels: Surface/Interface Modeling; Band Offsets; Interface Trap Control; Suitable High-k Gate Stacks, C-V and G-V Characteristics; CMOSFET Characteristics.
GaAs, InGaAs, InP, GaSb, InSb, GaN, and SiC Channels: Surface/Interface Modeling; Band Offsets; Surface Cleaning and Surface Preparation; Interface Passivation Techniques; Suitable High-k Gate Stacks; Integration on Silicon; C-V and G-V Characteristics; CMOSFET Characteristics.
Semiconductor Nano-Wire Technology: Synthesis Strategies for III-V Nanowires; Growth, Properties, and Device Applications of III-Nitride, III-Phospide, III-Arsenide, III-Antimonide, and III-V Ternary Nanowires; III-V Nanowire Transistors; III-V Nanowire LEDs, Lasers, and Solar Cells.
Carbon Nano-Tube and Graphene Technology: Synthesis Strategies for Carbon Nano-materials; Growth, Properties, and Device Applications of Graphene and Carbon Nanotubes; Interfacing Nanocarbons with Inorganic and Organic Semiconductors; Graphene Transistors; Carbon Nano-Tube Transistors.
Novel Transistor Structures: Multi-Gate MOSFETs; Organic FET and Thin Film Transistors with High-k Dielectrics; Transistor Structures Incorporating Strain Enhancement.
Gate Electrode Metals and Work Function Tuning: Dipoles at High-k/SiO_2 Interface and Cap Layers at High-k/Metal Interfaces; Role of Oxygen Vacancies; Gate First Integration; Gate Last Integration; Dual Metal, Dual Gate Dielectric Options.
Defects, Traps, and Reliability: Defect Generation Mechanisms and Models; Fast Transient Trapping; Slow Trapping; New Reliability Testing Techniques; SILC; NBTI and PBTI; TDDB.
Novel Dielectric Materials: Dielectrics with $k > 30$; Epitaxial Gate Insulators, Ferro-electric Materials.
Volatile and Non-Volatile Memory: Phase-Change RAM; Magnetic RAM; Ferroelectric RAM; Resistive RAM; Floating Body RAM; Conductive-Bridging RAM; Spin-Transfer Torque RAM.
Challenges for Process Development: Low Temperature Processing; 3D Integration; Morphology and Phase Control of Materials; Post Deposition Treatment; Surface Cleaning Technology; Etch Ability.

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

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

E11 State-of-the-Art Program on Compound Semiconductors (SOTAPOCS) 55
Electronics and Photonics Division

Compound and wide bandgap semiconductors are a significant enabler of numerous optoelectronic, high-speed, power, and sensor electronic materials, devices, and systems. The SOTAPOCS 55 symposium will address the most recent developments in inorganic compound and wide bandgap 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, and new nanoscale investigations and application of compound semiconductor nanomaterials are solicited. The following areas are of particular interest: (1.) Advances in bulk, epitaxial and nanoscale 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; and (10.) Reliability and device degradation mechanisms; (11.) Growth and characterization of compound semiconductor nanoscale material and devices; and (12.) Compound semiconductor nanodevices.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **C. O'Dwyer**, University of Limerick, e-mail: colm.odwyer@ul.ie; **E. Douglas**, Sandia National Laboratory, e-mail: Erica.Douglas@sandia.gov; **J. H. He**, National Taiwan University, e-mail: jhhe@cc.ee.ntu.edu.tw; and **S. Jang**, Dankook University, e-mail: jangmountain@dankook.ac.kr.

E12 ULSI Process Integration 8
Electronics and Photonics Division

The Eighth symposium on ULSI Process Integration will provide a forum for reviewing and discussing all aspects of process integration.

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

The deadline for the electronic 1-page abstract submission to ECS is May 17, 2013. Acceptance of a paper for ULSI Process Integration 8 obligates the author(s) to submit on-line a camera-ready copy of the full manuscript and a list of key words to ECS by July 19, 2013. Instructions and other information about the ECS Fall Meeting in san Francisco are available also on the ECS home page http://www.electrochem.org/meetings. Comments and inquiries about the symposium may be sent to the organizers:

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F — Electrochemical/Chemical Deposition and Etching

F1 Current Trends in Electrodeposition – An Invited Symposium
Electrodeposition Division

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

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizer: **C. Bonhote**, Hitchachi GST, e-mail: christian.bonhote@hitachigst.com.

F2 Emerging Materials and Processes for Energy Conversion and Storage
Electrodeposition Division / Battery Division

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 low-carbon energy conversion using photovoltaics, affordable energy storage for automotives, and scalable storage solutions for large stationary applications (from grid-level needs to dealing with the intermittency of solar). Small scale energy harvestors and energy storage devices, on the other hand, are of interest for microsystems (e.g. wireless sensing networks (WSN) and body area networks (BAN)) and implants. Integration of these components on a small footprint or chip demands novel strategies using dense architectures and conformal thin-film coatings. 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.

Nanostructured 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 include catalysts for hydrogen electro-oxidation, reformates and organic fuels, catalysts for oxygen reduction, supported and unsupported materials, polymer electrolyte for PEM and solid oxide fuel cells.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Y. Fukunaka**, JAXA and Waseda University, e-mail: hirofukunaka@gmail.com; **H. (Lili) Deligianni**, IBM, Thomas J. Watson Research Center, e-mail: lili@us.ibm.com; **C. Johnson**, Argonne National Laboratory, e-mail: cjohnson@anl.gov; **T. Van Nguyen**, University of Kansas, e-mail: cptvn@ku.edu; and **P. Vereecken**, IMEC, e-mail: Philippe.Vereecken@imec.be.

F3 Fundamentals and Applications of Electrophoretic Deposition

Electrodeposition Division

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

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Jan Talbot**, University of California - San Diego, e-mail: jtalbot@ucsd.edu; **James Dickerson**, Vanderbilt University, e-mail: james.h.dickerson@vanderbilt.edu; and **J. Fransaer**, Katholieke Universiteit, Leuven, e-mail: jan.fransaer@mtm.kuleuven.be.

F4 Fundamentals of Electrochemical Growth: From UPD to Microstructures 3

Electrodeposition Division

The symposium provides a forum for discussions about different fundamental aspects of electrochemical phase formation including: nucleation and growth, electrochemical epitaxy, properties, structure and morphology of electrodeposited films. Original papers are solicited in the areas of: 1. Nucleation and growth, 2. UPD and ultrathin films, 3. Electrodeposition kinetics and mechanisms, 4. Physical and chemical properties of deposits in relation with morphology and structure, 5. Modeling, and 6. Stress evolution in electrodeposited films.

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F5 Emerging Opportunities in Electrochemical Deposition for Nanofabrication

Electrodeposition Division / Physical and Analytical Electrochemistry Division

This symposium will cover advances in electrochemical processes used for fabricating electronic devices and related structures. Studies examining the use of electrolyte additives and engineered monolayer films to mediate metal deposition reactions are of central interest. Additives of interest range from underpotential deposited metals, to anions, cations and organic surfactants or polymers. Engineered films might include self-assembled monolayers to networks or nanoparticle layers with specific attention given to the formation and impact on metal deposition reactions. Papers are sought that explore questions related to nucleation and growth, morphological and microstructural evolution, based on surface and electroanalytical measurements. Attention will be given to mechanistic studies aimed at understanding growth processes such as electrodeposition, electroless deposition, chemical bath deposition, and electrochemical atomic layer deposition (E-ALD). Applications of interest range from copper electroplating for on chip Damascene and TSV interconnects to electroless processes for the metallization of non-conductive surfaces such as dielectrics. Papers detailing new processes and advances in understanding are desired while contributions pertaining to novel applications and the extendibility of established technology are also encouraged. Aspects of electrochemical deposition related to metallic foams for battery interconnects, metallization for photovoltaic devices, electrocatalysts for fuel cells, MEMS and related topics are also welcome.

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G — Electrochemical Synthesis and Engineering

G1 Alkaline Electrolyzers

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

Alkaline electrolyzers may offer significantly improved performance over those using acid electrolytes. Non-precious metal catalysts have sufficient stability to be used in alkaline media, leading to lower system cost. This symposium covers all aspects of alkaline electrolyzers (water, ammonia, urea, and alcohol electrolyzers). Topics of interest include, but are not limited to: (1.) electrocatalysts

and fundamental mechanistic aspects of redox processes; (2.) alkaline electrolytes (liquid alkaline electrolytes, anion conducting membranes); (3.) advanced electrode materials and structures; (4.) cell and system design, including reactant and product flow, heat transfer, and stack level materials corrosion; (5.) electrochemical performance and cell characterization; (6.) modeling and simulation of electrochemical phenomena and processes; and (7.) applications.

An issue of *ECS Transactions* is planned to be published "AFTER" the meeting. All authors accepted for presentation are obligated to submit their full text manuscript for the issue no later than December 06, 2013. All manuscripts will be submitted online, and must be in either MS Word or PDF format.

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **G. Botte**, Ohio University, e-mail: botte@ohio.edu; **K. Ayers**, Proton On Site, e-mail: KAyers@protononsite.com; **B. Y. Liaw**, University of Hawaii at Manoa, e-mail: bliaw@hawaii.edu; **S. Mukerjee**, Northeastern University, e-mail: s.mukerjee@neu.edu; and **V. Ramani**, Illinois Institute of Technology, e-mail: ramani@iit.edu.

G2 Synthesis and Electrochemical Engineering General Session

Industrial Electrochemistry and Electrochemical Engineering Division

Papers are solicited in areas of industrial electrochemistry and electrochemical engineering that are not covered by other symposia at this meeting. 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.

An issue of *ECS Transactions* is planned to be published "AFTER" the meeting. All authors accepted for presentation are obligated to submit their full text manuscript for the issue no later than December 06, 2013. All manuscripts will be submitted online, and must be in either MS Word or PDF format.

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **G. Botte**, Ohio University, e-mail: botte@ohio.edu; and **J. Staser**, University of Puerto Rico, e-mail: john.staser@upr.edu.

H — Fullerenes, Nanotubes, and Carbon Nanostructures

H1 Carbon Nanostructures 4 - Fullerenes to Graphene

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

This symposium will focus on both fundamental and applied studies of carbon nano-structures: fullerenes, carbon nanotubes and graphene and materials derived from them. Papers in physics, chemistry and materials science as they relate to the electrochemical methods, devices and applications will be considered. Topics may include synthesis and preparation, characterization and evaluation of electrochemically-relevant mechanical, thermal, chemical, optical and electronic properties. A particular emphasis will be sought on the applications of carbon nano-materials in electrochemical and related technologies. Materials development and introducing novel OD, 1D and 2D carbon nano-materials and their integration with other nano-pahse in functional nano-composites is of central interest. Topics also include applications in novel electronic and opto-electronic devices, new analytical methods, techniques and sensors and sensing platforms that utilize carbon nano-structures; micro- and nano-electromechanical devices; catalysts for energy conversion technologies including bio-catalysis and biologically inspired systems; development of active materials and structures for solar energy harvesting, photo- and electrochemical systems for carbon capture/transformation and fuel production and environmental technologies..

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 July 19, 2013. All manuscripts will be submitted online, and must be in either MS Word or PDF format.

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **D. Guldi**, Univ of Erlangen-Nurnberg, e-mail: guldi@chemie.uni-erlangen.de; **P. Atanassov**, University of New Mexico, e-mail: plamen@unm.edu; **M. Carter**, KWJ Engineering, e-mail: mtcarter62@comcast.net; **H. Martin**, Case Western Reserve University, e-mail: hbm@case.edu; and **K. Zaghib**, IREQ, e-mail: Zaghib.karim@ireq.ca.

I — Physical and Analytical Electrochemistry

I1 Physical and Analytical Electrochemistry Division General Session

Physical and Analytical Electrochemistry Division

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

An issue of *ECS Transactions* is planned to be published "AFTER" the meeting. All authors accepted for presentation are obligated to submit their full text manuscript for the issue no later than December 06, 2013. All manuscripts will be submitted online, and must be in either MS Word or PDF format.

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

I2 Invitational Symposium in Honor of Adam Heller on his 80th Birthday

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

Recent progress in diverse scientific fields ranging from bioelectrochemistry, battery technology, and photoconversion have been deeply influenced by the contributions to materials electrochemistry by Professor Adam Heller of the University of Texas at Austin. This symposium will recognize Prof. Heller's career and works on the occasion of his 80th birthday. A series of invited lectures will discuss fundamentals in broad areas of polymer science, biocatalysis and semiconductor electrochemistry, and explore applications in myriad fields, including biomedical devices, batteries, fuel cells, and solar energy.

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 December 06, 2013. 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. Calabrese Barton**, Michigan State University, e-mail: scb@egr.msu.edu; **P. Atanassov**, University of New Mexico, e-mail: plamen@unm.edu; **E. J. Cairns**, Lawrence Berkeley National Laboratory, e-mail: ejcairns@lbl.gov; and **S. Minteer**, University of Utah, e-mail: minteer@chem.utah.edu.

I3 Photoelectrochemistry and Photoassisted Electrocatalysis

Physical and Analytical Electrochemistry Division

Photoelectrochemical and photoassisted electrocatalysis processes are of major importance in a variety of contexts, ranging from 'artificial photosynthesis' to various types of photovoltaic applications and even in some cases modification of organic compounds. This symposium will feature a broad spectrum of talks devoted to the fundamental understanding of key processes as well as the technical application of these processes. We solicit contributions on experimental and theoretical studies of hydrogen production, photo-assisted breakdown of materials such as biomass, electrochemical aspects of artificial and natural photosynthetic systems and the coupling of photo-processes to electrochemical cells to drive the formation of products. Contributions are sought on photoassisted electrocatalysis, including mechanistic, material synthetic and chemical studies of catalytically active surfaces that are modified to enhance or tailor activity. We also welcome contributions related to enabling materials to be used in combination with these cells such as new electrolyte compositions that allow new functionality (larger voltage windows and so on).

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 December 06, 2013. 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: **Tom Zawodzinski**, University Tennessee, Knoxville, e-mail: tzawodzi@utk.edu; **E. McFarland**, University of California Santa Barbara, e-mail: mcfar@engineering.ucsb.edu; **R. Subramanian**, University of Nevada, e-mail: ravisv@unr.edu; **J. Turner**, NREL, e-mail: John_turner@nrel.gov; and **H. Wang**, NREL, e-mail: Heli.Wang@nrel.gov.

I4 Physical and Analytical Electrochemistry in Ionic Liquids 3

Physical and Analytical Electrochemistry Division / Battery Division / Electrodeposition Division / Sensor Division

This symposium will provide an international and interdisciplinary forum for researchers to present their latest research on topics involving physical and/or analytical electrochemistry in ionic liquids. Papers on both basic and applied research are encouraged. The topics will include, but are not limited to: (1.) electron transfer processes in ionic liquids; (2.) electrode kinetics in ionic liquids; (3.) the electrode/ionic liquid interface; (4.) electrochemical characterization of ionic liquids (e.g., conductivity, ion transport, electrochemical windows); (5.) experimental aspects of electrochemistry in ionic liquids; (6.) the electrochemistry of solutes in ionic liquids; (7.) electroanalytical determinations in ionic liquids; (8.) electrodeposition in ionic liquids (e.g., nucleation, deposition of alloys, characterization of electroactive species, and surface characterization); and (9.) electrochemical aspects of biological materials and systems in ionic liquids.

An issue of *ECS Transactions* is planned to be published "AFTER" the meeting. All authors accepted for presentation are obligated to submit their full text manuscript for the issue no later than December 06, 2013. All manuscripts will be submitted online, and must be in either MS Word or PDF format.

Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **H. Delong**, AFOSR, e-mail: hugh.delong@afosr.af.mil; **M. Carter**, KWJ Engineering, e-mail: mtcarter62@comcast.net; **J. Fransaer**, University of Leuven, e-mail: jan.fransaer@mtm.kuleuven.be; **R. Mantz**, ARO, e-mail: robert.a.mantz@us.army.mil; and **P. Trulove**, Naval Academy, e-mail: trulove@usna.edu.

I5 Processes 8

Physical and Analytical Electrochemistry Division / Energy Technology Division

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

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **A. Hillier**, Iowa State University, e-mail: hillier@iastate.edu; and **J. Prakash**, IIT, e-mail: prakash@iit.edu.

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

J1 Sensors, Actuators, and Microsystems General Session
Sensor Division

This symposium addresses all aspects of sensor, actuator and microsystems research and development. The inclusion of sensors and actuators into a range of application environments has been significantly increasing in order to provide improved system capabilities such as increased performance, decreased environmental impact, or higher efficiency. Sensors and actuators are often integrated into â€œsmartâ€ microsystems: microfabricated sensors and/or actuators combined with electronics which enable, for example, signal conditioning and data processing. The need for multifunctional, smart technologies, which depend on sensors, actuators and electronics is expected to increase in coming years as further demands and expectations are placed on systems and devices. This general session welcomes papers on all aspects of sensors, actuators and microsystems not covered in other sessions. Both basic and applied aspects of sensor R&D are of interest in this symposium.

This symposium intends to bring together a range of interdisciplinary topics and covers all materials aspects of sensors, actuators and microsystems. Primary emphasis will be placed upon applied aspects of the materials, synthesis, evaluation and development strategies of novel materials/device configurations for sensing and actuating functions as well as integrated microsystems. High temperature and low temperature applications will be discussed. Papers are solicited in, but not limited to, the following areas: (1.) physics and chemistry of sensor and actuator materials, fabrication and characterization of novel compositions; (2.) novel routes for the synthesis of materials with grain (pore) size control and distributions; (3.) novel sensor and actuator concepts, design, modeling and verification; (4.) sensing systems that include sampling systems and actuators, for example sensor arrays, electronic noses and tongues; (5.) physical, chemical and biological sensors and actuators, such as gas and liquid phase sensors, humidity, ion or molecular sensors, their system integration and actuating functions; (6.) optical, RF and wireless sensors and actuators, such as fiber optic sensors, microwave sensors, and optical and wireless integrations; (7.) emerging technologies and applications including sensors based on nanotechnology; and (8.) novel techniques to expand and ensure sensor stability and reliability.

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 December 06, 2013. 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: **M. Carter**, KWJ Engineering, e-mail: mtcarter62@comcast.net; **Z. Aguilar**, Ocean Nanotech, e-mail: zapaguilar@yahoo.com; **B. Chin**, Auburn University, e-mail: bchin@eng.auburn.edu; **G. Hunter**, NASA, e-mail: gary.w.hunter@nasa.gov; and **P. Sekhar**, Washington State University, e-mail: sekhar.praveen@gmail.com.

J2 Impedance Techniques, Diagnostics, and Sensing Applications
Sensor Division / Corrosion Division / Industrial Electrochemistry and Electrochemical Engineering Division / Physical and Analytical Electrochemistry Division

The purpose of this Symposium is to bring together leading experts with a variety of different experimental and theoretical skills working in areas of electrochemical impedance technology and analytical systems. Impedance can be employed for materials analysis and condition monitoring, directly determine a variety of variables such as motion, chemical composition or electric field and, indirectly, sense many other variables that can be converted into motion or permittivity, such as pressure, acceleration, fluid level, and fluid composition. Impedance spectroscopy-based measurements, represent a rich multi-discipline area of science that has been applied to a large number of important areas of research, such as: Corrosion studies and corrosion control; Monitoring of properties of electronic and ionic conducting polymers and coatings; Measurements in energy storage, batteries, and fuel cells-related systems; Mechanical measurements; Biological, biocellular, and biomedical sensors; Measurements in semiconductors, solid electrolytes, and electronic conductors; Studies of electrochemical kinetics, reactions and processes and their control.

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

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **V. Lvovich**, NASA, e-mail: vlvovich@ameritech.net; **D. Hansen**, Corrosion Division, e-mail: douglas.hansen@udri.udayton.edu; **A. Khosla**, Simon Fraser University, e-mail: ajit_khosla@sfu.ca; **M. E. Orazem**, UFL, e-mail: morazem@che.ufl.edu; **M. Smiechowski**, Guild and Associates, e-mail: matt@guildassociates.com; and **P. Vanysek**, NIU, e-mail: pvanysek@niu.edu.

J3 Luminescence and Display Materials: Fundamentals and Applications
Luminescence and Display Materials Division

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. 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, white LEDs, quantum cutting for solar cells, and related upconversion/downconversion processes.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **J. Collins**, Wheaton College, e-mail: jcollins@wheatonma.edu; **U. Happek**, University of Georgia, e-mail: uhappek@physast.uga.edu; **C. Hunt**, Unoiversity of California, Davis, e-mail: hunt@ucdavis.edu; **K. Mishra**, Osram Sylvania, e-mail: kailash.mishra@sylvania.com; and **A. Setlur**, General Electric, e-mail: setlur@research.ge.com.

J4 Microfluidic MEMS/NEMS, Sensors and Devices

Sensor Division / Physical and Analytical Electrochemistry Division / New Technology Subcommittee

This symposium will specifically focus on the underlying electrochemical, chemical and physical principles related to the micro electro mechanical and nano electro mechanical systems (MEMS and NEMS), sensors and integrated sensing devices. The focus on aspects of micro/nanomachining, fabrication processes, or packaging will be de-emphasized. Instead, the operation-critical phenomena and physical properties, especially as they begin to deviate in principle upon device miniaturization from the constructs of classical physical and conventional chemistry will be the focus of this symposium. The contributions are sought on aspects of analyte detection, sample introduction, sample transport, *in situ* device validation, and fabrication, encapsulation and packaging, in cases where the phenomena arising from miniaturization become germane.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **P. Vanysek**, NIU, e-mail: pvanysek@niu.edu; **D. Cliffel**, Vanderbilt University, e-mail: david.cliffel@vanderbilt.edu; **P. Hesketh**, Georgia Tech, e-mail: peter.hesketh@me.gatech.edu; and **A. Khosla**, Simon Fraser University, e-mail: ajit_khosla@sfu.ca.

J5 Sensors and Imaging Techniques Based on Fluorescence, SPR, SERS and Photoelectrochemistry

Sensor Division / Luminescence and Display Materials Division / Physical and Analytical Electrochemistry Division

This symposium will provide an international and interdisciplinary forum to present the latest research on sensors based on fluorescence, surface-enhance Raman scattering (SERS), surface plasmon resonance (SPR), and photoelectrochemistry. Topics of interest include but not limited to: (1.) exploring novel methods for signal transduction; (2.) development and utilization of nanomaterials and nanostructures for enhancement of sensor performance; (3.) development of molecular recognition probes; (4.) integration of sensors into microfluidic devices and lab-on-chips; (5.) Sensor optimum design, sensing data fusion, and simulation; and (6.) applications of sensors in real-word samples in the fields such as medical diagnosis, homeland security, environmental monitoring, and food safety.

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Abstracts should be submitted electronically to ECS headquarters, and questions and inquiries should be sent to the symposium organizers: **Nick Wu**, West Virginia University, e-mail: Nick.Wu@mail.wvu.edu; **John Collins**, Wheaton College, e-mail: jcollins@wheaton.edu; **A. Hillier**, Iowa State University, e-mail: hillier@iastate.edu; **Prashant Kumta** , University of Pittsburgh, e-mail: pkumta@pitt.edu; **Larry Nagahara**, NIH, e-mail: nagaharl@mail.nih.gov; and **A. Simonian**, Auburn University, e-mail: als@eng.auburn.edu.

J6 Sensors for Agriculture

Sensor Division / Physical and Analytical Electrochemistry Division

The quality, safety and security of our food is of paramount importance to every man, women and child of the United States. This symposium will provide a forum for the discussion of research and development in the field of sensors for agricultural applications. Topics of interest include but are not limited to: (1.) sensors for the monitoring of plant growth (sunlight, water and nutrient usage); (2.) sensors for the determination of plant health and stress (fungal, bacterial or viral infections, insect infestation); (3.) sensors for food quality (bruises, smell, sugar content, residual pesticides); and (4.) sensors for food safety (contamination with pathogenic bacteria, spores, viruses, pesticides). Both laboratory and in-the-field detection and sensing techniques are encouraged. All transduction methods are of interest in this symposium including optical imaging (visual, infrared, hyperspectral, fluorescent, luminescent, etc.), electrochemical (potentiometric, amperometric, conductometric), acoustic (microcantilever, quartz crystal microbalance, surface acoustic wave), gravimetric and combinations thereof.

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 December 06, 2013. 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: **B. A. Chin**, Auburn University, e-mail: chinbry@auburn.edu; **P. Hesketh**, Georgia Institute of Technology, e-mail: peter.hesketh@me.gatech.edu; **S. Minteer**, University of Utah, e-mail: minteer@chem.utah.edu; and **A. Simonian**, National Science Foundation, e-mail: asimonia@nsf.gov.

Student Travel Grant Application ECS San Francisco, CA

The Society's, Battery, Corrosion, Dielectric Science & Technology, Electrodesposition, Electronics and Photonics, Energy Technology, High Temperature Materials (HTM), Fullerenes, Nanotubes and Carbon Nanostructures (FNCN), Industrial Electrochemistry & Electrochemical Engineering (IE&EE), Luminescence and Display Materials (LDM), Organic and Biological Electrochemistry (O&BE), Physical and Analytical Electrochemistry, and Sensor Divisions offer travel grants to students presenting papers at the Society's next meeting in San Francisco, CA, October 27-November 1, 2013. **To apply, complete this application and send it along with a copy of your transcript and a letter from an involved faculty member attesting both to the quality of the student's work and financial needs, and a copy of the student's meeting abstract.** For additional information please contact the Division contact below, as requirements might differ among Divisions.

Meeting Site:_____

Name:_____

School Adress: _____

_____

Email:_____Phone #: _____

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

Major Subject:_____Grade point average: _____out of possible: _____

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

Symposium Title (#):_____

_____

_____

Title of paper to be presented at the meeting:_____

_____

_____

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

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

Estimated meeting expenditures: $_____

Signature:_____Date: _____

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

- ❑ Battery—*Send to*: Christopher Johnson, Argonne National Lab, 9700 S. Cass Ave, #CSE-205, Argonne, IL 60439-4803, USA, e-mail: johnsoncs@cmt.anl.gov
- ❑ Corrosion—*Send to*: N. Missert, Sandia National Labs, MS 1415, P. O. Box 5800, Albuquerque, NM 87185-0100, USA, e-mail: namisse@sandia.gov
- ❑ Dielectric Science & Technology—*Send to*: Vimal Desai Chaitanya, New Mexico State University, Office of the VP for Research MSC 3RES - Box 30001, Las Cruces, NM 88003-8001, USA, e-mail: vimalc@nmsu.edu
- ❑ Electrodeposition—*Send to*: Philippe Vereecken, IMEC, 3001 Leuven, Kapeldreef 75, Belgium, e-mail: vereeck@imec.be
- ❑ Electronics and Photonics—*Send to*: Pablo Chang, Northrop Grumman, 1 Space Park Blvd. # D1/1050D, Redondo Beach, CA 90278-1001, USA, e-mail: pablo.chang@ngc.com
- ❑ Energy Technology—*Send to*: Jean St. Pierre, University of Hawaii at Manoa, Hawaii Natural Energy Institute, 1680 East West Rd. POST 109, Honolulu, HI 96822, USA, e-mail: jsp7@hawaii.edu
- ❑ Fullerenes (FNCN)—*Send to*: Bruce Weisman, Rice University, Chemistry MS 60, 6100 Main Street. Houston, TX 77005, USA, e-mail: weisman@rice.edu
- ❑ HTM—*Send to*: Greg Jackson, University of Maryland, Dept. of Mechanical Engineering, 2181 Martin Hall, College Park, MD 20742-0001, USA, e-mail: gsjackso@umd.edu
- ❑ IE&EE—*Send to*: John Staser, Cond La Ciudadela 602, Ave., Las Cumbres #2, Guaynabo, 00969 Puerto Rico, e-mail: staser.john@gmail.com
- ❑ LDM—*Send to*: John Collins, Wheaton College, Dept. of Physics & Astronomy, 26 East Main Street, Norton, MA, 02766-0000, USA, e-mail: jcollins@wheatonma.edu
- ❑ O&BE—*Send to*: James D. Burgess, Case Western Reserve University, 10900 Euclid Ave, Cleveland, OH 44106-1712, USA, e-mail: jdb22@case.edu
- ❑ Physical and Analytical Electrochemistry—*Send to*: Andrew Hillier, Professor and Associate Chair, Dept. of Chemical and Biological Engineering, 2122 Sweeney Hall, Iowa State University, Ames, IA 50011, USA, e-mail: hillier@mail.iastate.edu
- ❑ Sensor—*Send to*: Praveen K. Sekhar, Washington State University, PO Box 641020, Pullman, WA 99164-1020, USA, e-mail: praveen.sekhar@vancouver.wsu.edu

Applications for Travel Grants for the San Francisco, CA, meeting must be received no later than May 17, 2013.

www.electrochem.org/sponsorship/travel_grants.htm

Young Faculty Travel Grant Application ECS San Francisco, CA

The Society's Battery and High Temperature Materials (HTM) Divisions offer travel grants to postdoctoral associates, junior faculty, and other young investigators presenting papers at the Society's meeting in San Francisco, CA, October 27-November 1, 2013. To apply, complete this application and send it along with a copy of your CV and a letter of recommendation from an established researcher attesting both to the quality of the applicant's work and financial needs, and a copy of the applicant's meeting abstract. For additional information please contact the Division contact below, as requirement might differ between Divisions.

Meeting Site:_____

Name:_____

Organization:_____

Adress: _____

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_____

Email:_____ Phone #: _____

Symposium Title (#):_____

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_____

Title of paper to be presented at the meeting:_____

_____

_____

Estimated meeting expenditures: $_____

Signature:_____ Date: _____

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

- ❑ Battery–*Send to*: Christopher S. Johnson, Argonne National Lab, 9700 S. Cass Ave. #CSE-205, Argonne IL 60439-4803, USA, e-mail: johnsoncs@cmt.anl.gov
- ❑ HTM–*Send to*: Greg Jackson, University of Maryland, Dept. of Mechanical Engineering, 2181 Martin Hall, College Park, MD 20742-0001, USA, e-mail: gsjackso@umd.edu

www.electrochem.org/sponsorship/travel_grants.htm

Applications for Travel Grants for the Toronto, ON, Canada meeting must be received no later than May 17, 2013.