

Special Meeting Section



Montreal skyline from Mount Royal / Mount Royal and Surroundings. Credit : © Tourisme Montréal, Stéphan Poulin

219th ECS Meeting
and
SOFC XII — 12th International Symposium on Solid Oxide Fuel Cells

Montréal

May 1-6, 2011

Montréal Convention Center — Montréal, QC, Canada



Montréal

QC, Canada

May 1-6, 2011

219th ECS Meeting and SOFC XII (12th International Symposium on Solid Oxide Fuel Cells)

welcome

Welcome to Montréal—a city that offers a spellbinding combination of European charm and North American energy. This sparkling St. Lawrence River island gem attracts thousands of visitors, who come to enjoy its warm welcome and dazzling line-up of events and festivities each year. We are pleased to venture into this city again for the 219th ECS Meeting. This major international conference will be held at the Montréal Convention Center, and will include 45 topical symposia consisting of 2,108 technical presentations. You are invited to participate not only in the technical program, but also in the other social events planned for the meeting.

Featured Speakers

PLENARY SESSION AND THE ECS LECTURE

How Can One Tell if a Li-Ion Battery Will Last for Decades in Only Three Weeks of Testing?

by Jeffery Dahn



Monday, May 2
1700h
Room 710, Level 7

Lithium-ion batteries are the preferred power sources for portable electronics where a calendar lifetime of three years and a charge-discharge cycle life of 500 cycles are adequate. Li-ion batteries are now targeted for EV and grid energy storage applications where thousands of cycles and lifetimes

of 10 and 30 years, respectively are desired. Researchers are faced with a daunting task: How to tell in a reasonable time (*i.e.*, in only a few weeks) if a change in an already excellent battery chemistry will further improve calendar and cycle lifetimes, bearing in mind that the loss in capacity of such cells over several weeks of testing is extremely small. In this lecture we discuss the role that precision coulometry and related measurements can play in the quest for long lifetime Li-ion cells.

JEFFERY DAHN is recognized as one of the pioneering developers of the lithium-ion battery that is now used worldwide in laptop computers and cell-phones. Dahn's recent work has concentrated on the application of combinatorial materials science methods to battery and fuel cell materials problems. He is the author of over 440 refereed journal papers and co-inventor of 55 inventions with patents issued or filed.

Professor Dahn obtained his BSc in physics from Dalhousie University (1978) and his PhD from the University of British Columbia in 1982. Dahn then worked at the National Research Council of Canada (1982-85) and at Moli Energy Limited (1985-90) before taking up a faculty position in the Physics Department at Simon Fraser University in 1990. He returned to Dalhousie University in 1996.

Dr. Dahn has always interacted strongly with industry. During his years at Simon Fraser University (1990-96) he collaborated strongly with the R&D team at NEC/Moli Energy Canada (now E-One/Moli Energy Canada). He took up the NSERC/3M Canada Industrial Research Chair in Materials for Advanced Batteries at Dalhousie University in 1996. Dahn now interacts strongly with 3M's programs in battery materials, fuel cell materials, and respirator carbons. The success of Dahn's research programs benefits from the quality of his collaborators at 3M, in particular, Larry Krause, Leif Christensen, Kevin Eberman, Mark Obrovac (now at Dalhousie), Mark Debe, Radoslav Atanasoski, Lisa Croll, and Simon Smith.

Professor Dahn has received numerous awards including: International Battery Materials Association (IBA) Research Award (1995); Herzberg Medal, Canadian Association of Physicists (1996); ECS Battery Division Research Award (1996); Fellow of the Royal Society of Canada (2001); Medal for Excellence in Teaching (2009) from the Canadian Assoc.

of Physicists, the Rio-Tinto Alcan Award from the Canadian Institute of Chemistry (2010); and the "Iron Man" award from the Center Court Basketball League on his retirement from play in 2010.

A former varsity athlete (soccer, Dalhousie University), Dahn has coached teams at all levels in both basketball and soccer. Both of Dahn's daughters were on the under-14 girls provincial championship team (2002) that Dahn coached. His son Jackson was on the 2008/09 and 2009/10 Sir John A. MacDonald High School basketball team which Dahn helped coach. The team won the Nova Scotia Provincial Championship in 2010. Dahn is now head coach of that team.

**2011 GORDON E. MOORE MEDAL
FOR OUTSTANDING ACHIEVEMENT
IN SOLID STATE SCIENCE
AND TECHNOLOGY AWARD LECTURE**

**Wide Bandgap Semiconductors for Electronics,
Photonics, and Sensing Applications**

by Stephen Pearton



**Monday, May 2
1415h
Room 518, Level 5**

Recent progress in the development of GaN-based transistors for gas and bio-sensing applications and amorphous indium gallium zinc oxide (IGZO) layers for use in thin film transistors (TFTs) on flexible substrates, including paper, will be presented. For the detection of gases such as hydrogen, the gateless

GaN transistors are typically coated with a catalyst metal such as Pd or Pt to increase the detection sensitivity at room temperature. Functionalizing the surface with oxides, polymers, and nitrides enhance the detection sensitivity for gases and ionic solutions. The use of enzymes or adsorbed antibody layers on the semiconductor surface leads to highly specific detection of a range of antigens of interest in the medical and security fields. We give examples of recent work showing sensitive detection of glucose, lactic acid, prostate cancer and breast cancer markers, and the integration of the sensors with wireless data transmission systems to achieve robust, portable sensors. The amorphous transparent conducting oxide InZnGaO_4 is attracting attention because of its high electron mobility ($10\text{-}50\text{cm}^2\text{V}^{-1}\text{sec}^{-1}$), high transparency in the visible region of the spectrum and its ability to be deposited with a wide range of conductivities. This raises the possibility of making low-cost electronics on a very wide range of arbitrary surfaces, including paper and plastics. N-type oxides such as zinc oxide, zinc tin oxide, indium gallium oxide, and indium gallium zinc tin oxide (IGZO) exhibit surprisingly high carrier mobilities even for amorphous films deposited at 300K. Examples of progress and discussion of remaining obstacles to use of IGZO TFTs will be presented.

STEPHEN PEARTON received his BS degree in physics from the University of Tasmania in 1978 and a PhD from the University of Tasmania in 1983. He was a postdoc at UC Berkeley prior to joining AT&T Bell Laboratories. He joined the University of Florida in 1994 where he is Distinguished Professor and Alumni Chair in the Department of Materials Science and Engineering.

Pearton has been a key figure in developing processing techniques used in compound semiconductor electronics and photonics. At Bell Labs he developed the use of ion implantation, dry etching, and contact technologies in successive generations of compound semiconductor devices.

At UF, Dr. Pearton has primarily focused on fabrication processes for blue/green/UV GaN-based LEDs, laser diodes, and power electronics. The LEDs are used in displays, automotive lighting and general illumination when combined with phosphors. His most recent interests have been in developing solid state sensors.

Dr. Pearton's publications have been cited over 35,000 times in the literature. He is a Fellow of APS, IEEE, AVS, ECS, MRS, and TMS. He received the 2005 Electronics Division Award from ECS, the 2007 John Thornton Award from AVS, the 2007 J. J. Ebers Award from IEEE, the 2011 Bardeen Award from TMS, and the 2011 Adler Lectureship from APS.

FOR THE REST OF US...

**Semiconductor Nanowires: A Platform for
Nanoscience and Nanotechnology**

by Charles Lieber



**Sunday, May 1
1830h
Room 516C, Level 5**

Advances in nanoscience and nanotechnology depend critically on the development of nanostructures whose properties are controlled during synthesis. Here we focus on this critical concept using semiconductor nanowires, which provide the capability for synthetic design to realize unprecedented

structural and functional complexity in building blocks, as a platform material. First, a brief review of the synthesis of complex modulated nanowires in which rational design can be used to precisely control composition, structure, and most recently, structural topology will be discussed. Second, the unique functional characteristics emerging from our exquisite control of nanowire materials will be illustrated with several selected examples from nanoelectronics, quantum electronics, and nano-enabled energy. Third, the remarkable power of nanowire building blocks will be further highlighted through their capability to create unprecedented active electronic interfaces with biological systems. Recent work pushing the limits of both multiplexed extracellular recording at the single cell level and the first examples of intracellular recording will be described, as well as the prospects for truly blurring the distinction between nonliving and living information processing systems.

CHARLES M. LIEBER attended Franklin and Marshall College for his undergraduate education and graduated with honors in chemistry. After doctoral studies at Stanford University and postdoctoral research at the California Institute of Technology, in 1987 he assumed an Assistant Professor position at Columbia University. There Lieber initiated research addressing the synthesis and properties of low-dimensional materials. He moved to Harvard University in 1991 and now holds a joint appointment in the Department of Chemistry and Chemical Biology, as the Mark Hyman Professor of Chemistry, and the School of Engineering and Applied Sciences. At Harvard, Lieber has pioneered the synthesis of a broad range of nanoscale materials, the characterization of the unique physical properties of these materials, the development of methods of hierarchical assembly of nanoscale wires, and the demonstration of key uses of these nanomaterials in nanoelectronics and computing, creating and developing nanoelectronics-biology interfaces, nano-enabled energy, and nanophotonics.

Professor Lieber's work has been recognized by a number of awards, including the MRS Fred Kavli Distinguished Lectureship in Nanoscience (2010), ACS Inorganic Nanoscience

Award (2009), NIH Pioneer Award (2009) ACS Award in the Chemistry of Materials (2004), APS McGroddy Prize for New Materials (2003), MRS Medal (2002), and Feynman Prize in Nanotechnology (2001). Dr. Lieber is an elected member of the National Academy of Sciences and the American Academy of Arts and Sciences, and an elected Fellow of the Materials Research Society, American Physical Society, American Chemical Society and American Association for the Advancement of Science. Lieber is Co-Editor of *Nano Letters*, and serves on the editorial and advisory boards of a large number of science and technology journals. He has published over 320 papers, which have been cited more than 50,000 times, and is the principal inventor on more than 35 patents. In his spare time, Lieber has been active in commercializing nanotechnology, and has founded several nanotechnology companies.

Short Courses & Workshops

Six **Short Courses** will be offered in conjunction with the 219th ECS Meeting. These courses will be held on Sunday, May 1, 2011, from 0900h to 1630h. The registration fee is \$425 for ECS members and \$520 for nonmembers; students are offered a 50% discount. The registration fee for the Short Course covers the course, text materials, continental breakfast, luncheon, and refreshment breaks; it does not cover meeting registration fees nor any other activities of the meeting. **The deadline for registration is April 1, 2011.** Written requests for refunds will be honored only if received at Society headquarters before April 8, 2011. Pre-registration is required. All courses are subject to cancellation pending an appropriate number of advance registrants. Before making any flight or hotel reservations, please check to make sure the course is running!

Visit the ECS website for full course descriptions and instructor biographies.

Short Course #1: Scientific Writing for Scientists and Engineers

D. Noel Buckley, Instructor

This course is intended for scientists and engineers with an interest in improving their skills in writing scientific documents including journal papers, conference proceedings papers, abstracts, reports, theses and proposals. The course is best suited to attendees who have some experience of writing technical documents and want to improve their skills. It will address elements of good writing in science and engineering, including standard practices, terminology, and formatting. It will teach attendees how to present information using properly structured sentences, paragraphs, sections, and chapters and how to organize experimental results and analysis in a format suitable for publication in the scientific literature as well as in reports, theses, etc. The topics to be covered include:

- structure of documents: papers, theses, reports, etc.;
- standard practices in presentation of scientific information: introduction, experimental, results, analysis, discussion, and conclusions;
- standard writing practices, terminology, and formatting: titles, table and figure captions, references;
- structure of textual material, sentences, and paragraphs;
- grammar, punctuation, abbreviations, and acronyms;
- organizing and communicating the experimental details; levels of detail in reporting of procedures; essential principles of measurements and equipment; description of equipment and procedures used;
- presentation of results: standards in the use of graphs and tables for data presentation; quantitative results; accuracy and internal consistency; schematics, micrographs, and pictures;

- references; consistency with the relevant literature; and
- mathematical descriptions, dimensions, and units.

Short Course #2: Mapping Electronic and Chemical Properties at the Nanoscale

Cyril Guedj, Instructor

This short-course develops the possible characterization tools to measure electronic and chemical properties at the nanoscale. In the first part, we will discuss the characterizations involving an incident electron beam as a probe. Various microscopic techniques such as SEM, TEM, STEM, HRTEM-(V)EELS, nano-Auger, and EDX will be presented and compared in term of spatial and energy resolution.

In the second part of the course, we will describe the possibilities and limitations of the characterizations involving photon probes, like XPS, XPEEM, UPS, spectral photoresponse, or TXRF.

In the third part, the techniques using ions as incident beam such as atom probe, SIMS, TOF-SIMS, LEIS, MEIS, RBS, and FIB will be detailed.

In the last part, the basic principles and limitations of techniques involving solid tips, like AFM, EFM, KFM, SSRM, SCM, and STM will be compared.

An overall comparison of the techniques will be finally presented, to provide a synthetic guide of existing tools to map electronic and chemical properties of solid-state materials with nanometric or sub-nanometric spatial resolution.

To benefit most effectively from this course, registrants should be familiar with material characterization, or have completed their first two years of a bachelor's program in physics, chemistry, or engineering.

Short Course #3: Basic Impedance Spectroscopy

Mark E. Orazem, Instructor

This course is intended for chemists, physicists, materials scientists, and engineers with an interest in applying electrochemical impedance techniques to study a broad variety of electrochemical processes. The attendee will develop a basic understanding of the technique, the sources of errors in impedance measurements, the manner in which experiments can be optimized to reduce these errors, and the use of graphical methods to interpret measurements in terms of meaningful physical properties. The topics to be covered include:

- the motivation for using impedance spectroscopy advantages as compared to other transient techniques and the conditions under which its use is ideally suited,
- the basic concepts of how impedance is measured,
- proper selection of experimental parameters,
- graphical representation of impedance data, including methods to extract some physically meaningful parameters,
- constant-phase elements,
- application of electrical circuit analogues, and
- the meaning of the Kramers-Kronig relations

The concepts will be illustrated by applications to different systems including corrosion, fuel cells, batteries, and transport through membranes such as skin. A list of suggested references will be provided.

This course is the first in a two course sequence offered at alternating ECS meetings by Professor Orazem. The second course in the series, "Advanced Impedance Spectroscopy," introduces model development based on proposed reaction mechanisms, statistical analysis of impedance data, and regression analysis.

Short Course #4:

Introduction to Solid Oxide Fuel Cells

Stuart B. Adler and Peter Holtappels, Instructors

The objective of this course is to provide an introduction to Solid Oxide Fuel Cell (SOFC) science and technology, and to provide a launching point for further reading/education in the area. Topics include current status of SOFC commercialization, process design and integration, stack design concepts, cell materials and fabrication, and characterization of electrochemical performance. Course activities include approximately 70% lecture, 15% demonstration, and 15% short-answer questions and computer exercises, followed by a brief panel discussion and speaker Q&A.

Prerequisites (to benefit most effectively from the course) include two or more years of a bachelor's program in physics, chemistry, or engineering (or equivalent), and basic computer skills (spreadsheet calculations). Handouts include a CD with course notes, exercises, and spreadsheet models. Students should bring with them a laptop computer running Microsoft Excel (Mac or PC) and a hand calculator. The topics to be covered include:

- current status of SOFC technology and commercial development,
- heat, work, and other system level design issues,
- basics of SOFC stack design,
- electrochemical performance and diagnostics, and
- SOFC materials.

Short Course #5:

Materials for Li-Ion Batteries: Structures, Performance, and Durability

Quinn C. Horn and Yue Qi, Instructors

Designing high energy, high power, long lasting, less expensive and safer rechargeable lithium batteries requires new developments in materials, which requires fundamental understanding of the many chemical, physical, and mechanical processes that determine the materials' performance and durability.

The aim of this course is to provide a foundation for understanding the structures, chemistry, and solid-state physics of the electrodes and electrolyte materials for rechargeable lithium batteries. Materials evolution during cell operation and failure mechanisms of these materials and their consequences on the cell behavior will be illustrated with real examples. Various computational tools, from first principle calculations to Newman's battery cell level of modeling, will be introduced to provide a multi-scale pathway to connect material design with battery design. Finally, we will introduce the new challenges that transportation applications face and the areas where material breakthroughs are required.

This course will cover the following:

- a general introduction into lithium and lithium ion batteries;
- materials inside Li-ion batteries, including: anodes and solid-electrolyte-interface (SEI) considerations, electrolytes, cathodes and interface considerations, and nano materials and nanostructured electrode design (pros and cons);
- degradation mechanisms (chemical and structural);
- multi-scale simulations for electrode materials; and
- special requirements for transportation applications.

Short Course #6:

Atomic Layer Deposition

Ana Londergan, Instructor

Recent advancements in nanotechnology have created a need for precise, conformal deposition of thin film materials. Atomic Layer Deposition (ALD) can enable the precise deposition of ultra-thin, highly conformal coatings over complex 3D topography, with controlled composition and properties. Consequently, ALD has become a technology of choice for a large variety of applications for and beyond the semiconductor industry, as proven from the countless applications emerging.

The first ALD processes were run more than 30 years ago and the first high volume production application of ALD was in the manufacturing of thin film electroluminescent displays by planar systems in the mid '80s. More recently, the continuous scaling of semiconductor devices has brought considerable attention to ALD. To date ALD has been introduced in manufacturing of disk drive recording heads as the read gap dielectric, as high dielectric constant material in DRAM capacitors and advanced CMOS gate stacks and in IC interconnects for W seed layer. The wider adoption of ALD as well as the extensibility of current applications face a number of challenges, such as integration into the process flow, productivity enhancement, development of ALD precursors and associated delivery systems, and overall cost of ownership (COO).

The first part of the course will introduce the fundamentals of ALD processing, from theoretical and empirical perspectives. Precursor and delivery systems development for ALD and productivity enhancement of ALD equipment and processes will be addressed. In the second part of the course, ALD applications and opportunities for the following areas will be discussed:

- semiconductor mainstream CMOS and memory applications: development and integration of ALD high-k oxides and metal electrodes;
- interconnects and contacts: integration of ALD films with Cu and low-k materials;
- ALD for optical and photonic applications;
- coating of nanoporous materials by ALD;
- selective area ALD for patterning of nanoscale films; and
- applications for ALD in other areas, such as disk drives, MEMS, nanotechnology, deposition on polymers, fuel cells, solar cells, etc.

Professional Development Workshops

John R. Susko, Instructor

ECS will sponsor the following three professional development workshops at no extra cost to meeting registrants. All workshops will be held in Room 447, Level 4.

Writing an Effective Cover Letter and Resume—The need for a cover letter, how to write it, the many "do's" and "don'ts" in preparing such a letter, and tips for drafting an effective resume.

Sunday1500-1545h
Monday1200-1245h

Job Interviewing Tips—How to improve your chances of impressing the interviewer; key questions to ask; and other important pointers for the interviewing process.

Sunday1600-1645h
Monday1300-1345h

Resume Round Table—Designed to provide feedback on resumes by publicly critiquing participants' resumes and offering suggestions on ways to make them more effective. To take full advantage of the workshop, please bring a copy of your current professional resume.

Monday 1400-1700h

Strategies to Boost Chances of NSF Funding Your Proposal

by George M. Janini

This professional development workshop is designed to provide information and advice for those seeking financial support for their research projects from the National Science Foundation. George Janini will address current funding opportunities at the Division of Chemistry, NSF, and strategies for the development of a winning NSF single investigator proposal. The presentation includes an outline of current funding opportunities, tips on proposal preparation, what makes a proposal competitive, what do reviewers want to know, how to find the right home for a proposal, how to have effective meetings with program directors, what to do if the proposal is declined, and how to get involved in NSF's proposal review processes. The workshop will be conducted in an informal setting: slides will be shown, but to take full advantage of the workshop, attendees are encouraged to interrupt with questions anytime during the presentation. The workshop is largely directed toward young faculty, postdocs, and advanced students, and may also be of interest to experienced investigators. The workshop is free to all meeting registrants.

GEORGE M. JANINI is currently a program director in the Division of Chemistry at the National Science Foundation. He joined NSF in July 2004 after fourteen years of service as a senior scientist in SAIC-Frederick Laboratory of Proteomics and Analytical Technologies, National Cancer Institute-Frederick, MD. Prior to this, Dr. Janini was a professor at Kuwait University for twelve years.

At the NSF Dr. Janini served as a program director in four different programs: Analytical and Surface Chemistry (ASC), Macromolecular, Supramolecular, and Nanochemistry (MSN), Chemical Catalysis (CAT), and Chemical Measurements and Imaging (CMI). Currently he is managing the CAT program and serving in the CMI program. Dr. Janini authored 89 peer-reviewed scientific publications and a U.S. Patent: (US 7,544,932,B2, June 9, 2009). Dr. Janini is the recipient of the 1977 Applied Analysis Chemistry Award of the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy (Pittcon) and the 2002 SAIC-Frederick Outstanding Science Achievement Award.



ECS • The Electrochemical Society
65 South Main Street
Pennington, NJ 08534-2839, USA
Phone: +1 609.737.1902
Fax: +1 609.737.2743
E-mail: ecs@electrochem.org

www.electrochem.org

Award Winners

NOTE: For complete biographies of the award recipients, and the schedule of their presentations, please see the General Meeting Program on the ECS website: www.electrochem.org/meetings/biannual/219/219.htm.

Dielectric Science & Technology Division Thomas D. Callinan Award



TSU-JAE KING LIU received her BS, MS, and PhD degrees in electrical engineering from Stanford University in 1984, 1986, and 1994, respectively. From 1992 to 1996 she worked as a Member of Research Staff at the Xerox Palo Alto Research Center.

In 1996, Dr. Liu joined the faculty of the University of California at Berkeley, where she is now the Conexant Systems Distinguished Professor of Electrical Engineering

and Computer Sciences and Associate Dean for Research in the College of Engineering.

Professor Liu's awards include the Defense Advanced Research Projects Agency Significant Technical Achievement Award (2000) for development of the FinFET; and the IEEE Kiyo Tomiyasu Award (2010) for contributions to nanoscale MOS transistors, memory devices, and MEMs devices. Her research activities are presently in energy-efficient electronic devices and technology, as well as materials, processes, and devices for integrated microsystems. She has authored or co-authored over 400 articles, holds 80 U.S. patents, and is an IEEE Fellow.

Electronics and Photonics Division Award



M. JAMAL DEEN is currently Professor of Electrical and Computer Engineering, Senior Canada Research Chair in Information Technology, and Director of the Micro- and Nano-Systems Laboratory at McMaster University.

Professor Deen completed his PhD degree in electrical engineering and applied physics at Case Western Reserve University in Cleveland, OH. His PhD

dissertation was on the design and modeling of a new CARS spectrometer for dynamic temperature measurements and combustion optimization in rocket and jet engines, and was sponsored and used by NASA, Cleveland.

As an undergraduate student at the University of Guyana, Dr. Deen won the Chancellor's medal as the second best graduating student and the Irving Adler prize as the best mathematics student (1978). As a graduate student, he was a Fulbright-Laspau Scholar from 1980 to 1982 and an American Vacuum Society Scholar from 1983 to 1984. He was an NSERC Senior Industrial Fellow in 1993 and has been a Distinguished Lecturer of the IEEE Electron Device Society since 2001.

Professor Deen's awards and honors include the ECS Dielectric Science & Technology Division Thomas D. Callinan Award (2002); the Distinguished Researcher Award, Province of Ontario (2001); Humboldt Research Award from the Alexander von Humboldt Foundation (2006); IBM Faculty Award (2006); the Eadie Medal from the Royal Society of Canada (2008); the Fessenden Medal from IEEE Canada (2011); and the degree Doctor of Engineering *honoris causa* from University of Waterloo (2011). His research record includes about 430

peer-reviewed articles (about 20% are invited), 14 invited book chapters, seven best paper awards, and six patents which have all been used in industry.

Dr. Deen is a founding Executive Editor of *Fluctuations and Noise Letters*; and a member of the editorial boards of *Nanotechnology*; *Journal of Nanoelectronics and Optoelectronics*, *International Journal of High Speed Electronics and Systems*, the *Microelectronics Journal*, and *Open Journal of Applied Physics*. He serves as the Solid-State Editor of *IEEE Transactions on Electron Devices* for nine years and as the Regional Editor (Canada and Central USA) of the IEEE Electron Devices Society Newsletter for six years. Dr. Deen has served as the technical chair, general chair, principal organizer, member of the technical committee or member of the international steering committee of more than 100 conferences and symposia in his fields of research interest.

Dr. Deen's peers have elected him a Fellow of The Royal Society of Canada (FRSC) - The Academies of Arts, Humanities, and Sciences of Canada; a Fellow of the Canadian Academy of Engineering (FCAE); a Foreign Fellow of the Indian National Academy of Engineering (FINAE-Foreign); a Fellow of The Institute of Electrical and Electronic Engineers (FIEEE); a Fellow of The American Physical Society (FAPS); a Fellow of The Electrochemical Society (FECS); a Fellow of The American Association for the Advancement of Science (FAAAS); a Fellow of The Engineering Institute of Canada (FEIC); and an Honorary Member of the World Innovation Foundation (HonMWIF) - the foundation's highest honor.

Energy Technology Division Research Award



CLAUDE LÉVY-CLÉMENT is Emeritus Director of Research at CNRS. Her key expertise is in using electrochemistry within the materials science field particularly addressing solar energy conversion and focusing on studies which will be applied to processing and devices. She was among the earliest researchers in the areas of photoelectrochemistry and investigated it as a mode for synthesis and processing of

materials, and for characterization of materials. In particular she studied the conditions under which different morphologies of porous silicon, silicon nanowires could be formed. Those studies resulted in a patented method, widely used in the industry, for texturizing and improving the performance of multicrystalline Si solar cells. Understanding developed in photoelectrochemical work and in electrochemical deposition of nanostructured semiconductor thin films led to demonstration of the first extremely thin absorber solar cell, the inorganic analog of the dye sensitized solar cell. She has also been active in rechargeable batteries and environmental fields with the study of remediation of nitrates using diamond and silicon electrodes.

Dr. Lévy-Clément joined the CNRS as a Research-Assistant in 1967 and received her Doctorat des Sciences in solid state chemistry from University of Paris XI, Orsay, France in 1974. She was promoted Director of Research and scientific leader of the Semiconductor Electrochemistry and Nanomaterials Team at Meudon-CNRS Campus in 1988. She moved with her team to Thiais-CNRS Campus (Institut de Chimie et Matériaux Paris-Est) in 1999 where she is presently. She made numerous research stays in renowned Laboratories in Europe, USA-Canada and Asia.

Dr. Lévy-Clément has been active in the European Section of ECS, serving as a Vice-Chair since 1997. She has been a partner in numerous international, European, and French projects; an editorial board member of several international journals; and invited as a scientific expert in the fields of energy, solar hydrogen, and photovoltaics on French, European, and USA panels. She has contributed over 250 papers published in

international journals, chapters in 13 books, nine patents, and supervised approximately 50 graduate students and postdoctoral associates.

Claude Lévy-Clément is also very visible in the scientific community giving numerous invited talks, chairing many sessions, and organizing conferences. Notable among those were the IPS-15 (2004) and ECS (International Symposium on Nanostructured Semiconductors, celebrating the first conferment of the Heinz Gerischer Prize to Fujishima, 2003) conferences in Paris. The establishment of the most prestigious Heinz Gerischer Prize which she has, almost single handed, mastered and served as chairperson for many years, is a most remarkable demonstration of a scientist's devotion to her community.

Fullerenes, Nanotubes, and Carbon Nanostructures Division Richard E. Smalley Research Award



ROBERT HADDON obtained the BSc (Hon.) degree at Melbourne University, and an organic chemistry PhD degree from Pennsylvania State University. He was a Queen Elizabeth II Fellow at the Australian National University, and in 1976 he joined Bell Laboratories, where he was a member of the Chemical Physics and Materials Research Departments (AT&T, Lucent Technologies). In 1997 he was

appointed Professor of Chemistry and Physics at the University of Kentucky, and in 1998 he became Director of the NSF Advanced Carbon Materials Center. He founded Carbon Solutions, a company that is focused on the synthesis and chemical processing of single-walled carbon nanotubes. In 2000, he was appointed Distinguished Professor in the Departments of Chemistry and Chemical & Environmental Engineering and Director of the Center for Nanoscale Science and Engineering at the University of California, Riverside.

Dr. Haddon's research interests are in the synthesis, electronic structure, and properties of molecules and materials, with particular emphasis on transport, magnetism, and superconductivity. Current interests include neutral radical conductors, carbon nanotubes, and graphene; recently his group has reported the application of covalent chemistry to the band gap engineering of graphene.

Professor Haddon was named 1991 Person of the Year by Superconductor Week, and a Fellow of AAAS and APS: "For work on organic electronic materials, including the prediction and discovery of superconductivity in alkali-metal-doped carbon-60." In recognition of this work he shared the 2008 American Physical Society James P. McGroddy Prize for New Materials. He is an ISI highly cited author in chemistry, materials science, and physics.

Industrial Electrochemistry & Electrochemical Engineering Division New Electrochemical Technology (NET) Award

The NET Award recognizes excellence in the commercialization of new electrochemical technology (see ECS *Interface* Summer 2010, p. 45, for more details), which typically represents a multidisciplinary team approach. The IE&EE Division's 2011 NET Award Committee, composed of seven ECS members from industry and academia, evaluated the sponsoring organization's nominations and then down-selected the best submission for a given year. The NET Award is presented every odd year.

This year the **U.S. ARMY ENGINEER RESEARCH AND DEVELOPMENT CENTER, CONSTRUCTION ENGINEERING RESEARCH LABORATORY (ERDC/CERL)**, Champaign, IL; and **ELECTRO TECH CP**, Accord, NY are the joint recipients of the 2011 IE&EE Division's NET Award, in recognition of their development of electro-osmotic pulse (EOP) technology. A NET Award Address will be presented by the recipients at the Montréal meeting. The U.S. Army Engineer Research and Development Center (ERDC) is one of the most diverse engineering and scientific research organizations in the world. The ERDC conducts R&D in support of the soldier, military installations, and the Corps of Engineers' civil works mission, as well as for other federal agencies, state, and municipal authorities, and with U.S. industry through innovative work agreements. Electro Tech CP, one of five companies that make up Structural Group, is a specialty provider of corrosion control services and technology that protects infrastructure, buildings, and investments worldwide.



VINCENT F. HOCK, JR. co-developed both the EOP concept and the fundamental principles of electro-osmotic transport in concrete. As a metallurgist, he also analyzed the chemical reactions that occurred at the anode and cathode for their effect on the system's efficiency. He is currently a senior technical advisor for the Materials and Structures Branch at ERDC-CERL in Champaign, IL. ERDC-CERL is an element of the U.S. Army Corps of

Engineers and Mr. Hock is one of the Army's most decorated researchers, with a record nine Army Research and Development Achievement Awards to date. He also is ERDC's only two-time recipient of the international R&D 100 Award. Mr. Hock and his teams have received other major recognition including two CETI Awards from FIATECH, the NOVA Award for Construction Innovation, FLC Awards in Technology Transfer, and have been named finalists for American Society of Civil Engineering CERF Charles Pankow Award (twice), the White House Closing the Circle Award, and the Small Business Innovation Research (SBIR) Program Award. His work has produced six patents with five pending, and generated over 150 publications and conference papers. He has been named a FIATECH Outstanding Researcher and twice chosen as CERL's Researcher of the Year. Mr. Hock was elected a Fellow of the National Association of Corrosion Engineers (NACE) in 2009 and will receive its Technical Achievement Award (TAA) this year. In addition, Mr. Hock is a member of the American Water Works Association (AWWA) and the Society of American Military Engineers (SAME). He holds a BS degree in chemistry from Saint Joseph University and an MS degree in metallurgy from Pennsylvania State University, both in Philadelphia, PA.



ORANGE S. MARSHALL, JR. served as project manager and system designer/reviewer for field testing of EOP with the United States military. His most recent tests successfully used EOP in the potentially explosive environment of military munitions in underground storage bunkers. Mr. Marshall is a materials engineer and project manager for the Materials and Structures Branch of ERDC-CERL, performing research predominantly in the field of materials

engineering. His broad knowledge and background in the areas of polymer science and engineering, materials engineering, and electrokinetic phenomena is used to solve complex problems, develop new theories and concepts, analyze and interpret data, and resolve technical issues where limited precedents exist. His research includes the physical and mechanical response of materials to damaging environments, load conditions on micro- and macroscopic levels, and investigations of advanced and

experimental materials. Mr. Marshall is a co-inventor on four patent applications in the fields of electro-osmosis and electrophoresis. In addition to numerous research reports, he also has written two Unified Facilities Guide Specifications for strengthening unreinforced masonry walls. His research in electrokinetics has been recognized with an Army Research and Development Achievement Award and awards from the Federal Laboratory Consortium, FIATECH, and the International Concrete Repair Institute (ICRI). Mr. Marshall holds a BS degree in chemistry from the University of Idaho.



MICHAEL K. MCINERNEY verified and refined the fundamental physical principles of electrokinetic transport in concrete, rock, and soil. Mr. McInerney is a research electronics engineer and project leader for the Materials and Structures Branch of ERDC-CERL. His areas of research include protection of electrical and electronic systems from electrical transients, control of water movement in porous materials using electrokinetics, nondestructive

testing (NDT) technologies, and characterization of urban and building electrical distribution systems. Mr. McInerney is an active member of the IEEE Electromagnetic Compatibility (EMC) Society and serves on several technical committees. He has published in IEEE journals and authored numerous technical reports and conference proceedings. Mr. McInerney was named the 2010 ERDC Researcher of the Year for his original research in the field of NDT. He has been awarded four patents with two pending and has received several team awards for EOP technology. He is a member of the U.S. Army's Electromagnetic Environmental Effects Committee and the U.S. Department of Defense's Military Standard and Handbook Committee for high-altitude electromagnetic pulse (HEMP) protection of fixed facilities. Mr. McInerney has an MS degree in electrical and computer engineering from the University of Illinois at Urbana-Champaign, IL, as well as BS degrees in electrical engineering (with honors), mathematics, and physics from Iowa State University in Ames, IA.



SEAN W. MOREFIELD provided verification of water movement in concrete rock and soil during EOP laboratory testing. He is a materials engineer and project leader for the Materials and Structures Branch of ERDC-CERL, working in the areas of porous construction materials, cement chemistry, and electrokinetics. His current master's thesis work involves research of the mechanisms of electrophoretic transport to increase the strength of

porous media. In addition to research papers, Mr. Morefield also has authored a book chapter on electrokinetics. For his work with EOP technology, Mr. Morefield is the co-recipient of four patents with two applications pending. His team awards include Army Research and Development Achievement Awards, the James D. Prendergast Technology Infusion Achievement Award, NOVA Award, and two Federal Laboratory Consortium Awards for Excellence in Technology Transfer. He also is a member of the ERDC team that received an R&D 100 Award in 2010 for developing a ground-breaking vitreous enameled coating for reinforcing steel in concrete. Mr. Morefield holds a BS degree in materials science and engineering and is currently a candidate for an MS degree in civil and environmental engineering, specializing in construction materials, at the University of Illinois in Champaign, IL.



PHILIP G. MALONE defined the fundamental chemical principles of electro-kinetic transport in concrete and soil and assisted in the design of active water removal in de-watering wells. Dr. Malone is a research geologist for the Engineering Science Systems and Materials Division of ERDC's Geotechnical and Structures Laboratory in Vicksburg, MS (ERDC-GSL). His projects focus on geochemical and mineralogic research, including research on concrete coatings and cementitious

products. He has extensive experience in electro-osmotic cementing reactions and has developed and transferred technology in the area of claddings, electrolytic reactions in concrete materials, and low-density concrete formulations. Dr. Malone has authored over 100 publications, holds 55 patents, and has three pending patent applications. He holds a ABBS degree in biology from the University of Louisville, an MA degree in geology from Indiana University in Bloomington, IN, and a PhD in geology from Case Western Reserve University in Cleveland, OH. During his graduate studies, Dr. Malone was chosen as a National Science Foundation Graduate Fellow, a NASA Graduate Trainee, and an NAS-NRC Post-Doctoral Fellow. His recent national-level recognition includes the R&D 100 Award for vitreous enameled coating and Army Research and Development Achievement Awards. He is a licensed professional geologist in Indiana and has served as a past Chapter President for the American Institute of Professional Geologists.



CHARLES A. WEISS, JR. provided the concrete and soil characterizations necessary to model the EOP theory and developed large-scale operations data. He is a research geologist and principal investigator for the Concrete and Materials Branch of ERDC's Geotechnical and Structures Laboratory in Vicksburg, MS (ERDC-GSL). Dr. Weiss' work focuses on geochemical and mineralogic research, with extensive experience in crystal chemistry and gel/crystal

mixtures in cementitious materials. He also has an interest in the forensic investigations of concrete and construction materials including cement, mineral admixtures, clays, and zeolites using nuclear magnetic resonance spectrometry, X-ray diffraction analysis, energy-dispersive X-ray chemical analysis, scanning electron microscopy, infrared spectrometry, optical microscopy, image analysis, conduction calorimetry, and differential scanning calorimetry. Dr. Weiss is interested in applying computational elements to the study of geomaterials and construction materials, including the hydration of cement-based materials and finite element method (FEM) modeling of incremental construction of mass concrete structures. Dr. Weiss has published more than 60 papers and reports and has over 22 patents or patents pending in a wide array of new technologies. He is part of ERDC teams that have received the international R&D 100 Award and Army Research and Development Achievement Awards. Dr. Weiss earned an AB degree in computer science and geology from Colgate University in Hamilton, NY, and MS and PhD degrees from the University of Illinois at Urbana-Champaign, IL. He is a registered professional geologist in Mississippi, a member of the American Geophysical Union, American Concrete Institute, Mineralogical Society of America, Sigma Xi: The Scientific Research Society, and a Fellow of the Clay Mineral Society.



PAUL A. NOYCE developed the system component design expertise necessary for commercial implementation of EOP technology in his position with Electrotech CP, ERDC's cooperative research and development partner. Mr. Noyce is a key developer for practical applications of electrochemical treatments that mitigate corrosion of reinforcing steel and steel frame structures, and for electro-osmotic treatments of water infiltration in sub-structures in

many unique applications worldwide. He was professionally trained as an electrical/electronics engineer in Bristol, England. Mr. Noyce has been recognized for his work in impressed current cathodic protection, concrete realkalization, electrochemical chloride extraction, and electro osmosis. He has published many articles on these subjects as well written about the technical benefits of their use in preserving historic structures and for long-term asset management. He is an active member on numerous corrosion technical committees. Electro Tech CP is a specialty provider of corrosion control and water intrusion prevention services and technologies that protect infrastructure, buildings, and investments worldwide. Electrotech CP is one of the six companies that make up the Structural Group headquartered in Baltimore, MD. Other Structural Group companies include Structural Preservation Systems, VSL, Pullman Power, SPS Infrastructure, and Shared Systems Technology. Structural Group businesses perform a wide range of projects involving industrial facilities, commercial properties, public infrastructure, and municipal buildings.

Physical and Analytical Division David C. Grahame Award



MASATOSHI OSAWA received his BE (1974), ME (1976), and DE (1984) degrees in material science from Tohoku University, Sendai, Japan. He was an Assistant Professor (1976-1988) and an Associate Professor (1988-1994) of Tohoku University. From 1984 to 1985, Dr. Osawa was also a visiting scientist at IBM San Jose Research Laboratories. He has been a full Professor of Catalysis Research Center at Hokkaido University, Sapporo, Japan since 1994.

Professor Osawa has made outstanding contributions in the field of physical electrochemistry through the development of Surface-Enhanced Infrared Absorption Spectroscopy (SEIRAS), a powerful infrared spectroscopy for electrochemistry. SEIRAS can selectively probe the electrochemical interface at a high sensitivity without severe interference from the bulk solution. The high sensitivity additionally has made possible to monitor fast surface reactions and dynamics with time resolutions ranging from ps to ms. He played key roles in almost all aspects in SEIRAS including the establishment of the theoretical background and development of experimental techniques. The usefulness of SEIRAS in electrochemistry has been demonstrated by the analyses of molecular adsorption/desorption and many reactions, which were reported in about 170 refereed papers, reviews, and book chapters. A series of studies on water in the double layer is most highly recognized.

Dr. Osawa's current interests include mechanisms of electrocatalytic reactions in relevance to fuel cells, and fast and ultrafast electrode dynamics.

For the development of SEIRAS, Professor Osawa received several awards, including: Academic Award from ECSJ (2001), Creative Research Award from the Chemical Society of Japan (2005), Jaques Tacussel Prize of ISE (2005), and The Japan Society for Analytical Chemistry Award (2010). He serves on the Editorial Board of *Journal of Electroanalytical Chemistry*.

European Section Heinz Gerischer Award



HELMUT TRIBUTSCH is formerly Professor of Physical Chemistry at Freie Universität Berlin and department head of the Hahn-Meitner Institute (presently Helmholtz Center-Berlin), Germany. Professor Tributsch is a genuine pioneer in the research of photoelectrochemical systems. He is highly renowned in terms of number and variety of breakthrough contributions, several of which have initiated important new directions in photoelectrochemistry, photo(electro)catalysis, electrochemistry instrumentations, and in nanomaterials. His highly creative work has inspired numerous researchers to investigate semiconductor photoelectrochemistry and has contributed fundamentally and profoundly to the understanding of electron-transfer mechanisms at the semiconductor/electrolyte interface. Prof. Tributsch was the first to show (during his PhD thesis, Supervisor Prof. Gerischer) that semiconductor sensitization of wide band semiconductors with organic dyes is possible, a process which has proven to be a step forward into a new research direction for solar energy devices. He has continuously promoted fundamental studies of photoelectrochemistry with great enthusiasm. He has been Founding member of EUROSOLAR and long-term member of their Board of Directors.

directions in photoelectrochemistry, photo(electro)catalysis, electrochemistry instrumentations, and in nanomaterials. His highly creative work has inspired numerous researchers to investigate semiconductor photoelectrochemistry and has contributed fundamentally and profoundly to the understanding of electron-transfer mechanisms at the semiconductor/electrolyte interface. Prof. Tributsch was the first to show (during his PhD thesis, Supervisor Prof. Gerischer) that semiconductor sensitization of wide band semiconductors with organic dyes is possible, a process which has proven to be a step forward into a new research direction for solar energy devices. He has continuously promoted fundamental studies of photoelectrochemistry with great enthusiasm. He has been Founding member of EUROSOLAR and long-term member of their Board of Directors.

Technical Exhibit

The Technical Session coffee break is scheduled for 0930h in the Exhibit area (Room 517BCD, Level 5), on Tuesday and Wednesday to allow meeting attendees additional time to browse through the exhibits. The exhibit will feature instruments, materials, systems, publications, and software of interest to attendees.

Exhibit Hours

- Monday, May 2**1800-2000h
includes the Monday Evening Poster Session
- Tuesday, May 3**0900-1400h
 re-opening.....1800-2000h
includes the Tuesday evening Poster Session
- Wednesday, May 4**.....0900-1300h

Exhibitors as of Press-Time

ECS

Booth 116
 ecs@electrochem.org
 www.electrochem.org

ALS CO., LTD

Booth 112
 Katsunobu Yamamoto
 yamamoto@bas.co.jp
 www.als-japan.com

Princeton Applied Research/Solartron Analytical

Booths 109/208/209
 Ari Tampasis
 ari.tampasis@ametec.com
 www.princetonappliedresearch.com / www.solartronanalytical.com

Bio-Logic

Booths 306/308
 David Carey
 david.carey@bio-logic.us
 www.bio-logic.us

eDAQ Inc.

Booth 206
 Michael Hagen
 mhagen@edaq.com
 www.edaq.com

ESL Electroscience

Booth 103
 Drew Chambers
 dchambers@electroscience.com
 www.electroscience.com

Evans Analytical Group

Booth 200
 Cindy Gentile
 cgentile@eaglabs.com
 www.eaglabs.com

eZelleron GmbH

Booth 304
 Andreas Froemmel
 froemmel.andreas@ezelleron.de
 www.ezelleron.eu

fuelcellmaterials.com

Booth 202
 Nathan Cooley
 ncooley@fuelcellmaterials.com
 www.fuelcellmaterials.com

Fuel Cell Technologies

Booth 318
 Chuck Derouin
 fuelcell@aol.com
 www.fuelcelltechnologies.com

FuelCon AG

Booth 100
 info@fuelcon.com
 www.fuelcon.com

Gamry Instruments

Booths 314/316
 Jacob Ketter
 jketter@gamry.com
 www.gamry.com

Gelest, Inc.

Literature Display
 Gabrielle Horvath
 ghorvath@gelest.com
 www.gelest.com

HEKA Electronics Inc.

Booth 207
 Stephen Jones
 management.ca@heka.com
 www.heka.com

Hysitron

Booth 106
 Greg Lance
 info@hysitron.com
 www.hysitron.com

INFICON

Booth 107
Tom Wilson
reachus@inficon.com
www.inficon.com

IVIUM Technologies

Booth 218
Pete Peterson
info@ivium.us
www.ivium.com

Kerafol GmbH

Booth 300
marketing@kerafol.com
www.kerafol.com

MALT Group

Booth 118
Takafumi Matsumoto
matsu@kagaku.com
www.kagaku.com/malt

Metrohm USA

Booths 108/110
info@metrohmusa.com
www.metrohmusa.com

MTI Corporation

Booth 114
Mel Jiang
mel@mtixtl.com
www.mtixtl.com

NuVant Systems, Inc.

Booth 201
Linda Smotkin
lindasueram@aol.com
www.nuvant.com

PEC Corp

Booth 119
Peter Ulrix
peter.ulrix@peccorp.com
www.peccorp.com

Pine Research

Booth 219
Marion Jones
mjones@pineinst.com
www.pineinst.com/echem

PLASMIONIQUE, Inc.

Booth 104
Andranik Sarkissian
sarkissian@plasmionique.com
www.plasmionique.com

Scribner Associates

Booth 101
Jason Scribner
jason@scribner.com
www.scribner.com

Wildcat Discovery Technologies

Booth 203
Ross Russo
rrusso@wildcatdiscovery.com
www.wildcatdiscovery.com

(continued on page 28)

Tutorials in Nanotechnology: Focus on Dielectrics for Nanosystems

Monday, May 2, 2011, 8:15 am

Montréal Convention Center, Room 520AD, Level 5

Tutorial 1

**The Perspective of Nanotechnology and Its
Convergence with Future Information Technology**

by Jong Min Kim

Tutorial 2

**Status Review of Nanocrystals Embedded
High-K Nonvolatile Memories**

by Yue W. Kuo

Tutorial 3

Si Nanowire FET Technology

by Hiroshi Iwai

Tutorial 4

**The Physics of Nanonet Fabrics and Its Applications
in Electronic, Optical, Biosensing, Energy Storage,
and MEMS Devices and Systems**

by Muhammad A. Alam

Tutorial 5

Sensor Systems for Healthcare & Homeland Security

by V. Ramgopal Rao

Sponsored by All ECS Divisions

FREE for all meeting participants

SPONSORS

Platinum Sponsors



SOFC Society of Japan

SPONSORS

Gold Sponsors

AIXTRON

Silver Sponsors



AsahiKASEI
ASAHI KASEI E-MATERIALS



IBM

mattson

QUALCOMM

SAFCHitech™
Enabling Technology

TOYOTA

(continued from page 25)

Event Highlights

NOTE: For a list of Committee Meetings, please visit the Montréal meeting page: www.electrochem.org/meetings/biannual/219/219.htm.

12th International Symposium on Solid Oxide Fuel Cells (SOFC XII)

Schedule of Events

All events take place at the Montréal Convention Center, except for the SOFC Banquet.

MONDAY, MAY 1

- 0800-1200h B7 - SOFC-XII Symposium, 517A, Level 5
- 0930-1000h Coffee Break, Foyer, Level 5
- 1200-1800h SOFC Poster Move-In, 517A, Level 5
- 1400-1620h B7 - SOFC-XII Symposium, 516C, Level 5
- 1400-1620h B7 - SOFC-XII Symposium, 517A, Level 5
- 1800-2000h SOFC Poster Session, 517A, Level 5

TUESDAY, MAY 2

- 0800-1200h B7 - SOFC-XII Symposium, 516C, Level 5
- 0800-1200h B7 - SOFC-XII Symposium, 517A, Level 5
- 0930-1000h Coffee Break, Room 517BCD, Level 5
- 1200-1800h SOFC Poster Move-In, 517A, Level 5
- 1400-1740h B7 - SOFC-XII Symposium, 516C, Level 5
- 1400-1740h B7 - SOFC-XII Symposium, 517A, Level 5
- 1540-1600h SOFC Coffee Break, 517A, Level 5*
- 1800-2000h SOFC Poster Session, 517A, Level 5

WEDNESDAY, MAY 3

- 0800-1200h B7 - SOFC-XII Symposium, 516C, Level 5
- 0800-1200h B7 - SOFC-XII Symposium, 517A, Level 5
- 0930-1000h Coffee Break, Room 517BCD, Level 5
- 1400-1720h B7 - SOFC-XII Symposium, 516C, Level 5
- 1400-1720h B7 - SOFC-XII Symposium, 517A, Level 5
- 1540-1600h SOFC Coffee Break, 517A, Level 5*
- 1800-2100h SOFC Banquet, Montreal Ballroom, Westin Montreal**

THURSDAY, MAY 4

- 0800-1200h B7 - SOFC-XII Symposium, 516C, Level 5
- 0800-1200h B7 - SOFC-XII Symposium, 517A, Level 5
- 0930-1000h Coffee Break, Foyer, Level 5
- 1200-1800h SOFC Poster Move-In, 517A, Level 5
- 1400-1740h B7 - SOFC-XII Symposium, 516C, Level 5
- 1400-1740h B7 - SOFC-XII Symposium, 517A, Level 5
- 1540-1600h SOFC Coffee Break, 517A, Level 5*
- 1800-2000h SOFC Poster Session, 517A, Level 5

FRIDAY, MAY 5

- 0800-1200h B7 - SOFC-XII Symposium, 516C, Level 5
- 0800-1200h B7 - SOFC-XII Symposium, 517A, Level 5
- 0930-1000h Coffee Break, Foyer, Level 5
- 1400-1700h B7 - SOFC-XII Symposium, 516C, Level 5
- 1400-1800h B7 - SOFC-XII Symposium, 517A, Level 5
- 1520-1540h SOFC Coffee Break, 517A, Level 5*

*SOFC registration required.

**SOFC registration or banquet ticket required.

SOFC

SUNDAY, MAY 1

- 0900h Short Courses
- 1500h Writing an Effective Cover Letter and Resume Workshop, Room 447, Level 4
- 1600h Job Interviewing Tips Workshop, Room 447, Level 4
- 1630h Strategies to Boost Chances of NSF Funding Your Proposal, Room 516C, Level 5
- 1730h ECS Student Mixer
- 1830h For the Rest of Us—“Semiconductor Nanowires: A Platform for Nanoscience and Nanotechnology,” Charles Lieber, Room 516C, Level 5
- 1900h Electronics and Photonics Division Award Reception and General Meeting, Room 519AB, Level 5
- 1930h Sunday Evening Get-Together, Room 710, Level 7

MONDAY, MAY 2

- 0930h Coffee Break, Foyer, Level 5
- 1200h Writing an Effective Cover Letter and Resume Workshop, Room 447, Level 4
- 1215h Industrial Electrochemistry & Electrochemical Engineering Division Luncheon & Business Meeting, Room 523, Level 5 (ticket required)
- 1215h Physical and Analytical Division Luncheon & Business Meeting, Room 524, Level 5 (ticket required)
- 1300h Job Interviewing Tips Workshop, Room 447, Level 4
- 1400h Resume Round Table Workshop, Room 447, Level 4
- 1415h 2011 Gordon E. Moore Award Lecture—“Wide Bandgap Semiconductors for Electronics, Photonics, and Sensing Applications,” S. J. Pearton, Room 518, Level 5
- 1800h ECS Transactions Tutorial Session for Authors, Room 511A, Level 5
- 1700h The ECS Lecture—“How Can One Tell if a Li-Ion Battery Will Last for Decades in Only Three Weeks of Testing?” by Jeffery Dahn
- 1800h Monday Evening Mixer, Student Poster Session, and Technical Exhibit Opening, Room 517BCD, Level 5

TUESDAY, MAY 3

- 0900h Technical Exhibit, Room 517BCD, Level 5
- 0930h Coffee Break, Room 517BCD, Level 5
- 1215h Annual Society Luncheon & Business Meeting with Student Poster Award Presentation, Room 524ABC, Level 5 (ticket required)
- 1700h ECS Transactions Tutorial Session for Editors, Room 521G, Level 5
- 1800h David C. Grahame Award Reception, Room 524A, Level 5 (no ticket required)
- 1800h Technical Exhibit and General Poster Session, Room 517BCD, Level 5

WEDNESDAY, MAY 4

- 0900h Technical Exhibit, Room 517BCD, Level 5
- 0930h Coffee Break, Room 517BCD, Level 5
- 1215h Dielectric Science & Technology Division Luncheon & Business Meeting, Room 448, Level 4 (ticket required)
- 1215h Energy Technology Division Luncheon & Business Meeting, Room 519A, Level 5 (ticket required)
- 1215h Fullerenes, Nanotubes and Carbon Nanostructures Division Luncheon & Business Meeting, Room 519B, Level 5 (ticket required)
- 1215h Organic & Biological Electrochemistry Division Luncheon & Business Meeting, Room 447, Level 4 (ticket required)

THURSDAY, MAY 5

- 0930h Coffee Break, Foyer, Level 5

FRIDAY, MAY 6

- 0930h Coffee Break, Foyer, Level 5

(continued on page 30)

Symposium Topics and Organizers

A — General Topics

- A0 — The Gordon E. Moore Medal for Outstanding Achievement in Solid State Science and Technology Award Presentation (M)
- A1 — General Student Poster Session (M) — *V. R. Subramanian, V. Chaitanya, and K. B. Sundaram*
- A2 — Nanotechnology General Session (Tu-W) — *W. E. Mustain and E. Traversa*
- A3 — Electrochemistry and Climate Change (M-W) — *S. E. Creager, I. Fritsch, and N. Sridhar*
- A4 — Tutorials in Nanotechnology: Focus on Dielectrics in Nanotechnology (M) — *D. Misra* **HC** **e**

B — Batteries, Fuel Cells, and Energy Conversion

- B1 — Batteries and Energy Technology Joint General Session (M-Th) — *M. C. Smart, P. N. Kumta, A. Manivannan, and S. R. Narayan*
- B2 — Direct Alcohol Fuel Cells (Tu-W) — *S. R. Narayan and T. Zawodzinski*
- B3 — Electrolytes for High Voltage Cathodes – Solids and Liquids (W) — *F. Alamgir, W. Henderson, and J. Yamaki*
- B4 — Metal/Air, Metal/Sulfur, and Metal/Water Batteries (Tu-W) — *Y. Shao-Horn, H. Arai, N. J. Dudney, and T. Fuller*
- B5 — Microstructure, Mechanisms, and Modeling of Battery Materials (M-Th) — *S. Harris and Y. Qi*
- B6 — Nanostructured Materials for Energy Storage and Conversion (M-Th) — *K. Zaghib, W. K. Chiu, C. M. Julien, W. E. Mustain, V. Ramani, and W. Van Schalkwijk*
- B7 — Solid Oxide Fuel Cells XII (SOFC-XII) (M-F) — *S. C. Singhal and K. Eguchi* **CD** **e**

C — Biomedical Applications and Organic Electrochemistry

- C1 — Organic and Biological Electrochemistry General Poster Session (Tu) — *J. Burgess*
- C2 — Recent Progress in Synthetic and Mechanistic Organic Electrochemistry (S-Tu) — *T. Fuchigami, G. T. Cheek, and A. J. Fry*

D — Corrosion, Passivation, and Anodic Films

- D1 — Corrosion General Session (Tu-Th) — *S. Fujimoto*

E — Dielectric and Semiconductor Materials, Devices, and Processing

- E1 — Silicon Compatible Materials, Processes, and Technologies for Advanced Integrated Circuits, and Emerging Applications (M-W) — *F. Roozeboom, E. P. Gusev, H. Iwai, D. Kwong, V. Narayanan, M. C. Ozturk, and P. J. Timans* **HC** **e**
- E2 — Bioelectronics, Biointerfaces, and Biomedical Applications 4 (M-W) — *M. Madou, A. Hoff, D. Landheer, L. Nagahara, A. Offenhaeusser, K. Sode, T. Thundat, and C. Wang* **SC** **e**
- E3 — Graphene, Ge/III-V, and Emerging Materials for Post CMOS Applications 3 (M-W) — *Z. Karim, S. De-Gendt, D. Misra, Y. Obeng, and P. Srinivasan* **HC** **e**
- E4 — Nanocrystal Embedded Dielectrics for Electronic and Photonic Devices (M-W) — *P. Mascher, P. Joshi, Y. Kuo, and M. E. Overbergs*
- E5 — Organic Semiconductor Materials, Devices, and Processing 3 (M-W) — *M. Deen, D. Gundlach, B. Iñiguez, and H. Klauk*
- E6 — Processes at the Semiconductor Solution Interface 4 (Tu-W) — *C. O'Dwyer and A. Etcheberry* **SC** **e**
- E7 — Silicon Nitride, Silicon Dioxide, and Emerging Dielectrics 11 (M-Th) — *R. Sah, D. Bauza, M. Deen, P. Joshi, S. King, P. Srinivasan, R. Todi, A. Toriumi, and J. Zhang* **HC** **e**
- E8 — Advanced Semiconductor-on-Insulator Technology and Related Physics 15 (Tu-Th) — *Y. Omura, F. Gamiz, H. Ishii, J. A. Martino, B. Nguyen, J. Raskin, and S. Selberherr* **HC** **e**
- E9 — Wide Bandgap Semiconductor Materials and Devices 12 (M-W) — *J. A. Bardwell, J. D. Caldwell, G. W. Hunter, Z. Mi, E. B. Stokes, and C. Wetzel* **HC** **e**
- E10 — Plasma Processing 18 (Tu) — *G. Mathad, M. Engelhardt, and D. W. Hess*

F — Electrochemical / Chemical Deposition and Etching

- F1 — Electrodeposition for Energy Applications 2 (M-W) — *S. R. Brankovic, L. Deligianni, K. Rajeshwar, J. L. Stickney, G. Zangari, and S. Zou*

- F2 — Surfactant and Additive Effects on Thin Film Deposition and Particle Growth 2 (M-Tu) — *T. P. Moffat and J. A. Switzer*

G — Electrochemical Synthesis and Engineering

- G1 — Industrial Electrochemistry and Electrochemical Engineering General Session (Tu-W) — *G. G. Botte*
- G2 — Characterization of Porous Materials 3 (Tu) — *B. Lakshmanan, G. Brisard, A. Lasia, and V. Sethuraman*
- G3 — Electrosynthesis and Electrochemical Processes, in Honor of W. Ves Childs (Tu-W) — *J. Weidner, I. Fritsch, and D. T. Mah*

H — Fullerenes, Nanotubes, and Carbon Nanostructures

- H1 — Electron Transfer and Applications of Fullerenes and Nanostructured Materials (Tu) — *F. D'Souza, S. Fukuzumi, and D. M. Guldi*
- H2 — Molecular and Supramolecular Chemistry of Fullerenes and Carbon Nanotubes (M) — *N. Martin and J. F. Nierengarten*
- H3 — Carbon Nanotubes and Nanostructures: Fundamental Properties and Processes (M-Tu) — *R. B. Weisman, S. K. Doorn, and M. Zheng*
- H4 — Carbon Nanotubes and Nanostructures: Applications and Devices (Tu-Th) — *S. V. Rotkin, Y. Gogotsi, J. Li, and R. Martel*
- H5 — Endofullerenes and Carbon Nanocapsules (Tu-W) — *L. Echegoyen, T. Akasaka, and A. Balch*
- H7 — Carbon Nanotubes and Nanostructures: Medicine and Biology (Tu-W) — *T. Da Ros, Z. P. Aguilar, R. Bolskar, A. Hirsch, and L. Wilson*
- H8 — Porphyrins and Supramolecular Assemblies (Tu, Th) — *N. Sollandie, K. Kadish, and R. Paolesse*
- H9 — Nanostructures for Energy Conversion (M-Tu) — *H. Imahori and P. V. Kamat*
- H10 — Chemistry and Physics of Graphene and 2D Nanostructures (Tu-W) — *P. V. Kamat and H. Grebel*

I — Physical and Analytical Electrochemistry

- I1 — Bioelectrocatalysis (Tu-W) — *S. Minteer, P. Atanassov, and S. Calabrese Barton*
- I3 — Computational Electrochemistry (M-W) — *S. J. Paddison*
- I4 — Electrocatalysis 5 (M-Th) — *G. Brisard, V. Ramani, and A. Wieckowski*
- I5 — Grahame Award Symposium and Physical and Analytical Electrochemistry General Session (Tu, Th) — *S. Minteer*
- I6 — Nanostructured and Functionalized Electroactive Polymer Films and Related Materials 2 (M-W) — *P. Kulesza, D. Hansen, and C. Kranz*

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

- J1 — Sensors, Actuators, and Microsystems General Session (M-Tu) — *Z. P. Aguilar and J. Li*
- J3 — Sensors for Biomedical Applications (Tu-W) — *A. Simonian, Z. P. Aguilar, J. Burgess, B. A. Chin, G. W. Hunter, and L. Nagahara*

Sessions are marked to indicate if they run on Sunday (**S**), Monday (**M**), Tuesday (**Tu**), Wednesday (**W**), Thursday (**Th**) and/or Friday (**F**).

HC **Hard-cover (HC)** editions of *ECS Transactions* will be available for purchase and pick-up at the meeting; or you may pre-order your hard-cover *ECS Transactions* issue using the meeting registration form in this brochure or when registering online.

SC **Soft-cover (SC)** editions of *ECS Transactions* will be available for purchase at the meeting and will be shipped to you after the meeting ends. Please visit the ECS Bookstore in Montréal to order your soft-cover ECST issue.

e **Electronic (PDF)** editions of *ECS Transactions* will be available ONLY via the ECS Digital Library (www.ecsdl.org). Electronic editions of the Montréal "at" meeting issues will be available for purchase beginning April 22, 2011. Please visit the ECS website for all issue pricing and ordering information for the electronic editions.

CD **Compact Disc (CD)** editions of *ECS Transactions* will be available for purchase and pick-up at the meeting; or you may pre-order your CD ECST issue using the meeting registration form in this brochure or when registering online. The CD edition of B7 (SOFC XII) also includes a 1-gigabyte USB drive containing the complete issue. Please note that the SOFC registration package includes a CD/USB copy of the SOFC proceedings.

(continued from page 28)

Hotel & Travel Information

The 219th ECS Meeting and SOFC XII will be held at the Montréal Convention Center located at 159 rue Saint-Antoine Ouest, 9^e étage, Montréal, Québec, H2Z 1H2 Canada). Guest room reservations for the meeting hotels (all located in the immediate vicinity of the Convention Center) can be made online from the ECS website at special discounted meeting rates. See the ECS website for more details and to make your reservation.

The deadline for reservations is April 1, 2011. Reservations attempted after April 1 will be accepted on a space and rate availability basis.

Companion Registrant Program—Guests of Technical Registrants are invited to register for the 219th Meeting as a “Companion Registrant.” The companion registration fee of \$25 (Early-Bird) or \$30 (after April 1) includes admission to non-ticketed social events, an exclusive lounge with beverage service, Monday through Thursday, 0800-1000h, and a special “Welcome to Montréal” orientation presented by Tourism Montréal on Monday, May 2 at 0900h in the St-Sulpice Room, 3rd Floor, Westin Montréal.

Technical Program

NOTE: The following is new information for oral and poster presentations.

Oral Presentations and Audio-Visual—Oral presentations must be in English. **Laptop computers and LCD projectors will be available in each symposium room for oral presentations. Authors are required to bring their presentation on a USB flashdrive only.** We strongly suggest that presenting authors verify flashdrive/laptop compatibility in the speaker-ready room at the meeting. Speakers requiring special equipment must make written request to ECS headquarters (meetings@electrochem.org) no later than three weeks before the meeting, and appropriate arrangements will be made at the expense of the author.

Poster Presentations and Sessions—Poster presentations must be 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. Please arrive approximately two to four hours before the start of your session to begin setting up your poster displays. Please do not begin setting up your poster until all the poster boards have been numbered. Plan your display to fit on one upright panel approximately 3 feet 10 inches high by 3 feet 10 inches wide (1.17 meters high by 1.17 meters wide). Present displayed information from left to right, starting at the top left of the panel. The paper title, number, names, and affiliations of all authors **MUST** be at the top of the display. The recommended print size for the title is approximately 1” to 2” (2.5 cm to 5 cm) high.

Authors should minimize written text but use it when necessary to emphasize essential data and/or to stimulate discussion. All illustrations, drawings, charts, pictures, graphs, figures, and written text should be large enough to allow easy reading from a distance of 5’ (1.5 m). Matted and finished photographs are recommended to enhance visibility. Pushpins and/or thumbtacks will be supplied at the meeting. Commercial advertisements or publicity will **NOT** be permitted in poster presentations. Authors violating this regulation will be asked to remove their presentations immediately. Authors are responsible for setting up their displays, for being present during the entire scheduled poster session, and for removing their displays at the conclusion of the poster session. No posters will be displayed without author participation.

NO EXCEPTIONS WILL BE GRANTED. Authors are responsible for the security of their displays and all items of value. ECS will not assume any responsibility for lost, stolen, or broken articles. Additional information or special requirements should be addressed to the individual symposium organizers prior to the meeting.

The **GENERAL SOCIETY STUDENT POSTER SESSION** will be held as a part of the Monday Evening Mixer and Technical Exhibit, which features instruments, materials, systems, publications, and software of interest to meeting attendees. All meeting registrants are invited to attend. Formal presentations will begin at 1800h. Students may start setting up their presentations at 1300h in Room 517BCD, Level 5; judging of the posters will begin at 1500h. Participants are encouraged to attend the Annual Society Luncheon and Business Meeting on Tuesday at 1215h (ticket required, except for winners) where the winners will be announced and given an award plaque.

Speaker-Ready Room—A Speaker-Ready Room will be available Sunday through Friday, in Room 521C, Level 5. This room is available to allow speakers the opportunity to preview and prepare for their presentations. We highly recommend that speakers verify their USB flashdrive’s compatibility with the sample laptop computer that will be located in this room, prior to their presentation. Additionally, there will be audiovisual technicians available for your assistance.

Speaker Indemnification—The ideas and opinions expressed in the technical sessions, conferences, and any handout materials provided are those of the presenter. They are not those of The Electrochemical Society (ECS), nor can any endorsement by ECS be claimed.

No Recording Allowed—Photographing and/or recording of presentations IS NOT PERMITTED unless specifically allowed by the speaker. Anyone making unauthorized photographs or recordings will be asked to leave the session.

Registration & General Meeting Information

Meeting Registration—The meeting registration area will be located in the Foyer, Level 5. Registration will open on Sunday and the technical sessions will be conducted Sunday through Friday.

Advance Registration—Advance registration is encouraged. Register online at www.electrochem.org, or fax your registration form to +1 609.737.2743. Attendees prepaying by credit card are encouraged to use our online system, or send the form by fax. If you send a registration by fax, please do not send another copy by mail, as this may result in duplicate charges. **The deadline for Early-Bird registration is April 1, 2011.** Refunds are subject to a 10% processing fee and will only be honored if written requests are received by April 8, 2011. All meeting participants are required to pay the appropriate registration fees. Early-Bird and post-April 1 registration payments must be made in U.S. Dollars via Visa, MasterCard, American Express, Discover Card, check, or money order payable to ECS.

Key Locations

Meeting RegistrationFoyer, Level 5
 Information/Message CenterFoyer, Level 5
 ECS Headquarters Office Room 521A, Level 5
 ECS Book Store.....Foyer, Level 5
 Speaker Ready Room..... Room 521C, Level 5
 Employment Interview RoomRoom 521B, Level 5
 Tourism Montréal Information Desk.....Foyer, Level 5

Registration and Book Store Hours

Sunday, May 1.....	0700-1900h
Monday, May 2.....	0700-1900h
Tuesday, May 3.....	0700-1730h
Wednesday, May 4.....	0800-1600h
Thursday, May 5.....	0800-1600h
Friday, May 6.....	0800-1200h

Registration Fees—ALL PARTICIPANTS AND ATTENDEES ARE REQUIRED TO PAY THE APPROPRIATE REGISTRATION FEE LISTED BELOW.

Payment can be made by cash, check or travelers' checks in U.S. funds drawn on a U.S. bank. Visa, MasterCard, American Express, or Discover are also accepted.

All technical registrations include a copy of the *Meeting Abstracts* on USB flashdrive only. Attendees who wish to have paper copies of abstracts should download and print them in advance of the meeting, from the ECS website, free of charge. Additional copies of the *Meeting Abstracts* on USB flashdrive may be purchased by registrants; the cost is \$87 for members and \$107 for nonmembers.

All prices are in U.S. dollars.

	Early-Bird (by April 1)	Apr. 2 through May 6
ECS Member.....	\$415	\$515
Nonmember.....	\$615	\$715
ECS Student Member.....	\$150	\$250
Student Nonmember.....	\$190	\$290
One Day ECS Member.....	\$275	\$375
One Day Nonmember.....	\$365	\$465
ECS Emeritus or Honorary Member.....	\$0	\$0
Companion Registrant.....	\$25	\$30
SOFC Technical Registrant*.....	\$750	\$850
SOFC Student Registrant*.....	\$475	\$575

*Price includes ECS meeting registration, a CD-ROM and USB flashdrive of the proceedings, afternoon coffee breaks, and Wednesday evening SOFC banquet.

All students must present a current, dated student ID card—or for post-docs, a letter from a professor stating that you are a full or part-time student—when you pick up your registration materials at the meeting.

Financial Assistance—Financial assistance is 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.

Employment Services—Companies desiring to recruit employees may place their announcements on a designated bulletin board in the registration area. Please note that these announcements should be no larger than 8 ½" by 11". A designated Employment Interview Room will be available from 0700-1900h Monday through Friday for representatives from those companies or institutions that would like to interview applicants during the meeting.

ADA Accessibility—Special accommodations for disabled attendees will be handled on an individual basis provided that adequate notice is given to the ECS headquarters office.



Upcoming ECS Meetings and Exhibits



220th ECS Meeting Boston, Massachusetts

October 9-14, 2011
Technical Exhibit: October 10-12

221st ECS Meeting Seattle, Washington

May 6-11, 2012
Technical Exhibit: May 7-9

PRiME 2012 Honolulu, Hawaii

October 7-12, 2012
Technical Exhibit: October 8-10

223rd ECS Meeting Toronto, Ontario, Canada

May 12-17, 2013
Technical Exhibit: May 13-15

www.electrochem.org