Early Bird Registration

Montréal 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

Canada

Featured Speakers

The ECS Lecture

Monday, May 2

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

by Jeffery Dahn

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.

2011 Gordon E. Moore Medal for Outstanding Achievement in Solid State Science and Technology

Monday, May 2

Wide Bandgap Semiconductors for Electronics, Photonics, and Sensing Applications

by Stephen Pearton

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 (10-50$cm^2 V^{-1} sec^{-1}$), 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.

His 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...

Sunday, May 1

Semiconductor Nanowires: A Platform for Nanoscience and Nanotechnology

by Charles Lieber

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 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.

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). 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. Lieber 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.

Hotel Reservations Information

The 219th ECS Meeting and SOFC XII will be held at the Montréal Convention Center located at 159 rue Saint-Antoine Ouest, 9e 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.

Ground Transportation

To get from the Montreal Airport to the Convention Center and area hotels, you can choose from the 747 Express Bus or taxi. See the ECS website for further details.

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 Montreal" orientation presented by Tourism Montreal on Monday, May 2 at 0900h in the Companion Registrants Lounge.

Please note that online registration is not available for Companion Registrants. For your convenience, you may register using the attached Early-Bird Registration Form.

Short Courses and 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 1700h. The registration fee is $425 for ECS members and $520 for nonmembers. **Students are offered a 50% discount.** The registration fee for the course covers the course, text materials, continental breakfast, luncheon, and refreshment breaks; it is not applicable to any other activities of the meeting. **The deadline for registration for a course is April 1, 2011.** Interested parties may register using the Early-Bird Registration Form in this brochure. Written requests for refunds will be honored only if received at ECS headquarters before April 8, 2011. **Pre-registration is required.** All courses are subject to cancellation pending an appropriate number of advance registrants.

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

Short Course #1

Scientific Writing for Scientists and Engineers

D. N. 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

C. 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, 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
M. 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
S. B. Adler and P. Holtappels, Instructors

The objective of this course is to provide an introduction to Solid Oxide Fuel Cell (SOFC) science & 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.

NOTE: A limited amount of funding is available to eligible students to cover registration fees to attend this Short Course. Funding is available to student attendees less than 30 years old, irrespective of nationality. Individuals must be attending High Temperature Materials Division sponsored or co-sponsored symposia as part of the ECS biannual meeting in Montreal. Funding is limited to $600 per individual. Applicants should contact ECS no later than January 31, 2011 with a letter explaining why they think it is important that they attend this Short Course. ECS will forward all requests to the fund administrators at least six weeks prior to the meeting for consideration. Applicants will be notified of their status at least one month prior to the meeting if they are eligible to receive funding to cover the registration fees for this short Course. Send your application to David Harkness, Director of Constituent Services, e-mail: david.harkness@electrochem.org.

Short Course #5

Materials for Li-Ion Batteries: Structures, Performance, and Durability
Q. C. Horn and Y. Q., 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
A. 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 extendibility 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

The three professional development workshops—Writing an Effective Cover Letter and Resume, Job Interviewing Tips, and Resume Roundtable—are free to all technical meeting registrants, and are taught by John Susko, retired corporate executive. If you plan to attend the Resume Roundtable, please bring a copy of your current resume.

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

(continued on page 6)

Meeting Events-at-a-Glance

Sunday, May 1

0900h	Short Courses
1500h	Writing an Effective Cover Letter and Resume Workshop
1600h	Job Interviewing Tips Workshop
1730h	ECS Student Mixer
1830h	For the Rest of Us — "Semiconductor Nanowires: A Platform for Nanoscience and Nanotechnology," Charles Lieber
1900h	Electronics and Photonics Division Award Reception and General Meeting; no ticket required
1930h	Sunday Evening Get-Together

Monday, May 2

0930h	Coffee Break
1200h	Writing an Effective Cover Letter and Resume Workshop
1215h	Industrial Electrochemistry & Electrochemical Engineering Division Luncheon & Business Meeting; non-refundable ticketed event
1215h	Physical and Analytical Electrochemistry Division Luncheon & Business Meeting; non-refundable ticketed event
1300h	Job Interviewing Tips Workshop
1400h	Resume Roundtable Workshop
1415h	2011 Gordon E. Moore Award Lecture: "Wide Bandgap Semiconductors for Electronics, Photonics, and Sensing Applications" by S. J. Pearton
1500h	*ECS Transactions* Tutorial Session for Authors
1700h	The ECS Lecture: "How Can One Tell if a Li-ion Battery Will Last for Decades in Only Three Weeks of Testing?" Jeffery Dahn
1800h	Monday Evening Mixer, Student Poster Session, and Technical Exhibit Opening

Tuesday, May 3

0900h	Technical Exhibit
0930h	Coffee Break
1215h	Annual Society Luncheon & Business Meeting with Student Poster Award Presentation; non-refundable
1800h	Technical Exhibit and General Poster Session
1700h	*ECS Transactions* Tutorial Session for Editors
1800h	Technical Exhibit and General Poster Session

Wednesday, May 4

0900h	Technical Exhibit
0930h	Coffee Break
1215h	Dielectric Science & Technology Division Luncheon & Business Meeting; non-refundable ticketed event
1215h	Energy Technology Division Luncheon & Business Meeting; non-refundable ticketed event
1215h	Fullerenes, Nanotubes & Carbon Nanostructures Division Luncheon & Business Meeting; non-refundable ticketed event
1215h	Organic & Biological Electrochemistry Division Luncheon & Business Meeting; non-refundable ticketed event
1800h	SOFC Banquet (included in SOFC registration fee)

Thursday, May 5

0930h	Coffee Break

Friday, May 6

0930h	Coffee Break

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Strategies to Boost Chances of NSF Funding Your Proposal

(continued from page 5)

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.

Early-Bird Registration Instructions

Complete ALL sections of the Early-Bird Registration Form located on the adjacent page or the ECS website. Make check or money order payable to The Electrochemical Society. Payments must be made in U.S. funds drawn on a U.S. bank; MasterCard, Visa, American Express, or Discover are also accepted. **Completed registration forms along with payment must be received by April 1, 2011 to qualify for the Early-Bird rates.** All refunds are subject to a 10% processing fee. Written requests for refunds will be honored only if received at the ECS headquarters office by April 8, 2011.

Attendees prepaying by credit card may send their Early-Bird Registration forms to the ECS headquarters office by fax: 1.609.737.2743. If you send your Early-Bird Registration form by fax, please do not send another copy by mail, as this may result in duplicate charges. All Early-Bird registrations will be confirmed by mail.

A—Registration Fees

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.

B—Sunday Short Courses

Deadline for Short Course registration is April 1, 2011. **Pre-registration is required.** All courses are subject to cancellation pending an appropriate number of advance registrants. The registration fee is $425 for ECS Members and $520 for nonmembers. Students are offered a 50% discount. Includes admittance to Sunday Short Courses ONLY; not applicable to any other meeting activities.

C—Luncheons & Special Events

Tickets are non-refundable because ECS is required to pay the hotel for all tickets ordered.

	Early-Bird (by April 1)	Apr. 2 through May 6
Monday (May 2)		
Industrial Electrochemistry & Electrochemical Engineering Division Luncheon & Business Meeting	$27	$32
Physical and Analytical Electrochemistry Division Luncheon & Business Meeting	$27	$32
Tuesday (May 3)		
Annual Society Luncheon & Business Meeting	$27	$32
Wednesday (May 4)		
Dielectric Science & Technology Division Luncheon & Business Meeting	$27	$32
Energy Technology Division Luncheon & Business Meeting	$27	$32
Fullerenes, Nanotubes & Carbon Nanostructures Division Luncheon & Business Meeting	$27	$32
Organic & Biological Electrochemistry Division Luncheon & Business Meeting	$27	$32
SOFC Banquet	$150	$200

SYMPOSIUM TOPICS

A — General Topics

A0 — The Gordon E. Moore Medal for Outstanding Achievement in Solid-State Science and Technology Award

A1 — General Student Poster Session

A2 — Nanotechnology General Session

A3 — Electrochemistry and Climate Change

A4 — Tutorials in Nanotechnology: Focus on Dielectrics in Nanotechnology HC e

B — Batteries, Fuel Cells, and Energy Conversion

B1 — Batteries and Energy Technology Joint General Session

B2 — Direct Alcohol Fuel Cells

B3 — Electrolytes for High Voltage Cathodes – Solids and Liquids

B4 — Metal/Air, Metal/Sulfur, and Metal/Water Batteries

B5 — Microstructure, Mechanisms, and Modeling of Battery Materials

B6 — Nanostructured Materials for Energy Storage and Conversion

B7 — Solid Oxide Fuel Cells XII (SOFC XII) CD e

C — Biomedical Applications and Organic Electrochemistry

C1 — Organic and Biological Electrochemistry General Poster Session

C2 — Recent Progress in Synthetic and Mechanistic Organic Electrochemistry

D — Corrosion, Passivation, and Anodic Films

D1 — Corrosion General Session

E — Dielectric and Semiconductor Materials, Devices, and Processing

E1 — Silicon Compatible Materials, Processes, and Technologies for Advanced Integrated Circuits and Emerging Applications HC e

E2 — Bioelectronics, Biointerfaces, and Biomedical Applications 4 SC e

E3 — Graphene, Ge/III-V, and Emerging Materials for Post-CMOS Applications 3 HC e

E4 — Nanocrystal Embedded Dielectrics for Electronic and Photonic Devices

E5 — Organic Semiconductor Materials, Devices, and Processing 3

E6 — Processes at the Semiconductor Solution Interface 4 SC e

E7 — Silicon Nitride, Silicon Dioxide, and Emerging Dielectrics 11 HC e

E8 — Advanced Semiconductor-on-Insulator Technology and Related Physics 15 HC e

E9 — Wide Bandgap Semiconductor Materials and Devices 12 HC e

E10 — Plasma Processing 18

F — Electrochemical / Chemical Deposition and Etching

F1 — Electrodeposition for Energy Applications 2

F2 — Surfactant and Additive Effects on Thin Film Deposition and Particle Growth 2

G — Electrochemical Synthesis and Engineering

G1 — Industrial Electrochemistry and Electrochemical Engineering General Session

G2 — Characterization of Porous Materials 4

G3 — Electrosynthesis and Electrochemical Processes, in Honor of W. Ves Childs

H — Fullerenes, Nanotubes, and Carbon Nanostructures

H1 — Electron Transfer and Applications of Fullerenes and Nanostructured Materials

H2 — Molecular and Supramolecular Chemistry of Fullerenes and Carbon Nanotubes

H3 — Carbon Nanotubes and Nanostructures: Fundamental Properties and Processes

H4 — Carbon Nanotubes and Nanostructures: Applications and Devices

H5 — Endofullerenes and Carbon Nanocapsules

H7 — Carbon Nanotubes and Nanostructures: Medicine and Biology

H8 — Porphyrins and Supramolecular Assemblies

H9 — Nanostructures for Energy Conversion

H10 — Chemistry and Physics of Graphene and 2D Nanostructures

I — Physical and Analytical Electrochemistry

I1 — Bioelectrocatalysis

I3 — Computational Electrochemistry

I4 — Electrocatalysis 5

I5 — Grahame Award Symposium and Physical and Analytical Electrochemistry General Session

I6 — Nanostructured and Functionalized Electroactive Polymer Films and Related Materials 2

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

J1 — Sensors, Actuators, and Microsystems General Session

J3 — Sensors for Biomedical Applications

***ECS Transactions* (ECST) – Symposia with issues available "at" the meeting are labeled with the following icons:**

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 ECST issue using the meeting registration form in this brochure or when registering online.

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.

SC **Softcover** (SC) editions 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 Montreal to order your softcover 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 Montreal "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.

***ECS Transactions* – Forthcoming Issues**

In addition to those symposia that have committed to publishing an issue of *ECS Transactions*, all other symposia potentially will be publishing an issue of ECST approximately 12 weeks after the Montreal meeting. If you would like to receive information on any of these issues when they become available, please e-mail ecst@electrochem.org. Please include your name, e-mail address, and all issues in which you are interested.

SPECIAL OFFER!

Purchase a hardcover copy of *ECS Transactions* Volume 35, Issues 1*, 2, 3, 4, 5, or 6 with your Montreal meeting registration and receive 10% off that issue's list price! For ECS Members the 10% discount will be on top of your regular Member discount for these issues. Any discounted books or CDs purchased must be picked up at the Montreal meeting. The discount does not apply to electronic editions of these issues. This discount is not valid on any other issues of ECST, Monographs, or Proceedings Volumes purchased at the meeting.

** The SOFC-XII issue of ECST (ECST 35-1) is not available in a hardcover edition, but as a CD-ROM with a USB flashdrive included.*

Early-Bird Registration Form

Montréal, QC, Canada | May 1-6, 2011

Register Online
www.electrochem.org

Please complete using block capital letters and return to the following address.
The Electrochemical Society, 65 South Main Street, Pennington, NJ 08534-2839, USA
Tel: 609.737.1902 • Fax: 609.737.2743 • E-mail: ecs@electrochem.org • Web: www.electrochem.org

Early-Bird Registration Deadline: April 1, 2011

Name _____

Mailing Address _____

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BADGE INFORMATION *(use only the spaces available)*

First Name (Given) Last Name (Family)

Company or University

City, State/Country

A—Early-Bird Registration Fees

All technical registration fees include the Meeting Abstracts on USB Flashdrive. All prices are in U.S. dollars.

ECS Member	_____	$415
Nonmember	_____	$615
ECS Student Member	_____	$150
Student Nonmember	_____	$190
One Day ECS Member (Day: _____)	_____	$275
One Day Nonmember (Day: _____)	_____	$365
ECS Emeritus or Honorary Member	_____	$0
SOFC Technical Registrant	_____	$750
SOFC Student Registrant	_____	$475
Companion Registrant	_____	$25
Companion Name: _____		

A—Enter Registration Fees Total $_____

B—Sunday Short Courses

Deadline for Short Course registration is April 1, 2011. Pre-registration is required. *All courses are subject to cancellation pending an appropriate number of Early-Bird registrants. All course prices are $425 for ECS Members and $520 for nonmembers. Students receive 50% discount on all course prices.*

1 — Scientific Writing for Scientists and Engineers	$_____
2 — Mapping Electronic and Chemical Properties at the Nanoscale	$_____
3 — Basic Impedance Spectroscopy	$_____
4 — Introduction to Solid Oxide Fuel Cells	$_____
5 — Materials for Li-Ion Batteries: Structures, Performance, and Durability	$_____
6 — Atomic Layer Deposition	$_____

B—Enter Short Course Total $_____

C—Luncheons & Special Events

Write the number of tickets desired for each event on the corresponding line and enter the total amount for all tickets on Line C. ***Tickets are non-refundable.***

Monday, May 2

Industrial Electrochemistry & Electrochemical Engineering Division Luncheon & Business Meeting	_____	$27
Physical and Analytical Electrochemistry Division Luncheon & Business Meeting	_____	$27

Tuesday, May 3

Annual Society Luncheon & Business Meeting	_____	$27

Wednesday, May 4

Dielectric Science & Technology Division Luncheon & Business Meeting	_____	$27
Energy Technology Division Luncheon & Business Meeting	_____	$27
Fullerenes, Nanotubes & Carbon Nanostructures Division Luncheon & Business Meeting	_____	$27
Organic & Biological Electrochemistry Division Luncheon & Business Meeting	_____	$27
SOFC Banquet, for non-SOFC registrants ONLY	_____	$150

C—Enter Special Events Total $_____

D—Publications

The following issues of ECS Transactions *will be published from symposia held during the Montreal meeting and will be available for pick-up at the meeting. Discount prices shown are for ECS Members (M) and Nonmembers (NM). Please see the Symposium Topics section of this brochure for details about the discounted prices.* **Electronic (PDF)** *editions of these issues are available for purchase beginning April 22, 2011, and ONLY by visiting the ECS Digital Library (www.ecsdl.org). Please visit the ECS website for all issue pricing and ordering information for the electronic editions.*

(Please see the Symposium Topics page for a list of all issues that will be available after the meeting)

HC *Hard-cover*
CD *Compact Disc and USB flashdrive*

		List Price	Member Discounted Price	Nonmember Discounted Price
CD	Vol. 35 No. 1 **Solid Oxide Fuel Cells 12 (SOFC-XII)** *Editors: S. C. Singhal, et al.*	____ ~~$265~~	____ $186	____ $239
HC	Vol. 35 No. 2 **Silicon Compatible Materials, Processes, and Technologies for Advanced Integrated Circuits and Emerging Applications** *Editors: F. Roozeboom, et al..*	____ ~~$125~~	____ $88	____ $113
HC	Vol 35 No. 3 **Graphene, Ge/III-V, Nanowires and Emerging Materials for Post-CMOS Applications 3 -and- Tutorials in Nanotechnology: Dielectrics in Nanosystems** *Editors: Z. Karim, D. Misra, et al.*	____ ~~$139~~	____ $97	____ $125
HC	Vol 35 No. 4 **Silicon Nitride, Silicon Dioxide, and Emerging Dielectrics 11** *Editors: R. Ekwal Sah*	____ ~~$166~~	____ $116	____ $149
HC	Vol 35 No. 5 **Advanced Semiconductor-on-Insulator Technology and Related Physics 15** *Editors: Y. Omura*	____ ~~$139~~	____ $97	____ $125
HC	Vol 35 No. 6 **Wide Bandgap Semiconductor Materials and Devices 12** *Editors: J. A. Bardwell, et al.*	____ ~~$115~~	____ $81	____ $104

D—Enter Publications Total $_____

For questions concerning registration, please contact our Customer Service Department at customerservice@electrochem.org or 609.737.1902, extension 104.

TOTAL (Add Lines A+B+C+D) $_____
(All prices in U.S. Dollars)

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Payment must be received by **April 1, 2011** to qualify for Early-Bird rates. Checks must be in U.S. funds drawn on a U.S. bank. Make checks payable to: **The Electrochemical Society**.

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