Special Meeting Section

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Boston

Massachusetts

220th ECS Meeting

& Electrochemical Energy Summit

October 9-14, 2011

Westin Boston Waterfront and Boston Convention & Exhibition Center | Boston, MA

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Welcome to Boston! We are pleased to venture into this city for the 220th ECS Meeting. This major international conference will be held at the Westin Boston Waterfront and the Boston Convention and Exhibition Center (BCEC), and will include 47 topical symposia consisting of 2,699 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 Speaker

Olin Palladium Award Lecture

The Use of Renewable Energy in the Form of Methane via Electrolytic Hydrogen Generation

by Koji Hashimoto

Monday, October 10
1400h
Room 252 B, Level 2, BCEC

A look at world energy consumption from 1980 to 2008 indicates that the continuation of increases in energy consumption will lead to complete exhaustion of petroleum, natural gas, uranium, and coal reserves by the middle of this century. In order to avoid a situation of no fuel and intolerable global warming, we must immediately establish new technology to use only renewable energy, through which all of the world's population can survive.

For more than 20 years, we have been proposing global carbon dioxide recycling. Global carbon dioxide recycling consists of power generation by solar cells in deserts, hydrogen production by seawater electrolysis and methane production by the reaction of hydrogen with carbon dioxide at nearby desert coasts, methane combustion and carbon dioxide capture by energy consumers, and transportation of carbon dioxide to desert coasts.

Among systems in global carbon dioxide recycling, seawater electrolysis and methane formation from carbon dioxide have not been industrially performed. We have created anodes for oxygen evolution without toxic chlorine formation in seawater electrolysis, energy-saving cathodes for hydrogen production, and catalysts for methane formation with almost 100% selectivity by the rapid reaction of carbon dioxide with hydrogen. In 1995, we constructed a prototype plant for global carbon dioxide recycling, and in 2003, constructed an industrial scale pilot plant consisting of hydrogen production by seawater electrolysis and carbon dioxide methanation. The improvement of materials and systems and the construction of larger test plants are in progress.

Created materials, systems, and the current status of global carbon dioxide recycling will be presented.

Koji Hashimoto's research interests include creation of corrosion-resistant amorphous and other novel materials, electrodes for electrolysis of aqueous solutions and catalysts for fuel production, applications of modern surface-analytical techniques, passivity, role of corrosion-resistant elements, and the effect of nanocrystalline heterogeneity on corrosion resistance.

The latter study is focused on key materials and systems for a supply of renewable energy in the form of methane. The key materials are the cathode for hydrogen production and the anode for only oxygen formation without chlorine evolution in seawater electrolysis and the catalyst for methanation of carbon dioxide with hydrogen. Dr. Hashimoto built a prototype plant at Tohoku University in 1995 and industrial scale plants of seawater electrolysis and carbon dioxide methanation at Tohoku Institute of Technology in 2003. Recent efforts have been concentrated in decreasing the price of methane by improvement of materials and systems in addition to construction of larger systems.

Short Courses & Tutorials

Six **Short Courses** will be offered in conjunction with the 220th ECS Meeting. These courses will be held on Sunday, October 9, 2010 from 0900h to 1600h. Fees are $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. All courses and tutorial are subject to cancellation pending an appropriate number of advance registrants and therefore, pre-registration is required. **The deadline for registration for ALL Short Courses is September 9, 2011**. Written requests for refunds will be honored only if received at Society headquarters before September 16, 2011. **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

Advanced 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 course is best suited for an attendee who has some experience with making impedance measurements and wants to develop a deeper understanding of the technique. 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 regression 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 type of information that can be extracted from impedance measurements, including the limitations of the technique,
- proper selection of experimental parameters,
- the types of errors expected in impedance measurements, and methods to assess the importance of these errors and to reduce their magnitude,
- use of the Kramers-Kronig relations as a tool for evaluating impedance data,
- use of regression techniques and appropriate selection of weighting strategies,
- application of electrical circuit analogues,
- development of mathematical models appropriate for interpretation of impedance spectra in terms of physical properties, and
- applications to different systems including corrosion, fuel cells, characterization of electronic materials, transport through membranes such as skin.

This course is the second in a two course sequence offered at alternating ECS meetings by Prof. Orazem. This course provides a summary of the material presented in the "Basic Impedance Spectroscopy" course and then adds model development based on proposed reaction mechanisms, statistical analysis of impedance data, and regression analysis.

Short Course #2

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 will be of particular interest to researchers and graduate students as well as to university faculty who want to improve both their own writing and that of their students. 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 #3

Grid Scale Energy Storage
Jeremy P. Meyers, Instructor

This course is intended for chemists, physicists, materials scientists, and engineers to better understand the specific requirements for energy storage on the electric grid. The course will introduce students to the concepts associated with the "smart grid" and the demands that intermittent renewable power sources place on the grid from the perspective of distribution. We will then examine some of the key technologies under consideration for energy storage and the technical targets and challenges that must be addressed.

Students will be brought up to date with the current state of the art, and review data from demonstration systems, experimental data from prototype designs, and some modeling and analysis. The following areas will be covered in this short course:

- introduction to the electric grid and renewable power sources;
- current role of energy storage on the grid;
- location and deployment of energy storage on the "smart grid";
- existing technologies for energy storage on the grid;
- adaptation of secondary batteries for grid-based storage applications;
- redox flow batteries;
- high-temperature batteries for energy storage;
- novel battery concepts;
- materials and engineering challenges for grid storage; and
- diagnostics and characterization techniques.

Short Course #4

Operation and Exploitation of Electrochemical Capacitor Technology

John R. Miller, Instructor

Electrochemical Capacitors (ECs), sometimes called supercapacitors or ultracapacitors, are receiving increased attention for use in power sources of many applications because they offer extraordinarily high reversibility, provide unexcelled power density, and have exceptional cycle-life. Combination systems, including those with batteries and capacitors, IC engines and capacitors, and fuel cells with capacitors are now appearing and being used to increase the energy efficiency of vehicles and industrial equipment like fork lifts, trams, and overhead cranes by capturing energy that is normally wasted. Systems developed specifically for grid power quality applications are now appearing.

This tutorial is targeted at technologists interested in understanding and exploiting electrochemical capacitor technology. The basics are covered first, including a description of the nature and significance of electric double layer charge storage, the general design of such products, and the similarities and differences between these devices and traditional capacitors and batteries. Two-terminal electrical measurement techniques are discussed and test data is used to develop equivalent circuit models. Power/energy behavior and tradeoffs are presented along with reliability design. Many example applications are covered in detail. The goal of the tutorial is to provide basic understanding, necessary tools, and sufficient operating information to allow direct and successful advancement and/or exploitation of electrochemical capacitor technology.

Short Course #5

Polymer Electrolyte Fuel Cells

Hubert Gasteiger and Thomas Schmidt, Instructors

This short-course develops the fundamental thermodynamics and electrocatalytic processes critical to polymer electrolyte fuel cells (PEFCs including direct methanol and alkaline membrane FCs). In the first part, we will discuss the relevant half-cell reactions, their thermodynamic driving forces, and their mathematical foundations in electrocatalysis theory (e.g., Butler-Volmer equations). Subsequently, this theoretical framework will be applied to catalyst characterization and the evaluation of kinetic parameters like activation energies, exchange current densities, reaction orders, etc. In the second part of the course, we will illuminate the different functional requirements of actual PEFC (incl. DMFC and AMFC) components and present basic *in situ* diagnostics (Pt surface area, shorting, H2 crossover, electronic resistance, etc.). This will be used to develop an in-depth understanding of the various voltage loss terms that constitute a polarization curve. Finally, we will apply this learning to describe the principles of fuel cell catalyst activity measurements, the impact of uncontrolled-operation events (e.g., cell reversal), and the various effects of long-term materials degradation. To benefit most effectively from this course, registrants should have completed at least their first two years of a bachelor's program in physics, chemistry, or engineering; or have several years of experience with PEFCs.

Short Course #6

Electrodeposition: Fundamentals and Applications to Energy Conversion Systems

Stanko Brankovic and Giovanni Zangari, Instructors

Electrodeposition is increasingly being used in the fabrication of materials and devices, and most recently this technique has been successfully applied to the fabrication of various components in energy conversion systems. This course will offer the opportunity to students, researchers and practitioners with a variety of technical backgrounds to be introduced for the first time or to refresh their understanding of the fundamentals of the technique, as well as to gain a perspective of its potentials. In particular, in this course the attendees will gain practical knowledge of the methods and techniques used in the synthesis of catalysts for fuel cells, components for batteries, and thin film radiation absorbers for photovoltaic devices. The course will be structured in two modules.

A. Fundamentals of Electrodeposition:
- thermodynamics and kinetics
- thin film formation: the art and science of controlling microstructure and morphology
- proper selection of experimental parameters, and
- electrochemical engineering aspects.

B. Electrodeposition for Energy Conversion Devices:
- recent techniques to control film formation down at the single atomic layer: surface limited replacement reaction and electrochemical atomic layer epitaxy,
- electrodeposition of electrocatalyst materials,
- how to produce interpenetrating structures: application to batteries and supercapacitors, and
- thin film radiation absorbers for photovoltaic devices.

Professional Development Workshops

John R. Susko, Instructor

ECS will sponsor the following three professional development workshops at no extra charge to meeting registrants. All workshops will be held in Room 255, Level 2, BCEC. **John R. Susko** has been a corporate executive, entrepreneur, and chief technologist. As an entrepreneur, his work encompassed research, development, and product certification of state-of-the art energy management systems for building lighting and controls, as well as financial, sales, and personnel aspects of business. He was a senior engineer in IBM, where he held numerous engineering and management positions in the research and development of advanced materials and technologies critical to IBM

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.

Sunday, October 9, 2011.....1500-1545h
Monday, October 10, 2011.....1200-1245h

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

Sunday, October 9, 2011.....1600-1645h
Monday, October 10, 2011.....1300-1345h

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, October 10, 2011.....1400-1700h

Award Winners

In addition to the Olin Palladium Award being presented to **Koji Hashimoto** (see page 20), the following awards are being presented in Boston. 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/220/220.htm.

2011 Class of ECS Fellows

Established in 1989, the designation of Fellow of The Electrochemical Society is awarded for individual contributions and leadership in the achievement of science and technology in the area of electrochemistry and solid state sciences and current active participation in the affairs of ECS.

Hugh C. DeLong, Director of the U.S. Air Force Research Laboratory's Air Force Office of Scientific Research, has brought in top researchers around the world to pioneer existing new techniques in chemistry and in biotechnology which incorporated bio-inspired and bioderived concepts. He is focused on using chemistry and biology to develop new materials and device concepts for application to real-world problems of significance to the Air Force, and in fielding sensor platforms based on novel chemistry and biology to accomplish new capabilities in sensor design. His efforts have achieved many exciting breakthroughs in materials and techniques that have been incorporated in AFRL facilities and Air Force weapon systems, such as a vapor lubricant system for IHPTET phase III engine, a new solid lubricant in use on an existing satellite, new coatings for F-15 and C-17, and JSF, a new nanolithography instrument for assembly at the nanoscale that became Discovery of the Year for *Discovery Magazine*.

To date his own work has produced three patents, 50 peer-reviewed journal articles, 27 books/book chapters, 38 proceedings articles and reports, over 56 invited research presentations, and numerous non-invited research presentations. Dr. De Long was commissioned as an officer in the USAF (1985). He was a satellite vehicle engineer and then worked for the ASAT Program Office until he was sent off to pursue a PhD. He joined the USAF research team in 1990, first with Frank J. Seiler Research Laboratory at USAFA as Electrochemistry Research Leader, then as Electrochemistry Division Chief. He became a program manager with AFOSR (1990) managing the Surface and Interfacial Chemistry program. Dr. DeLong joined the chemistry faculty of U.S. Naval Academy (1999) until his retirement in 2002. He became a Program Manager of the Biomimetics, Biomaterials, & Biointerfacial Sciences program (2002) until he became Deputy Director (2008) then Director (2009). In 2007, he was inducted as a Fellow of the American Association for the Advancement of Science (AAAS). In 2006, he was inducted as an AFRL Fellow. He is a member of ECS, the American Chemical Society, the American Association for the Advancement of Science, the Materials Research Society, and Sigma Xi.

Hubert Gasteiger received his PhD in chemical engineering from UC Berkeley in 1993. His thesis research on the methanol oxidation on alloy model-electrodes, prepared and characterized in ultra high vacuum (UHV), was conducted under the guidance of Elton Cairns, Phil Ross, and Nenad Marković. During his postdoctoral appointment at the Lawrence Berkeley National Laboratory (1994-1995), Gasteiger, Marković, and Ross pioneered a method by which single-crystals and UHV-prepared electrodes could be inserted into a rotating ring disk electrode (RRDE) configuration to examine their electrocatalyic activity for hydrogen and CO oxidation as well as for oxygen reduction. From 1996 to 1998, he was research assistant with Jürgen Behm at Ulm University, where he established a research group with focus on heterogeneous gas-phase catalysis (preferential oxidation of carbon monoxide) and co-developed the thin-film RRDE method for high-surface-area electrocatalysts.

In the fall of 1998, he joined the Fuel Cell Activities program at GM/Opel as Technical Manager, located in Mainz-Kastel (Germany) for the first year, then in Honeoye Falls (NY, USA). There, he led a research group on the development and characterization of membrane electrode assemblies (MEAs) and MEA materials; in 2004 he was promoted to GM Technical Fellow. Subsequently (September 2007 through December 2008), he was Director of Catalyst Technology at Acta S.p.A. (Italy), leading catalyst and electrode development for alkaline membrane fuel cells and electrolyzers. In 2009, he was a visiting professor at MIT, working on lithium-air batteries and fuel cell electrocatalysis with Yang Shao-Horn and her group. In April 2010, he was appointed Chair of Technical Electrochemistry at the Chemistry Department of the Technische Universität München, with a main focus on materials, electrodes, and diagnostics development for battery and fuel cell applications.

His work has been published in ca. 70 peer-reviewed articles (h-index 42), 13 book chapters, and 29 patent applications/patents. He also served as Editor-in-Chief for Wiley's *Handbook of Fuel Cells – Fundamentals, Technology, and Applications* (four and two volumes appeared in 2003 and 2009, respectively) and currently chairs the ECS Fuel Cell Subcommittee. In 2004, he received the Klaus-Jürgen Vetter Award for Electrochemical Kinetics from the International Society of Electrochemistry.

Arumugam Manthiram is the Joe C. Walter Chair in Engineering and Director of the Texas Materials Institute and the Materials Science and Engineering Graduate Program at the University of Texas at Austin. He received BS (1974) and MS (1976) degrees in chemistry from Madurai University, India, and a PhD degree in chemistry in 1980 from the Indian Institute of Technology, Chennai, under the supervision of Prof. Jeganatha Gopalakrishnan. After his doctoral work, he worked as a postdoctoral researcher at the Indian Institute of Science, Bangalore, for one year, as a Lecturer in Chemistry at Madurai Kamaraj University, Madurai, for four years; as a postdoctoral researcher at the Inorganic Chemistry Laboratory of the University of Oxford, England, for one year; and at the University of Texas at Austin for five years, with Professor John B. Goodenough. He became an assistant professor in the Department of Mechanical Engineering at the University of Texas at Austin in 1991 and rose to the rank of professor in 2000.

Award Winners
(continued from previous page)

Professor Manthiram directs a large research group in electrochemical energy technologies with 27 graduate students and postdoctoral researchers. His current research is focused on materials for lithium-ion batteries, supercapacitors, fuel cells, and solar cells. Specifically, his group is engaged in developing new, low-cost, efficient materials for these clean energy technologies; novel chemical synthesis and processing approaches for nanomaterials; and a fundamental understanding of their structure-property-performance relationships. He is the co-founder of ActaCell, a startup company that is engaged in developing high power lithium-ion batteries. He has authored more than 400 publications, including more than 340 journal articles. He has also been awarded seven patents with an additional four patent applications currently pending. His published work has been cited more than 8,000 times with an h-index of 46.

Professor Manthiram received the Engineering Foundation Faculty Excellence Award in 1994, the Mechanical Engineering Department Faculty Leadership Award in 1996, and the Mechanical Engineering Department Outstanding Teaching Award in 2011. He was elected as a Fellow of the American Ceramic Society in 2004. He was awarded the Charlotte Maer Patton Centennial Fellowship in Engineering in 1998, the Ashley H. Priddy Centennial Professorship in Engineering in 2002, the BF Goodrich Endowed Professorship in Materials Engineering in 2006, the Jack S. Josey Professorship in Energy Studies in 2008, and the Joe C. Walter Chair in Engineering in 2009.

Ashok Kumar Shukla is an alumnus of the Indian Institute of Technology, Kanpur, and is presently the Chair of the Solid State and Structural Chemistry Unit, Indian Institute of Science, Bangalore. Prior to this, on loan from Indian Institute of Science during 2003-2009, Professor Shukla provided leadership to Central Electrochemical Research Institute (CECRI) at Karaikudi as its Director, and helped transform CECRI into a leading centre in Fuel Cell R&D and engineering. Professor Shukla has made extensive scientific and engineering contributions to the field of renewable energy, materials chemistry and electrochemical science and technology through interdisciplinary research during the last 30 years, in particular, for investigations leading to novel electrocatalysts, superior lithium-ion cathodes/anodes, polymer electrolyte membranes, mixed-reactant fuel cells and low-cost high energy-density lead-acid batteries with special mention to self-supported polymer electrolyte, and direct borohydride fuel cell systems. His innovations in tropical lead-acid batteries have been incorporated by lead-acid battery industries in their commercial products. His recent work on cost-effective hybrid ultracapacitors is remarkably innovative for quickly harvesting and storing energy, and is especially promising for rural lighting and electric vehicle applications.

Professor Shukla has served as an Associate Editor for the *Journal of The Electrochemical Society*, and has been a member of Editorial Advisory Boards of *Electrochimica Acta* and the *Journal of Applied Electrochemistry*. He is presently the Editor of *Bulletin of Material Science* and is also on the Editorial Board of *Ionics*. He has authored/co-authored more than 270 scientific papers in reputed national/international journals and has over a dozen national/ international patents to his credit. Professor Shukla is recipient of several awards, and is a fellow of Indian National Science Academy, National Academy of Sciences, and National Academy of Engineering. He is the first Chair of the ECS India Chapter.

Paul Chappell Trulove is a professor of chemistry at the U.S. Naval Academy. He received his BS in chemistry from the University of Kansas in 1984. Upon graduation he entered the Air Force where he served for over 20 years achieving the rank of Lieutenant Colonel. While on active duty he completed his MS in chemistry from the California State University at Northridge (1988), and his PhD from the State University of New York at Buffalo (1992). His PhD work was carried out under the direction of Robert A. Osteryoung. In the Air Force he had a diverse set of assignments including tours at the Air Force Rocket Propulsion Laboratory, Edwards AFB, where he conducted research on rocket oxidizer corrosion; and the Frank J. Seiler Research Laboratory, U.S. Air Force Academy, where he studied compact power applications of ionic liquids. His last five years on active duty were spent at the Air Force Office of Scientific Research where he was program manager for Surface and Interfacial Science. Under his program he managed all Air Force basic research funding in the areas of corrosion, compact power, electrochemical processes and reactions, advanced surface structures, and tribochemistry. Upon retirement from the Air Force in 2004 he joined the chemistry faculty at the U.S. Naval Academy.

Ionic liquids have been the dominate focus of Prof. Trulove's research throughout much of his career. His current research is directed at investigations of the fundamental properties of ionic liquids and the application of these solvents to the processing and modification of natural polymers. In addition, he has also worked extensively on the application of ionic liquids for high-energy density batteries and metal alloy deposition. He has published 113 technical articles (60 peer-reviewed) on these subjects, and he holds two patents on biopolymer processing in ionic liquids. He has contributed nine chapters to books and edited 22 technical proceedings. In addition to numerous military decorations, he is the recipient of the Air Force Materiel Command, Science, and Technology Award, and the U.S. Naval Academy Class of 1951 Civilian Faculty Research Award.

Prof. Trulove has served as Chair (2009-2011), Vice-Chair (2007-2009), and Secretary-Treasurer (2005-2007) of the ECS Physical and Analytical Electrochemistry Division (PAED). He has organized and chaired 14 symposia at ECS international meetings including the last seven International Symposia on Molten Salts and Ionic Liquids.

Karim Zaghib obtained his MS in 1987 and his PhD in 1990, both in electrochemistry from the Institut National Polytechnique de Grenoble, France under the direction of Bernadette Nguyen. In 2002, he received the HDR (Habilitation à Diriger la Recherche) in materials science from the Université de Pierre et Marie Curie, Paris, France.

From 1986 to 1990, Dr. Zaghib developed Al-Mn Alloys in molten salts as negative electrodes for Li-ion batteries and Cu-Zn displacement reactions. In 1990, Dr. Zaghib published a new method to enhance the electrodeposition of metals. He was a post-doctoral fellow (1990-1992) under a Saft-DGA contract. From 1992 to 1995, Dr. Zaghib was guest researcher for the Japanese Ministry of International Trade and Industry (METI) where he was instrumental in introducing Li-ion technology to the company. Dr. Zaghib is currently Administrator of the Conversion and Storage of Energy department (IREQ). At Hydro-Québec, he started a collaboration with Michel Armand on new materials and electrolytes. In 1998, Dr. Zaghib started a collaboration with Kim Kinoshita at LBNL to understand the

oxidation and irreversible capacity loss versus the particle size of natural graphite. During the last 15 years, Dr. Zaghib has actively collaborated with John Goodenough (University of Texas, Austin), and Christian Julien and Alain Mauger (Paris 6 University, France) to develop the olivine and silicate cathode materials for Li-ion batteries.

Dr. Zaghib has published 150 papers, has 88 patents, and has served as editor or co-editor of 13 books. He was organizer or co-organizer of 45 symposia, meetings, and workshops. In June 2010, he was the General Chair of the International Meeting on Lithium Batteries (IMLB) in Montréal, Québec. He is very active in ECS, and recently completed his term as the Chair of the Energy Technology Division. Dr. Zaghib is the recipient of the International Electric Research Exchange (IERE) Research Award (2008) in Iguaçu, Brazil, the Energy Technology Division Research award 2009, and the International Battery Association (IBA) Research Award in January 2010.

Giovanni Zangari is a professor in the Department of Materials Science and Engineering and the Center for Electrochemical Science and Engineering at the University of Virginia (UVa). He received MS (1991) and PhD (1995) degrees from the Politecnico di Milano and Torino, respectively. He completed his PhD under the guidance of Pietro Cavallotti, working on the electrochemical deposition and magnetic properties of Co-Pt alloys. From 1995 to 1998 he was a postdoctoral associate in the Data Storage Systems Center at Carnegie Mellon University under the supervision of Dave Lambeth, focusing on the fabrication of magnetic sensors and the electrodeposition of magnetic nanostructures. From 1998 to 2002 he was an assistant and then associate professor in the Department of Metallurgical and Materials Engineering and the MINT center at the University of Alabama in Tuscaloosa, before joining UVa in 2002.

Professor Zangari's research interests are in the area of electrochemical materials science, with specific emphasis on the electrodeposition of alloys for magnetic and microelectronic applications, and the investigation of the role of thermodynamic and kinetic phenomena in the formation of structure and microstructure in electrodeposited alloys. Of particular significance is his development of a process for the electrochemical growth of Co-Pt alloys, exhibiting hard magnetic properties in the as-deposited state. Recently, his research has been centered on the use of electrodeposition and electrochemical surface modification in the field of energy conversion, focusing mainly on non-noble metal alloys for electrocatalysis, metal oxides for photoelectrochemical solar cells, and nanoporous materials as potential high surface area electrodes.

Professor Zangari is co-author with students and colleagues of more than 130 archival peer-reviewed papers, has presented more than 50 invited talks internationally, and is listed as inventor on four U.S. patents; he also co-authored one book on electrodeposition, with Yuliy Gamburg. He serves as a Key Reader for *Metallurgical and Materials Transactions B*. He has been active in ECS for more than 10 years, where he is currently the Secretary of the Electrodeposition Division. He co-organized numerous symposia at ECS meetings and has contributed to the editing of the relative proceedings volumes; he has also taught several ECS short courses. Most recently, he was the guest editor of the summer 2011 issue of *Interface*, featuring the topic of electrodeposition for energy conversion.

Thomas A. Zawodzinski is presently the Governor's Chair in Electrical Energy Conversion and Storage, with appointments in the Chemical and Biomolecular Engineering Dept., at the University of Tennessee-Knoxville and at Oak Ridge National Laboratory.

Previously he was the Ohio Eminent Scholar in Fuel Cells, Director of the Case Advanced Power Institute, and the Founding Director of the Wright Fuel Cell Group. He directed a Multidisciplinary University Research Initiative funded through the U.S. Army Research Office on "An Integrated Experimental and Computational Approach Toward Catalyst Design for Fuel Cell Systems." He also worked closely with industry, interacting with companies engaged in work on phosphoric acid, molten carbonate and solid oxide fuel cells, in addition to PEMFCs.

Prior to coming to Case, as Team Leader for Fuel Cells in MST-11 at LANL, Dr. Zawodzinski played a leadership role in a comprehensive fuel cell program with R&D components related to automotive, stationary, and portable power applications of fuel cells. Dr. Zawodzinski plays a technical leadership role in the PEM fuel cell community and led the LANL team optimizing reformate/air fuel cells, for which he received the DOE Fuel Cell Award in 1999. In addition to his fuel cell work, while at LANL, Dr. Zawodzinski initiated and led programs addressing lithium batteries, including preparation of new electrolytes, new methods for studies of transport and electrode materials; self-assembled monolayers for device preparation; sensors for chem/bio agents and biologically important compounds; artificial muscles; and electrochemical reactors as well as several other areas.

He has published more than 100 refereed papers, holds four patents, and has co- edited several books on fuel cells and written a number of book chapters. He is a co-author on three of the Journal of The Electrochemical Society's 100 most cited papers. Dr. Zawodzinski has been a Member-at-Large for the ECS Energy Technology Division and the ECS Physical and Analytical Electrochemistry Division, has served on the Fuel Cell Subcommittee, and has organized or co-organized numerous technical symposia at ECS meetings. Dr. Zawodzinski received his Bachelor's and PhD degrees in chemistry from the State University of New York at Buffalo. His PhD work, under the supervision of Robert Osteryoung, focused on room temperature ionic liquids.

2010 Norman Hackerman Young Author Awards

Xingbao Zhu received the Young Author Award in the category of Electrochemical Science & Technology (ES&T), for "Performance of the Single-Chamber Solid Oxide Fuel Cell with a $La_{0.75}Sr_{0.25}Cr_{0.5}Mn_{0.5}O_{3-\delta}$-Based Perovskite Anode," (JES, Vol. 157, p. B691). Zhu received a master's degree from Harbin Institute of Technology, majoring in condensed matter physics. Zhu's work focused on preparing a composite SOFC anodes with super abilities of carbon resistance and sulfur tolerance, under Zhe Lü.

Currently Zhu is a PhD candidate, under Zhe Lü, at Harbin Institute of Technology, majoring in physics and focusing on the fabrication of nano-infiltration anode or cathode with high electrochemical performance and stability.

Award Winners
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During 2010-11, Zhu was a visiting scholar at the Georgia Institute of Technology, under Meilin Liu, majoring in materials science and engineering and focusing on the fabrication of a composite cathode with LSM film coated LSCF porous cathode using a sol-gel method. This material is based upon work supported as part of the DOE SECA Core Technology Program under Award Number DE-NT0006557. Zhu will receive a PhD degree from Harbin institute of Technology in 2012.

Zhu's research interests include: the study and analysis of forming mechanism for carbon deposition on Ni surfaces, the relationship between preparation processes and microstructures (nano-particles and nano-films), the effect of microstructures on the catalytic activity of SOFC electrodes, and combined heat and power generation systems based on single chamber SOFCs and direct flame SOFCs.

In the category of Solid State Science & Technology (SSS&T), the Young Author Award winners were Stephen E. Potts, Erik Langereis, and Gijs Dingemans, for "Low Temperature Plasma-Enhanced Atomic Layer Deposition of Metal Oxide Thin Films" (JES, Vol. 157, p. P66).

Stephen E. Potts obtained his MSci degree in cChemistry in 2005 at University College London (UCL), UK. He continued at UCL, studying toward his PhD under the supervision of Claire J. Carmalt. He designed and synthesized a variety of novel imido-, cyclopentadienyl- and guanidinate-based precursors for chemical vapor deposition (CVD) and atomic layer deposition (ALD) processes to tungsten and zirconium carbonitride films, showing just how crucial the ligand sphere was to the final film composition.

Completing his PhD in 2008, Dr. Potts started in his current position as a postdoctoral researcher in the Plasma & Materials Processing Group, led by Erwin Kessels, at the Eindhoven University of Technology, the Netherlands. He focuses on ALD, the use of plasmas as part of the deposition process and the principal reaction mechanisms. This involves the testing of new, alternative precursors to oxide, nitride, and metallic films and analysis of how these can affect the resulting film properties. A major goal of his work is the development of low-temperature ALD processes that can be used on temperature-sensitive substrates. He has also worked within the European Community's FP7 CORRAL project, which concerned the deposition of ultra-thin films at very low temperatures for the corrosion protection of temperature-sensitive steel and aluminum alloys. He demonstrated the first use of plasma-enhanced ALD as a method for the deposition of corrosion-resistant films.

Erik Langereis graduated from the Department of Applied Physics at the Eindhoven University of Technology, the Netherlands, in 2003. He continued his studies in the research group of Erwin Kessels at the same university, pioneering the development of plasma-assisted atomic layer deposition (ALD) processes in Eindhoven.

Dr. Langereis demonstrated several benefits of using a plasma in ALD, such as allowing for tunable and improved material properties and achieving a high film quality for depositions at reduced temperatures. Moreover, he focused on the underlying reaction mechanisms by adopting a variety of *in situ* diagnostics. He initiated the application of *in situ* spectroscopic ellipsometry during ALD and showed the versatility of the technique by acquiring data in between the ALD cycles. After receiving his PhD in 2008, he stayed in the group of Prof. Kessels and researched the plasma-assisted ALD processes of ultrahigh-k dielectrics and high-work-function electrode materials.

Since 2010, Dr. Langereis has worked as a lecturer at the department of Physics and Astronomy at Utrecht University. By arranging research projects for students, setting-up master classes on the departmental research and guest lectures of university researchers at high schools, he works on making the transition from high school to university smoother. His main focus is to inform and motivate students, helping them realize that science is an active and exciting field.

Gijs Dingemans studied applied physics at the Eindhoven University of Technology (TU/e) in the Netherlands. He carried out his MSc research in the field of microcrystalline Si solar cells at Forschungszentrum Jülich in Germany, where he developed novel *in situ* plasma diagnostics to probe the amorphous to microcrystalline phase transition and determine the optimal deposition parameter window for thin film solar cells. Subsequently, Gijs spent half a year in Africa working for a Dutch NGO to promote the use of solar home systems in the rural areas by supporting local entrepreneurs. In 2008, he started his PhD research at the TU/e on surface passivation for Si photovoltaics, in close collaboration with industry. He focused on the properties of aluminum oxide thin films synthesized by atomic layer deposition (ALD) and on the application of these technologies for high efficiency (industrial) solar cells. In addition, he developed novel passivation schemes comprising ALD materials and contributed to significant progress in the understanding of the underlying passivation mechanisms. At present, Gijs has authored more than ten scientific publications and his research also resulted in multiple patent applications.

Battery Division Research Award

Yang-Kook Sun is a professor of Energy Engineering at Hanyang University, Korea. He received his PhD in chemical engineering from Seoul National University in 1992. That same year he joined Samsung Heavy Industries as a team leader for developing a molten carbonate fuel cell system. In 1996, he joined Samsung Advanced Institute of Technology, where he was the team leader of the lithium polymer battery team, and his contribution was a cornerstone for the commercialization of the lithium polymer battery of Samsung SDI. He received the "Grand Prize Award" from the Korea Patent Association due to his contribution to lithium ion battery commercialization in 1999. After joining Hanyang University in 2000, Prof. Sun set up one of the largest and the most active battery material research centers, called ITRC, in Korea and probably in the world that is supported by the Ministry of Information and Communication of the Republic of Korea. He became an active member of the Korean Academy of Science and Technology in 2007 and a Distinguished Professor at Hanyang University in 2008.

Professor Sun is also very active in the scientific community giving a large number of invited talks, chairing many sessions, and organizing conferences on energy storage. Among these,

his notable achievement was as chair and co-chair on the Advanced Lithium Batteries for Automotive Applications conference (Argonne in September 2008, Tokyo in November 2009, Seoul in September 2010, and Beijing in September 2011). He recently received a research award from ECS for his outstanding research contributions to the field of novel electrochemical technologies in 2007.

Professor Sun's major research interests are design, synthesis, and structural analysis of new innovative energy storage and conversion of materials, and their applications in electrochemical devices of lithium ion batteries, supercapacitors, and dye sensitized solar cells. One of his pioneering research works in lithium ion battery field is the establishment of a new concept for core-shells with concentration-gradient type composite cathode materials based on lithium nickel oxide as the core and lithium nickel manganese oxide as the shell. We anticipate that this novel approach should lead to the design and development of a wide range of other safe and stable, high-capacity intercalation compounds. Currently, he expanded his research to lithium-metal free Li-S and Li-air batteries.

He has published more than 261 reviewed papers and has 104 registered patents in the field of batteries and electrochemistry. His several patents have been contracted with several companies and three of them are being used for commercial production.

Battery Division Technology Award

Jeffrey 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 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.

Corrosion Division H. H. Uhlig Award

Patrik Schmuki studied physical chemistry at the University of Basel (MSc, 1988), and carried out his graduate studies in Materials Science at ETH-Zurich (PhD in 1992). He was a research associate at ETHZ (1992-1994), then worked at Brookhaven National Laboratory, NY, U.S., (1994-95) using synchrotron techniques for thin film studies. From 1995-1997 he was at the Institute for Microstructural Sciences of the National Research Council of Canada, where his research focused on surface phenomena on Si and III-V semiconductors. In 1997 he was elected an associate professor for microstructuring of materials in the Department of Materials Science of EPFL Lausanne. In the fall of 2000 he joined the materials science faculty at the University of Erlangen-Nuremberg (Germany) as a full professor and head of the Institute for Surface Science and Corrosion.

Professor Schmuki has published more than 360 research papers, edited six books, and he holds six patents. His h-index is 53, and the total number of citations exceeds 10,000. Professor Schmuki is active in various professional societies, among them ECS and the International Society of Electrochemistry (ISE). With ECS, he started as a member of the executive committee (2000-2005) of the Corrosion Division, then became Vice-Chair (2005-2006), and Chair (2007-2008). He also served as a Chair of the ECS European Section from 2002-2004. Since 2010, he is the Chair of Division 4 of ISE. From 1999-2009, he was a member of the Executive Committee of the International Corrosion Council.

Professor Schmuki a member of the Editorial Board of *Electrochemistry Communications*, *Electrochimica Acta*, *Acta Biomaterialia*, and *Corrosion Reviews*. Moreover, he has organized more than 15 international symposia and workshops.

His key achievements are based on using electrochemistry within the materials science field, mainly addressing corrosion, micro-/nanostructures and surfaces/interface investigations. In the last five years, research activities have focused on self-organizing electrochemistry, particularly on the formation, properties, and applications of self-aligned TiO_2 nanotubes. Among several honors he has received are the H. H. Uhlig Award of NACE International (2005). In 2008 he was named Fellow of The Electrochemical Society, and in the same year he was awarded with the Alessando Volta Award of the ECS European Section.

Electrodeposition Division Research Award

Phillippe Allongue is a research director at the Centre National de la Recherche Scientifique (CNRS) at Ecole Polytechnique, Physique de la Matière Condensée, in France (Palaiseau, France). He received his electrical engineering degree in electronics and a master's degree in materials science in 1980. His PhD (obtained in 1988 from the Université Pierre et Marie Curie, Paris) focused on III-V based photoelectrochemical cells, with emphasis on their stabilization against corrosion by redox reaction. Appointed by CNRS in 1983 at Laboratoire de Physique des Liquides et Electrochimie (now LISE, Université Pierre et Marie Curie, Paris), he joined Heinz Gerischer at the Fritz-Haber Institute, Berlin, as an Alexander von Humboldt postdoctoral fellow from 1990 to 1992. In Berlin he initiated his work on silicon anisotropic etching using *in situ* STM. Back in France (at LISE then at PMC), he developed different research

Award Winners

(continued from previous page)

activities including: fundamental aspects of electrodeposition, with focus on metal/silicon deposition and more recently on monolayer alloys deposition and selective deposition on bimetallic surfaces; electrodeposition of magnetic nanostructures with special emphasis on the influence of the local atomic environment on surface magnetism thanks to real time *in situ* magnetic characterizations; organic functionalization of silicon surfaces, with early focus on the reduction of diazonium salts (in cooperation with J. Pinson, Paris) and now with focus on grafting methods on other types of silicon substrates to develop biosensor and hybrid devices; and electrochemical nanostructuring by application of ultra short voltage pulses to develop electrochemical nanolithography (in cooperation with R. Schuster now at KIT).

High Temperature Materials Division J. Bruce Wagner, Jr. Award

Toshiaki Matsui is an associate professor in the Department of Energy and Hydrocarbon Chemistry at Kyoto University, Japan. He received BS, MS, and PhD degrees in chemistry from Kyoto University, in 2001, 2003, and 2008, respectively. He was an assistant professor at Kyoto University from 2004 to 2008, and was promoted to a senior lecturer in 2008 and then to an associate professor in 2011.

Dr. Matsui's research interests are in the area of solid-state electrolytes and electrocatalysts for the electrochemical energy conversion devices, reforming catalysts for hydrogen production, environmental catalysts, and synthesis and processing for functional ceramics. Current research includes work on the developed of new proton-conductive electrolytes based on the solid acids/pyrophosphate composite system for use in the intermediate-temperature fuel cells operative at ca. 200-300°C. In the area of solid oxide fuel cells, recently, he focuses on the quantitative analysis of electrode microstructure to clarify the correlation with performance deterioration and activation behavior during discharge operation. He has published over 60 refereed journal articles regarding the above-mentioned topics.

Symposium Topics and Organizers

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.

CD Compact Disc (CD) editions of *ECS Transactions* will be available for purchase and pick-up at the meeting. The CD edition of B10 (PEFC 11) also includes a 1 gigabyte USB drive containing the complete issue.

e Electronic (PDF) editions of *ECS Transactions* will be available ONLY via the ECS Digital Library (www.ecsdl.org). Electronic editions of the Boston "at" meeting issues will be available for purchase beginning September 30, 2011. Please visit the ECS website for all issue pricing and ordering information for the electronic editions.

A — General Topics

A1 — General Student Poster Session (M) — *V. Subramanian, V. Chaitanya, M. P. Foley and K. Sundaram*

A2 — Nanotechnology General Session (W-Th) — *O. Leonte, F. Chen, J. Li and W. E. Mustain*

A3 — Electrochemical Energy Summit - An International Summit in Support of Societal Energy Needs (S-Tu) — *C. Bock and J. Leddy*

A4 — Grand Challenges in Energy Conversion and Storage (M-W) — *D. Sadoway, Y. Fukunaka, R. Mukundan and X. Zhou*

A5 — Pioneering Women in Electrochemistry (W) — *C. Korzeniwski and H. Martin*

B — Batteries, Fuel Cells, and Energy Conversion

B1 — Battery / Energy Technology Joint General Session (M-Th) — *M. M. Doeff, N. Dudney, A. Manivannan and S. Narayan*

B2 — Battery Safety and Abuse Tolerance (M-Tu) — *D. Doughty, K. Abraham, J. Jeevarajan and C. Orendorff*

B3 — Challenges for Transportation Batteries (W) — *C. Johnson, B. Liaw and K. Zaghib*

B4 — Electrochemical Utilization of Solid Fuels (M-Tu) — *T. Gur and S. Gopalan*

B5 — Electrochemical Capacitors: Fundamentals to Applications (M-Th) — *D. Bélanger, R. Brodd, T. Brousse, P. N. Kumta, J. W. Long, P. Simon and W. Sugimoto*

B6 — Intercalation Compounds for Rechargeable Batteries (M-Th) — *R. Kanno, Y. Meng and K. Zaghib*

B7 — Large Scale Energy Storage for Smart Grid Applications (W) — *R. F. Savinell, J. P. Meyers, S. Narayan and D. Wheeler*

B8 — Lead-Acid Batteries and Capacitors, New Designs, and New Applications (W) — *K. R. Bullock and P. T. Moseley*

B9 — Mathematical Modeling of Lithium Ion Batteries and Cells (M-Tu) — *V. Subramanian and J. Stockel*

B10 — Polymer Electrolyte Fuel Cells 11 (S-F) — *H. Gasteiger, F. N. Büchi, A. J. Davenport, M. Edmundson, T. Fuller, D. Jones, C. Lamy, R. Mantz, S. Mukerjee, H. Nakagawa, S. Narayanan, V. Ramani, T. J. Schmidt, P. Shirvanian, P. Strasser, K. Swider-Lyons, H. Uchida and A. Z. Weber* CD e

B11 — Rechargeable Lithium and Lithium Ion Batteries (M-Th) — *M. K. Sunkara, K. Abraham, R. Brodd, R. Bugga and M. C. Smart*

B12 — Electrochemical Processes for Fuels (M-F) — *X. Zhou, G. Brisard, M. Mogensen and W. E. Mustain*

D — Corrosion, Passivation, and Anodic Films

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

D2 — Coatings for Corrosion Protection (M-Tu) — *M. Rohwerder and V. J. Gelling*

D3 — Corrosion on Land, Sea, and Air (W) — *D. Shifler, Z. P. Aguilar, B. Hinderliter and F. J. Martin*

D4 — Critical Factors in Localized Corrosion 7 (M-Th) — *N. Birbilis, A. J. Davenport, G. Frankel, J. R. Kish and K. R. Zavadil*

D5 — High Temperature Corrosion and Materials Chemistry 9 - A Symposium in Honor of Professor Robert A. Rapp (M-Tu) — *J. Fergus, P. Gannon, M. Harper, T. Markus, T. Maruyama, E. Opila, V. Ravi, D. Shifler and E. Wuchina*

D6 — Where Metals Meet Human Tissue (M-Tu) — *S. Virtannen, D. Hansen, S. Hiromoto, B. Shaw and A. Simonian*

E — Dielectric and Semiconductor Materials, Devices, and Processing

E1 — Solid State Topics General Session (W) — *K. Sundaram, H. Iwai, O. Leonte, M. Tao, R. Todi and X. Wang*

E2 — Atomic Layer Deposition Applications 7 (M-W) — *J. W. Elam, S. Bent, S. De Gendt, A. Delabi, A. Londergan, F. Roozeboom and O. Van der Straten* HC e

E4 — High Dielectric Constant and Other Dielectric Materials for Nanoelectronics and Photonics 9 (M-W) — *S. Kar, M. Houssa, H. Iwai, K. Kita, D. Landheer, D. Misra and S. Van Elshocht* HC e

E5 — Processing Materials of 3D Interconnects, Damascene and Electronics Packaging (M-W) — *G. Mathad, R. Akolkar, D. Barkey, M. Hayase, K. Kondo, M. Koyanagi, P. Ramm and F. Roozeboom*

E6 — Photovoltaics for the 21st Century 7 (W-Th) — *M. Tao, C. Claeys and H. Deligianni* HC e

E7 — Semiconductor Cleaning Science and Technology 12 (SCST 12) (M-Tu) — *J. Ruzyllo, T. Hattori, P. W. Mertens and R. E. Novak* HC e

E8 — State-of-the-Art Program on Compound Semiconductors 53 (SOTAPOCS 53) (M-W) — *M. Overberg, J. LaRoche and K. C. Mishra* HC e

E9 — ULSI Process Integration 7 (M-Th) — *C. Claeys, S. Deleonibus, H. Iwai, J. Murota and M. Tao* HC e

E10 — GaN and SiC Power Technologies (M-Th) — *K. Shenai, M. Dudley, R. Garg, A. Khan and R. Ma* HC e

F — Electrochemical / Chemical Deposition and Etching

F1 — Current Trends in Electrodeposition - An Invited Symposium (W) — *G. Stafford*

F2 — Electrodeposition of Nanoengineered Materials and Devices 4 (M-Tu) — *N. Myung, S. Brankovic, H. Deligianni, J. N. Harb, P. Hesketh, E. Podlaha, J. Rohan, J. Talbot and G. Zangari*

F3 — Fundamentals of Electrochemical Growth: From UPD to Microstructures 2 (M-W) — *S. Brankovic, P. Allongue, M. Innocenti, L. Peter, N. Vasiljevic and G. Zangari*

F4 — Semiconductors, Metal Oxides, and Composites: Metallization and Electrodeposition of Thin Films and Nanostructures 2 (W-Th) — *P. Vereecken, J. Fransaer, G. Oskam and I. Shao*

G — Electrochemical Synthesis and Engineering

G1 — Industrial Electrochemistry and Electrochemical Engineering General Session (W) — *J. Weidner*

G2 — Nanostructured Materials: Chemistry & High-Temperature Applications (W) — *T. Armstrong and E. Traversa*

H — Fullerenes, Nanotubes, and Carbon Nanostructures

H1 — Carbon Nanotubes and Nanostructures: From Fundamental Properties and Processes to Applications and Devices (W-Th) — *D. Guldi, S. De Gendt, H. Klauk, J. Li, R. Weisman, K. Worhoff and K. Zaghib*

I — Physical and Analytical Electrochemistry

I1 — Physical and Analytical Electrochemistry General Session (M-Tu, Th) — *R. Mantz*

I3 — Bioelectroanalysis (W) — *S. Minteer and B. Chin*

I4 — Electrochemistry at Nanoscale Dimensions 2 (M) — *D. Cliffell*

I7 — Physical and Analytical Electrochemistry in Ionic Liquids 2 (W) — *P. Trulove, H. De Long and R. Mantz*

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

J1 — Sensors, Actuators, and Microsystems General Session (M-Tu) — *M. Carter, Z. P. Aguilar, J. Li and B. Ward*

J2 — Impedance Techniques: Diagnostics and Sensing Applications (W) — *V. Lvovich, M. Orazem, P. Vanysek and Y. Yoon*

J3 — Luminescence and Display Materials: Fundamentals and Applications (M-W) — *J. Collins, B. Di Bartolo, U. Happek, D. Lockwood, K. C. Mishra and M. Raukas*

J6 — Sensors Based on Fluorescence, SERS, SPR, and Photoelectrochemistry (W) — *N. Wu, L. Nagahara and A. Simonian*

The Electrochemical Society

electrochemical energy summit 2011

220th ECS Meeting & Electrochemical Energy Summit

An International Summit in Support of Societal Energy Needs

ecs is proud to present the first-ever international Electrochemical Energy Summit (the E2 Summit) from October 9-11, being held in conjunction with the 220th ECS Meeting.

Global energy needs continue to grow with population and industrialization. Economic, political, and environmental issues are largely dictated by energy needs. This first Electrochemical Energy Summit brings together policy makers and researchers to educate about the critical issues of energy needs and the pivotal research in electrochemical energy that can address societal needs.

Gather together with leading government and industry experts and outline your own pathways and plans for electrochemical energy success.

- Attend the opening session on Sunday, October 9, 2011.
- Participate in a three-day poster session and associated reception.
- A Directory of Electrochemical Energy Research will be generated from the poster session and an electronic version will be made available at no cost.
- Engage in a panel discussion where distinguished scientists will integrate the questions of energy with the solutions that electrochemical power systems can provide.

E2 Summit Event Highlights

Sunday, Oct 9	1630-1730h	Plenary Session
	1730-1930h	Sunday Evening Get-Together and Poster Session
Monday, Oct 10	1400-1600h	Poster Session
	1630-1830h	Panel Discussion
Tuesday, Oct 11	1400-1600h	Poster Session

All of the events of the E2 Summit are included with your meeting registration; plus a Directory of Electrochemical Energy Research will be generated from the poster presentations and an electronic version will be made available at no cost.

Come See Toyota's Fuel Cell Hybrid Vehicle

Come see the Toyota Fuel Cell Hybrid Vehicle-Advanced (FCHV-adv) on display at the Westin Boston Waterfront from Sunday, October 9 through Tuesday, October 11.

Proton and SunHydro are partners in the development of renewable electrolysis-based hydrogen fueling solutions. Proton has partnered with Toyota to deploy a fleet of 10 FCHV-adv vehicles, and is managing a groundbreaking test and demonstration program at its prototype SunHydro station in Wallingford, CT. The SunHydro station is the first privately funded and publicly available station in the U.S., and is demonstrating a truly unique configuration that will enable the mass deployment of a cost-effective hydrogen infrastructure.

The FCHV-adv utilizes the same core hybrid synergy drive (HSD) technology used in the Toyota Prius. The FCHV-adv fuel cell system features four compressed hydrogen fuel tanks, an electric motor, a nickel-metal hydride battery, and a power control unit. Hydrogen gas is fed into the fuel cell stack where it is combined with oxygen. The electricity produced by this chemical reaction is used to power the electric motor and to charge the battery. In addition to superior fuel economy, the FCHV-adv is smog-free, with water vapor as its only byproduct, producing zero emissions while driving.

Over the next three years, more than 100 FCHV-adv vehicles will be deployed as part of an expanded demonstration program, aimed at increasing awareness of fuel cell technology and spurring development of much-needed infrastructure prior to the planned market introduction in 2015.

Meet the E2 Summit Panel Participants…

Krishnan Rajeshwar, *Panel Discussion Moderator*
The Editor of *Interface* since 1999, Krishnan Rajeshwar is a Distinguished University Professor and Associate Dean of the College of Science at the University of Texas at Arlington. His research interests include photoelectrochemistry, solar energy conversion, renewable energy, materials chemistry, semiconductor electrochemistry, and environmental chemistry. Professor Rajeshwar is an ECS Fellow and received the ECS Energy Technology Division Research Award in 2009. He has edited books, special issues of journals, and conference proceedings and is the author of over 450 refereed publications.

Eric D. Isaacs, *Director, Argonne National Laboratory*
Eric D. Isaacs, a prominent University of Chicago physicist with a PhD from the Massachusetts Institute of Technology in the area of magnetic semiconductors, is the President of UChicago Argonne, LLC, and Director of Argonne National Laboratory. He previously served as Argonne's deputy laboratory director for programs, leading the laboratory's strategic planning process and overseeing the laboratory-directed research and development program and educational programs, and Director of Nanoscale Materials. He was a professor of physics in the University of Chicago's James Franck Institute, and spent 13 years at Bell Laboratories, where he was a member of the technical staff, Director of the Materials Physics Research Department, and Director of the Semiconductor Physics Department. As a postdoctoral fellow at Bell Laboratories he studied magnetism and correlated electronic systems, mostly with synchrotron-based X-ray techniques. Dr. Isaacs is a fellow of the American Physical Society and has served on a number of national scientific advisory committees, including the Basic Energy Sciences Advisory Committee, and has authored or co-authored more than 140 scientific papers and presentations.

Tatsuya Shinkawa, *Chief Representative, New Energy & Industrial Technology Development Organization*
Tatsuya Shinkawa is the Chief Representative, Washington, DC international office, of the New Energy and Industrial Technology Development Organization (NEDO), Japan. Previously he worked on electricity policy, nuclear safety policy, and economic and industrial policy in Japan's Ministry of Economy, Trade, and Industry (METI), and was in charge of the electricity policy from 2000 to 2004. He designed the LLP law of Japan and also was formerly Director, Human Resource Policy Office, Economic and Industrial Policy Bureau, METI. He earned his master's degree at Kyushu University, Interdisciplinary Graduate School of Engineering Sciences, Japan, and was a visiting researcher in Stanford University.

Detlef Stolten, *Director of the Institute of Energy Research/Fuel Cells, Juelich Research Center*
Detlef Stolten received his doctorate in ceramics from the University of Technology at Clausthal, Germany and served as a research scientist with Robert Bosch, and as a group and project leader with Daimler Benz/Dornier prior to joining the Juelich Research Center. He is a full Professor for Fuel Cell Technology at the University of Technology (RWTH) at Aachen, Germany. Professor Stolten chaired the Strategic Research Agenda for Hydrogen and Fuel Cells of the EU until 2005 and is the current chair of the Executive Committee of the IEA Annex Advanced Fuel Cells and the co-chair of IEA's Expert Group on Science for Energy. The author of two books and member of the advisory board of *Fuel Cells*, Professor Stolten's research focuses on fuel cells and hydrogen comprising electrochemistry, stack technology and energy process engineering of SOFC, DMFC, high temperature PEM, liquid fuel reforming systems and auxiliary power units as well as water electrolysis. Additionally, he heads a group working on carbon separation in power plants.

John A. Turner, *Research Fellow, National Renewable Energy Laboratory*
John A. Turner, holds a PhD from Colorado State University, served a postdoctoral appointment at the California Institute of Technology, and is a Fellow of the Renewable and Sustainable Energy Institute. He is currently a Research Fellow at the National Renewable Energy Laboratory, conducting research with enabling technologies for the implementation of hydrogen systems into the energy infrastructure. His research includes the direct conversion (photoelectrolysis) systems for hydrogen production from sunlight and water, catalysts for the hydrogen and oxygen reactions, materials for advanced fuel cell membranes, and corrosion studies of fuel cell metal bipolar plates. Other work involves the study of electrode materials for high energy density lithium batteries and fundamental processes of charge transfer at semiconductor electrodes. He is a two-time recipient of the Midwestern Research Institute President's Award for Exceptional Performance in Research, and has received several other awards including six Outstanding Mentor Awards from the U.S. Department of Energy for his work with undergraduate students. He is the author or coauthor of over 130 peer-reviewed publications and coeditor of the *Journal of Renewable and Sustainable Energy*.

Mark Verbrugge, *Director of Chemical Sciences and Materials System Laboratory, General Motors*
After receiving his doctorate in chemical engineering from the College of Chemistry at the University of California (Berkeley), Mark Verbrugge began his nearly 25-year General Motors career with the GM Research Labs. During his time at GM he was awarded a Sloan Fellowship to the Massachusetts Institute of Technology, where he received an MBA. He then returned to join GM's Advanced Technology Vehicles (ATV) as Chief Engineer for Energy Management Systems. He later rejoined the GM Research Labs (now the Chemical Sciences and Materials Systems Laboratory) as Director of the Materials and Processes Lab, which maintains global research programs ranging from chemistry, physics, and materials science to the development of structural subsystems and energy storage devices. Having published and patented in a variety of technical areas, early into his career he received the Norman Hackerman Young Author Award and the ECS Energy Technology Divison Award. Honored with several internal GM awards, he also received a Lifetime Achievement Award from the United States Council for Automotive Research and was elected to the National Academy of Engineering.

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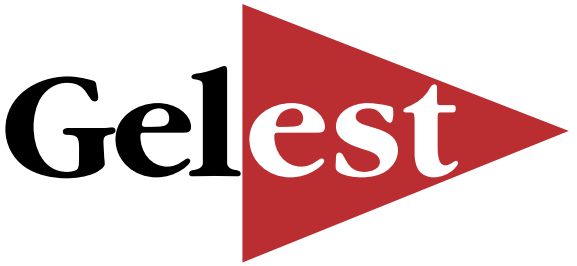

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Event Highlights

NOTE: *For a list of Committee Meetings, please visit the Boston meeting page: www.electrochem.org/meetings/biannual/220/220.htm.*

Sunday, October 9

0900h.....Short Courses begin

1630h.....The 220th Meeting and Electrochemical Energy Summit Lecture, Room 253 A/B, Level 2, BCEC

1730h.....Sunday Evening Get-Together and Electrochemical Energy Summit Poster Session, Room 253 C & Northeast Foyer, Level 2, BCEC

1930h.....ECS Student Mixer

Monday, October 10

0930h.....Technical Session Coffee Break, Westin & BCEC Foyers

1215h.....Battery Division Luncheon & Business Meeting, Harbor Ballroom III, Conference level, Westin (ticket required)

1215h.....High Temperature Materials Division Luncheon & Business Meeting, Carlton, Conference level, Westin (ticket required)

1400h.....Electrochemical Energy Summit Poster Session, Room 253 C, Level 2, BCEC

1400h.....2011 Olin Palladium Award Lecture: "The Use of Renewable Energy in the form of Methane Via Electrolytic Hydrogen Generation," by K. Hashimoto, Room 252 B, Level 2, BCEC

1630h.....Electrochemical Energy Summit Panel Discussion, Harbor Ballroom III, Conference Level, Westin

1700h.....ECS Transactions Tutorial Session for Authors, Burroughs, Conference Level, Westin

1800h.....Monday Evening Mixer, Student Poster Session, and Technical Exhibit Opening, Galleria, Galleria Level, Westin

1830h.....Author Meet and Greet: Meet Mordechay Schlesinger, Galleria, Galleria Level, Westin

Tuesday, October 11

0900h.....Technical Exhibit, Galleria, Galleria Level, Westin

0930h.....Technical Session Coffee Break, Galleria, Galleria Level, Westin & BCEC Foyers

1215h.....Corrosion Division Luncheon & Business Meeting, Webster, Lobby Level, Westin (ticket required)

1215h.....Sensor Division Luncheon & Business Meeting, Hancock, Lobby Level, Westin (ticket required)

1400h.....Electrochemical Energy Summit Poster Session, Room 253 C, Level 2, BCEC

1800h.....Corrosion Division Award Reception, Hancock, Lobby Level, Westin (ticket required)

1800h.....Luminescence & Display Materials Division Reception and General Meeting, Alcott, Mezzanine Level, Westin (no ticket required)

1800h.....Technical Exhibit and General Poster Session, Galleria, Galleria Level, Westin

Wednesday, October 12

0900h.....Technical Exhibit, Galleria, Galleria Level, Westin & BCEC Foyers

0930h.....Technical Session Coffee Break, Galleria, Galleria Level, Westin

1215h.....Electrodeposition Division Luncheon & Business Meeting, Webster, Lobby Level, Westin (ticket required)

1800h.....General Poster Session, Galleria, Galleria Level, Westin

1900h.....Battery Division Award Reception, Webster, Lobby Level, Westin (ticket required)

*The Luminescence and Display Materials Division Luncheon & Business Meeting has been replaced by a Reception and General Meeting on Tuesday at 1800h.

Thursday, October 13

0930h.....Technical Session Coffee Break, Foyers, Westin & BCEC

Friday, October 14

0930h.....Technical Session Coffee Break, Foyers, Westin & BCEC

Hotel & Travel Information

The 220th ECS Meeting and Electrochemical Energy Summit will be held at the Westin Boston Waterfront and the Boston Convention and Exhibition Center (Summer Street, Boston, Massachusetts 02210). We strongly encourage you to stay at the meeting headquarters hotel, the Westin Boston Waterfront, where your stay will be most enjoyable and convenient. Reservations can be made online from the ECS website at special discounted meeting rates: $219 Single / $229 Double. See the ECS website for more details and to make your reservation.

The deadline for reservations is September 9, 2011. Reservations attempted after September 9 will be accepted on a space and rate availability basis.

Companion Registrant Program—Guests of Technical Registrants are invited to register for the 220th Meeting as a "Companion Registrant." The companion registration fee of $25 (Early-Bird) or $30 (after September 9) includes admission to non-ticketed social events, an exclusive lounge with beverage service, Monday through Thursday, 0800-1000h, and a special "Welcome to Boston" orientation presented by the Greater Boston Convention and Visitors Bureau on Monday, October 10 at 0900h in the Companion Registrants Lounge, Hale, Mezzanine Level, Westin.

Technical Program

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.** 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; judging of the posters will begin at 1500h. Participants are encouraged to attend the Technical Exhibit on Tuesday at 1200h, where the winners will be announced and presented with their awards.

Tech Table—A Tech Table staffed by audio-visual technicians will be available Sunday through Friday, for any audio-visual assistance needed for oral presentations.

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, 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, Concourse Level, Westin. Registration will open on Saturday and the technical sessions will be conducted Sunday through Friday.

Early-Bird Registration—Early-Bird registration is encouraged. Register online at www.electrochem.org, or fax your registration form to 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 September 9, 2011.** Refunds are subject to a 10% processing fee and will only be honored if written requests are received by September 16, 2011. **Regular registration rates are in effect online after September 9, 2011 and at the meeting.** All meeting participants are required to pay the appropriate registration fees. Early-Bird and post-September 9 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 Registration	Foyer, Concourse Level, Westin
Information/Message Center	Foyer, Concourse Level, Westin
ECS Headquarters Office	Quincy, Lobby Level, Westin
ECS Central/Bookstore	Foyer, Concourse Level, Westin
Speaker Ready Room	TBD

ECS Central/Bookstore Hours

Sunday, October 9	0700-1900h
Monday, October 10	0700-1900h
Tuesday, October 11	0700-1730h
Wednesday, October 12	0800-1600h
Thursday, October 13	0800-1600h
Friday, October 14	0800-1200h

Registration Hours

Sunday, October 9	0700-1900h
Monday, October 10	0700-1900h
Tuesday, October 11	0700-1730h
Wednesday, October 12	0800-1600h
Thursday, October 13	0800-1600h
Friday, October 14	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.

ECS Member	$515
Nonmember	$715
ECS Student Member	$250
Student Nonmember	$290
One Day ECS Member	$375
One Day Nonmember	$465
ECS Emeritus or Honorary Member	$ 0
Companion Registrant	$ 30

All students must send verification of student eligibility along with their registration. All technical registrations include a copy of Meeting Abstracts (on flash drive only). Attendees who wish to have paper copies of abstracts in advance of the meeting should download copies from the ECS website, free of charge.

Financial Assistance—Financial assistance is limited ad 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".

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.

Technical Exhibit

The Technical Session coffee break is scheduled for 0930h in the Galleria, Galleria Level, Westin, 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, October 10.....1800-2000h
includes the Monday Evening Poster Session

Tuesday, October 11 .....0900-1400h
includes Technical Session Coffee Break
re-opening.....1800-2000h
includes the Tuesday evening Poster Session

Wednesday, October 12....0900-1300h
includes Technical Session Coffee Break

Exhibitors as of Press-Time

ECS

ecs@electrochem.org
www.electrochem.org

Agilent Technologies

Joan Horwitz
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www.agilent.com

AJA International

Linda Tardie
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ALS CO., LTD

Katsunobu Yamamoto
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Princeton Applied Research/ Solartron Analytical

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Brian Sayers
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Bruker Corporation

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Cambridge NanoTech

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