Brazilian

The Brazilian Section (BS) sponsored the **XVI Simpósio Brasileiro de Eletroquímica e Eletroanalítica** (SIBEE) that was held on April 15-19, 2007 in the city of Águas de Lindóia, in the State of São Paulo, and granted two awards and four special mentions for the best student poster presentations. The BS participation in this well-attended national symposium devoted to electrochemistry and electroanalytical chemistry aims to encourage student participation in national meetings as well as to invite all members of the Brazilian electrochemistry community to join ECS.

The XVI SIBEE had almost 450 participants with high attendance by graduate and undergraduate students (47% and 15%, respectively). Almost 400 papers were presented at this national meeting in different areas of solid-state, electrochemical science and technology, and electroanalytical chemistry. ECS Sr. Vice-President Barry MacDougall (National Research Council, Canada) participated as Plenary Lecturer.

The Student Poster Section Awards winners were: **Vinicius R. Gonçales** from IQ-USP, São Paulo (SP) for his work in electrochemical sensors (co-authors: Maria R. Alcântara and Susana I. Córdoba de Torresi) and **Valéria Cristina Fernandes** from UFSCar, São Carlos (SP) for her work in electrode materials (co-authors: Emanuele Salvietti, Francesca Loglio, Massimo Innocenti, Lucia H. Mascaro, and M. Luisa Foresti). Student Poster Special mentions were granted to: **Marcos J. L. Santos** from DQ-UEM, Maringá (PR) for his work in conducting polymers (co-authors: J. Ferreira and E. M. Girotto); **Marcos Cramer Esteves** from IQ-USP, São Paulo (SP) for his work in electrodeposition (co-authors: Elizabeth J. Podlaha and Paulo T. A. Sumodjo); **Cosmelina G. Da Silva** from EE/PEMM/COPPE - UFRJ, Rio de Janeiro (RJ) for her work in corrosion (co-authors: I. C. P. Margarit-Mattos and O. R. Mattos), and **Thiago R. L. C. Paixão** from IQ-USP, São Paulo (SP) for his work in electrochemical sensors (co-authors: Camila C. M. Garcia, Marisa H. G. Medeiros, and Mauro Bertotti).

San Francisco

On February 13, 2007, **ECS President Mark Allendorf** (Sandia National Labs) delivered a talk entitled "Metal Organic Frameworks: Nanoporous Materials for Sensing, Separations, and More." Dr. Allendorf gave a lively report on the Cancun meeting and plans for the remaining 3 months of his ECS presidency, then presented his recent experimental and simulation work on nanoporous organometallic nanoclusters. These are 1, 2, or 3D crystalline structures with highly controlled and predictable (MD) porosity/high surface area that are strong functions of pH and bound species. He discussed applications to hydrogen storage, drug delivery, and sensors.

On March 22, 2007, **Ben Feldman**, Director of Advanced Development at Abbott Diabetes Care, presented his work on FreeStyle Navigator, which is a continuous blood glucose measuring system designed to provide real-time glucose values updated each minute for up to five days, as well as glycemic alarms and glycemic trend information. Navigator is based on a transcutaneous glucose sensor, which is self-inserted, and self-calibrated by the user. The sensing element operates at a very low potential of 40 mV vs. the Ag/AgCl reference electrode, offering several advantages over conventional hydrogen peroxide-based transcutaneous glucose sensors, which operate at approximately 500 mV vs. Ag/AgCl. Navigator is much less sensitive to electrochemical interferents. Acetaminophen (3000 mg/mL, measured in the presence of 5 mM glucose) produced no detectable signal at Navigator, compared with an interference of 140% (or signal equivalent to an additional 7mM glucose) at the conventional sensor. In addition, Navigator's calibration curves pass through the origin, with no detectable intercept. This leads to increased accuracy in measurement of very low glucose values.

Dr. Feldman also presented the results of clinical trials, which showed excellent tracking of glucose levels and compared favorably with conventional glucose sensors in the Clarke error assessment. The presentation was well received by the participants, including local members of both ECS and the American Chemical Society. Questions and discussion ranged from the electrochemical pathway of the Wired Enzyme-based sensing element to the practical limitations of such devices, including its adherence to the patient's skin.

The Section's **Daniel Cubicciotti Student Award** was established in 1994 to assist deserving students in Northern California to pursue a career in the physical sciences or engineering. This year, the award recipient was James Wilcox of UC Berkeley. In a meeting on April 25, the award was presented to Mr. Wilcox by Dr. Anthony Giannuzzi from the award sponsor Structural Integrity Associates. The award recipient and two other finalists gave presentations on their research.

The first presentation, "Optimization of $LiFePO_4$/C Composite Cathode Materials," was given by the award recipient, **James Wilcox** of UC Berkeley. The speaker discussed experiments he carried out to ascertain property requirements for carbon coatings that would yield high-rate capable $LiFePO_4$/C composite cathodes. Good carbon coatings contain a high ratio of sp^2:sp^3 character

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Allen Bard Receives the European Section's Gerischer Award

At the spring 2007 ECS meeting in Chicago, **Allen J. Bard** received the 2007 Gerischer Award of the ECS European Section. (See the spring 2007 issue of *Interface*, p.54, for more on Prof. Bard.)

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carbon, are thin, and uniformly coat the active material. Composite powders containing less than 2 wt.% carbon showed a five order of magnitude increase in room temperature conductivity over untreated $LiFePO_4$ powders. Through the proper selection of carbon containing additives and graphitization catalysts, Mr. Wilcox and his collaborators produced carbon coatings with an enhanced sp^2 character, as determined by Raman spectroscopy, at the relatively low temperatures required to produce $LiFePO_4$. The improvement in the graphitic nature of the carbon coatings correlated very strongly with increases in pressed pellet conductivities and the rate performance of the final composite.

Mr. Wilcox also discussed a novel synthetic route based on combustion processes that yields carbon coatings with an even higher degree of graphitization, which involved formation of nanoscale $LiFePO_4$ active material on a prefired C backbone. The improved carbon coating, in conjunction with ability to produce nanometer sized primary particles, make these synthetic techniques a promising means of improving the rate performance of $LiFePO_4$.

The second presentation, "Novel Electrochemical Synthesis of Nickel Oxide Nanowires," was given by **Yash Bhargava**, also of UC Berkeley. Mr. Bhargava discussed a novel self-assembly synthesis technique that produces corrosion resistant, magnetically functionalized nickel-rich oxide nanowires via an electrochemical process. This technique has the advantage of generating metal oxide nanowires at relatively low temperatures without the use of a catalyst.

The growth method was discovered serendipitously while studying the oxidation behavior of Alloy 600 in simulated pressurized water reactor environments. Due to the nanowires's fortuitous but unexpected discovery, there is a significant amount of work on many facets that must be performed to understand their growth and maximize their utility. Thus far, he has determined that the as-grown nanowires possess a composition of 49 a/o oxygen, 47 a/o Ni, and 4 a/o Fe, large aspect ratios (average diameter of 20 nm and lengths up to 10 μm), and that they are single crystalline. Magnetic measurements have also shown that the nickel-rich oxide nanowires are ferromagnetic with a coercivity of approximately 85 Oe and a remnant field of 0.032 emu/g at 300 K. He is currently working on extending this growth technique to other alloys and trying to understand the growth mechanism, and is investigating several energy applications for the nanowires, including battery electrode materials, p-type materials for solar cells, and for use in molten carbonate fuel cells.

The final presentation, "Principles and Simulations of PEM Fuel Cell Electrochemistry," was delivered by **Varun Rai** of Stanford University. Mr. Rai presented the development of a computational chemistry based multi-scale model for use in computational fluid dynamics simulations of polymer electrolyte membrane (PEM) fuel cells. The multi-scale model is based on dynamic Monte Carlo (DMC) simulations of the chemistry on the electrocatalyst surfaces.

Adsorbate interactions relevant for electrochemical steps of the oxygen reduction reactions were discussed. Because of the possible importance of such adsorbate interactions and other non-linear local chemical effects, DMC methods are expected to describe the chemical behavior more accurately than environment-averaged methods. DMC is computationally much more demanding than conventional approaches, and a number of DMC simulations algorithms have been proposed in the past, each with particular limitations. Mr. Rai presented a new DMC algorithm that can be applied for time-varying rate coefficients and has a computational cost per time step that is independent of the lattice size, thus combining the advantages of the widely used Variable Step Size Method and the First Reaction Method.

DMC simulations of cyclic voltammetry experiments of PEM fuel cell electrochemistry compared favorably with experimental observations, with discrepancies assigned to the absence of adsorbed O interactions from the model. There are plans to include such interactions in future work. ■