

STUDENT NEWS

ECS Summer Research Fellowships

The Electrochemical Society is currently soliciting applications for the 2002 Society Summer Fellowships, which are given each year to assist a student in continuing his/her graduate work during the summer months, in a field of interest to the Society. Each year the Society gives up to four such fellowships, named in honor of prominent Society members Edward G. Weston, Colin Garfield Fink, Joseph W. Richards, and F. M. Becket. The amount given for each fellowship is \$4,000.

In order to be eligible for a Summer Fellowship, the individual must be a graduate student pursuing work between the degree of BS and PhD, in a college or university, who will continue his or her studies after the summer period. A previous holder of a Summer Fellowship is eligible for reappointment.

Qualified graduate students are invited to apply for these fellowships. Applicants must complete an application form and supply the following information: (1) a brief statement of educational objectives; (2) a brief statement of the thesis research problem, including objectives, work already accomplished, and work planned for the summer of 2002; (3) a transcript of undergraduate and graduate academic work; and (4) two letters of recommendation, one of which should be from the applicant's research advisor.

As it is the spirit of these awards that they be the sole sponsor of the summer graduate work, successful recipients of a

fellowship must agree not to hold other appointments or other fellowships during the summer of 2002.

Application forms are available from the chairman of the Fellowship Award Subcommittee, to whom completed applications and letters of recommendation should be sent: Robin McCarley, Louisiana State University, Department of Chemistry, 232 Choppin Hall, Baton Rouge, LA 70803, USA, tel: 504.388.3239, fax: 504.388.3458, e-mail: robin_mccarley_at_new_chem@chemserv.chem.lsu.edu.

The deadline for receipt of completed applications is January 1, 2002. Award winners will be announced on April 1, 2002.

Student Achievement Awards



H. H. Dow Memorial Student Achievement Award

The H. H. Dow Memorial Student Achievement Award was established by the Industrial Electrolysis and Electrochemical Engineering Division to recognize promising young engineers and scientists in the fields of electrochemical engineering and applied electrochemistry. This award was made possible by a gift from the Dow Chemical Company Foundation and is intended to encourage the recipient to continue a career in electrochemical engineering or applied electrochemistry. The award honors the memory of H. H. Dow, a prolific inventor and tenacious businessman, and one of the principal organizers and a charter member of The Electrochemical Society.

This award, which consists of a certificate and a check in the amount of \$1,000 is made each year and is intended to be used to pay for expenses associated with the recipient's education or research project, tuition, books, equipment, or supplies.

To be eligible to receive this award, candidates must be enrolled in a college or university as a graduate student or have been accepted for enrollment. The application for the award must include: (1) transcripts of all post-secondary school academic work; (2) a description of the research project to be engaged in during the next year; (3) a statement which describes the relationship of the project to the field of electrochemical engineering or applied electrochemistry; and (4) a biography, resume, or curriculum vitae. The description and statement should be no longer than two double-spaced typewritten pages. The application must also include a letter of recommendation from the applicant's research supervisor.

The recipient shall be notified by the chairman of the Industrial Electrolysis and Electrochemical Engineering Division and shall be requested, as a condition of the award, to submit to the Division chairman a written summary of research accomplished during the year in which he or she was an award recipient. The chairman will have the option of distributing this summary to members of the Division or submitting it to the editor of the *Journal* for consideration for publication.

(continued on next page)

General Society Student Poster Session Winners

AMY BESING (right) received one of the General Society Student Poster Session Awards from ECS President **CARL OSBURN**. Besing's paper was entitled, "Effect of Inhibitor Ions on the Dissolution of Surface Intermetallics on Al 2024-T3 Alloy" (A. Wieckowski, advisor, University of Illinois, Urbana-Champaign).

The other award went to V. Sochnikov for "Computer Simulations of Two-Dimensional Metal Electrodeposition" (S. Efrima, advisor, Ben-Gurion University).

There were three Honorable Mentions as well, for "Application of Local Electrochemical Impedance Spectroscopy for Localized Corrosion of Organic Coatings," by L. V. S. Philippe, S. B. Lyon, advisor, UMIST; "The Electrochemical Behavior of Carbon Steel in Nitrite and Bicarbonate Solutions," by P. Khalafpour, (V. Birss, advisor, University of Calgary); and "Lithium-Conductive Perfluorosulfonate Membranes in Nonaqueous Solvents," by C. A. Ray, (S. A. Perusich, advisor, Auburn University).



Student News

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IE&EE Student Achievement Award

A second award will be made by the IE&EE Division and the recipient will be selected from the applicants for the H. H. Dow Memorial Award. This award also consists of a certificate and a check in the amount of \$1,000. Again, the award is to be used to pay for expenses associated with the recipient's education or research project. As with the H. H. Dow award, the recipient will be required to submit a written summary of the research accomplished during the award year to the chairman of the Division.

All application materials should be sent to Dr. Clifford W. Walton, FMC Corporation, PO Box 8, Princeton, NJ 08543-0008, USA, tel: 609.951.3189, fax: 609.951.3668. For express delivery, add the physical address: US Highway 1 at Plainsboro Road. Deadline for receipt of completed applications is September 15, 2001.

Awarded Student Memberships Available

The Society's **Corrosion, Dielectric Science and Technology, Electronics, High Temperature Materials, Industrial Electrolysis and Electrochemical Engineering, and Physical Electrochemistry Divisions** are offering Awarded Student Memberships to qualified full-time students for the year 2002. To be eligible, students must be in their final two years of an undergraduate program or enrolled in a graduate program in science, engineering, or education (with a science or engineering degree). Postdoctoral students are not eligible. Awarded memberships are renewable for up to four years; applicants must reapply each year. Awarded member-

ships begin on January 1 of the calendar year following receipt of the application. Memberships include subscriptions to the *Journal of The Electrochemical Society* online, *Electrochemical and Solid-State Letters* online, and *Interface*.


To apply for an Awarded Student Membership, use the application form on page 60. Deadline for submission is October 15, 2001.


Student Travel Grants

Several of the Society's Divisions offer travel assistance to students presenting papers at Society meetings. These travel grants are intended to aid students in attending the meeting. **To be eligible for a grant**, applicants must be scheduled to present a paper in a symposium or session sponsored or cosponsored by the Division to which the application is made. To apply for a travel grant, use the application form on page 60.

Application Requirements—All applications for the 2001 Joint International Meeting in San Francisco, CA, September 2-7, must be received no later than **July 27, 2001**. To apply for travel support, please complete the Student Travel Grant form on page 60, return it with a letter of recommendation from a faculty advisor, and a copy of the meeting abstract. See individual listings for any additional requirements.


The following Divisions are currently offering grants:


 **Dielectric Science and Technology**—The Division is offering travel grants of up to \$600 each to students presenting papers at the ECS meeting in San Francisco, CA, in September 2001.

 **Electrodeposition**—In commemoration of Abner Brenner's pioneering contributions to the field of electrodeposition, the Division offers up to three \$750 travel grants per year


to graduate students who present papers in symposia sponsored or cosponsored by the Division. In addition, the Division also offers up to two \$450 travel grants per year to students making a presentation of interest to the Division in the General Society Student Poster Session.

In addition to the basic Travel Grant application requirements, a recommendation letter from the student's graduate research advisor is also required. Optional supporting documents such as article reprints, transcripts, or reports are also invited.


 **Electronics**—The Division is offering travel grants of up to \$600 each to students presenting papers in a symposium sponsored or cosponsored by the Electronics Division at the ECS meeting in San Francisco, CA, in September 2001.


 **Energy Technology**—The Division will be offering travel grants up to \$600 to students presenting a paper in a symposium sponsored or cosponsored by the Energy Technology Division and attending the ECS meeting in San Francisco, CA, in September 2001.

In addition to the basic Travel Grant application requirements, other supporting documents are also invited.

 **High Temperature Materials**—The Division will be offering travel grants up to \$500 to student members of the Division who are presenting papers at ECS Meetings. These grants will be made on a first-come, first-served basis, with up to three awards made per meeting.

In addition to the basic Travel Grant application requirements, include a letter from a faculty advisor attesting to the student's financial needs.

 **Physical Electrochemistry**—The Division will support the travel of students to each ECS meeting. Eligible students must be a graduate student or upper level undergraduate and must be scheduled to present a talk at a symposium sponsored by the Physical Electrochemistry Division. The maximum amount given for travel support will be up to \$2,000 to be distributed among the awardees.

 **Sensor**—The Division will be offering travel grants of up to \$300 each to students presenting papers at the ECS meeting in San Francisco, CA, in September 2001. The student must be or become a member of ECS, be in a program of study toward an advanced degree at a university, and apply for funding at the time of submission of their abstract to ECS. ■

PLEASE NOTE



The deadline for **Student Travel Grants** has been moved to **July 27, 2001** due to the early meeting in **San Francisco, CA**.



2001 Student Research Awards of the Battery Division

The Battery Division is pleased to announce the two 2001 Student Research Award Winners.



MINGCHUAN ZHAO is currently a PhD candidate working under the guidance of Professor Howard D. Dewald in the department of chemistry and biochemistry at Ohio University. He received an MS from University of Science and Technology of China in 1997 and a BE from Hefei University of Technology, China, in 1994.

Zhao's thesis research focuses on the electrochemical stability study of the anode materials in Li-ion battery electrolytes. He has successfully implemented various electrochemistry techniques (CV, chronocoulometry, anodic stripping analysis, and OCV) and electrode surface probe techniques (FTIR-ATR and IR microscope) to

locate and verify the electrochemical instability of the anode materials (battery grade copper foil and graphite-coated copper foil) in different Li-ion battery electrolytes. Control-potential electrolysis (a quantitative electrochemical method) was developed to evaluate the dissolution of copper in the electrolytes under polarized conditions; this method is an effective way to quantitatively evaluate the impurity influence. He also developed a complete route using flame AAS to quantitatively evaluate the instability of copper substrate under its OCV. At present, he is performing ac impedance investigation of the interface of the copper substrate and the Li-ion battery electrolyte solutions to try to understand the reaction mechanism at the molecular level. ■



VENKAT SUBRAMANIAM is a PhD student in the department of chemical engineering at the University of South Carolina and working under the guidance of Professor Ralph E. White. Subramaniam obtained a bachelor's degree in chemical and electrochemical engineering at the Central Electrochemical Research Institute (CECRI), in India in 1997. After graduation, Subramaniam plans to join the department of chemical engineering at the University of South Carolina as an assistant research professor.

Subramaniam has developed a first-principles model based on jump balances and analyzed the transient behavior of a shrinking metal hydride

particle. He has simulated the effect of applied current density on concentration profiles and discharge curves. To reduce irreversible capacity loss during the initial cycles of lithium-ion batteries, Subramaniam deposited nanoscale layers of nickel metal over graphite electrode particles and developed a simple theoretical model for the same.

He has also developed several efficient models for battery electrodes. In one work, Subramaniam developed approximate dynamic models based on parabolic polynomials that describe the concentration profile of an electrochemically active species in a spherical electrode particle. These models save computation time without loss of accuracy in pseudo two-dimensional problems. In another work, he extended the conventional separation of variables method to predict the electrochemical performance of particle battery electrodes by removing the inhomogeneity inherent to the electrochemical systems. Subramaniam also has developed a generalized symbolic solution for the diffusional impedance of porous electrodes. Subramaniam can be contacted via e-mail at venkngoms@hotmail.com. ■



Nitodas Receives 2001 Morris Cohen Graduate Student Award



The Corrosion Division is pleased to announce the 2001 Morris Cohen Graduate Student Award Winner, **STEPHANOS F. NITODAS**. Nitodas attended the National Technical University of Athens from 1991 to 1996, and graduated with a diploma in chemical engineering in 1996. In the spring of 1997, he began graduate studies in materials science in the department of chemical engineering at the University of Rochester. He received a Graduate Aid in the Areas of National Need Fellowship (GAANN) Fellowship in 1997, and an Elon Huntington Hooker Graduate Fellowship in 1999. Under the direction of Professor Stratis V. Sotirchos, he pursued his research on the kinetics of the chemical vapor deposition of metal oxides in order to prepare coatings for the protection of SiC-based ceramics from oxidation in high-temperature applications. He received his MS in 1998 and his PhD in 2000. He has been working in Axcelis Technologies (formerly Eaton Corporation) since October 2000, conducting characterization work in the ion implantation field. ■

The Electrochemical Society Awarded Membership & Travel Grant Forms

The Corrosion, Dielectric Science and Technology (DS&T), Electronics, High Temperature Materials (HTM), Industrial Electrolysis and Electrochemical Engineering (IE&EE), and the Physical Electrochemistry Divisions are offering Awarded Student Memberships to qualified full-time students. Eligible students must be in their final two years as undergraduates or be enrolled in a graduate program in science, engineering, or education (with a science or engineering degree). Awarded memberships are renewable for up to four years; applicants must reapply each year.

Memberships begin on January 1 of the calendar year following receipt of the application and include subscriptions to the *Journal Online*, *Letters Online*, and *Interface*. The application deadline is October 15, 2001.

AWARDED MEMBERSHIP APPLICATION

Name: _____

Home Address: _____

Date of Birth: _____

Phone #: _____

E-mail: _____

School, Division, and Department: _____

School Address: _____

Undergraduate Year (U) or Graduate Year (G) - circle one:

U3 U4 G1 G2 G3 G4 G5 GPA _____

Major Subject: _____

Have you won this award before? - circle one: Yes No

If yes, how many times? _____

Signature of Student: _____

Date: _____

Faculty member attesting to eligibility of student:

Name: _____

Department: _____

Signature: _____

Date: _____

Division under which award is being applied for:
(Applications made to multiple Divisions will be rejected)

☐ **Corrosion**—Send to: G.S. Frankel, Dept. of Materials Science & Engineering, 477 Watts Hall, The Ohio State University, Columbus, OH 43210. E-mail: frankel.10@osu.edu.

☐ **DS&T**—Send to: D. Misra, Dept. of Elec. and Computer Engr., NJIT, Newark, NJ 07102. E-mail: dmisra@megahertz.njit.edu.

☐ **Electronics**—Send to: Cor L. Claeys, IMEC, Kapeldreef 75, B-3001, Leuven, Belgium. E-mail: claeys@imec.be.

☐ **HTM**—Send to: Mark D. Allendorf, Sandia National Labs, MS 9052, P. O. Box 969, Livermore, CA 94551-0969. E-mail: mdallen@sandia.gov.

☐ **IE&EE**—Send to: James M. Fenton, Dept. of Chemical Engr., U-222, Rm. 208, Univ. of Connecticut, Storrs, CT 06269-3139. E-mail: jmfent@eng2.uconn.edu.

☐ **Physical Electrochemistry**—Send to: Johna Leddy, Dept. of Chem., University of Iowa, Iowa City, IA 52242. E-mail: jleddy@blue.weeg.uiowa.edu.

The Society's Dielectric Science and Technology (DS&T), Electrodeposition, Electronics, Energy Technology, High Temperature Materials (HTM), Physical Electrochemistry and Sensor Divisions offer travel grants to students presenting papers at Society meetings. For the individual rules of each Division's grant program, please see the Student Travel Grant announcements on the preceeding pages of this issue of *Interface*. To apply, complete this application and send it along with a letter from an involved faculty member attesting both to the quality of the student's work and financial needs, and a copy of the student's Meeting Abstract. (Preference for travel allocation grants will be given to ECS student members.)

STUDENT TRAVEL GRANT APPLICATION

Meeting Site: _____

Name: _____

School Address: _____

E-mail: _____

Major Subject: _____

Undergraduate grade point average: _____

Out of possible: _____

Graduate grade point average: _____

Out of possible: _____

Division Symposium Title: _____

Title of Paper to be Presented at Meeting: _____

Are you a Student Member of the Society? _____
(If not, please additionally submit the Awarded Student Membership application at left.)

Estimate meeting expenditures: \$ _____

Signature: _____

Date: _____

Check Division under which award is being applied for:
(Applications made to multiple Divisions will be rejected)

☐ **DS&T**—Send to: D. Misra, Dept. of Elec. and Computer Engr., NJIT, Newark, NJ 07102. E-mail: dmisra@megahertz.njit.edu.

☐ **Electrodeposition**—Send to: J. Stickney, Dept. of Chemistry, Univ. of Georgia, Athens, GA 30602. E-mail: stickney@sunchem.chem.uga.edu.

☐ **Electronics**—Send to: Cor L. Claeys, IMEC, Kapeldreef 75, B-3001, Leuven, Belgium. E-mail: claeys@imec.be.

☐ **Energy Technology**—Send to: Thomas F. Fuller, 300 Chestnut Hill Road, Glastonbury, CT, 06033-4153. E-mail: fullert@ifc.utc.com.

☐ **HTM**—Send to: F. Garzon, Los Alamos National Lab, MS 0429, Los Alamos, NM 87545. E-mail: garzon@lanl.gov.

☐ **Physical Electrochemistry**—Send to: Johna Leddy, Dept. of Chem., University of Iowa, Iowa City, IA 52242. E-mail: jleddy@blue.weeg.uiowa.edu.

☐ **Sensor**—Send to: Peter Hesketh, George W. Woodruff School of Mech. Eng., Georgia Inst. of Technology, Atlanta, 801 Ferst Dr., GA 30332. E-mail: peter.hesketh@me.gatech.edu.

Application and faculty letter must be received no later than one month prior to the meeting for which a travel grant is sought.

Electrochemistry Is Alive and Well—The field of electrochemistry is still attractive to young scientists. Ravi Bhavsar, an honors student at John Adams High School, in South Bend, Indiana, has completed an original research project in electrochemistry. The work caught the attention of Prashant Kamat, chairman of the ECS Fullerenes Group, when he attended the Northern Indiana Regional Science Fair. Bhavsar's work, excerpted here, was done under the direction of Nevin Longenecker, science instructor at the school. This project was funded by the Indiana Academy of Sciences and has received several awards. Congratulations to Ravi and best of luck in his future career efforts—we hope in the field of electrochemistry!

Evaluating Factors to Optimize Energy Output from an Aluminum-Air Fuel Cell

by Ravi Bhavsar

The potential hazards, scarcity, and increasing prices of fossil fuels have caused many scientists to begin a quest for more efficient alternate energy sources. One major consumption of fossil fuels is in motor vehicles, also a major source of air pollution. The electric battery has been one option as an alternative energy source; however, major disadvantages such as excessive charging time and limited numbers of recharges tend to restrict this alternative from mass-market production.

Fuel cells have shown an extremely high potential of becoming the major energy source for the future. Fuel cells, like batteries, make use of chemical reactions, as opposed to combustion, which results in low efficiency due to loss of heat. They can be regenerated as fast as the reactants can be replenished. The aluminum-air cell was first an air-depolarized cell. However, recent research shows that the cell can be independent of the oxygen in the air around it by adding hydrogen peroxide to the electrolyte.

Much research has been done already on efficiency, types of anode,

and temperature effects. Fewer studies exist comparing the performance of different electrolytes in the aluminum fuel cell. Almost no studies have been found comparing the performances of different cathode materials.

This investigation was carried out in a 7 cm by 7 cm by 7 cm constructed cell and a 250 mL beaker. Tests were done strictly to compare the energy output of the cell using different materials for the cathode and different types/concentrations of electrolytes. All tests were conducted in a temperature-controlled incubator at 28°C. Current and voltage readings were taken on a closed circuit with a 100 ohm resistor. Power/time graphs were integrated to obtain total energy produced.

The control series made use of 200 mL of 2 M KOH and a 4 mm diameter carbon graphite rod as the cathode. Al sheet obtained from Steel Works was used as the aluminum source. The four solutions tested were 1 M KOH, 4 M KOH, 2 M NaOH, and 2 M NaCl. Four different materials were tested as cathodes. They were a 9 mm diameter carbon rod, a carbon graphite board (cut to

identical surface area of control cathode), carbon fiber board (also cut), and a 4 mm diameter copper rod.

When energy produced in 48 hours was compared for each series, 2 M KOH, 1 M KOH, and 2 M NaOH all produced around 80 J. However, when 1 M KOH was used, a large mass of aluminate precipitate lined the inside of the cell and covered the cathode. When the concentration of KOH was increased to 4 M, output climbed to about 141 J. Relative to the other solutions tested, 2 M NaCl produced very little energy. All the cathodes tested produced more energy in 48 hours of cell operation than the control (4 mm diameter rod). The carbon graphite board produced the most energy. Increasing the surface area about 3x to 5x also increased the energy output (to about 210 J). The surface area test was done only to show that the increased output of the 9 mm diameter rod may have been due to an increased surface area as opposed to a different type of carbon material.

This investigation was partially funded by the Indiana Academy of Science. ■

