HAWAII Meeting Highlights

The beautiful island of Oahu in the Hawaiian Islands lent its "aloha" atmosphere to the joint international meeting in Honolulu this past October. Over 2900 attended the meeting, which was sponsored by ECS with The Electrochemical Society of Japan, and with the technical co-sponsorship of the Japan Society of Applied Physics. Glimpses of Hawaiian shirts could be seen among the usually more formal crowds, as attendees presented or heard nearly 2400 papers presented in 43 symposia. The plenary lecture and the Olin Palladium Award address brought standing room only crowds to the lecture halls, and the many luncheons and banquets were happily filled, even as the sands and sunshine beckoned outside.

Plenary Address: Recent Progress in Photoelectrochemistry

The technical program officially began with a plenary lecture by Professor Kenichi Honda of the Tokyo Institute of Polytechnics. Professor Honda can truly be regarded as one of the pioneers of modern photoelectrochemistry. He is perhaps best known, outside of this specialized community, for his landmark study of the solar-assisted electrolysis of water with irradiated titanium dioxide photoanodes. This work was carried out when Honda was at the University of Tokyo. There, in the 1970s, he established an active group in the field of photoelectrochemistry comprised of Fujishima, Watanabe, and other researchers—many of whom have had illustrious careers of their own since then. Indeed the 1970s can be regarded as the halcyon days of photoelectrochemistry, with intense activity in all parts of the world, including Japan.

Professor Honda began his lecture with an historical perspective of how the field evolved, as early as in 1839, with Becquerel's experiments of the influence of light on metal electrodes. His excellent review of the progress made in photoelectrochemistry was organized into photoelectrode preparation aspects, photoelectrochemical reactions, and applications.

Beginning with the first topic, Honda discussed tailored photoelectrode assemblies comprised of multiple layers and semiconductor-metal composites. Chemical modification of semiconductor surfaces (e.g., with Langmuir-Blodgett films) is a tactic for precise control of the interfacial chemistry and electrostatics. This area continues to be actively investigated by researchers in many countries. Size quantization—where the optical properties of the semiconductor (for example) exhibit interesting changes (from the bulk counterpart) when the particle size approaches the exciton dimension—is no longer a topic confined to the solid-state physics community. This lecture contained examples of similar studies in semiconductor-liquid interfacial environments, which have provided interesting data in recent years.

Under the second topic of photoelectrochemical reactions, water splitting (a

Professor Kenichi Honda (left) delivered the Plenary Lecture in Honoloulu.

ECS President Dale Hall (holding medal, above) presents Charles R. Martin with the ECS Carl Wagner Award.

Prof. John E. Goodenough (right) delivered the ECS Olin Palladium Award address.

reaction undoubtedly close to Professor Honda's heart!), CO_2 reduction and oxidative decomposition of organic compounds were discussed. The individual HER and OER water splitting components can be accomplished with sacrificial electron donors and acceptors respectively. Photoelectrodes, with layered and tunnel chemical structures, have been demonstrated to be capable of driving these reactions in a sustained fashion without photocorrosion. Materials such as inorganic niobates, titanates, and tantalates have been added to the library of candidate photoelectrodes alongside the TiO_2 workhorse. Honda's review of this topic was primarily confined to a discussion of the progress made by Japanese researchers. Finally, he also described two-photon water-splitting systems and efforts to split water with visible light.

In these times of increasing concerns with CO_2 emissions from fossil fuel combustion and implications for global climate change, photoelectrochemical methods for CO_2 reduction have assumed particular relevance. A crucial factor, as pointed out by Honda, rests with the fact that electrolytic approaches for driving this difficult reaction would make little sense if the electricity needed is derived from fossil sources. Thus, even if the solar-assisted approaches are much less efficient (than their "dark" counterparts), the former would win out on environmental considerations alone. Both gas phase and solution phase photoelectrochemical CO_2 reduction pathways are being studied in many laboratories, especially in Japan.

Professor Honda concluded his review with a short discussion of possible technological applications emerging from the field of photoelectrochemistry. These include solar energy conversion using photovoltaic and photoelectrolytic approaches, and environmental remediation. At least to this writer, one of the most impressive aspects of Honda's lecture (other than the technical ones) was the total lack of reference to his own singular contributions to the field in the areas of energy conversion and dye sensitization—a feature of this talk underlining his humility and graciousness.

ECS Olin Palladium Award Address

Professor John Goodenough presented his award address, entitled "Electrochemistry and Energy Conversion," following the Honors and Awards Session on Wednesday morning. In this lecture, Professor Goodenough shared his insights into the fields of photoelectrolysis, rechargeable batteries, and fuel cells gathered over an illustrious career spanning four decades on two continents. At the onset of his talk, he made the point about how scientific inquiry transcends geographic and cultural boundaries. He acknowledged the fruitful collaboration he has enjoyed with researchers from many countries, including Japan and India.

In the first part of his talk, Goodenough reminded the audience of the energy crisis in the 1970s and of the critical need that arose then for tapping renewable energy sources such as the sun. He established research in the area of semiconductor photoelectrolysis at Oxford University in the U.K. The studies on the chemical modification of TiO_2 surfaces and photoelectrochemical reduction of protons on

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Board Highlights

- The Board of Directors approved the re-appointment of Paul A. Kohl as Editor of the *Journal* and *Letters*.
- Dennis R. Turner was named as the recipient of the next Vittorio de Nora Award, to be presented at the spring 2000 meeting.

The nontechnical registrants had the opportunity to learn a traditional Hawaiian hula dance from this graceful instructor (far left).

Members of the Hawaii Host Committee helped enroll new members and assisted in the registration area. From left to right are Chairman Bruce Liebert, Bor Yann Liaw, and Yao-yu Wang (above).

ECS Executive Director Roque Calvo (bottom photo, left), with Shigeru Yamauchi, President of The Electrochemical Society of Japan.

All photos this spread by Eye of the Islands Photography, Inc.

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p-GaP that emanated from this group constitute important advances in the field of photoelectrochemistry. With a conviction that the semiconductor-assisted approach to solar energy conversion would perhaps not prove fruitful from a technological perspective, Goodenough remarked that it was time for him to move on to study other ways in which solid-state chemistry could contribute to energy conversion problems.

His subsequent research served to demonstrate the concepts of tunnel structures and fast ion conductors. This portion of the talk dealt with 1-dimensional, 2-D, and 3-D frameworks designed to provide low-energy transport pathways for alkali metal cations. Materials such as NASICON, pyrochlores, and perovskites comprised the core of this discussion. The talk then switched to batteries and specifically the lithium ion rechargeable variety. Goodenough referred to the studies at Oxford on $Li_{1-x}MO_2$ (M = Ni, Co) cathodes as well as spinels (e.g., $LiMn_2O_4$).

All in all, the specialists and the neophytes in the audience alike enjoyed the Olin Palladium Award address by Professor Goodenough, especially so because it was delivered in a delightful style blending humor and wisdom. ■

The close of the meeting brought everyone to a traditional Hawaiian luau. Flanked by torch-bearers, and dancers in front, are (from left to right), Shigeru Yamauchi, President of The Electrochemical Society of Japan, Mizue Yamauchi, ECS President Dale Hall, Pam Hall, and Nancy Hall.

***The 1999 Class of ECS Fellows**—seated from left to right, Shimshon Gottesfeld, William (Bill) M. Yen, Ralph E. White, Kathryn Bullock, and Yue Kuo. Standing, from left to right, Dieter Landolt, Stanley Bruckenstein, Norio Sato, (ECS President Dale Hall), and Jerzy Ruzyllo. Missing from the photo is Eric W. Brooman. (Ed. Note: This image was altered to include two Fellows who were not present at the first photo session.)*

Fellows of The Electrochemical Society

1990

Allen J. Bard
Robert B. Comizzoli
Glenn W. Cullen
Theodore I. Kamins
Paul C. Milner
Edward H. Nicollian
Robert A. Osteryoung
Arnold Reisman
Lubomyr T. Romankiw
Geraldine C. Schwartz
Ben G. Streetman
J. Bruce Wagner, Jr.

1991

Theodore R. Beck
Elton J. Cairns
Bruce E. Deal
Werner Kern
William A. Pliskin
Charles W. Tobias
Rolf Weil

1992

Richard C. Alkire
Vittorio de Nora
Jerome Kruger
Barry Miller
Dennis R. Turner
Jerry M. Woodall

1993

Richard P. Buck
Larry R. Faulkner
Dennis W. Hess
Vik J. Kapoor
Rolf H. Muller
Carlton M. Osburn
Robert A. Rapp
George L. Schnable
Y. H. Wong
Petr Zuman

1994

George K. Celler
Sung-Nee (George) Chu
John P. Dismukes
Richard B. Fair
Adam Heller
Richard A. Oriani
Boone B. Owens
Wayne L. Worrell

1995

Fred C. Anson
Laurence D. Burke
Brian E. Conway
Robert P. Frankenthal
Karl M. Kadish
Digby D. Macdonald
Gleb Mamantov
Florian Mansfeld
Royce W. Murray
John Newman
Yutaka Okinaka
Howard W. Pickering
George Rozgonyi
Mordechay Schlesinger
Karl E. Spear

1996

John M. Blocher, Jr.
Hans K. Bohni
Der-Tau Chin
Hugh Isaacs
Wolfgang J. Lorenz
S. J. Pearton
Subhash C. Singhal
Venkataraman Swaminathan

1997

James A. Amick
Denis Noel Buckley
Michel J. Froment
Eliezer Gileadi
Koji Hashimoto
Chung-Chiun Liu
Ed McCafferty
Theodore D. Moustakas
Shyam P. Murarka
Stella W. Pang
Joachim Walter Schultze
James D. Sinclair
Norman L. Weinberg
Lawrence Young

1998

Huk Y. Cheh
Donald E. Danly
Dennis H. Evans
Funio Hine
Dennis C. Johnson
Zoltan Nagy
Katsumi Niki
Jun-ichi Nishizawa
Fan Ren
Antonio J. Ricco
David A. Shores
William H. Smyrl
George Thompson

1999

Eric Brooman
Stanley Bruckenstein
Kathryn Bullock
Shimshon Gottesfeld
Yue Kuo
Dieter Landolt
Jerzy Ruzyllo
Norio Sato
Ralph E. White
William B. Yen