

ECS V. P. Osaka

Awarded Japan's Purple Ribbon Medal



TETSUYA OSAKA (shown here with Mrs. Tetsuya Osaka, seated) received the Medal with Purple Ribbon from the Emperor of Japan for his outstanding achievement in the development of ultra-small magnetic recording head based on electrochemical nanotechnology.

TETSUYA OSAKA was awarded the Medal with Purple Ribbon by the Emperor of Japan in spring of 2010, for his outstanding achievement in the development of an ultra-small magnetic recording head based on electrochemical nanotechnology. Professor Osaka has been a professor of applied physical chemistry in the Department of Applied Chemistry, in the School of Advanced Science and Engineering at Waseda University (Tokyo, Japan) since 1986. He received his bachelor's degree in 1969, his master's degree in engineering in 1971, and his doctoral degree in engineering in 1974 from Waseda University.

Dr. Osaka is currently the third Vice-President of ECS. He serves as Chair of the Symposium Subcommittee and serves on Ways & Means and Technical Affairs Committee. He has been a member of the Society Meeting Committee and a Member-at-Large of the Japan Section. In 1996, he received the ECS Electrodeposition Division Research Award, and in 2002, he was named an ECS Fellow.

The Japanese government biannually bestows the medals with a Red Ribbon, Green Ribbon, Yellow Ribbon, Blue Ribbon, Dark Blue Ribbon, and Purple Ribbon upon individuals who have greatly contributed to society. Medals with Purple Ribbon are given for accomplishments in the fields of academia, art, and sports. The Medals of Honor are awarded from the Emperor of Japan, twice each year, on April 29 (the birthday of the Showa Emperor) and November 3 (the birthday of the Meiji Emperor).

Professor Osaka has contributed to the field of electrochemical nanotechnology starting in his early research period. Electrochemical nanotechnology is a novel interdisciplinary field, in which electrochemical reactions at interfaces are strictly controlled on the atomic or molecular scale. He has succeeded in creating highly functional materials fabricated with electrochemical nanotechnology.

Professor Osaka's research on the electrochemical creation of soft magnetic materials with a highly saturated magnetic-flux density (B_s) was published in *Nature* in 1998 has greatly contributed to improving hard disk drives (HDD). Soft magnetic materials are a major component in the magnetic heads of HDD. For manufacturing high-density HDD, high B_s density and low coactivity are both required in minimized device materials. One of the best films is a composition of $\text{Co}_{65}\text{Ni}_{12}\text{Fe}_{23}$, and indicates $B_s = 2.1$ T and $H_c = 1.2$ Oe. In addition, the film has a very fine crystalline structure, 10 to 15-nanometer-size fcc-bcc mixed phase, near zero-magnetostriction line in phase diagram. A GMR head fabricated with the CoNiFe film showed superior performances, $B_s = 2.1$ T, leading to a breakthrough for materializing ultra-high areal density magnetic recording.

Dr. Osaka's research contributions have been recognized by other awards such as the Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science, and Technology (2008), the Society Prize of the Chemical Society of Japan (2004), the Pergamon Gold Medal of the ISE (1999/2000), the Society Award of the Electrochemical Society of Japan (2001), the Society Award of the Surface Finishing Society of Japan (1999), and the Simon Wernic International Award of the International Union for Surface Finishing (1996). He is also a Fellow of IEEE (2002) and IUPAC (2004). He has been named as a highly-cited researcher in category materials science in ISIHighlyCited.com. ■

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Richard Alkire Receives FMS National Materials Advancement Award



PETR VANÝSEK (left), ECS past Secretary and current President of FMS, with **RICHARD ALKIRE** at the presentation of the FMS National Materials Advancement Award to Dr. Alkire in December.

The Holeman Lounge of the National Press Club in Washington, DC on December 8, 2010 was the focal point of great pride for ECS. Long-time member and past President (1985-1986) of ECS, **RICHARD C. ALKIRE** received from the Federation of Materials Societies the prestigious National Materials Advancement Award. He shared the honor this year with another recipient, Diran Apelian from Worcester Polytechnic Institute.

The National Materials Advancement Award recognizes individuals who have demonstrated outstanding capabilities and contributions in advancing the multidisciplinary field of materials science and engineering, the effective and economic use of materials in the market place, and the application of materials developments to national problems and defense, and the development and implementation of national policy, which furthers the impact of materials science and engineering on our society.

Richard Alkire is a professor emeritus in the Chemical and Biomolecular Engineering Department at the University of Illinois at Urbana-Champaign. He received the award in particular in recognition of his imaginative pioneering work in the

field of electrochemical engineering, especially in bridging the gap between fundamental science and applications, for his administrative leadership and for his extraordinary mentoring accomplishments. Richard Alkire, a PhD recipient from the University of California at Berkeley, has led the electrochemical engineering field in numerical simulations and experimental verification of behavior in complicated electrochemical systems for forty years and he is particularly known for fundamental investigations of electrical current and potential distribution phenomena. He was also first to introduce finite element analysis to electrochemical applications.

Dr. Alkire served on many national committees helping the policymakers understand the importance of electrochemical processes and devices. He was founding Chair of the Chemical Sciences Roundtable, which enhances understanding of chemical sciences and technologies which directly affect government. In his home state of Illinois he has served on the Governor's Science Advisory Committee and on the Board of Directors of the Department of Natural Resources.

Richard Alkire joins a fine roster of accomplished individuals who have received this award.

- Richard C. Alkire, Emeritus Professor, past Vice Chancellor for Research, University of Illinois, Urbana-Champaign (2010); ECS member
- Diran Apelian, Howmet Professor of Mechanical Engineering, Worcester Polytechnic Institute (2010)
- Jeffrey Wadsworth, Batelle (2009)
- Siegfried Hecker, Co-Director of the Center for International Security and Emeritus Director of Los Alamos National Laboratory (2008); ECS member
- Mihail C. Roco, founding Chair of the National Science and Technology Council's subcommittee on Nanoscale Science, Engineering and Technology (NSET) (2007)
- Leo Christodoulou, program manager (DARPA) (2006)
- Alton D. Roming, Jr., Senior Vice President of Sandia National Laboratories (2005)
- James B. Roberto, Deputy Director, Oak Ridge National Laboratory (2004)
- John H. Hopps, Jr., U.S. DoD (2003)
- Jerry M. Woodall, D. Baldwin Sawyer Professor at Yale University (2002); ECS member
- Bhakta B. Rath, Associate Director of the Naval Research Laboratory (2001)
- Mildred S. Dresselhaus, Director, Office of Science, U.S. Department of Energy (2000)
- Merton C. Flemings, Toyota Professor, MIT (1999)
- Robert Baboian, retired Fellow of Texas Instruments (1998); ECS Member
- Arden L. Bement, Jr., NIST, (1997), Presently Director NSF
- Mary L. Good, Under Secretary of Commerce (1996)
- Peter R. Bridenbaugh, Executive Vice President-Automotive, ALCOA (1995)
- Nathan E. Promisel, retired Director of the National Materials Advisory Board (1994)

- Lyle H. Schwartz, Director of the Materials Science and Engineering Laboratory at the National Institute of Standards and Technology (1993); ECS member
- George E. Brown, Jr., Chairman of the House Science, Space and Technology Committee (1992)
- Rustum Roy, Director of the Materials Education Council (1991)
- Klaus M. Zwilsky, Director of the National Materials Advisory Board (1990)
- Allen G. Gray, Technical Director Emeritus, ASM International (1989)
- Morris Cohen, Institute Professor Emeritus, MIT (1988); ECS member
- William O. Baker, retired Chairman of the Board of AT&T Bell Laboratories (1987)
- John B. Wachtman, Jr., Director of the Center for Ceramics Research at Rutgers University (1986)
- Paul C. Maxwell, Science Consultant to the U.S. House of Representatives Committee on Science (1985)

Upcoming ECS Meetings and Exhibits



220th ECS Meeting

Boston
Massachusetts

October 9-14, 2011

Technical Exhibit: October 10-12

www.electrochem.org

In Memoriam



Karl Kordesch
1922-2011

KARL KORDESCH, a long time member of ECS, and a pioneer in the development of alkaline battery and fuel cell technology, died January 12, 2011 in Eugene, Oregon at the age of 88.

Dr. Kordesch was awarded over 100 patents during his career and authored over 200 publications on the topics of batteries and fuel cells. He was the recipient of many awards and honors, among them the Wilhelm Exner Medal (1967), the ECS Vittorio de Nora Gold Medal (1986), the Austrian State Energy Prize and the Erwin Schroedinger Prize (1990), the Frank M. Booth Prize of the Royal Society of Great Britain (1992), and the Auer V. Welsbach Medal (1992). He authored several books: *Batteries Vol. 1*, Marcel Dekker, NY (1974); *Electric Vehicles Vol. 2*, Marcell Dekker, NY (1977); *Progress in Batteries and Solar Cells, Vol. 2*, by A. Kozawa, K. V. Kordesch, E. Voss, and J. P. Gabano (1979); *Brennstoffbatterien* Springer (1984); and *Fuel Cells and Their Applications* (with G. Simader), Wiley, NY (1996).

From 1981 to 1985, Kordesch was general secretary of the International Society of Electrochemistry (ISE). In 1990 he received an Honorary Doctorate from the Technical University of Vienna. Born in Vienna, he earned his PhD in chemistry from the University of Vienna in 1948. Although his dissertation topic was not related to electrochemistry, he was already working on commercial metal-air battery electrodes. He was recruited by the United States Signal Corps in 1953 as part of World War II's Operation Paperclip. From 1953 to 1955 he served as a Staff Scientist in the

Battery Division of the U.S. Signal Corps laboratory at Fort Monmouth, New Jersey. When he came to the United States, he adopted his Father's name "Viktor" as his middle name. He said he was tired of writing "Karl (no middle initial) Kordesch" on official documents.

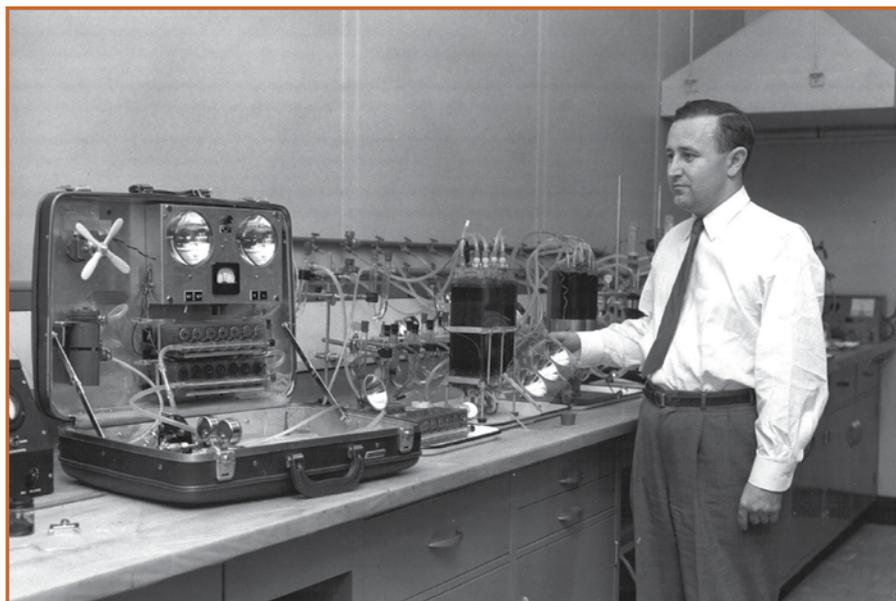
Karl Kordesch made two fundamental contributions that changed the battery world, what we would now call "disruptive" technology advances. The first was the design of the alkaline dry cell, which made it the high-power long-life battery it is today. The second was the creation of the thin carbon fuel cell electrode. These two discoveries led to his interest in electric vehicles and the rechargeable alkaline battery. He had a deep understanding of electrochemistry, but he always coupled that scientific knowledge with a genius for applications and demonstrations.

In 1955 he moved to Cleveland, Ohio, to work at the Parma Technical Center of Eveready, a division Union Carbide Corporation. He presented a fuel cell demonstration at the Brussels World Fair in 1958, using a suitcase with a hydrogen-oxygen fuel cell, based on the graphite tube design. His development of thin carbon electrodes for fuel cells came soon thereafter. These fuel cells were used in military and space applications, but practical demonstration projects appealed to Kordesch's sense of fun. In 1967 he built a fuel cell/NiCd battery hybrid electric

motorcycle. Dr. Kordesch was always interested in showing how scientific advances can be put to practical use. The motorcycle was featured in television commercials for the program "21st Century," hosted by Walter Cronkite and sponsored by Union Carbide. He relished telling people how he had to join the actors' union to ride the motorcycle in the commercials. He rode the motorcycle in the hallways of the Parma Technical Center until it was deemed a safety risk—for the pedestrians who could not hear the motorcycle coming—even though he made liberal use of the horn.

In 1970 he converted a 1961 Austin A-40 to a battery electric vehicle, then to a fuel-cell-lead acid battery hybrid. The car went through several incarnations, including a gasoline generator-battery hybrid. The car was chosen for practical reasons: the car had a sturdy frame, was a "square-back" with access to the cargo area, and the manual transmission was light. The Austin had an unfortunate design flaw that made shifting into 4th gear and reverse almost a 50-50 proposition. He purchased the disabled car from a neighbor, rebuilt the transmission himself, and converted the car at night and on weekends in his garage in Lakewood, Ohio. His fuel cell design provided the basis for the 40 kWh alkaline hydrogen-oxygen fuel

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KARL KORDESCH presented a fuel cell demonstration at the Brussels World Fair in 1958, using a suitcase with a hydrogen-oxygen fuel cell, based on the graphite tube design. He is shown here testing the demonstration at the Parma Technical Center.

Karl Kordesch*(continued from previous page)*

cell for the General Motors Electrovan. He thought the “home version” electric car should seat four passengers, have an efficient drive system (hence the manual transmission and clutch), have the range and speed of a conventional automobile, and not cost a fortune. Fitted with oversize tires, the car did manage 55 mph. Faced with a choice of an extra battery or the spare tire, the extra battery won. Being a practical man, the motorcycle, the batteries, and the generator he used for the gasoline hybrid were purchased from Sears. This generator and its use in the car highlight the tenacity and wide range of skills that Kordesch brought to his free time “hobby.” The generator, when installed, worked fine, but lost power slowly over several weeks. He disassembled the generator down to the last screw several times before he found that the camshaft had not been properly hardened. With the new camshaft, it worked, as he knew it should.

Dr. Kordesch had a sense of humor about his work: The car was entered into the Cleveland Auto Show, and won trophies in the “special” category. The gasoline crisis of the 1970s made electric cars popular, for awhile. Dr. Kordesch was a member of the Ohio Electric Vehicle Association and helped many of the members with their cars. The fuel cell car also received an award at the New York Auto Show. The car was shipped to Newark, NJ, in a trailer, then driven through the Holland Tunnel to the show. He enjoyed talking about batteries with other scientists, hot rod enthusiasts from the car shows, with amateur electric car builders, and with anyone who shared his interest and enthusiasm for batteries.

While working at Union Carbide in 1960, Karl Kordesch, P. A. Marsal, and Lewis Urry were granted a patent (2,960,558) for the alkaline dry cell battery, which eventually became the D-sized Eveready Energizer battery. This revolutionary battery introduced the new powdered zinc gel anode. By 1972, the alkaline fuel cell research program at Union Carbide declined, and Kordesch focused more on the alkaline MnO_2 dry cell. Patents and innovations kept on coming. The rechargeable alkaline MnO_2 battery became one of his favorite projects. On one occasion, Kordesch gave a lecture at the Parma Technical Center where he powered the projector with rechargeable alkaline batteries hidden under the table that supported

the projector, and only gave away the secret at the end of the talk. He was enthusiastic about the possibilities for rechargeable alkaline batteries, and his commitment to the rechargeable battery shaped a large part of his later work.

In 1977 he took early retirement from Union Carbide and accepted the position of Professor and Chair of the Institute of Inorganic Chemical Technology at the Technical University of Graz in Austria. He remained as Director of the Institute until 1992, and then as Emeritus Professor. While at the Institute at the Technical University of Graz, he directed work on electrochemical systems under contracts with Varta Batteries in Germany and other European battery manufacturers. He also headed projects covering fuel cell systems, zinc-bromine batteries, bipolar batteries, catalysts, and environmental studies, among others. During this time the Austin was converted to zinc bromine batteries.

In 1986 he co-founded Battery Technologies Incorporated (BTI) in Toronto, Canada and became the Senior Vice-President of Research and Development. Twenty patents were granted to him and assigned to BTI on Rechargeable Alkaline Manganese Dioxide (RAM) Batteries. During the Toronto period, he owned every battery operated gadget he could buy—all fitted with rechargeable alkaline batteries. His Canadian auto license plate read “0 Hg”. In the United States, these batteries were sold under the Renewal brand. He enjoyed the freedom he had to work on his rechargeable batteries, an effort not supported for commercial reasons earlier in his career.

Karl Kordesch never quit working on batteries and fuel cells. In the following decades he was involved with research projects, grants, and companies all over the world. With Energy Ventures Inc. (EVI) of Canada, he managed a development program covering rechargeable nickel-zinc and zinc-carbon batteries. He also joined Apollo Energy Systems, Inc. as Vice-President in charge of fuel cell development. He was always eager and willing to share his encyclopedic knowledge of batteries; and he was gratified to see the electric car and the hybrid-electric make a comeback in the last years.

In 2009, Karl “retired” to Eugene, Oregon. He was still in contact with the battery community, working on a manuscript and active until the last days of his life. In 2010 he was diagnosed with leukemia. He was fully aware that he had only a short time left, and handled his affairs with dignity and grace and

with his characteristic good humor. He had the time to say farewell to many of his family and friends who are spread all over the world. He died on January 12 at home, surrounded by his family.

Karl Kordesch left a scientific legacy that shaped our battery operated world. Literally billions of alkaline batteries are used every year. He strongly advocated rechargeable dry cell technology. He was 40 years early with the electric hybrid vehicles that he enjoyed building and driving. He will be missed by his family, his colleagues, former students and the scientific community. ■

This notice was written by Martin E. Kordesch, Athens, OH; Albert V. Kordesch, Santa Cruz, CA; Ralph J. Brodd, Lexington, KY; Viktor Hacker, Graz, Austria; and Waltraud-Mautner, Graz, Austria.