



**Ed. Note:** We are pleased to introduce a new column in *Interface*, "Websites of Note." Zoltan Nagy, longtime ECS member, is the guest contributor for this column. Dr. Nagy spends much of his time surfing the Web and editing/maintaining three informational electrochemistry websites (to be featured at a later date).

## websites of note

by Zoltan Nagy

### All about Electrochemistry

"Elementary electrochemistry in somewhat greater depth than is found in standard textbooks, but at a level still suitable for first-year college and advanced high school courses" describes this site pretty well. A fairly classical treatment, short on modern aspects like kinetics and surface science.

- Stephen Lower, Simon Fraser University
- <http://www.chem1.com/acad/webtext/elchem/>

### Electrochemistry Source Portal

Portal to many thousands of electrochemistry information items. More than 1,000 links to websites of interest. 3,000+ books and proceedings volumes. 5,000+ review chapters. Listing of more than 600 graduate schools, from more than 60 countries. Popular science articles in many magazines. Societies, journals, handbooks, nomenclature, meetings, etc. More than 1,000 simple and brief definitions of words and phrases used often in electrochemistry, crosslinked with an encyclopedia containing more than 30 popular-science style articles, written by leading experts in the field.

- Hosted by the Ernest B. Yeager Center for Electrochemical Sciences at Case Western Reserve University
- <http://electrochem.cwru.edu/portal/>

### Gordon Conferences, 1964-2005

Forty years of Gordon Research Conferences on Electrochemistry, in memory of Robert A. Osteryoung, one of the founders of the conference. All programs are listed, group photos, and photos of chairpersons. Large file, loads slowly, but worth it: a great historical collection.

- Compiled by Debbie Boxall and Steve Feldberg, and conserved by Petr Vanýsek
- <http://www.vanysek.com/electrochem/rao.htm>

### About the Author

**ZOLTAN NAGY** is a semi-retired electrochemist. After 15 years in a variety of electrochemical industrial research, he spent 30 years at Argonne National Laboratory carrying out research on electrode kinetics and surface electrochemistry. Presently he is at the Chemistry Department of the University of North Carolina at Chapel Hill. He welcomes suggestions for entries; send them to [nagy@email.unc.edu](mailto:nagy@email.unc.edu).

## ECS Cosponsored Conferences for 2009

*In addition to the regular ECS biannual meetings, ECS, its Divisions, and Sections cosponsor meetings and symposia of interest to the technical audience ECS serves. The following is a list of the cosponsored meetings for 2009. Please visit the ECS website for a list of all co-sponsored meetings.*

- **60<sup>th</sup> Annual Meeting of the International Society of Electrochemistry**, August 16-21, 2009, Beijing, China, [event09.ise-online.org](http://event09.ise-online.org)
- **International Symposium on Electrochemistry for Energy Conversion and Storage (ISEECS)**, August 22-25, 2009, Wuhan-Three Gorges, China, [www.3gorges2009.cn](http://www.3gorges2009.cn)
- **10<sup>th</sup> International Conference on Advanced Batteries and Accumulators**, August 30-September 3, 2009, Brno, Czech Republic, [www.aba-brno.cz/aba2008/introduction.php](http://www.aba-brno.cz/aba2008/introduction.php)
- **Microelectronic Technology and Devices** (SB Micro 2009), August 31-September 3, 2009, Natal, Brazil, [www.lasic.ufrn.br/chiponthedunes2009/](http://www.lasic.ufrn.br/chiponthedunes2009/)
- **BATTERIES 2009 - The International Power Supply Conference and Exhibition**, September 30-October 2, 2009, Cannes-Mandelieu, France, [www.batteriesevent.info](http://www.batteriesevent.info)
- **6<sup>th</sup> International Conference on Electromagnetic Processing of Materials (EPM 2009)**, October 19-23, 2009, Dresden, Germany, [www.epm2009.de](http://www.epm2009.de)
- **2009 Fuel Cell Seminar & Exposition**, November 16-20, 2009, Palm Springs, CA, USA, [www.fuelcellseminar.com](http://www.fuelcellseminar.com)

*To learn more about what an ECS cosponsorship could do for your conference, including information on publishing proceeding volumes for co-sponsored meetings, or to request an ECS cosponsorship of your technical event, please contact [ecs@electrochem.org](mailto:ecs@electrochem.org).*

## ECS Welcomes New Staff



**KARLA T. STEIN** joined ECS in March as the new Director of Membership and Development, bringing a wealth of development experience from her 12 years in leadership roles in non-profit healthcare. She has served as an Executive Director with the American Cancer Society, a Senior Vice-President of Major Gifts with The American Heart Association, and most recently as a Vice-President with the Robert Wood Johnson

Hamilton Hospital Foundation. In these various capacities she has been responsible for establishing major gift and planned giving programs that included the development of Gift Advisory Councils, prospect research and identification, solicitation, establishing cultivation and stewardship activities, grant writing, volunteer development including a Young Professionals Group, board governance, donor relations, event planning, public relations, and brand awareness. Prior to entering the non-profit field, Karla was an International Sales Director for Lenox China & Crystal, Inc. for over a decade where she did market research and established the Lenox brand in Japan, Europe, Bermuda, and the Caribbean. She has had experience in registering the Lenox trademark internationally and most recently the Grounds for Healing® certificate of registration for the hospital foundation.

In her new role at ECS, Karla will be focusing on elevating the global membership and establishing a major gift and planned giving program. Student relations will also be

a priority and Karla will be working to augment student membership; increase funding that will support the expansion of the Student Chapters and student awards; increase the amount and number of the travel grants, summer fellowships, and internships; as well as provide a more enriching student program at the ECS meetings. In addition, she will be working collaboratively with the Divisions and Sections to champion their efforts to elevate their membership and symposium fundraising initiatives.

Karla is a native of Indianapolis, Indiana and a business graduate from the University of Evansville. She resides in Lawrenceville, New Jersey and has two sons that live in Richmond, Virginia.



**LAUREN GERMANO** joined ECS in August 2008 as the Administrative Assistant to the Membership & Development Department. In addition to supporting the Director and Assistant Director of Membership & Development, her responsibilities include maintenance of member, nonmember, student, and donor profiles, processing of dues renewal invoices and new membership applications, as well as enthusiastically

responding to the needs of our ECS callers and visitors. A native of Pennsylvania, Lauren currently resides in Pennington, New Jersey.



## websites of note

by Zoltan Nagy

### Electrochemical Technology in Microelectronics

The applications of electrochemical technology to microelectronics are expanding rapidly. As the dimensions of the features of microelectronic components have decreased, associated materials effects, interfacial effects, and molecular-scale interactions have become increasingly important for electrochemical metal deposition and removal. Several papers in this site focus on those aspects.

- IBM J. Res. & Dev., Vol. 49, No. 1, January 2005
- <http://www.research.ibm.com/journal/rd49-1.html>

### Electrochemistry of the Nerve Impulse

All you ever wanted to know about electrochemical mechanism of the nervous system. You can learn about “axons,” which are responsible for the transmission of information between different points of the nervous system—their function is analogous to the wires that connect different points in an electric circuit. Membrane potentials, action potentials, ionic pathways, ion channels, reversal potentials, voltage clamps, and capacitive currents are all explained in detail.

- F. Bezanilla, University of Chicago
- <http://nerve.bsd.uchicago.edu/med98a.htm>

### Famous Electrochemists

A large collection of short biographies, illustrated with many pictures, of electrochemists and scientists in related fields. The collection starts in the 1500s and extends to this time. Over one hundred are listed, and unfortunately details are not available for all. Numerous further links are provided in every case, making this site a very extensive historical collection.

- Evgeny Katz, Clarkson University
- <http://people.clarkson.edu/~ekatz/scientists/electrochemists.htm>

### About the Author

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## websites of note

by Zoltan Nagy

### Electrochemistry Lecture Notes

As part of a "Lecture Notes for First-Year Chemistry," it is a good elementary introduction to electrochemistry. However, it's heavily thermodynamics oriented and short on modern areas like kinetics and surface electrochemistry.

- Michael Mombourquette, Queen's University
- <http://www.chem.queensu.ca/people/faculty/mombourquette/FirstYrChem/electro/index.htm>

### Battery University

The introduction states: "Battery University is an online resource that provides practical battery knowledge for engineers, educators, students, and battery users alike. The papers address battery chemistries, best battery choices, and ways to make your battery last longer." The site indeed contains a very wide range of information on a wide variety of batteries.

- Isidor Buchmann, Cadex Electronics Inc.
- <http://www.batteryuniversity.com/index.htm>

### Collecting the History of Fuel Cells

A good collection of historical notes about fuel cells, from the earliest days to the present, by the Smithsonian. They welcome your input. Contact them if you have any historical material, references, data, pictures, etc: "Through this website we are seeking historical materials relating to fuel cells. We have constructed the site to gather information from people already familiar with the technology—people such as inventors, researchers, manufacturers, electricians, and marketers."

- The Smithsonian Institution
- <http://americanhistory.si.edu/fuelcells/index.htm>

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## In the **NEXT** issue of **INTERFACE**

- **ECS SCIENCE AT ITS BEST** continues... The spring 2010 issue will conclude the two-part series (begun in the spring 2009 issue) featuring the most influential papers that have appeared in the *Journal of The Electrochemical Society*. The various Divisions within ECS will provide comments on these hand-picked papers, and perspectives on how they have had an impact on the progress in a given field of solid-state or electrochemical science and technology.
- The issue will contain a Special Meeting Section on the **217<sup>th</sup> ECS MEETING**, April 25-30, 2010, highlighting information on the featured speakers, award winners, and special events. The meeting is taking place in Vancouver, the home of the 2010 Olympic winter games.
- Be sure to check out two regularly-occurring departments: the popular **TECH HIGHLIGHTS**, where each article reviewed (from the *Journal of The Electrochemical Society* and *Electrochemical and Solid-State Letters*) is available free online; and the newest, **WEBSITES OF NOTE**, featuring websites of interest to the ECS community.

## Looking for Student News

Send all correspondence to

65 South Main Street  
Pennington, NJ 08534-2839, USA  
Tel: 609.737.1902  
Fax: 609.737.2743  
E-mail: [interface@electrochem.org](mailto:interface@electrochem.org)

ECS takes an active interest in the affairs of its Student Members, and is always interested in hearing from you about your interests, activities, and accomplishments.

**www.electrochem.org**

## Corporate Member News

### Spotlight on SWITCH Materials

**SWITCH MATERIALS INC.** ([www.switchmaterials.com](http://www.switchmaterials.com)) is the Society's newest Corporate Member. SWITCH was founded in 2006 by Dr. Neil Branda to develop a price-competitive smart-window solution for automotive manufacturers and building architects/owners. Using its patented technology, SWITCH delivers an innovative variable transmission film (VTF) that dynamically provides protection from heat, glare, and UV, thereby reducing energy costs while allowing users to

control and maximize natural lighting conditions. Located in Vancouver (BC, Canada), SWITCH provides advanced R&D, manufacturing capacity, and global distribution to serve the rapidly growing smart window market in North America, Europe, and Asia.

SWITCH's VTF is based on patented photo/electrochromic hybrid dyes that automatically darken when exposed to the sun to reduce solar heat gain and to shield building occupants and furnishings from the harmful effects of UV light. In low light conditions the tint can be cleared by the application of low voltage electricity to allow maximum benefit of natural lighting while saving on electric lighting costs.

SWITCH's unique materials can be processed from solution using inexpensive roll-to-roll film laminating techniques, allowing significant cost savings over alternative technologies and can be incorporated into OEM and window fabricator's product lines at low cost to maximize the leverage of existing distribution channels and minimize the requirement for capital-intensive manufacturing facilities. Currently in the commercialization phase, SWITCH is actively working to provide a full range of smart window films aimed at key suppliers for implementation into luxury automotive packages and new/retrofit building window systems. ■



## websites of note

by Zoltan Nagy

### Nomenclature, Definitions, and Standards

"When I use a word," (Alice was told in Wonderland) "it means just what I choose it to mean—neither more nor less". Well, scientists and engineers beg to differ. To permit meaningful communication in science and technology, there are some internationally agreed (or, at least, suggested) definitions and standards listed in the "IUPAC Recommendations and Technical Reports." Many of them are about electrochemistry, and hopefully they are followed by all.

- International Union of Pure and Applied Chemistry
- <http://electrochem.cwru.edu/estir/nom.htm>

### Application Notes for Electrochemical Instrumentation and Methods

Detailed notes on instrumentation and primers on measuring techniques for electrochemistry, electroanalysis, plating, and corrosion. Voltammetry, polarography, impedance measurements, potentiostats, reference electrodes, and much more.

- Princeton Applied Research
- <http://www.princetonappliedresearch.com/products/apnotes.cfm>

### Walther Nernst Memorial

A website dedicated to the memory of Walther Hermann Nernst (1864-1941). Nernst was the founder of the Physicochemical Institute (1895) at the University of Göttingen, the first institute fully devoted to physical chemistry and electrochemistry, and he was the second chair (after Leipzig). He was the discoverer of the "Nernst equation of electrode potentials" (1890) among many other accomplishments; and the winner of the Nobel Prize in Chemistry (1920).

- Ulrich Schmitt, University of Göttingen
- <http://www.nernst.de/>

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## websites of note

by Zoltan Nagy

### The Internet Archive of Old Books and Journals

"The Internet Archive" is building a digital library of Internet sites and other cultural artifacts in digital form. Like a paper library, it provides free access to researchers, historians, scholars, and the general public. Among the collections is "The Open Library," working to create a Web page for every book ever published, however, only in the absence of copyright restrictions, thereby limiting the collection to old books and journals. This site seems to concentrate on, but is not limited to, publications in English.

- Open-Access Text Archive
- <http://www.archive.org/details/texts>

### European Digital Library

There is a similar project also in Europe, provided by "La Bibliothèque nationale de France." This site seems to concentrate on, but is not limited to, French publications. This and the previous site are both fully searchable and the books and journals can be read on-line or downloaded in PDF format.

- Gallica Digital Library
- <http://gallica.bnf.fr/?lang=en>

### Old Electrochemistry Books Published in English

If you are looking for old electrochemistry books, you do not have to dig through the above sites; all the searching has already been done for you. The links are available at ESTIR in chronological order (or searchable by keywords) covering more than one hundred years, up to some books from the 1920s.

- Ernest B. Yeager Center for Electrochemical Sciences (YCES)
- <http://electrochem.cwru.edu/estir/old-books.htm>

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William D. Brown  
President

## Results of the 2010 Election of Officers and Slate for 2011

The ECS Tellers of Election have announced the results of the 2010 election of Society officers, with the following elected: President—William D. Brown, University of Arkansas; Vice-President—Tetsuya Osaka, Waseda University; and Treasurer—Christina Bock, National Research Council of Canada. The terms of Esther Takeuchi (Vice-President), Fernando Garzon (Vice-President), and Johna Leddy (Secretary) were unaffected by this election.

At the Board of Directors meeting in Vancouver, Canada on April 29, 2010, members of the Board of Directors voted to approve the slate of candidates recommended by the ECS Nominating Committee. The slate of candidates for the next ECS election of officers, to be held in January 2011, include: for President—Esther Takeuchi; for Vice-President (one to be elected)—Paul Kohl and Krishnan Rajeshwar. Full biographies and candidate statements will appear in the winter 2010 issue of *Interface*.



Tetsuya Osaka  
Vice-President



Christina Bock  
Treasurer



## websites of note

by Zoltan Nagy

### Cyclic Voltammetry and the Frontiers of Electrochemistry

In contrast to numerous other introductory books and lecture notes, which are largely thermodynamics oriented, this is a fairly detailed textbook of modern electrochemistry. Covering interfacial processes, charge-transfer kinetics and diffusion, adsorption, surface effects, redox processes, catalysis and inhibition, deposition/dissolution at the monolayer and bulk levels, photoelectrochemistry at metal and semiconductor electrodes, and some electroanalytical techniques in seventeen chapters available in PDF format.

- M. Noel and K. I. Vasu, CECRI
- michael-noel-electrochemistry.tripod.com/cvm.htm

### Resources for Electrochemistry

Information and collection of links about a wide variety of electrochemical topics that are difficult to find anywhere else. Reference electrodes, the Luggin probe, potentiostats, cyclic voltammetry, electrochemical impedance spectroscopy, quartz-crystal microbalance technique, meetings and short courses, bookstore, etc.

- Robert S. Rodgers, Research Solutions & Resources
- www.consultrsr.com/index.htm

### Fuel Cell History

This two-part paper gives a somewhat whimsical description of the development of the fuel cell from William Robert Grove through Charles Langer and Ludwig Mond, Francis Thomas Bacon, Harry Karl Ihrig, Willard Thomas Grub, Leonard Niedrach, Karl Kordesch, up to the 1980s. This history is written in the context of the hydrogen fueled automobile (transportation in general), a brief history of which is included with a number of examples and some nice old pictures.

George Wand, Fuel Cell Today

- www.fuelcelltoday.com/events/archive/2006-06/Fuel-Cell-History--Part-1
- www.fuelcelltoday.com/events/archive/2007-01/Fuel-Cell-History--Part-2

### About the Author

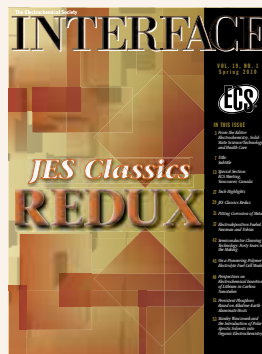
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## In the **NEXT** issue of **INTERFACE**

- The winter issue will feature the **ECS SENSOR DIVISION**, guest edited by Peter Hesketh, Georgia Tech Institute of Technology. Articles will include bio/nano sensors (quantum dots, disease screening and detection), sensors for energy and environmental security, smart sensors and sensor integration, and sensors for food safety and agriculture.
- **TECH HIGHLIGHTS** will continue to provide readers with free access to some of the most interesting papers published in the ECS journals.
- **HIGHLIGHTS FROM LAS VEGAS...** The winter 2010 issue will feature photos and reports from the 218<sup>th</sup> ECS meeting in Las Vegas.
- Don't miss the next edition of **WEBSITES OF NOTE** which gives readers a look at some little-known, but useful sites.

## Erratum

erratum



In the spring 2010 issue of *Interface*, on page 59, the Canadian Section News item listed David James as second place winner in the student poster awards for the November Canadian Section symposium in Halifax. The correct second place winner was awarded to Rodney Smith, Department of Chemistry, Memorial University of Newfoundland.



## websites of note

by Zoltan Nagy

### Experiments in Electrochemistry

The "Fun Science Gallery" presents "fun, simple, low cost science experiments for amateur scientists and for motivating children to engage in science" for quite a variety of disciplines including electrochemistry. "Building a lemon battery or even a tomato battery, measuring the conductivity of water, performing galvanic deposits, are only a few of the fun and educational experiments described." Volta's pile, the Daniell cell, and concentration cells are also described and instructions given how to build them.

- Giorgio Carboni
- [http://www.funsci.com/fun3\\_en/electro/electro.htm](http://www.funsci.com/fun3_en/electro/electro.htm)

### Technical Notes on Electrochemical Techniques

A number of detailed Technical Bulletins, Technical Notes, and Applications Notes, mainly about electrochemical impedance spectroscopy (EIS) available in PDF format. To be used for basic research, applications for fuel cells, batteries, corrosion, bioimpedance, civil engineering, and solid state materials. Basic mathematical theory, instrumentation, and applications. Also potentiodynamic polarization scan technique and cell design. Includes also a searchable collection of 140 published papers that refer to experiments carried out in these areas.

- Solartron Analytical
- <http://www.solartronanalytical.com/Pages/ApplicationTechnicalNotes.htm>

### Electrochemistry for Corrosion

Very detailed description of electrochemical aspects of corrosion. Electrochemical theory of corrosion, basics of electrochemical instrumentation, cell designs, and electrochemical measurement techniques for corrosion measurements. Describes steady-state and potential sweep methods, transient methods, AC impedance measurements (electrochemical impedance spectroscopy), and electrochemical noise methods.

- R. A. Cottis and A. Llewellyn, University of Manchester
- [http://corrosiontest.its.manchester.ac.uk/lecturenotes/Echem/index\\_main.htm](http://corrosiontest.its.manchester.ac.uk/lecturenotes/Echem/index_main.htm)

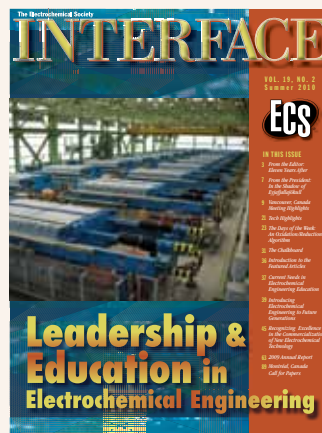
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## In the **NEXT** issue of **INTERFACE**

- **CARBON-BASED NANOMATERIALS** in general and graphene in particular have attracted much attention in recent months. The spring 2011 issue will feature a series of articles on graphene-related R&D.
- **MONTREAL MEETING SPECIAL SECTION...** The spring issue will feature highlights from the upcoming ECS meeting in Montreal, Canada, including photos and biographies of all major award winners, special meeting events, and hotel and travel information.
- **TECH HIGHLIGHTS** will continue to provide readers with free access to some of the most interesting papers published in the ECS journals.
- Don't miss the next edition of **WEBSITES OF NOTE** which gives readers a look at some little-known, but useful sites.

## Erratum



In the summer 2010 issue of *Interface*, on page 21, the Tech Highlights column contained an error. In the first highlight ("A Solid-State, Rechargeable, Long Cycle Life Lithium-Air Battery," *J. Electrochem. Soc.*, **157**, A50), "LiO<sub>2</sub>" was used throughout the highlight, instead of "Li-O<sub>2</sub>".



## websites of note

by Zoltan Nagy

### Graphene-based Electrochemical Sensors and Biosensors: A Review

Graphene, emerging as a true 2-dimensional material, has received increasing attention due to its unique physicochemical properties (high surface area, excellent conductivity, high mechanical strength, and ease of functionalization and mass production). This article selectively reviews recent advances in graphene-based electrochemical sensors and biosensors. In particular, graphene for direct electrochemistry of enzyme, its electrocatalytic activity toward small biomolecules (hydrogen peroxide, NADH, dopamine, etc.), and graphene-based enzyme biosensors have been summarized in more detail; graphene-based DNA sensing and environmental analysis have been discussed. Future perspectives in this rapidly developing field are also discussed.

- Y. Shao, *et al.*, Pacific Northwest National Laboratory
- [http://www.princeton.edu/~cml/assets/pdf/pu\\_10\\_22shao.pdf](http://www.princeton.edu/~cml/assets/pdf/pu_10_22shao.pdf)

### Graphene-based Electrochemical Supercapacitors

Graphenes prepared by three different methods have been investigated as electrode materials in electrochemical supercapacitors. The samples prepared by exfoliation of graphitic oxide and by the transformation of nano diamond exhibit high specific capacitance in aq. sulphuric acid, the value reaching up to 117 F/g. By using an ionic liquid, the operating voltage has been extended to 3.5 V (instead of 1 V in the case of aq. sulphuric acid), the specific capacitance and energy density being 75 F/g and 31.9 Wh/kg respectively. This value of the energy density is one of the highest values reported to date. The performance characteristics of the graphenes which are directly related to the quality, in terms of the number of layers and the surface area, are superior to that of single-walled and multi-walled carbon nanotubes.

- S. R. C. Vivekchand, *et al.*, Jawaharlal Nehru Centre for Advanced Scientific Research
- <http://www.ias.ac.in/chemsci/Pdf-Jan2008/9.pdf>

### Public Domain Information – Free Software for Electrochemistry

Visit this site if you need computer programs to simulate or evaluate data from a wide variety of electrochemical techniques. Impedance spectroscopy, voltammetry, cyclic voltammetry, square wave voltammetry, chronoamperometry, sampled dc polarography, potentiometric titration curves, pH and acid-base equilibrium calculations, controlled-potential/controlled-current transient methods, and chemical reaction network toolbox. Links are also included to a number of bibliographies: books, proceedings, review chapters, and research papers.

- Ernest B. Yeager Center for Electrochemical Sciences (YCES)
- <http://electrochem.cwru.edu/estir/pdi.htm>

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Name \_\_\_\_\_ Membership No. \_\_\_\_\_

#### Old address

Organization \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

City \_\_\_\_\_

State/Province \_\_\_\_\_

Postal Code \_\_\_\_\_

Country \_\_\_\_\_

E-Mail \_\_\_\_\_

#### New address

Organization \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

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City \_\_\_\_\_

State/Province \_\_\_\_\_

Postal Code \_\_\_\_\_

Country \_\_\_\_\_

E-Mail \_\_\_\_\_

Phone \_\_\_\_\_

Fax \_\_\_\_\_





## websites of note

by Zoltan Nagy

### History of Electrodeposition

Some of the very early papers describing the discovery of electroplating in various forms can be found at this site. Several papers reported rough (dendritic/mossy) electrodeposition of metals almost immediately after Volta's discovery of the "pile." The first ones were probably Nicholson and Carlisle, and independently, Cruickshank. The first real electroplating, gold plating of coins, was reported soon thereafter by Brugnatelli. Decades later, the discovery of "electroforming or electrotyping" was reported independently by De la Rue and Jacobi.

- Ernest B. Yeager Center for Electrochemical Sciences (YCES)
- <http://electrochem.cwru.edu/estir/history.htm>

### Electroplating

A book chapter on electroplating, describing the basic electrochemistry background, surface preparation, direct current electrodeposition, pulse plating, laser-induced metal deposition. Types of electroplating processes: mass plating, rack plating, continuous plating, in-line plating. Types of metal coatings: sacrificial coatings, decorative protective coatings, engineering coatings, minor metal coating, unusual metal coating, alloy coatings, multilayered coatings, composite coatings, conversion coatings, anodized coatings. Related processes: electroless deposition (autocatalytic plating), immersion plating, electroforming.

- H. Lou (U. Lamar, Beaumont, TX) and Y. Huang (Wayne State U., Detroit, MI)
- [http://chem1.eng.wayne.edu/~yhuang/Papers/Book\\_Plating\\_ECHP.pdf](http://chem1.eng.wayne.edu/~yhuang/Papers/Book_Plating_ECHP.pdf)

### Application Notes

A large collection of application notes, including galvanostatic and potentiostatic techniques, impedance spectroscopy, corrosion measurements, testing of batteries, fuel cells, supercapacitors, etc.; handbook of electrochemical impedance spectroscopy; interactive transfer function library; interactive equivalent circuit library; and interactive faradaic impedance library.

- Bio-Logic USA
- <http://www.bio-logic.info/potentiostat/notes.html#an>

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(The Electrochemical Society, 65 South Main Street, Building D, Pennington, NJ, 08534-2839, USA)

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## websites of note

by Zoltan Nagy

### Frequently Asked Questions about Lead-Acid Batteries

Detailed information about many practical aspects of car batteries: "car, power sports (including motorcycle), truck, boat, marine, recreational vehicle, solar, and other starting and deep cycle applications." Consequently, largely limited to lead acid batteries. Contains also hundreds of links to other battery informational sites, to battery manufacturers, and many battery related accessories (chargers, etc.).

- Car Battery and Deep Cycle Batteries (W. Darden)
- <http://www.batteryfaq.org>

### Education about Lithium Batteries

"A resource that includes helpful articles on battery replacements, battery news, and battery technologies. Throughout this battery resource you will find articles covering a wide variety of battery topics." Limited mostly to lithium batteries and their uses, such as iPod batteries, digital camera batteries, etc.

- BatteryEducation.com
- [http://www.batteryeducation.com/battery\\_article\\_index/index.html](http://www.batteryeducation.com/battery_article_index/index.html)

### General Battery Chemistry FAQ

A general battery site containing information about many primary and secondary battery types. "Batteries come in a lot of different varieties. The most common are carbon-zinc, alkaline, lead acid, nickel metal hydride, nickel cadmium, and lithium ion. But there are many other battery chemistries, each with their own advantages and disadvantages. The different battery designs currently used, some of the chemistry involved, and advantages and disadvantages of each design are discussed."

- PowerStream Technology
- <http://www.powerstream.com/BatteryFAQ.html>

### About the Author

**ZOLTAN NAGY** is a semi-retired electrochemist. After 15 years in a variety of electrochemical industrial research, he spent 30 years at Argonne National Laboratory carrying out research on electrode kinetics and surface electrochemistry. Presently he is at the Chemistry Department of the University of North Carolina at Chapel Hill. He welcomes suggestions for entries; send them to [nagyz@email.unc.edu](mailto:nagyz@email.unc.edu).

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## websites of note

by Zoltan Nagy

### Biographical Memoirs of American Scientists

Many hundreds of "Biographical Memoirs" are available, published by "The National Academies Press," covering American scientists from a wide variety of disciplines, including some connected to electrochemistry.

- <http://books.nap.edu/html/biomems>

### Raymond Matthew Fuoss (by M. A. Coplan)

Physical chemist with a strong interest in the conductance of electrolytes and irreversible processes in electrolytes, Fuoss's work included all aspects of electrolytic conductivity from the development of new instruments and techniques to high quality conductance data and the theoretical development of ever more refined conductance equations. He determined conductance for the wide variety of solvents and solutes over a wide range of dielectric constant, viscosity, and temperature.

- <http://books.nap.edu/html/biomems/rfuoss.pdf>

### Izaak Maurits Kolthoff (by J. F. Coetzee)

Widely regarded as the father of modern analytical chemistry. He contributed significantly to electroanalytical chemistry. He developed the theory of potentiometric and conductometric titrations and studied voltammetry on dropping mercury electrodes, and on solid microelectrodes. He also worked on the colorimetric and potentiometric determination of pH, the pH concept, titrations, indicators, and buffers.

- <http://books.nap.edu/html/biomems/ikolthoff.pdf>

### Charles Norwood Reilley (by R. W. Murray)

Analytical chemist with strong interest in electrochemical analysis. He devised many instrumental methods for detection of chemical reactions as they reached stoichiometric completion, using polarized electrodes, coulometry, high frequency impedance, optical absorbance, and nuclear magnetic resonance. He contributed to early understanding of chronopotentiometry and thin layer electrochemistry. He invented a membrane electrode that was commercialized for determination of dissolved oxygen in natural waters. He was interested in high frequency titrimetry and constant current coulometric analysis.

- <http://books.nap.edu/html/biomems/creilley.pdf>

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## websites of note

by Zoltan Nagy

### Science Prize for Online Resources in Education (SPORE) Winners

The Science Prize for Online Resources in Education (SPORE) has been established to encourage innovation and excellence in education, as well as to encourage the use of high-quality online resources by students, teachers, and the public. Essays from the SPORE winners are published each month in *Science*, and are collected at this site. Large variety of educational sites, covering all fields of science, including chemistry, physics, biology, astronomy, geology, you name it, they have it. The award is sponsored by the American Association for the Advancement of Science.

- <http://www.sciencemag.org/site/special/spore/>

### Electrochemical Educational Outreach Sites

Popular science style information for the general public about all aspects of electrochemistry. The Electrochemistry Encyclopedia contains more than forty articles written in simple language by international experts in the field, linked for definitions to the Electrochemistry Dictionary. The latter contains more than one thousand simple definitions of words and phrases often used in electrochemistry. The Encyclopedia articles cover topics such as batteries, fuel cells, electroplating, sensors, electroanalytical chemistry, electrochemical engineering, industrial electrolysis, corrosion, photoelectrochemistry, archaeological uses, animal and plant electrochemistry, just to mention a few. Many more articles are presently written and planned. Hosted by the Ernest B. Yeager Center for Electrochemical Sciences at Case Western Reserve University.

- <http://electrochem.cwru.edu/encycl/>
- <http://electrochem.cwru.edu/ed/dict.htm>

### Chemtutor — A General Chemistry Educational Site

Chemistry help is available here for high school or college students. Chemtutor begins with the fundamentals and gives expert help with the most difficult phases of understanding your first course in chemistry.

- <http://chemtutor.com/>

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## In the **NEXT** issue of **INTERFACE**

- **LI ION BATTERY SAFETY** is the theme of the summer 2012 issue of *Interface*. Guest edited by **Dan Doughty** (of Battery Safety Consulting, Inc.), the articles will focus on: a "General Discussion of Battery Safety," by **Dan Doughty and Pete Roth**; "How Electrolytes Influence Battery Safety," by **Chris Orendorff and Pete Roth**; "Battery Safety Qualification," by **Judy Jeevarajan and Clint Winchester**; "Battery Modeling of Safety Events," by **Bob Spotnitz and Rick Muller**; and "How Separators Influence Battery Safety," by **Chris Orendorff and Rick Pekala**.

- **HIGHLIGHTS FROM THE ECS SPRING 2012 MEETING IN SEATTLE...** View some photos from the spring 2012 ECS meeting, including award presentations and a summary of the first-ever Clean Water Technologies Symposium.
- **TECH HIGHLIGHTS** will continue to provide readers with free access to some of the most interesting papers published in the ECS journals.
- Don't miss the next edition of **WEBSITES OF NOTE** which gives readers a look at some little-known, but very useful sites.





## websites of note

by Zoltan Nagy

### Automotive Battery Training Manual

A very detailed manual on the use and care of lead-acid batteries, including important hazard warnings and safety instructions. Safety precautions. How a battery works. Battery construction. Battery ratings. Effects during discharge. Effects during charging. Battery care and maintenance. Common battery causes of failure. New battery installation. Battery testing.

- First National Battery Company
- <http://www.battery.co.za/download/dl/AutoTrainMan.pdf>

### Lithium Batteries

Variety of information on lithium batteries. General safety precautions for using, handling, and designing. General features. Coin type rechargeable lithium batteries. Comparison table of lithium battery types. Applications. Selecting a battery. Battery selector chart.

- Panasonic Corporation
- <http://industrial.panasonic.com/www-data/pdf/AAA4000/AAA4000PE12.pdf>

### Battery Handbooks

Several detailed handbooks on different battery systems. Alkaline. Alkaline miniature. Carbon zinc. Lithium iron disulfide. Lithium-photo/coin. Nickel-metal hydride. Silver oxide. Zinc air miniature.

- Energizer Battery Manufacturing Company
- <http://data.energizer.com/Static.aspx?Name=AppManuals>

### Gamry Instruments

Electrochemical Instrumentation and Application Notes

A variety of application and technical notes about electrochemical instrumentation and measuring techniques; many related to batteries, supercapacitors, and corrosion. Impedance spectroscopy, quartz crystal microbalance, potentiostats, faraday cage, reference electrodes, etc.

- <http://www.gamry.com/application-notes>

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## In the **NEXT** issue of **INTERFACE**

- **REDCAT™**... The Society's new professional search and networking site is the cover story for the fall 2012 issue of *Interface*. Find out about the latest additions to the site, including a job board. Find a group you'd like to join, such as the one to discuss Li ion batteries, or start your own discussion. See the latest research coming from one of several scientific news feeds, and see who's recently joined. There's a lot to see, learn, and do on Redcat.
- **CONDUCTING POLYMERS** will also be featured in the fall 2012 issue. Guest edited by **Durga Misra** and **Peter Hesketh**, the issue will include several feature articles: "Novel MEMS Devices

Based on Conductive Polymers," by **Seiichi Takamatsu** and **Toshihiro Itoh**; "Nanoparticle-doped Electrically Conducting Polymers for Flexible Nano-Micro Systems," by **Ajit Khosla**; and "Electrochemical Assay of GSTP1-Related DNA Sequences for Prostate Cancer Screening," by **Amir H. Saheb, Michelle Leon, and Mira Josowicz**.

- **TECH HIGHLIGHTS** continues to provide readers with free access to some of the most interesting papers published in the ECS journals, including articles from the Society's newest journals: *ECS Journal of Solid State Science and Technology*, *ECS Electrochemistry Letters*, and *ECS Solid State Letters*.
- Don't miss the next edition of **WEBSITES OF NOTE** which will focus on all the ECS websites: the new ECS Digital Library, the ECS home site, and Redcat.







## websites of note

by Zoltan Nagy

### Welcome Redcat

A new electrochemistry community networking site is now online. Discover what the community is talking about by connecting to your community globally. Share ideas and develop new research streams with your peers—talk to them, learn from them, help mentor them. Build your profile and add work experience, add articles you've recently written, affiliations, your photo, add any special events or meetings you will be attending in the coming months as a speaker, organizer, or registrant, and much more. Join a discussion group on a favorite topic of your interest, or if you cannot find one, start it yourself and make yourself the moderator if you wish. Make Redcat your one-stop connection to people, breaking research and news, and important events. The newest feature of Redcat is a Jobs and Resumes listing page. Redcat also has a powerful and versatile research feature that you can use on any topic of your interest; you can also collect your searches and results and save them in Redcat for later reference and use. Created by ECS, Redcat is free to join.

- <http://redcatresearch.org/>

### ECS Website

The Society itself has a site filled with a large amount of information available to members and nonmembers alike. This has been available for a long time, so it is the granddaddy of Redcat. You can find detailed information on past, present, and future meetings to help you plan ahead. The Divisional and Committee structure of the Society and all the Sectional activities are included. You can use the bookstore to purchase (members at discount) monograph volumes of the Society and all issues of *ECS Transactions*. There is a Membership Directory to find a long lost colleague. Awards, Short Courses and Professional Development Workshops, and a special student section: Student Chapters, travel grants and discounts, etc. You can read the full content of the most recent and all older *Interface* issues, and you can find information on the history of the Society. All available at the ECS site.

- <http://www.electrochem.org/>

### ECS Digital Library

One of the richest sources is the Digital Library. ECS's legacy content of nearly 100,000 papers and abstracts, All present and past (to 1902) publications of the Society will eventually be available, in fully searchable form. The four ECS journals, *Interface*, *ECS Transactions*, and recent *ECS Meeting Abstracts* are fully available now. This includes the continuation of the *Journal of The Electrochemical Society*, and the three new publications that were started recently (*ECS Journal of Solid State Science and Technology*, *ECS Electrochemistry Letters*, and *ECS Solid State Letters*). Full text research articles are available for members and subscribers, while the table of contents and abstracts of the research articles and the full content of the *Interface* and *ECS Meeting Abstracts* is available free to all. This content is immediately and widely disseminated to more than 1,000 academic, research, and corporate libraries worldwide. The ECS journals are the only top journals in electrochemistry still published by a nonprofit, scholarly society.

- <http://www.ecsdl.org/>

### Electrochemistry and Neuroscience

Provides a brief history of electrochemistry, with special emphasis on its connection to neuroscience. Subsequently, it treats modern electrochemistry and its relation with neurology, with a somewhat critical and new approach, something that may be subject to considerable discussion, approval, or rejection. But maybe this is what makes it worth reading.

- G. C. O'Kelly (San Luis Laboratories)
- <http://httpprints.yorku.ca/archive/00000144/00/UNEVEN5x.pdf>

### Exploring the Potential of Electrodialysis

A general treatment of electrodialysis with some suggested laboratory experiments. Electrodialysis is an electrochemical membrane separation technique for ionic solutions. It can be used in the separation and concentration of salts, acids, and bases from aqueous solutions, the separation of monovalent ions from multivalent ions, and the separation of ionic compounds from uncharged molecules. Industrial applications encompass several industries and include the production of potable water from brackish water, removal of metals from wastewater, demineralization of whey, deacidification of fruit juices, and the removal of organic acids from fermentation broth. Included are experimental investigations of the practical engineering aspects of electrodialysis: operating parameters such as concentrate concentration, applied voltage, the number of membrane pairs, flow rate, feed concentration, and temperature.

- S. Farrell, R. P. Hesketh, and C. S. Slater (Rowan U.)
- <http://www.che.utexas.edu/nams/farrell.pdf>

### Ceramic Films Using Cathodic Electrodeposition

Electrodeposition is evolving as an important method in ceramic processing. Two processes for forming ceramic films by cathodic electrodeposition are electrophoretic deposition, in which suspensions of ceramic particles are used, and electrolytic deposition, which is based on the use of metal salts solutions. Electrolytic deposition enables the formation of thin ceramic films and nanostructured powders; electrophoretic deposition is an important tool in preparing thick ceramic films and body shaping.

- I. Zhitomirsky (McMaster U.)
- <http://www.tms.org/pubs/journals/JOM/0001/Zhitomirsky/Zhitomirsky-0001.html>

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## websites of note

by Zoltan Nagy

### The 2000 Nobel Prize in Chemistry

Alan Heeger, Alan G. MacDiarmid, and Hideki Shirakawa were the awardees "for the discovery and development of conducting polymers." The site contains details of the award ceremony, the Nobel lectures, and details about the biography and accomplishments of the awardees.

- [http://www.nobelprize.org/nobel\\_prizes/chemistry/laureates/2000/](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2000/)

### Conducting Polymers

A very detailed treatment of conducting polymers. Including electron-conducting, proton-conducting, and ion-conducting polymers. The theory and mechanism of conduction, and some practical uses. It treats in detail more than ten different conducting polymers, providing their molecular structures and their reactions.

- J. Steinke, Imperial College, London
- <http://www.ch.ic.ac.uk/local/organic/tutorial/steinke/4yrPolyConduct2003.pdf>

### Application Guide for Aluminum Electrolytic Capacitors

The site contains detailed description of production techniques of electrolytic capacitors, comparison to other types of capacitors, their electrical characteristics, and instructions for their correct and safe usage techniques. In spite of the dominance of printed circuit boards, these "old-fashioned" capacitors still have many uses and applications today.

- Cornell Dubilier, Liberty, SC
- <http://electrochem.cwru.edu/encycl/misc/c04-appguide.pdf>

### Ion-selective Electrode Measurements, A Beginner's Guide

Basic information on ISEs. Including: basic theory of ISE measurements; types of ion selective electrodes; reference electrodes; problems with ISE measurements; calibration theory; calibration practice; measuring procedures; methods of analysis; types of measuring devices and data processing; recent developments; recent research into corrections for interfering ions; and Internet links and bibliography.

- C. C. Rundle, Nico2000, London
- <http://www.nico2000.net/Book/Guide1.html>

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## 223<sup>rd</sup> ECS Meeting

### Annual Society Luncheon and Business Meeting

The Annual Society Luncheon and Business Meeting will take place on Tuesday, May 14, starting at 1215h. The President, Secretary, and the Treasurer will give brief reports on the current state of the Society, and the Student Poster Award presentation will take

place at this annual business luncheon. All members and meeting attendees are welcome to participate in this event. Tickets are \$27.00 by Early-Bird deadline, and \$32.00 onsite. See page 17 more information about the Toronto meeting, including how to register.



## websites of note

by Zoltan Nagy

### Nanoelectrochemistry: Metal Nanoparticles, Nanoelectrodes, and Nanopores

A recent detailed review of nanoelectrochemistry: electrochemistry of metal nanoparticles; voltammetry of solutions of isolatable nanoparticles; electrochemistry of films of nanoparticles; electrochemistry at nanoscopic electrodes; and electrochemistry at single nanopores.

- R. W. Murray (UNC at Chapel Hill)
- [http://mccarley.chemistry.lsu.edu/Chemistry7750/F2009/Nanoelectrochemistry%20-%20Metal%20Nanoparticles%20Nanoelectrodes%20and%20Nanopores%20\(Royce%20W%20Murray\).pdf](http://mccarley.chemistry.lsu.edu/Chemistry7750/F2009/Nanoelectrochemistry%20-%20Metal%20Nanoparticles%20Nanoelectrodes%20and%20Nanopores%20(Royce%20W%20Murray).pdf)

### Electron Transfer in Functionalized Fullerenes

A considerable amount of work concerning systems in which C<sub>60</sub> is an electron acceptor has been published. The fundamental principles behind fullerene donor-acceptor systems are revisited and the experimental methods available for the study of these systems is presented. Potential applications of photoinduced electron transfer systems. Intermolecular charge transfer complexes involving fullerenes.

- P. J. Bracher and D. I. Schuster (New York U.)
- <http://www.paulbracher.com/laboratory/pubs/pub0001.pdf>

### Electrochemistry of Carbon Nanotube Composite Electrodes

A new type of composite electrode based on the combination of carbon nanotubes and sol-gel technology is reported. This approach combines the advantages of sol-gel based ceramic materials with the favorable electrochemistry of carbon nanotubes. The characteristics of the designed electrodes are controlled by altering the nature (in terms of methyl, ethyl or propyl-derived silane precursor) or the amount of the sol used. The composite electrodes exhibit well-defined electrochemical properties with superior characteristics compare to other carbon based composite electrodes.

- L. G. Bachas (U. of Kentucky)
- [http://acs.omnibooksonline.com/data/papers/2001\\_18.5.pdf](http://acs.omnibooksonline.com/data/papers/2001_18.5.pdf)

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## websites of note

by Zoltan Nagy

### Guide to Electrochemical Technology for Synthesis, Separation, and Pollution Control

Chemical manufacturers and users are daily faced with decisions associated with the need to improve chemical processes (e.g., increase selectivity, separate difficult mixtures, decrease energy consumption, recover the value of chemicals in waste streams, minimize the discharge of a toxic by-product, etc). This Guide seeks to show that modern electrochemical technology can offer the preferred solution to a range of problems, and several illustrative examples are described. What is electrolysis? Applications of electrochemical technology. Why consider electrolysis now? Will electrochemical technology solve your problem? Examples of electrolytic processes.

- D. Pletcher (U. of Southampton)
- <http://www.electrosynthesis.com/pdfs/Guide.pdf>

### Electrochemical Technology for Environmental Treatment and Clean Energy Conversion

The applications of electrochemical technology in environmental treatment, materials recycling, and clean synthesis are briefly reviewed. The diversity of these applications is shown by the number of industrial sectors involved. The scale of operation ranges from microelectrodes to large industrial cell rooms. The features of electrochemical processes are summarized. Electrochemical reactors for energy conversion are also considered, with an emphasis on load-leveling and proton-exchange membrane (PEM) (hydrogen–oxygen) fuel cells.

- F. C. Walsh (U. of Bath)
- <http://www.iupac.org/publications/pac/2001/pdf/7312x1819.pdf>

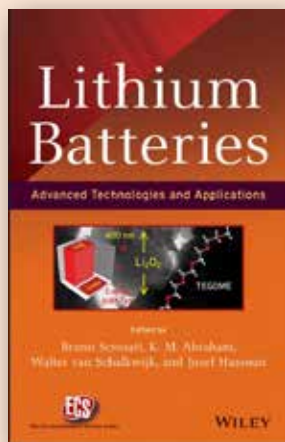
### Electrodialysis

Electrodialysis is used to transport salt from one solution, the diluate, to another solution (concentrate) by applying an electric current. This is done in an electrodialysis cell providing all necessary elements for this process. The concentrate and diluate are separated by a membrane into the two different process streams (concentrate and diluate), an electric current is applied, moving the salt over the membrane. Applications are: desalination of salt water, stabilization of wine, whey demineralization, pharmaceutical applications, pickling bath recycling, etc.

- PCA - Polymerchemie Altmeier GmbH
- <http://www.pca-gmbh.com/appli/ed.htm>

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## 224<sup>th</sup> ECS Meeting Highlight

ECS celebrates the publication of  
***Lithium Batteries—Advanced Technologies and Applications***

**Meet, greet, and chat with some of the editors!**  
**Plus, enter to win\* a signed copy of *Lithium Batteries***

**When:** Wednesday, October 30, 2013 • See Meeting Program for time.

**Where:** ECS Booth in the 224<sup>th</sup> ECS Meeting Technical Exhibit

\*Please refer to the 224<sup>th</sup> ECS Meeting Program for further details about the time and location of this event. No purchase is necessary but you must be present to win. Official rules available upon request to [ecs@electrochem.org](mailto:ecs@electrochem.org).

**You must be present at the Meet and Greet Book Signing & Giveaway to be eligible to win.**

Please check your meeting badge sheet for your book giveaway entry ticket and the 224<sup>th</sup> ECS Meeting Program for more details.



## websites of note

by Zoltan Nagy

### The Aluminum Smelting Process: How the Hall-Heroult Process Works

A detailed description of the high-temperature molten-salt electrolysis process. Aluminum properties. Discovery and extraction - a brief history. Process basics. Detailed description of a cell and its basic functioning. How an aluminum smelter is made, Process thermodynamics - enthalpy, free energy, cell voltage. The voltage drop in the electrolyte. Some important figures. Bath chemistry. Electrolyte properties. Current efficiency. Cell thermal balance. Anode effect. Influence of magnetic fields.

- <http://www.aluminum-production.com/>

### Electrochemical Reactions - Electrolytic Cells

Fairly detailed discussion of general electrochemistry, minus kinetics. Voltaic cells. Predicting spontaneous redox reactions from the sign of  $E^\circ$ . Standard-state reduction half-cell potentials. The Nernst equation. Faraday's law. The electrolysis of aqueous and high-temperature molten NaCl. Electrolysis of water.

- Department of Chemistry, Purdue University
- <http://chemed.chem.purdue.edu/genchem/topicreview/bp/ch20/electro.php>
- <http://chemed.chem.purdue.edu/genchem/topicreview/bp/ch20/faraday.php>

### Electrochemical Processing of Refractory Metals in High-Temperature Molten-Salts

The refractory metals comprise the elements Ti, Zr, Hf, V, Nb, Ta, Cr, Mo, and W. They are also known as the transition elements and are found in the periodic table in Groups 4, 5, and 6. Electrochemical processing is used extensively in the primary extraction of these metals (electrowinning), the purification and recycling (electrorefining), and the formation of coatings (electroplating). Electrolysis in fused salts as well as other nonaqueous media has enormous potential for materials processing. First, because of the special attributes of nonaqueous electrolytes, electrochemical processing in these media has an important role to play in the generation of advanced materials with specialized chemistries or tailored microstructures (electrosynthesis). Second, as environmental quality standards rise beyond the capabilities of classical metals extraction technologies to comply, electrochemical processing may prove to be the only acceptable route from ore-to-metal.

- D. R. Sadoway, (MIT)
- <http://web.mit.edu/dsadoway/Desktop/dsadoway/www/58.pdf>

### About the Author

ZOLTAN NAGY is a semi-retired electrochemist. After 15 years in a variety of electrochemical industrial research, he spent 30 years at Argonne National Laboratory carrying out research on electrode kinetics and surface electrochemistry. Presently he is at the Chemistry Department of the University of North Carolina at Chapel Hill. He welcomes suggestions for entries; send them to [nagyz@email.unc.edu](mailto:nagyz@email.unc.edu).





## websites of note

by Zoltan Nagy

### Physical Properties of Ionic Liquids: Database and Evaluation

A comprehensive database on physical properties of ionic liquids, which was collected from 109 published sources spanning the period from 1984 through 2004. There are 1680 pieces of data on the physical properties for 588 available ionic liquids. From these the values for 276 kinds of cations and 55 kinds of anions were extracted. Contents: 1. The Classification of Ionic Liquids. Phase transition temperature: Melting point, Glass Transition Point, Decomposition Point, Freezing Point, and Clearing Point. 2. Density, Viscosity and Surface Tension. 3. Conductivity, Polarity, and Electrochemical Window. 43 pages.

- S. Zhang, et al., Chinese Academy of Sciences
- <http://www.nist.gov/data/PDFfiles/jpcrd721.pdf>

### A Catalog of Commercially Available Ionic Liquids

Ionic liquids are ionic, salt-like materials that are liquid below 100 °C. Their use can be classified as process chemicals (e.g., solvents, separation media) and performance chemicals (e.g., electrolytes, lubricants). Ionic liquids tend to have appealing solvent properties and are miscible with water or organic solvents. Sigma-Aldrich offers a market-leading range of ammonium, imidazolium-, phosphonium-, pyridinium-, pyrrolidinium-, sulfonium, etc.-based ionic liquids.

- Sigma-Aldrich
- <http://www.sigmaaldrich.com/chemistry/chemistry-products.html?TablePage=16255866>

### A Listing of Recent Publications on Ionic Liquids

The peer-reviewed articles on this *ChemComm* web themed issue highlight recent cutting edge achievements from prominent scientists working on all aspects of ionic liquid chemistry. Contributions range from new fundamental knowledge to novel applications of ionic liquids that take advantage of their unique attributes. The guest editors for this issue are Robin D. Rogers (University of Alabama), Douglas MacFarlane (Monash University) and Suojian Zhang (Institute of Process Engineering).

- Royal Society of Chemistry
- <http://pubs.rsc.org/en/journals/articlecollectionlanding?sercode=cc&themeid=d3759160-edca-4baf-871d-b8873930c974>

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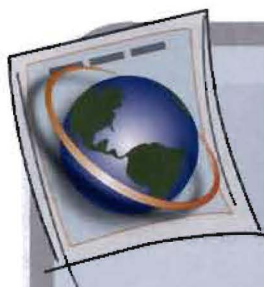
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## websites of note

by Zoltan Nagy

### Physical and Interfacial Electrochemistry

Ion-solvent interactions. Ion-ion interactions. Electrochemical thermodynamics. Electrode-solution interface. Electrode kinetics. Material transport. Hydrodynamic electrodes. (Lecture notes)

- M. Lyons, Trinity College
- <http://chemistry.tcd.ie/undergraduate/chemistry/js/CH3304/index.php>

### Surface Electrochemistry and Reactivity

The surface of the metal substrate. Platinum single crystals. Charge displacement and anion adsorption. Adatom adsorption. Foreign adatom layers. Potential of zero total charge.

- J. M. Feliu and E. Herrero, Universitat d'Alacant
- <http://publicacions.iec.cat/repository/pdf/00000168%5C00000016.pdf>

### Analytical Electrochemistry: A Laboratory Manual

Cyclic voltammetry at solid electrodes. Cyclic voltammetry with a microelectrode. Chronoamperometry with a planar solid electrode. Cyclic voltammetry of dopamine: an *ec* mechanism. Analysis of trace lead in water by anodic stripping voltammetry. Acetaminophen (Tylenol): electroanalytical study of acetaminophen by cyclic voltammetry. Ascorbic acid (vitamin C): a cyclic voltammetric study of its oxidation at a glassy carbon electrode.

- T. Kuwana, University of Kansas
- [http://www.asdlib.org/onlineArticles/elabware/kuwanaEC\\_lab/ec\\_labmanual1.htm](http://www.asdlib.org/onlineArticles/elabware/kuwanaEC_lab/ec_labmanual1.htm)

### Analytical Electrochemistry: The Basic Concepts

Electrochemistry is something that is seldom studied and yet is all around us, including the control circuitry of our body. We are familiar with lightning that reverberates with thunder in a rainstorm, with batteries that power flashlights and hybrid autos, and with sensor devices such as smoke and carbon dioxide detectors, or glucose analyzers for monitoring diabetes. All rely on or exhibit some basic electrochemistry. To understand electrochemical phenomenon we need to have some understanding of basic concepts and the language that conveys these concepts. It is the goal of this module to get you started – so you can explore further as you wish. Web-links and hardcopy references are provided to assist you in that process.

- R. S. Kelly, East Stroudsburg University
- [http://www.asdlib.org/onlineArticles/ecourseware/Kelly\\_Potentiometry/EC\\_CONCEPTS1.HTM](http://www.asdlib.org/onlineArticles/ecourseware/Kelly_Potentiometry/EC_CONCEPTS1.HTM)

### ElectroChemical DataBase: Gibbs energies of transfer

This searchable collection lists the Gibbs energies of transfer for ions partitioning between water and a mutually immiscible solvent. The solvents listed are 1,2-dichloroethane, 1,6-dichlorohexane, 2-heptanone, 2-octanone, NPOE-nitrophenyloctylether, trifluorotoluene, acetophenone, nitrobenzene and o-dichlorobenzene.

- H. H. Girault, École polytechnique fédérale de Lausanne
- <http://sbsrv7.epfl.ch/instituts/isic/lepa/cgi/DB/InterrDB.pl>

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### Lecture Notes in Electrochemistry/Electrochemical Engineering

Detailed course material from MIT, including: equivalent circuit models, thermodynamics, reaction kinetics, transport phenomena, electrostatics, electrokinetics, porous media, and phase transformations.

- M. Bazant, MIT
- <http://ocw.mit.edu/courses/chemical-engineering/10-626-electrochemical-energy-systems-spring-2011/lecture-notes/>

### Electroforming — a Unique Metal Fabrication Process

Electroforming plays an important role in our daily lives. We have contact with its results many times each day and it greatly enhances our lifestyle in a variety of ways. In addition, it is an extremely versatile process. For instance, it is used to produce micro components for the medical and electronics industries and huge components for the aircraft and aerospace industries. For many applications it has become indispensable.

- R Parkinson, Nickel Development Institute
- [http://www.nickelinstitute.org/~Media/Files/TechnicalLiterature/Electroforming\\_AUniqueMetalFabricationProcess\\_10084\\_.pdf](http://www.nickelinstitute.org/~Media/Files/TechnicalLiterature/Electroforming_AUniqueMetalFabricationProcess_10084_.pdf)

### Electrochemical Machining of Metal Plates

Technical basis of electrochemical machining. Experimental basis of electrochemical machining. Theoretical basis of current distribution. Experimental tests and results (stationary cathode, advancing cathode, rotating cathode). Interpretations of results. Implementation of the process.

- J. F. Cooper and M. C. Evans, Lawrence Livermore National Laboratory
- <http://www.llnl.gov/tid/lof/documents/pdf/317378.pdf>

### Electropolishing of Stainless Steels

Electropolishing is a chemical surface finishing technique, by which metal is electrolytically removed, ion by ion, from the surface of a metal object. The primary objective is to minimize microroughness, thus dramatically reducing the risk of dirt or product residues adhering and improving the cleanability of surfaces. Electropolishing is also used for deburring, brightening, and passivating. The process exposes an undisturbed, metallurgically clean surface, eliminating thermal stress and surface roughening, and improving the corrosion resistance.

- Kosmač, Euro Inox
- [http://www.euro-inox.org/pdf/map/Electropolishing\\_EN.pdf](http://www.euro-inox.org/pdf/map/Electropolishing_EN.pdf)

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