



5X

Journal of The  
Electrochemical  
Society

---

A Journal for Solid-State and  
Electrochemical Science and Technology

---

Volume 145, Number 7  
July 1998



COPYRIGHT OFFICE  
1998

**I**n June 1998, the **Journal** and The Electrochemical Society reached a point of no return. For the first time since July 1977, the **Journal** offered no rapid-publication section. We have been brought to this departure of the Letters Section after years of planning and there will be no turning back, just a single backward glance. This month, July 1998, the Letters Section becomes its own publication — *Electrochemical and Solid-State Letters*. *Letters* is the first, and only, electrochemical journal dedicated exclusively to rapid publication with a lagtime goal of eight to ten weeks to electronic publication. *Letters* is a joint publication of ECS and the Electron Devices Society (EDS) of the Institute of Electrical and Electronics Engineers (IEEE), bolstering its solid-state component. The departure of the Letters Section will bring a new emphasis to its content, facilitating growth in quality and quantity. *Letters* will be a part of the member benefits package of both ECS and EDS, giving it an initial circulation of more than 15,000 individuals and institutions, twice that of the **Journal**.

The Letters Section of the **Journal** grew out of the Accelerated Brief Communications (ABCs). In July 1977, Editor Norman Hackerman created ABCs as a short lagtime section of the **Journal**. They were printed from camera-ready copies from the authors and inserted into each issue at the end of the Technical Papers Section. In May 1991, Editor Barry Miller moved ABCs to the front of the **Journal**, had them typeset, and renamed them the Letters Section. These short papers have provided authors an opportunity to disseminate important new information in a timely manner.

After 21 years of nurturing a rapid-publication section, the **Journal** now improves upon the concept and moves forward, allowing the need for rapid publication to be better met by a new publication. Perhaps better said by Weber: "*Past all thought of 'if' or 'when' — no use resisting — abandon thought and let the dream descend...*" "*Past the point of no return, the final threshold — what... secrets will we learn beyond the point of no return?*"



**Paul Kohl**  
Editor

<b>A Study on the Origin of Nonfaradaic Behavior of Anodic Contact Glow Discharge Electrolysis. The Relationship Between Power Dissipated in Glow Discharges and Nonfaradaic Yields</b> <i>S. K. Sengupta, R. Singh, A. K. Srivastava</i> .....	2209
<b>Reactivation of Passivated Iron Electrodes in a Magnetic Field</b> <i>C. Wang, S. Chen, H. Ma</i> .....	2214
<b>Study of the Hydrogen Evolution Reaction on Ni-Mo-P Electrodes in Alkaline Solutions</b> <i>R. K. Shervedani, A. Lasia</i> .....	2219
<b>The Electrochromic Behavior of Indium Tin Oxide in Propylene Carbonate Solutions</b> <i>P. M. M. C. Bressers, E. A. Meulenkamp</i> .....	2225
<b>Electrochemical Deposition of Prussian Blue from a Single Ferricyanide Solution</b> <i>R. Yang, Z. Qian, J. Deng</i> .....	2231
<b>The Effect of Nonstoichiometry of Surface Oxides Formed during High Temperature Oxidation on the Corrosion Resistance of Ferritic Chromium Steel</b> <i>T. Zimina, E. Oshe, V. Dubkov, P. Zimin, E. Zabrodszkaya</i> .....	2236
<b>Structural and Optical Characterization of Porous 3C-SiC</b> <i>T. Monguchi, H. Fujioka, K. Ono, M. Oshima, T. Serikawa, T. Hayashi, K. Horiuchi, S. Yamasbita, K. Yoshii, Y. Baba</i> .....	2241
<b>Morphological Changes at the Interface of the Nickel-Yttria Stabilized Zirconia Point Electrode</b> <i>R. J. Aaberg, R. Tunold, M. Mogensen, R. W. Berg, R. Odegård</i> .....	2244
<b>On the Reduction of Lithium Insertion Capacity in Hard-Carbon Anode Materials with Increasing Heat-Treatment Temperature</b> <i>E. Buiel, A. E. George, J. R. Dahn</i> .....	2252
<b>Corrosion Protection of Untreated AA-2024-T3 in Chloride Solution by a Chromate Conversion Coating Monitored with Raman Spectroscopy</b> <i>J. Zhao, G. Frankel, R. L. McCreery</i> .....	2258
<b>The Corrosion of Mo-Al Alloys in a H<sub>2</sub>/H<sub>2</sub>S/H<sub>2</sub>O Gas Mixture at 800-1000°C</b> <i>W. Kai, C. Y. Bai</i> .....	2265
<b>The Effect of Crevice-Opening Dimension on the Stability of Crevice Corrosion for Nickel in Sulfuric Acid</b> <i>M. I. Abdulsalam, H. W. Pickering</i> .....	2276
<b>Characterization of AA2024-T3 by Scanning Kelvin Probe Force Microscopy</b> <i>P. Schmutz, G. S. Frankel</i> .....	2285
<b>Corrosion Study of AA2024-T3 by Scanning Kelvin Probe Force Microscopy and In Situ Atomic Force Microscopy Scratching</b> <i>P. Schmutz, G. S. Frankel</i> .....	2295
<b>Impedance Studies of the Oxygen Reduction on Thin Porous Coating Rotating Platinum Electrodes</b> <i>J. Perez, E. R. Gonzalez, E. A. Ticianelli</i> .....	2307
<b>Electrochemical Studies of Carbon Films from Pyrolyzed Photoresist</b> <i>J. Kim, X. Song, K. Kinoshita, M. Madou, R. White</i> .....	2314
<b>Surface Studies of Cu<sub>x</sub>Co<sub>3-x</sub>O<sub>4</sub> Electrodes for the Electrocatalysis of Oxygen Evolution</b> <i>N. Fradette, B. Marsan</i> .....	2320
<b>The Thermal Stability of Lithium Polymer Batteries</b>	

**Editor****Paul A. Kohl**Georgia Institute of Technology  
Atlanta, Georgia 30332-0100, USA**Associate Editors****D. Noel Buckley**University of Limerick  
Limerick, Ireland**Frank R. McLarnon**Lawrence Berkeley National Laboratory  
Berkeley, California 94720-0001, USA**Thomas P. Moffat**National Institute of Standards and Technology  
Gaithersburg, Maryland 20899, USA**John Newman**University of California  
Berkeley, California 94720-1462, USA**Stanley I. Raider**IBM T.J. Watson Research Center  
Yorktown Heights, New York 10598-0218, USA**Daniel Scherson**Case Western Reserve University  
Cleveland, Ohio 44106, USA**Mordechay Schlesinger**University of Windsor  
Windsor, Ontario N9B 3P4, Canada**Publications Staff**Mary E. Yess, *Publications Manager*Artie Ann Berry, *Publications Assistant*Anne L. Clementson, *Publications Assistant*Paul Cooper, *Publications Assistant*Terry Cooper, *Publications Assistant*Cynthia Freeman, *Publications Assistant*Patricia T. Lorynski, *Publications Clerk*Ellen S. Popkin, *Publications Assistant***Publication Committee**Eric W. Brooman, *Chairman*

Alison J. Davenport

Paul A. Kohl

Johna Leddy

Wolfgang J. Lorenz

Patrick J. Moran

Bertram Schwartz

Kathryn A. Striebel

John R. Susko

Robin A. Susko

Robert E. Swarrop

Jan B. Talbot

Kohei Uosaki

Y. H. Wong

The Electrochemical Society is an educational, nonprofit 501(c)(3) organization with more than 7000 scientists and engineers in over 65 countries world-wide who hold individual membership. Founded in 1902, the Society has a long tradition in advancing the theory and practice of electrochemical and solid-state science by dissemination of information through its publications and international meetings.

The *Journal of The Electrochemical Society* (USPS 284-140) (ISSN 0013-4651) is published monthly by The Electrochemical Society, Inc., 10 South Main Street, Pennington, NJ 08534-2896, USA, at Cummings Printing Co., 4 Peters Brook Drive, PO Box 16495, Hooksett, NH 03106-6495, USA. Subscription to members is part of membership service. Annual Membership dues: \$90 for Active Members and \$10 for Student Members. Subscription to nonmembers \$500 plus \$25 for postage outside U.S. Single copies \$15 for members and \$47 for nonmembers.

Periodicals postage paid at Pennington, New Jersey, USA and at additional mailing offices. POSTMASTER: Send address changes to: The Electrochemical Society, Inc., 10 South Main Street

## Publication Information

**Address:** The mailing address for the Executive Offices, Editorial Department, and the Circulation Department of The Electrochemical Society is: 10 South Main Street, Pennington, New Jersey, 08534-2896, USA. The telephone number is (609) 737-1902. The Fax number is (609) 737-2743, and e-mail may be sent to: [ecs@electrochem.org](mailto:ecs@electrochem.org). The ECS Home Page is located at the following address on the World Wide Web: <http://www.electrochem.org>.

**Manuscripts:** Manuscripts are accepted for publication by the *Journal* with the understanding that they are unpublished, original works which have not been submitted elsewhere while under consideration by the *Journal* Editorial Board. Manuscripts conforming to the "Instructions to Authors," which can be found in this issue, should be sent in quadruplicate to the Editorial Department. To help offset publication costs, a payment of \$70 per printed page is required. If at least one author is a Society member, a 10% discount is given.

**Permission to Publish:** The *Journal* is a copyrighted publication, and manuscripts submitted to the *Journal* become the property of the Society. Permission to publish parts of papers in the *Journal* is granted to current periodicals, provided due credit is given and provided that not more than one-sixth of any one paper is used in derivative works. Reproduction or replication of more than one-sixth of a paper is forbidden and illegal unless prior written authorization is obtained from the Society, along with permission from the author. Address such requests to the Society's Publications Manager.

**Permission to Reproduce:** Reprographic copying beyond that permitted by the fair use provisions of the Copyright Act of 1976 is granted to libraries and other users registered with the Copyright Clearance Center provided that the fee of \$7 (US) (CCC Code 0013-465 1/97) per article is paid directly to: Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, USA; Telephone: (508) 750-8400; Fax: (508) 750-4744; e-mail: [info@copyright.com](mailto:info@copyright.com). Copying for other than internal or personal use without the express written permission of the Society is prohibited. Direct all permission requests to the Society's Publications Manager.

**Article Copies:** Single copies of articles (from 1982 to the present) are available from The Electrochemical Society to members at \$10 (US) per article, and to nonmembers at \$15 (US) per article. Orders may be placed via the ECS Home Page at <http://www.electrochem.org>. A copy of any particular paper (including those prior to 1982) may be obtained from University Microfilms, Inc., 300 North Zeeb Street, Ann Arbor, MI 48106, USA; Telephone, USA and Canada: (800) 248-0360; all other countries (415) 433-5500; Fax: (415) 433-0100; e-mail: [orders@infostore.com](mailto:orders@infostore.com).

**Single Issues and Bound Volumes:** The Society has available for sale a limited inventory of single issues and bound volumes of the *Journal*. Contact the Circulation Department for more information. Positive microfilm copies of issues may also be obtained from University Microfilms, Inc., 300 North Zeeb Street, Ann Arbor, MI 48106, USA; Telephone, USA and Canada: (800) 248-0360; all other countries (415) 433-5500; Fax: (415) 433-0100; e-mail: [orders@infostore.com](mailto:orders@infostore.com).

**Claims:** All claims for missing issues should be reported within 60 days of normal delivery date, and should be directed to the Circulation Department, The Electrochemical Society, Inc., 10 South Main Street, Pennington, NJ 08534-2896, USA.

**Address Changes:** Notice of a change in address should be sent to the Circulation Department, The Electrochemical Society, Inc., 10 South Main Street, Pennington, NJ 08534-2896, USA. Include the mailing label or the number from the mailing label from your previous issue of the *Journal* to ensure proper identification.

**Notice:** Statements and opinions given in articles and papers in the *Journal of The Electrochemical Society* are those of the contributors, and The Electrochemical Society, Inc., assumes no

## Spectroelectrochemical Studies of Indium Hexacyanoferrate Electrodes Prepared by the Sacrificial Anode Method

*K.-C. Ho, J.-C. Chen* .....2334

## Modification of the Lithium Metal Surface by Nonionic Polyether Surfactants: Quartz Crystal Microbalance Studies

*M. Mori, Y. Naruoka, K. Naoi, D. Fauleux* .....2340

## Electrochemical Synthesis of Urea at Gas-Diffusion Electrodes. IV. Simultaneous Reduction of Carbon Dioxide and Nitrate Ions with Various Metal Catalysts

*M. Shibata, K. Yoshida, N. Furuya* .....2348

## Characterization of High-Surface-Area Electrocatalysts Using a Rotating Disk Electrode Configuration

*T. J. Schmidt, H. A. Gasteiger, G. D. Stäb, P. M. Urban, D. M. Kolb, R. J. Behm* .....2354

## Water Electrolysis Using Diamond Thin-Film Electrodes

*N. Katsuki, E. Takahashi, M. Toyoda, T. Kurosu, M. Iida, S. Wakita, Y. Nishiki, T. Shimamune* .....2358

## The Mechanism of Electropolishing of Titanium in Methanol-Sulfuric Acid Electrolytes

*O. Piotrowski, C. Madore, D. Landolt* .....2362

## Electrochemical Behavior and Surface Morphologic Changes of Copper Substrates in the Presence of 2,5-Dimercapto-1,3,4-thiadiazole. In Situ EQCM and Phase Measurement Interferometric Microscopy

*Q. Chi, T. Tatsuma, M. Ozaki, T. Sotomura, N. Oyama* .....2369

## Super Dense LiC<sub>2</sub> as a High Capacity Li Intercalation Anode

*C. Bindra, V. A. Nalimova, D. E. Sklovsky, Z. Benes, J. E. Fischer* .....2377

## Photochemical and Photoelectrochemical Behavior of a Novel TiO<sub>2</sub>/Ni(OH)<sub>2</sub> Electrode

*R. Kostecki, T. Richardson, F. McLarnon* .....2380

## Quartz Crystal Microbalance Investigation of Electrochemical Calcium Carbonate Scaling

*C. Gabrielli, M. Keddad, A. Khalil, G. Maurin, H. Perrot, R. Rosset, M. Zidoune* .....2386

## Passivity and Breakdown of Carbon Steel in Organic Solvent Mixtures of Propylene Carbonate and Dimethoxyethane

*D. A. Shifler, J. Kruger, P. J. Moran* .....2396

## The Impact of the Operation Mode on Pattern Formation in Electrode Reactions. From Potentiostatic to Galvanostatic Control

*N. Mazouz, G. Flätgen, K. Krischer, I. G. Kevrekidis* .....2404

## Influence of Nitrogen-Containing Precursors on the Electrocatalytic Activity of Heat-Treated Fe(OH)<sub>2</sub> on Carbon Black for O<sub>2</sub> Reduction

*R. Côté, G. Lalonde, D. Guay, J. P. Dodelet, G. Dénès* .....2411

## Study of the Structural Change Due to Heat-Treatment in High Resistivity Electroless NiPC Film

*T. Osaka, T. Higashikawa, A. Iizuka, M. Takai, M. Kim* .....2419

## Prediction of Li Intercalation and Battery Voltages in Layered vs. Cubic Li<sub>x</sub>CoO<sub>2</sub>

*C. Wolverton, A. Zunger* .....2424

## Gas Conversion Impedance: A Test Geometry Effect in Characterization of Solid Oxide Fuel Cell Anodes

*S. Primdahl, M. Mogensen* .....2431

<b>Changes in the Environment of Hydrogen in Porous Silicon with Thermal Annealing</b> <i>Y. H. Ogata, F. Kato, T. Tsuboi, T. Sakka</i> .....	2439
<b>Room Temperature Operating Solid-State Sensor for Chlorine Gas</b> <i>Y. Niizeki, S. Shibata</i> .....	2445
<b>Incorporation of Cadmium Sulfide into Nanoporous Silicon by Sequential Chemical Deposition from Solution</b> <i>M. Gros-Jean, R. Herino, D. Lincot</i> .....	2448
<b>Effect of the Gas-Phase Reaction in Metallorganic Chemical Vapor Deposition of TiN from Tetrakis(dimethylamido)titanium</b> <i>J.-Y. Yun, M.-Y. Park, S.-W. Rhee</i> .....	2453
<b>Fibrous and Porous Microstructure Formation in 6H-SiC by Anodization in HF Solution</b> <i>W. Shin, T. Hikosaka, W.-S. Seo, H. S. Ahn, N. Sawaki, K. Koumoto</i> .....	2456
<b>Dry Etching of SrS Thin Films</b> <i>J. W. Lee, M. R. Davidson, B. Pathangey, P. H. Holloway, S. J. Pearton</i> .....	2461
<b>Tribochemical Reactions of Silicon: An In Situ Infrared Spectroscopy Characterization</b> <i>V. A. Muratov, J. E. Olsen, B. M. Gallois, T. E. Fischer, J. C. Bean</i> .....	2465
<b>High-Temperature Diffusion of Hydrogen and Deuterium in Titanium and Ti<sub>3</sub>Al</b> <i>S. Naito, M. Yamamoto, M. Doi, M. Kimura</i> .....	2471
<b>Photoluminescence Studies of Cadmium Selenide Crystals in Contact with Group III Trialkyl Derivatives</b> <i>E. J. Winder, T. F. Kuech, A. B. Ellis</i> .....	2475
<b>Reduction in Contact Resistance with In Situ O<sub>2</sub> Plasma Treatment</b> <i>K. Yonekura, S. Sakamori, K. Kawai, H. Miyatake</i> .....	2480
<b>Measurements of VOCs with a Semiconductor Electronic Nose</b> <i>M. C. Horrillo, J. Getino, L. Arés, J. I. Robla, I. Sayago, F. J. Gutiérrez</i> .....	2486
<b>Interface States Distribution in Electrical Stressed Oxynitrided Gate-Oxide</b> <i>S. Belkouch, T. K. Nguyen, L. M. Landsberger, C. Aktik, C. Jean, M. Kabrzi</i> .....	2489
<b>Design of Injection Feed Multiwafer Low-Pressure Chemical Vapor Deposition Reactors</b> <i>L. Zambov, C. Popov, B. Ivanov</i> .....	2494
<b>Aqueous KOH Etching of Silicon (110). Etch Characteristics and Compensation Methods for Convex Corners</b> <i>B. Kim, D.-i. D. Cho</i> .....	2499
<b>Amorphous Hydrogenated Silicon Films for Solar Cell Application Obtained with 55 kHz Plasma Enhanced Chemical Vapor Deposition</b> <i>B. G. Budaguan, A. A. Sherchenkov, D. A. Stryabilev, A. Y. Sazonov, A. G. Radosel'sky, V. D. Chernomordic, A. A. Popov, J. W. Metselaar</i> .....	2508
<b>Dry Etch Patterning of LaCaMnO<sub>3</sub> and SmCo Thin Films</b> <i>J. J. Wang, J. R. Childress, S. J. Pearton, F. Sharifi, K. H. Dahmen, E. S. Gillman, F. J. Cadieu, R. Rani, X. R. Qian, L. Chen</i> .....	2512
<b>Growth Kinetics of Chemical Vapor Deposition of <math>\beta</math>-SiC from (CH<sub>3</sub>)<sub>2</sub>SiCl<sub>2</sub>/Ar</b> <i>T. Tago, M. Kawase, Y. Yoshihara, K. Hashimoto</i> .....	2516

*President*  
**Gerard M. Blom**  
Philips Research  
Briarcliff Manor, New York 10510-2099, USA

*Vice-President*  
**Dale E. Hall**  
National Institute of Standards & Technology  
Gaithersburg, Maryland 20899, USA

*Vice-President*  
**Carlton M. Osburn**  
North Carolina State University  
Raleigh, North Carolina 27695, USA

*Vice-President*  
**Jan B. Talbot**  
University of California, San Diego  
La Jolla, California 92093-0411, USA

*Secretary*  
**Robin A. Susko**  
IBM Corporation  
Endicott, New York 13760, USA

*Treasurer*  
**W. D. Brown**  
University of Arkansas  
Fayetteville, Arkansas 72701, USA

*Executive Director*  
**Roque J. Calvo**  
The Electrochemical Society, Inc.  
10 South Main Street  
Pennington, New Jersey 08534-2896, USA  
Phone: 609 737 1902  
Fax: 609 737 2743  
E-mail: ecs@electrochem.org

## Benefits of Membership

- **The Journal of the Electrochemical Society.** Your Society membership includes this top-quality, peer-reviewed monthly publication. Each issue includes some 55 or more original papers selected by a prestigious editorial board, on topics covering both electrochemical and solid-state science and technology.
- **Electrochemical and Solid-State Letters.** This peer-reviewed, electronic journal is available to members at: <http://www.electrochem.org/letters.html>
- **Interface.** Keep abreast of what's happening in the field (and who's making it happen) through *Interface*, a quarterly publication featuring articles and news of general interest to those in the field.
- **Professional Development and Education.** Exchange technical ideas and advances at the Society's semi-annual international meetings or through the programs of the twenty-three local sections in the USA, Canada, Europe, and Japan.
- **Publications.** Keep aware of pertinent scientific advances through the Society's publications, including proceedings volumes, meeting abstracts, and monograph volumes.
- **Opportunity for Recognition.** Recognize the accomplishments of your peers through the Awards Program, which provides over two dozen Society Awards annually.
- **Networking and Contacts.** Take advantage of the numerous opportunities to meet with your peers and expand your circle of valuable contacts.
- **Membership Directory.** Available only to members, the Directory provides easy reference to your colleagues throughout the world.
- **Money Savings.** Get exceptional discounts on all Society publications, page charges, meetings, and short courses.

# Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

## Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

## Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

## Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

## API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

## LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

## FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

## E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.