

Journal of The Electrochemical Society

2011 • Volume 158, Number 5

JESQAN 158 (5)



A Journal for Solid-State and
Electrochemical Science and Technology

Table of Contents

Batteries and Energy Storage

Electrochemical Energy Storage Device for Electric Vehicles <i>Q. Zhang, Q.-F. Dong, M.-S. Zheng, Z.-W. Tian</i>	A443
A High Precision Coulometry Study of the SEI Growth in Li/Graphite Cells <i>A. J. Smith, J. C. Burns, X. Zhao, D. Xiong, J. R. Dahn</i>	A447
Surface Film Formation on $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ Electrode in an Ionic Liquid Solvent at Elevated Temperature <i>J. Mun, T. Yim, K. Park, J. H. Ryu, Y. G. Kim, S. M. Oh</i>	A453
Impacts of Surface Mn Valence on Cycling Performance and Surface Chemistry of Li- and Al-Substituted Spinel Battery Cathodes <i>J.-W. Song, C. C. Nguyen, H. Choi, K.-H. Lee, K.-H. Han, Y.-J. Kim, S. Choy, S.-W. Song</i>	A458
Preparation and Characterization of Fast Ion Conducting Lithium Thio-Germanate Thin Films Grown by RF Magnetron Sputtering <i>I. Seo, S. W. Martin</i>	A465
^{13}C Solid State NMR Suggests Unusual Breakdown Products in SEI Formation on Lithium Ion Electrodes <i>N. Leifer, M. C. Smart, G. K. S. Prakash, L. Gonzalez, L. Sanchez, K. A. Smith, P. Bhalla, C. P. Grey, S. G. Greenbaum</i>	A471
Effects of Dispersant on the Conductive Carbon for LiFePO_4 Cathode <i>C.-C. Chang, L.-J. Her, H.-K. Su, S.-H. Hsu, Y. T. Yen</i>	A481
Effective Transport Properties of LiMn_2O_4 Electrode via Particle-Scale Modeling <i>A. Gupta, J. Hun Seo, X. Zhang, W. Du, A. Marie Sastry, W. Shyy</i>	A487
Passivating Ability of Surface Film Derived from Vinylene Carbonate on Tin Negative Electrode <i>S. Park, J. Heon Ryu, S. M. Oh</i>	A498
LiF Formation and Cathode Swelling in the Li/CF_x Battery <i>J. Read, E. Collins, B. Piekarski, S. Zhang</i>	A504
Effects of E-beam Irradiation on Physical and Electrochemical Properties of Inorganic Nanoparticle Separators with Different Particle Sizes <i>M. Kim, J. Yong Sohn, Y. Chang Nho, J. Hyeok Park</i>	A511
Comparative Study of the Capacity and Rate Capability of $\text{LiNi}_y\text{Mn}_z\text{Co}_{1-2y-z}\text{O}_2$ ($y = 0.5, 0.45, 0.4, 0.33$) <i>Z. Li, N. A. Chernova, M. Roppolo, S. Upreti, C. Petersburg, F. M. Alamgir, M. Stanley Whittingham</i>	A516
Neutron Imaging of Lithium Concentration in LFP Pouch Cell Battery <i>J. B. Siegel, X. Lin, A. G. Stefanopoulou, D. S. Hussey, D. L. Jacobson, D. Gorsich</i>	A523
Electrochemical Characterization of SEI-Type Passivating Films Using Redox Shuttles <i>M. Tang, J. Newman</i>	A530
Study of the $\text{LiMn}_{1.5}\text{Ni}_{0.5}\text{O}_4$/Electrolyte Interface at Room Temperature and 60°C <i>H. Duncan, D. Duguay, Y. Abu-Lebdeh, I. J. Davidson</i>	A537
Soft-Chemical Synthesis and Electrochemical Property of $\text{H}_2\text{Ti}_{12}\text{O}_{25}$ as a Negative Electrode Material for Rechargeable Lithium-Ion Batteries <i>J. Akimoto, K. Chiba, N. Kijima, H. Hayakawa, S. Hayashi, Y. Gotob, Y. Idemoto</i>	A546
Polysilane/Acenaphthylene Blends Toward Si-O-C Composite Anodes for Rechargeable Lithium-Ion Batteries <i>H. Fukui, H. Obsuka, T. Hino, K. Kanamura</i>	A550



Editor

Daniel Scherson

Case Western Reserve University
Cleveland, Ohio 44106, USA

Associate Editors

Jonah D. Erlebacher

Johns Hopkins University
Baltimore, Maryland 21218, USA

Thomas F. Fuller

Georgia Institute of Technology
Atlanta, Georgia 30332, USA

Raymond J. Gorte

University of Pennsylvania
Philadelphia, Pennsylvania 19104, USA

Takayuki Homma

Waseda University
Tokyo, Japan

Charles L. Hussey

University of Mississippi
University, Mississippi 38677, USA

Yue Kuo

Texas A&M University
College Station, Texas 77843, USA

Dolf Landheer

National Research Council - Canada
Ottawa, Ontario, Canada

Mark E. Orazem

University of Florida
Gainesville, Florida 32611, USA

Martin Winter

University of Münster
Münster, Germany

Editorial Board

Doron Aurbach, Jennifer Bardwell,
Jonah D. Erlebacher, Thomas F. Fuller,
Andrew Gewirth, Raymond J. Gorte,
Dennis Hess, Takayuki Homma, Charles Hussey,
Yue Kuo, Dolf Landheer, Mark E. Orazem,
Daniel Scherson, Martin Winter,

Editorial Advisory Committee

Silvia Armini, S. V. Babu, Teng-Ming Chen,
Shimshon Gottesfeld, Rika Hagiwara, Ray Hua
Hornig, Daniel Lincot, Arumugam Manthiram,
Kailash Mishra, Thomas Moffat, S. J. Pearton,
Tae-Yeon Seong, Gery Stafford, Bernard
Tribollet, John Wilkes, Rong-Jun Xie

Publications Staff

Annie Goedkoop, *Director of Publications*
Dinia Agrawala, Anne L. Clementson,
Paul Cooper, Andrea L. Guenzel, John Lewis,
Heather McAlinn, Elizabeth Schademann,
Beth Anne Stuebe

Publication Committee

Subhash Singhal, *Chairman*
Scott A. Calabrese Barton, Dennis W. Hess,
Alanah Fitch, Johna Leddy, Randy Leising,
Andrew Lin, Hiroshi Nishihara,
Krishnan Rajeshwar, Don Roepner,
Andrea Russell, Jerzy Ruzyllo, Daniel Scherson,
Enrico Traversa, Jennifer Wang, John Weidner

The Journal of The Electrochemical Society (J. Electrochem. Soc.) (USPS 284-140) (ISSN 0013-4651) is published monthly by The Electrochemical Society, 65 South Main Street, Pennington, NJ 08534-2839, USA, at Cummings Printing Co., 4 Peters Brook Drive, PO Box 16495, Hooksett, NH 03106-6495, USA. Periodicals postage paid at Pennington, New Jersey, USA and at additional mailing offices. POSTMASTER: Send address changes to: The Electrochemical Society, 65 South Main Street, Pennington, NJ 08534-2839, USA. Canada Post: Publications Mail Agreement #40612608 Canada Returns to be sent to Bleuchip International, P.O. Box 25542, London, ON N6C 6B2.

Publication Information

ECS Members: Access to the online edition of the current volume plus the entire online archive of the Journal is available to ECS members as part of their ECS Member Article Pack. The paper edition of the current volume is available to the members at an additional charge. Annual dues: \$98 for Active Members and \$18 for Student Members.

Subscriptions: Rates and packages vary. Send inquiries to Corey Eberhart, Global Sales Manager, ECS, 65 South Main Street, Pennington, New Jersey, 08534-2839, USA. Tel.: 609.647.3616; Fax: 609.737.2743; E-mail: corey.eberhart@electrochem.org. Visit the ECS website for more information.

Address: The address for the Executive Offices and Editorial Department of the Journal is: The Electrochemical Society, 65 South Main Street, Pennington, New Jersey, 08534-2839, USA. Tel.: 609.737.1902; Fax: 609.737.2743; E-mail: ecs@electrochem.org; Web: www.electrochem.org.

The address of the Circulation Department for ECS members is: 65 South Main Street, Pennington, New Jersey, 08534-2839, USA.

The address for the nonmembers' Circulation Department is: American Institute of Physics, P.O. Box 503284, St. Louis, MO 63150-2839, USA.

Manuscripts: Manuscripts are accepted for publication by the *Journal* with the understanding that they are unpublished, original works that have not been submitted elsewhere while under consideration by the *Journal* Editorial Board. See the "Instructions to Authors," which can be found in this issue. To help offset publication costs, a payment of \$80 per printed page is required. A discount is given if at least one author is a Society member at the time of a paper's submission.

Permission to Re-publish: The *Journal* is a copyrighted publication, and manuscripts submitted to the *Journal* become the property of ECS. Permission to re-publish parts of papers in the *Journal* is granted to current periodicals, provided due credit is given and 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 ECS, along with permission from the author. Please use the Permission Request Form on the ECS Website (www.electrochem.org).

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 (CCC Code 0013-465 1/97) is paid directly to: Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, USA; Tel: 978.750.8400; Fax: 978.750.4744; E-mail: info@copyright.com. Copying for other than internal or personal use without the express written permission of ECS is prohibited; please use the Permission Request Form on the ECS website (www.electrochem.org).

Article Copies: Single copies of articles are available from ECS to members at \$20 (US) per article, and to nonmembers at \$25 (US) per article. Orders may be placed via the ECS website.

Single Issues: ECS has available for sale a limited inventory of single issues of the *Journal*. Contact the ECS Circulation Department for more information. Positive microfilm copies of issues may also be obtained from ProQuest Information and Learning, 300 North Zeeb Road, Ann Arbor, MI 48106, USA; Tel: USA and Canada: 800.248.0360; all other countries 415.433.5500; Fax: 415.433.0100; E-mail: 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 at the address given above.

Address Changes: Notice of a change in address should be sent to the Circulation Department at the address given above.

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, assumes no responsibility for them.

Online Edition: Full-text articles are available either through ECS membership, an institutional subscription, or by purchase, for all issues from 1948 (Vol. 93) and forward. The online edition is available at:

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

LiMn₂O₄ Spinel/LiNi_{0.8}Co_{0.15}Al_{0.05}O₂ Blends as Cathode Materials for Lithium-Ion Batteries

H. Y. Tran, C. Täubert, M. Fleischhammer, P. Axmann, L. Küppers, M. Wohlfahrt-Mebrens A556

Modeling of a Commercial Graphite/LiFePO₄ Cell

M. Safari, C. Delacourt A562

Energy Harvesting and Storage with Lithium-Ion Thermogalvanic Cells

N. S. Hudak, G. G. Amatucci A572

Optimized Cu-Contacted Si Nanowire Anodes for Li Ion Batteries

Made in a Production Near Process

H. Föll, J. Carstensen, E. Ossei-Wusu, A. Cojocar, E. Quiroga-González, G. Neumann A580

Reversible Insertion of a Trivalent Cation onto MnO₂ Leading to Enhanced Capacitance

P. Kumar Nayak, N. Munichandraiah A585

Inorganic Glue Enabling High Performance of Silicon Particles as Lithium Ion Battery Anode

L.-F. Cui, L. Hu, H. Wu, J. Wook Choi, Y. Cui A592

Electrocatalytic Activities of La_{0.6}Ca_{0.4}CoO₃ and La_{0.6}Ca_{0.4}CoO₃-Carbon Composites Toward the Oxygen Reduction Reaction in Concentrated Alkaline Electrolytes

X. Li, W. Qu, J. Zhang, H. Wang A597

Bi-Functional Oxygen Electrodes Using LaMnO₃/LaNiO₃ for Rechargeable Metal-Air Batteries

M. Yuasa, M. Nishida, T. Kida, N. Yamazoe, K. Shimanoe A605

Modeling the Dependence of the Discharge Behavior of a Lithium-Ion Battery on the Environmental Temperature

U. Seong Kim, J. Yi, C. B. Shin, T. Han, S. Park A611

Fuel Cells and Energy Conversion

Sr₂Fe_{1.5}Mo_{0.5}O₆ as Cathodes for Intermediate-Temperature Solid Oxide Fuel Cells with La_{0.8}Sr_{0.2}Ga_{0.87}Mg_{0.13}O₃ Electrolyte

G. Xiao, Q. Liu, F. Zhao, L. Zhang, C. Xia, F. Chen B455

Effect of Titanium Dioxide Supports on the Activity of Pt-Ru toward Electrochemical Oxidation of Methanol

R. E. Fuentes, B. L. García, J. W. Weidner B461

Relative Humidity Dependence of Pt Utilization in Polymer Electrolyte Fuel Cell Electrodes: Effects of Electrode Thickness, Ionomer-to-Carbon Ratio, Ionomer Equivalent Weight, and Carbon Support

K. Shinozaki, H. Yamada, Y. Morimoto B467

Electrical Conductivity and Thermoelectric Power of La₂NiO_{4+δ}

S.-Y. Jeon, M.-B. Choi, J.-H. Hwang, E. D. Wachsman, S.-J. Song B476

Chemical Bonding Analysis of HCl Pretreatment on the Omnidirectional Silicon Solar Cells with Microspherical Texture/ITO Stacks

C.-H. Chen, P.-C. Juan, H.-L. Hwang B481

Functional DMFC Cathode Catalysts and Supports Based on Niobium Oxide Phase

B. B. Blizanac, S. Pylpyenko, T. S. Olson, D. Konopka, P. Atanassov. . . . B485

Determination of Surface Exchange Coefficients of LSM, LSCF, YSZ, GDC Constituent Materials in Composite SOFC Cathodes

E. N. Armstrong, K. L. Duncan, D. J. Oh, J. F. Weaver, E. D. Wachsman. . . B492

A Study on In-Situ Sintering of Ni-10 wt % Cr Anode for MCFC

D. Lee, J. Kim, K. Jo B500

Steam-Carbon Fuel Cell Concept for Cogeneration of Hydrogen and Electrical Power

B. R. Alexander, R. E. Mitchell, T. M. Gür. B505

Modeling Impedance Response of SOFC Cathodes Prepared by Infiltration

F. Bidrawn, R. Küngas, J. M. Vohs, R. J. Gorte. B514

Evaluation of SOFC Interconnects Made of Ferritic Steels with Nano-Structured Oxi-Ceramic Protective Coatings Deposited by the LAFAD Process

V. I. Gorokhovsky, P. E. Gannon, J. Wallace, D. VanVorous, C. Bowman, M. C. Deibert, R. J. Smith B526

Modeling the Dynamic Behavior of Proton-Exchange Membrane Fuel Cells

P. O. Olapade, J. P. Meyers, R. Mukundan, J. R. Davey, R. L. Borup B536

Cost Effective In-Situ Characterization of Coatings for PEFC Bipolar Plates Demonstrated with PVD Deposited CrN

S. Auvinen, T. Tingelöf, J. K. Ikonen, J. Siivinen, M. Johansson B550

Pulsed Electrodeposition of CuInSe₂ Thin Films onto Mo-Glass Substrates

S.-Y. Hu, W.-H. Lee, S.-C. Chang, Y.-L. Cheng, Y.-L. Wang B557

Electrochemical Activity and Catalyst Utilization of Low Pt and Thickness Controlled Membrane Electrode Assemblies

M. S. Saba, D. Malevich, E. Halliop, J. G. Pharoah, B. A. Peppley, K. Karan B562

Morphological Control of Electrospun Nafion Nanofiber Mats

J. B. Ballengee, P. N. Pintauro B568

Oxygen Exchange Kinetics of the IT-SOFC Cathode Material Nd₂NiO_{4+δ} and Comparison with La_{0.6}Sr_{0.4}CoO_{3-δ}

A. Egger, E. Bucher, W. Sitte B573

Simulation of Multistep Enzyme-Catalyzed Methanol Oxidation in Biofuel Cells

P. Kar, H. Wen, H. Li, S. D. Minteer, S. Calabrese Barton B580

Corrosion, Passivation, and Anodic Films

XANES Study of the Chemistry of Molybdenum in Artificial Corrosion Pits in 316L Stainless Steel

A. J. Davenport, A. J. Dent, M. Monir, J. A. Hammons, S. Majid Ghabari, P. D. Quinn, T. Rayment C111

Electrochemical Examinations on the Corrosion Behavior of Boron Carbide Reinforced Aluminum-Matrix Composites

H. Ding, L. H. Hibara C118

Raman Spectroscopy Characterization of Aqueous Vanadate Species Interaction with Aluminum Alloy 2024-T3 Surfaces

B. L. Hurley, S. Qiu, R. G. Buchheit C125

Ultra-Thin Aluminium Oxide Films Deposited by Plasma-Enhanced Atomic Layer Deposition for Corrosion Protection

S. E. Potts, L. Schmalz, M. Fenker, B. Díaz, J. Światowska, V. Maurice, A. Seyeux, P. Marcus, G. Radnóczy, L. Tóth, W. M. M. Kessels C132

Influence of Post-Welding Heat Treatment on the Corrosion Behavior of a 2050-T3 Aluminum-Copper-Lithium Alloy Friction Stir Welding Joint

V. Proton, Joël Alexis, E. Andrieu, C. Blanc, Jérôme Delfosse, Loïc Lacroix, Grégory Odemer C139

Direct Growth of Highly Ordered Crystalline Zirconia Nanowire Arrays with High Aspect Ratios on Glass by a Tailored Anodization

S.-Z. Chu, K. Wada, S. Inoue, H. Segawa C148

Effect of Copper on Anodic Activity of Aluminum-Lead Model Alloy in Chloride Solution

Anawati, S. Diplas, K. Nisancioglu C158

Electrochemical/Chemical Deposition and Etching

Electrodeposition of Distinct One-Dimensional Zn Biaxial Microbelt from the Zinc Chloride-1-Ethyl-3-methylidazolium Chloride Ionic Liquid

J.-M. Yang, Y.-T. Hsieh, T.-T. Chu-Tien, I.-W. Sun D235

Growth and Characterization of Tree-Like Crystalline Structures during Electrochemical Formation of Porous GaN

K. Al-Heuseen, M. R. Hashim, N. K. Ali D240



The Electrochemical Society (ECS) is an educational, nonprofit 501(c)(3) organization with more than 8000 scientists and engineers in over 75 countries world-wide who hold individual membership. Founded in 1902, ECS 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.

Society Officers

President

William D. Brown

University of Arkansas
Fayetteville, Arkansas 72701, USA

Vice-President

Esther Takeuchi

University at Buffalo
Buffalo, New York 14260, USA

Vice-President

Fernando H. Garzon

Los Alamos National Laboratory
Los Alamos, New Mexico 87545, USA

Vice-President

Tetsuya Osaka

Waseda University
Shinjyuku-ku, Tokyo 169-8555, JAPAN

Secretary

Johna Leddy

University of Iowa
Iowa City, Iowa 52242, USA

Treasurer

Christina Bock

National Research Council - Canada
Ottawa, ON K1A-0R6, CANADA

Executive Director

Roque J. Calvo

The Electrochemical Society
65 South Main Street
Pennington, New Jersey 08534-2839, USA
Phone: 609 737 1902
Fax: 609 737 2743
E-mail: ecs@electrochem.org
Web: www.electrochem.org

Benefits of Membership

- **The Journal of The Electrochemical Society.** Society membership includes this top-quality, peer-reviewed monthly publication. Each issue includes some 70 or more original papers selected by a prestigious editorial board, on topics covering both electrochemical and solid-state science and technology. The electronic edition is available to members at: <http://ecsdj.org/JES/>
- **Electrochemical and Solid-State Letters.** This peer-reviewed, rapid publication electronic journal is available to members at: <http://ecsdj.org/ESL/>
- **Interface.** This quarterly publication features 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 19 local sections in the USA, Canada, Europe, Israel, Korea, and Japan.
- **Publications.** Stay aware of pertinent scientific advances through the Society's publications, including ECS Transactions, 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 ECS 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 ECS publications, page charges, meetings, and short courses.

Divisions

Battery

Nancy J. Dudney, *Chair*
Zempachi Ogumi, *Vice-Chair*
Arumugam Manthiram, *Secretary*
Bor Yann Liaw, *Treasurer*
Curtis F. Holmes, *Advisor*

Corrosion

Alison Davenport, *Chair*
Douglas C. Hansen, *Vice-Chair*
Shinji Fujimoto, *Secretary-Treasurer*
David Lockwood, *Advisor*

Dielectric Science and Technology

Kalpathy Sundaram, *Chair*
Oana Leonte, *Vice-Chair*
Hazara Rathore, *Secretary*
Dolf Landheer, *Treasurer*
John Flake, *Advisor*

Electrodeposition

Christian Bonhote, *Chair*
Hariklia Deligianni, *Vice-Chair*
Giovanni Zangari, *Secretary*
Elizabeth Podlaha-Murphy, *Treasurer*
Patrik Schmuki, *Advisor*

Electronics and Photonics

Yue Kuo, *Chair*
Ping-Chih Chang, *First Vice-Chair*
Bernd Kolbesen, *Second Vice-Chair*
Andrew M. Hoff, *Secretary*
Ren Fan, *Treasurer*
M. Jamal Deen, *Advisor*

Energy Technology

Sundar Narayanan, *Chair*
Jean St-Pierre, *Vice-Chair*
Jeremy P. Meyers, *Secretary*
Adam Weber, *Treasurer*
Alok Srivastava, *Advisor*

Fullerenes, Nanotubes, and Carbon Nanostructures

Dirk Guldi, *Chair*
R. Bruce Weisman, *Vice-Chair*
Jean-Francois Nierengarten, *Secretary*
Francis D'Souza, *Treasurer*
Carl F. Holmes, *Advisor*

High Temperature Materials

Enrico Traversa, *Chair*
Jeffrey Fergus, *Senior Vice-Chair*
Timothy Armstrong, *Junior Vice-Chair*
Xiao-Dong Zhou, *Secretary-Treasurer*
David Shifler, *Advisor*

Industrial Electrochemistry and Electrochemical Engineering

John Weidner, *Chair*
Vijay K. Ramani, *Vice-Chair*
Gerardine Botte, *Secretary-Treasurer*
David J. Lockwood, *Advisor*

Luminescence and Display Materials

Kailash Mishra, *Chair*
John Collins, *Vice-Chair*
Holly Comanzo, *Secretary-Treasurer*
Pablo Chang, *Advisor*

Organic and Biological Electrochemistry

Albert Fry, *Chair*
James D. Burgess, *Vice-Chair*
Jun-ichi Yoshida, *Secretary-Treasurer*
M. Jamal Deen, *Advisor*

Physical and Analytical Electrochemistry

Paul Trulove, *Chair*
Shelley D. Minteer, *Vice-Chair*
Robert A. Mantz, *Secretary*
Pawel J. Kulesza, *Treasurer*
Patrik Schmuki, *Advisor*

Sensor

Jing Li, *Chair*
Zoraida P. Aguilar, *Vice-Chair*
Michael T. Carter, *Secretary*
Eric Brosha, *Treasurer*
David Shifler, *Advisor*

Electrochemical Assemble of Single Crystalline Twin ZnO Nanorods

J. Xia, Xi-bong Lu, Cheng-sheng Wang, Ye-xiang Tong, Liu-ping Chen . . . D244

Filling Narrow Trenches by Iodine-Catalyzed CVD of Copper and Manganese on Manganese Nitride Barrier/Adhesion Layers

Y. Au, Y. Lin, R. G. Gordon . . . D248

Removal of Anodic Aluminum Oxide Barrier Layer on Silicon Substrate by using Cl_2/BCl_3 Neutral Beam Etching

J. K. Yeon, W. S. Lim, J. B. Park, N. Y. Kwon, S. I. Kim, K. S. Min, I. S. Chung, Y. W. Kim, G. Y. Yeom . . . D254

Ozone Based Atomic Layer Deposition of Hafnium Oxide and Impact of Nitrogen Oxide Species

A. Delabie, J. Suerts, S. V. Elshocht, S.-H. Jung, P. I. Raisanen, M. E. Givens, E. J. Shero, J. Peeters, V. Machkaoutsan, J. W. Maes . . . D259

Effect of Solvent on the Morphology of Nickel Localized Electrochemical Deposition

Y. S. Chen, J. C. Lin, Z. H. Lin, C. Li, J. K. Chang . . . D264

Electrodeposition and Characterization of Thin-Film Platinum-Iridium Alloys for Biological Interfaces

A. Petrossians, J. J. Whalen III, J. D. Weiland, F. Mansfeld . . . D269

Effect of Al Distribution on Carrier Generation of Atomic Layer Deposited Al-Doped ZnO Films

D.-J. Lee, J.-Y. Kwon, S.-H. Kim, H.-M. Kim, K.-B. Kim . . . D277

Role of Electro-Deposition Parameters on Preparing Tailored Dimension Vertically-Aligned ZnO Nanowires

B. Bin Li, U. Philipose, C. F. de Souza, H. E. Ruda . . . D282

Light Extraction Efficiency Enhancement of GaN Blue LED with ZnO Nanotips Prepared by Aqueous Solution Deposition

M.-K. Lee, C.-L. Ho, C.-C. Lin, N.-R. Cheng, M.-H. Hwang, Y.-K. Chien, C.-F. Yen . . . D286

Sensitivity Enhancement for Quantitative Electrochemical Determination of a Trace Amount of Accelerator in Copper Plating Solutions

Y.-D. Chiu, W.-P. Dow, S.-M. Huang, S.-L. Yau, Y.-L. Lee . . . D290

Microstructure and Pattern Size Dependence of Copper Corrosion in Submicron-Scale Features

U.-H. Lee, H. J. Jeon, T. Kang, H.-J. Sohn, K. H. Oh, E. K. Her, H. N. Han, H. W. Lee, I. Kim, D. Kim, S.-K. Lee, H.-J. Lee . . . D298

Vertically-Aligned of Sub-Millimeter Ultralong Si Nanowire Arrays and Its Reduced Phonon Thermal Conductivity

C.-Y. Chen, D. H. Phan, C.-C. Wong, T.-J. Yen . . . D302

Electrochemical Synthesis and Engineering

Tungsten Electrode Erosion by Microplasmas in Saline Solution

C.-Y. Sie, H.-W. Chang, C.-C. Hsu . . . E37

Controllable Electrochemical Synthesis and Photocatalytic Activity of CeO_2 Octahedra and Nanotubes

M. Xu, S. Xie, X.-H. Lu, Z.-Q. Liu, Y. Huang, Y. Zhao, J. Ye, Y.-X. Tong . . . E41

Electrochemical Reduction of CO_2 to CH_3OH at Copper Oxide Surfaces

M. Le, M. Ren, Z. Zhang, P. T. Sprunger, R. L. Kurtz, J. C. Flake . . . E45

Physical and Analytical Electrochemistry

Oxygen Permeation in Thin, Dense $\text{Ce}_{0.9}\text{Gd}_{0.1}\text{O}_{1.95-\delta}$ Membranes I. Model Study

C. Chatzichristodoulou, M. Sogaard, P. V. Hendriksen . . . F61

Oxygen Permeation in Thin, Dense $\text{Ce}_{0.9}\text{Gd}_{0.1}\text{O}_{1.95-\delta}$ Membranes II. Experimental Determination

C. Chatzichristodoulou, M. Sogaard, J. Glasscock, A. Kaiser, S. P. Vagn Foghmoes, P. Vang Hendriksen . . . F73

Charged Defect Quantification in Pt/Al₂O₃/In_{0.53}Ga_{0.47}As/InP**MOS Capacitors**

R. D. Long, B. Shin, S. Monaghan, K. Cherkaoui, J. Cagnon,
S. Stemmer, P. C. McIntyre, P. K. Hurley G103

Deposition Temperature and Thermal Annealing Effects on the Electrical Characteristics of Atomic Layer Deposited Al₂O₃ Films on Silicon

J. M. Rafi, M. Zabala, O. Beldarrain, F. Campabadal G108

Water Diffusion in Silica Glass and Wet Oxidation of Si: An Interpretation for the High Speed of Wet Oxidation

M. Tomozawa G115

HfO₂, Sr-Ta-O and Ti-Ta-O High-k Dielectrics for Metal-Insulator-Metal Applications

M. Lukosius, C. Baristiran Kaynak, S. Rushworth, Ch. Wenger G119

Influence of Oxygen to Argon Ratio on the Properties of RF Magnetron Sputtered Ba_{0.7}Sr_{0.3}TiO₃ Thin Films

R. Reshmi, M. K. Jayaraj, M. T. Sebastian G124

Combination of Strong Blue Up-Conversion Photoluminescence and Greatly Enhanced Ferroelectric Polarization in Tm³⁺-Yb³⁺-W⁶⁺-Doped Bi₄Ti₃O₁₂ Thin Films

F. Gao, G. Ding, H. Zhou, G. Wu, N. Qin, D. Bao G128

Semiconductor Devices, Materials, and Processing**Luminescence Properties of Yb²⁺ Doped NaBaPO₄ Phosphate Crystals**

Y. Huang, P. Wei, S. Zhang, H. J. Seo H465

The Phase Change Effect of Oxygen-Incorporation in GeSbTe Films

M. H. Jang, S. J. Park, D. H. Lim, S. J. Park, M.-H. Cho, D.-H. Ko,
S. J. Cho H471

Frequency and Noise Performances of Photoelectrochemically Etched and Oxidized Gate-Recessed AlGaN/GaN MOS-HEMTs

Y.-L. Chiou, C.-S. Lee, C.-T. Lee H477

Improved Optical Transmittance of Boron Doped ZnO Thin Films by Low Pressure Chemical Vapor Deposition with Pulse Boron Doping

C.-S. Lee, K.-H. Yoon, B. T. Ahn H482

Water Motion over a Wafer Surface Rotating in a Single-Water Wet Cleaner

H. Habuka, S. Ohashi, T.-A. Tsuchimochi, T. Kinoshita H487

Exciton Localization Behaviors of Basal Stacking Faults in *a*-Plane AlGaN Alloys

H.-M. Huang, Y.-C. Wu, T.-C. Lu H491

Toward 4H-SiC MISFETs Devices Based on ONO (SiO₂-Si₃N₄-SiO₂) Structures

R. Esteve, S. A. Reshanov, S. Savage, M. Bakowski, W. Kaplan,
S. Persson, A. Schöner, C.-M. Zetterling H496

Zero Dipole Formation at HfGdO/SiO₂ Interface by Hf/Gd Dual-Sputtered Method

J.-C. Wang, P.-C. Chou, C.-S. Lai, J.-Y. Lin, W.-C. Chang, H.-C. Lu,
C.-I. Wu, P.-S. Wang H502

Postannealing Effect on ITO/p⁺-GaP with a Diffused Layer

H. M. Lo, S. C. Shei, X. F. Zeng, S. J. Chang, H. Y. Lin H506

Comprehensive Characterization of DC Sputtered AZO Films for CIGS Photovoltaics

C.-H. Huang, H.-L. Cheng, W.-E. Chang, M.-S. Wong H510

P-Type ZnO:P Films Fabricated by Atomic Layer Deposition and Thermal Processing

Y. T. Shib, J. F. Chien, M. J. Chen, J. R. Yang, M. Shiojiri H516

Real-Time Raman Scattering Analysis of the Electrochemical Growth of CuInSe₂ Precursors for CuIn(S,Se)₂ Solar Cells

V. Izquierdo-Roca, E. Saucedo, J. S. Jaime-Ferrer, X. Fontané,
A. Pérez-Rodríguez, V. Bermúdez, J. R. Morante H521

Sections**Arizona**

Don Gervasio, *Chair*
gervasio@email.arizona.edu

Brazilian

Luís Frederico P. Dick, *Chair*
ldick@ufrgs.br

Canadian

Sylvie Morin, *Chair*
smorin@yorku.ca

Chicago

Giselle Sandi, *Chair*
gsandi@anl.gov

China

Lin Zhuang, *Chair*
lzhuang@whu.edu.cn

Cleveland

Irina Serebrennikova, *Chair*
Irina.Serebrennikova@energizer.com

Detroit

Xia Wang, *Chair*

European

Pawel Kulesza, *Chair*
pkulesza@chem.uw.edu.pl

Georgia

Peter Hesketh, *Chair*
peter.hesketh@me.gatech.edu

India

Ashok Shukla, *Chair*
akshukla2006@gmail.com

Israel

Doron Aurbach, *Chair*
aurbach@mail.biu.ac.il

Japan

Toshio Fuchigami, *Chair*
fuchi@echem.titech.ac.jp

Korea

Kwang Bum Kim, *Chair*
kbbkim@yonsei.ac.kr

Mexican

Ignacio Gonzalez, *Chair*
igm@xanum.uam.mx

National Capital

Paul Natishan, *Chair*
natishan@nrl.navy.mil

New England

Kevin White, *Chair*
kwhite@exponent.com

Pittsburgh

Konstantin Pimenov, *Chair*
konstantinpimenov@consolenergy.com

San Francisco

Ken Lux, *Chair* ken@alttextech.com

Taiwan

Jing-Yih Cherng, *Chair*
amitajim@yahoo.com

Texas

Harovel G. Wheat, *Chair*
hwheat@mail.utexas.edu

Twin Cities

Francis Guillaume, *Chair*
guill001@tc.umn.edu

The Electrochemical Society MONOGRAPH SERIES

The following volumes are sponsored by ECS, and published by John Wiley & Sons, Inc. They should be ordered from: ECS, 65 South Main St., Pennington, NJ 08534-2839, USA or www.electrochem.org/dl/bookstore.htm

NEW!

Modern Electroplating (5th Edition)
by M. Schlesinger and M. Paunovic
(2010) 736 pages
ISBN 978-0-470-16778-6

Fuel Cells: Problems and Solutions
by V. Bagotsky
(2009) 320 pages
ISBN 978-0-470-23289-7

Electrochemical Impedance Spectroscopy
by M. E. Orazem and B. Tribollet
(2008) 524 pages
ISBN 978-0-470-04140-6

Fundamentals of Electrochemical Deposition (2nd Edition)
by M. Paunovic and M. Schlesinger
(2006) 373 pages
ISBN 978-0-471-71221-3

Fundamentals of Electrochemistry (2nd Edition)
Edited by V. S. Bagotsky
(2005) 722 pages
ISBN 978-0-471-70058-6

Electrochemical Systems (3rd Edition)
by John Newman and Karen E. Thomas-Alyea
(2004) 647 pages
ISBN 978-0-471-47756-3

Modern Electroplating (4th Edition)
Edited by M. Schlesinger and M. Paunovic
(2000) 888 pages
ISBN 978-0-471-16824-9

Atmospheric Corrosion
by C. Leygraf and T. Graedel
(2000) 3684 pages
ISBN 978-0-471-37219-6

Uhlig's Corrosion Handbook (2nd Edition)
by R. Winston Revie
(2000) paperback, 1340 pages
ISBN 978-0-471-78494-4

ECS Members will receive a discount. All prices are subject to change without notice.



www.electrochem.org

Room-Temperature Direct Bonding Using Fluorine Containing Plasma Activation

C. Wang, T. Suga H525

Growth and Characterization of AlN and AlGaN Epitaxial Films on AlN Single Crystal Substrates

R. Dalmau, B. Moody, R. Schlessler, S. Mita, J. Xie, M. Feneberg, B. Neuschl, K. Thonke, R. Collazo, A. Rice, J. Tweedie, Z. Sitar H530

Retention Behavior Using SiN Spacers Charging on nMOSFETs for Future Nonvolatile Memory Application

C.-Y. Ho, Y. F. Chen, C. W. Ho, Wei. Chang, S. W. Chou, J. Gong. H536

Comparison of the Microstructure and Optical Properties of InAs Quantum Dots Grown with/without an AlAs Insertion Layer

Y.-F. Lai, H.-C. Chung, C.-P. Liu, S.-F. Chen, Y.-L. Lai, Y.-C. Fang, L. Hsu H540

MEMS Process by Film Transfer Using a Fluorocarbon Anti-Adhesive Layer

G. Schelcher, S. Brault, F. Parrain, E. Lefevre, E. Dufour-Gergam, M. Tatoulian, D. Bouville, M. Desgeorges, F. Verjus, A. Bosseboeuf H545

Formation of Ni-Silicide at the Interface of Ni/4H-SiC

Y. Jung, J. Kim H551

Temperature Dependent Crystal-Field Splitting and Band-Edge Characteristic in Cu(Al_xIn_{1-x})S₂ (0 ≤ x ≤ 1) Series Solar Energy Materials

C.-H. Ho H554

Investigation of NiCr Thin Film Resistors for InP-Based Monolithic Microwave Integrated Circuits (MMICs)

R. Driad, M. Krieg, N. Geldmacher, J. Rüster, F. Benkbelifa H561

Synthesis and Luminescent Properties of Li₃Ba₂Y₃(MoO₄)₈:Ln³⁺ (Ln = Eu, Tb, Dy) Phosphors for UV-LEDs

M. Shang, G. Li, X. Kang, D. Yang, J. Lin H565

Geometry Pattern for the Wire Organic Electrochemical Textile Transistor

X. Tao, V. Koncar, C. Dufour H572

Improving the Performance of Nanowires Polycrystalline Silicon Twin Thin-Film Transistors Nonvolatile Memory by NH₃ Plasma Passivation

Y.-C. Wu, M.-F. Hung, P.-W. Su H578

Comparative Studies on InGaP/GaAs Heterostructure-Emitter Bipolar Transistors with Tunneling- and Superlattice-Confinement Structures

J.-H. Tsai H583

Towards Passivation of Ge(100) Surfaces by Sulfur Adsorption from a (NH₄)₂S Solution: A Combined NEXAFS, STM and LEED Study

C. Fleischmann, S. Sioncke, S. Couet, K. Schouteden, B. Beckhoff, M. Müller, P. Hönicke, M. Kolbe, C. Van Haesendonck, M. Meuris, K. Temst, A. Vantomme H589

200 mm Silicon On Porous Layer Substrates Made by the Smart Cut Technology for Double Layer-Transfer Applications

A.-S. Stragier, T. Signamarcheix, T. Salvétat, E. Nolot, J. Dechamp, D. Mercier, P. Gergaud, A. Tauzin, L. Clavelier, M. Lemiti H595

Highly Controlled Wet and Dry Etching of Gallium Doped (Mg, Zn) O Epilayers Grown Using Metalorganic Vapor Phase Epitaxy

J. Tresback, J. M. Pierce, Y. S. Ali, A. Krabnert, H. Wen, M. Kumar, B. T. Adekore H600

Monochlorosilane for Low Temperature Silicon Epitaxy

P. Tomasini, K. D. Weeks H604

Sensors and Displays: Principles, Materials, and Processing

Transparent Conducting Ti-Doped ZnO Thin Films Applied to Organic Light-Emitting Diodes

Z.-L. Tseng, P.-C. Kao, C.-S. Yang, Y.-D. Juang, Y.-M. Kuo, S.-Y. Chu J133

Construction of Highly Transparent Plasma Display Devices Using Hydrothermally Synthesized Green-Emitting LaPO₄:Ce,Tb Nanophosphors

W.-S. Song, Y.-S. Kim, H. Yang J137

Fabrication of Micro-Patterned 2D Nanorod and Nanohole Arrays by a Combination of Photolithography and Nanosphere Lithography <i>H. K. Park, J. H. Moon, S. Yoon, Y. Rag Do</i>	J143
The Effects of Ultraviolet Exposure on the Device Characteristics of Atomic Layer Deposited-ZnO:N Thin Film Transistors <i>J.-M. Kim, S. J. Lim, T. Nam, D. Kim, H. Kim</i>	J150
Concentration Dependence of Energy Transfer between Eu²⁺ Ions Occupying Two Crystallographic Sites in Ba_{1.6}Ca_{0.4}P₂O₇ <i>X. Zhang, W. Li, H. J. Seo</i>	J155

Nanostructured Materials, Carbon Nanotubes, and Fullerenes

Characterization of Poly(brilliant cresyl blue)-Multiwall Carbon Nanotube Composite Film and Its Application in Electrocatalysis of Vitamin B₉ Reduction <i>Y. Umasankar, T.-W. Ting, S.-M. Chen</i>	K117
Electrochemical Synthesis of M:DNA Nanohybrids <i>S. Jayaraman, W. Tang, R. Yongsunthon</i>	K123
Highly Ultraviolet-Transparent ZnO:Al Conducting Layers by Pulsed Laser Deposition <i>S. P. Liu, D. S. Wuu, S. L. Ou, Y. C. Fu, P. R. Lin, M. T. Hung, R. H. Horng</i>	K127
Wafer-Scale Growth of ITO Nanorods by Radio Frequency Magnetron Sputtering Deposition <i>J. H. Park, H. K. Park, J. Jeong, W. Kim, B. K. Min, Y. R. Do</i>	K131
Efficiency Improvement of Dye-Sensitized Solar Cell with Ultraviolet and Hydrogen Chloride Treatments <i>M.-K. Lee, H. Yen, C.-C. Hsiao</i>	K136

Interdisciplinary Topics

Liquid-Phase Molecular Layer Deposition: Potential Applications to Multi-Dye Sensitization and Cancer Therapy <i>T. Yoshimura, H. Watanabe, C. Yoshino</i>	P51
Parametric Studies on the Photovoltaic Performance Improvement of a Nanotube Photo-Electrochemical Solar Cell <i>W. H. Chen, A. G. Miranda, C. W. Hong</i>	P57
Charge Transport Through Thin Amorphous Titanium and Tantalum Oxide Layers <i>K. Stella, D. A. Kovacs, D. Dising, W. Brezna, Jürgen Smoliner</i>	P65

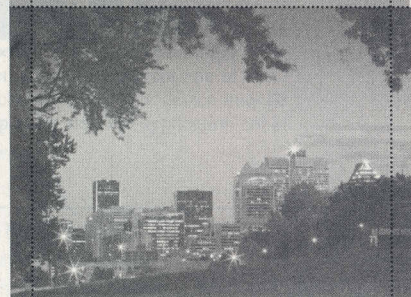
Reviews-Critical Reviews in Electrochemical and Solid-State Science and Technology

High Doping Density/High Electric Field, Stress and Heterojunction Effects on the Characteristics of CMOS Compatible p-n Junctions <i>E. Simoen, G. Eneman, M. Bargallo Gonzalez, D. Kobayashi, A. Luque Rodríguez, J.-A. Jiménez Tejada, C. Claeys</i>	R27
---	-----

Miscellaneous

Publisher's Note: Single-Particle Model for a Lithium-Ion Cell: Thermal Behavior [J. Electrochem. Soc., 158, A122 (2011)] <i>M. Guo, G. Sikha, R. E. White</i>	S11
Publisher's Note: Dependence of the Switching Characteristics of Resistance Random Access Memory on the Type of Transition Metal Oxide: TiO₂, ZrO₂, and HfO₂ [J. Electrochem. Soc., 158, H417 (2011)] <i>W. G. Kim, M. G. Sung, S. J. Kim, J. H. Yoo, T. O. Youn, J. W. Oh, J. N. Kim, B. G. Gyun, T. W. Kim, C. H. Kim, J. Y. Byun, W. Kim, M. S. Joo, J. S. Rob, S. K. Park</i>	S12
Comment on Oxygen Solubility Measurements in Non-Aqueous Electrolytes <i>Y. Ein-Eli, A. Kravtsov</i>	S13
Erratum: Dependence of the Decomposition of Trimethylaluminum on Oxygen Concentration [J. Electrochem. Soc., 158, H93 (2010)] <i>S. Yamashita, K. Watanuki, H. Ishii, Y. Shiba, M. Kitano, Y. Shirai, S. Sugawa, T. Ohmi</i>	S14

Future Technical Meetings



**2011 Spring Meeting
Montréal, QC, Canada**

May 1-6, 2011
Technical Exhibit: May 2-4

**2011 Fall Meeting
Boston, Massachusetts**

October 9-14, 2011
Technical Exhibit: October 10-12

**2012 Spring Meeting
Seattle, Washington**

May 6-11, 2012
Technical Exhibit: May 7-9

**2012 PRiME
Fall Meeting
Honolulu, Hawaii**

October 7-12, 2012
Technical Exhibit: October 8-10



For more information
on these future
meetings, contact ECS.

Tel: 609.737.1902
Fax: 609.737.2743

www.electrochem.org