Contents

Preface ix
Acknowledgements xi

NUCLEAR
State of Nuclear Energy In the World 3
Thomas L. Sanders

BATTERIES AND ENERGY STORAGE
Correlation Between Microstructure and Oxygen Removal in Solid-Oxide-Fuel-Cell-Model Electrodes Pt(O₂)/YSZ and Pd(O₂)/YSZ 15
G. Beck

Electrical and Morphological Characterization of Monocultures and Co-Cultures of Shewanella Putrefaciens and Shewanella Oneidensis in a Microbial Fuel Cell 25
K. E. Larson and M. C. Shaw

BIOMASS
Refractory Ceramic Lining Selection and Troubleshooting in Thermal 39
Biomass Operations
Dana G. Goski, Timothy M. Green, and Dominic J. Loiacono

Comparison of Two Stage Mesophilic and Thermophilic Anaerobic 47
Digestion of OFMSW
Gayathri Ram Mohan, Patrick Dube, Alex MacFarlene, and Pratap Pulliammanappalli
Biogasification of Marine Algae *Nannochloropsis Oculata* 59
Sarnidhi Buxy, Robert Dillz, Pratap Pullammanappallil

A Preliminary Study of an Innovative Biomass Waste Aerobic Degradation System for Hot Water Heating 69
Haorong Li, Daing Hong Yu, and Yanshun Yu

Multi-Energy Optimization Process: Biodiesel Production through Ultrasound and Microwaves 79
S. Getty, M. Kropf, and B. Tittmann

Effects of Fuel Grade Ethanol on Pump Station and Terminal Facilities 89
Greg Quickel, John Beavers, Fang Gu, and Narasi Sridhar

Distributed Hydrogen Generation and Storage from Biomass 105
Peter J. Schubert, Joseph Paganessi, Alan D. Wilks, and Maureen Murray

**ELECTRIC GRID**

Gallium Nitride for Grid Applications 117
Mike Soboroff

**GEOTHERMAL**

High-Temperature Circuit Boards for Use in Geothermal Well Monitoring Applications 125
Jennifer K. Walse, Matthew W. Hooker, Kaushik Mallick, and Mark J. Lizotte

Self-Degradable Cementitious Sealing Materials in Enhanced Geothermal System 137
Toshifumi Sugama, Tatiana Pyatina, and Thomas Butcher

**HYDROGEN**

Thermodynamics and Kinetics of Complex Borohydride and Amide Hydrogen Storage Materials 157
Andrew Goudy, Adeola Ibiakunle, Saidi Sabitu, and Toluope Durojalye

Microstructure and Corrosion Behavior of the Cu-Pd-M Ternary Alloys for Hydrogen Separation Membranes 169
O. N. Doğan, M. C. Gao, and R. Hu

Metal-Hydrogen Systems: What Changes When Systems go to the Nano-Scale? 181
A. Pundt

**MATERIALS AVAILABILITY FOR ALTERNATIVE ENERGY**

Preparation of Organic-Modified Ceria Nanocrystals with Hydrothermal Treatment 195
Katsutoshi Kobayashi, Masaaki Haneda, and Masakuni Ozawa
Integration of MgO Carbonation Process to Capture CO₂ from a Coal-Fired Power Plant
Sushant Kumar

Investigation on Ammonium Phosphate Mixed SiO₂/Polymer Hybrid Composite Membranes
Uma Thanganathan

NANOCOMPOSITES AND NANOMATERIALS

Nano-Heterogeneous Structuring Effects on Thermal Power Factor and Thermal Conductivity
Gustavo Fernandes, Do-Joong Lee, Jin Ho Kim, Seungwoo Jung, Gi-Yong Jung, Fazal Wahab, Youngok Park, Ki-Bum Kim, and Jimmy Xu

Development of Thermoelectric Devices for Structural Composites
Connittan Jacob Panachaveettil, Xinghua Si, Zahra Zamanipour, Ranji Vaidyanathan, and Daryoosh Vashaee

Effect of Sn Concentration on Physical Properties of ZnO Thin Films Grown by Spray Pyrolysis on SnO₂:F/Glass
Mejda Ajili, Michel Castagné, and Najoua Kamoun Turki

Effect of Heat Treatment on the Physical Properties of In₂S₃ Prepared by Chemical Bath Deposition
Mouna Kilani, Cathy Gguasch, Michel Castagné, and Najoua Kamoun-Turki

Effect of Indium Concentration on the Physical Properties of In₂O₃ Nanomaterials Grown by Spray Pyrolysis
Nasreddine Beji, Mejda Ajili, Zeineb Sboui, and Najoua Kamoun-Turki

One-Pot Synthesis of Functionalized Few-Walled Carbon Nanotube/MnO₂ Composite for High Performance Electrochemical Supercapacitors
Yingwen Cheng, Hongbo Zhang, Songtao Lu, Shutong Zhan, Chakrapani Varanasi, and Jie Liu

SOLAR

The Use of Inexpensive, All-Natural Organic Materials in Dye-Sensitized Solar Cells
J. Whitehead, J. Tannaci, and M. C. Shaw

Deep Level Defects in N⁺-CdS/P-CdTe Solar Cells

Growth Dynamics in Thin Films of Copper Indium Gallium Diselenide Sputtered from a Quaternary Target
J. A. Frantz, R. Y. Bekale, J. D. Myers, V. Q. Nguyen, A. Bruce, S. V. Frolov, M. Cyrus, and J. S. Sanghera