

---

# Energy Technology/Battery (General) – 223rd ECS Meeting

---

## Editors:

### A. Manthiram

The University of Texas at Austin  
Austin, Texas, USA

### A. Manivannan

U.S. Department of Energy  
Morgantown, West Virginia, USA

### S. R. Narayan

University of Southern California  
Los Angeles, California, USA

## Sponsoring Divisions:



**Energy Technology**



**Battery**



Published by

**The Electrochemical Society**

65 South Main Street, Building D  
Pennington, NJ 08534-2839, USA

tel 609 737 1902

fax 609 737 2743

[www.electrochem.org](http://www.electrochem.org)

**ecs**transactions™

**Vol. 53, No. 30**

---

Copyright 2013 by The Electrochemical Society.  
All rights reserved.

This book has been registered with Copyright Clearance Center.  
For further information, please contact the Copyright Clearance Center,  
Salem, Massachusetts.

Published by:

The Electrochemical Society  
65 South Main Street  
Pennington, New Jersey 08534-2839, USA

Telephone 609.737.1902  
Fax 609.737.2743  
e-mail: [ecs@electrochem.org](mailto:ecs@electrochem.org)  
Web: [www.electrochem.org](http://www.electrochem.org)

ISSN 1938-6737 (online)  
ISSN 1938-5862 (print)  
ISSN 2151-2051 (cd-rom)

ISBN 978-1-62332-127-7 (Softcover)  
ISBN 978-1-60768-482-4 (PDF)

Printed in the United States of America.

---

## Table of Contents

*Preface* *iii*

### **Chapter 1** **PEMFC - Membranes, Cells, and Stacks**

The Application of Intermediate Temperature Fuel Cell for the Auxiliary Power Unit of the Air Conditioning System in an Electric Vehicle 3

*S. S. Pethaiah, A. Subiantoro, U. Stimming*

Behavior of a Single Direct Methanol Fuel Cell in Stacks at Air Maldistribution Conditions 11

*X. G. Yang, Q. Ye, P. Cheng*

Influence of Artificial Ageing of Gas Diffusion Layers on the Water Management of PEM Fuel Cells 21

*T. Arlt, M. Klages, I. Manke, M. Messerschmidt, H. Riesemeier, A. Hilger, J. Scholta, J. Banhart*

Poly(vinyl alcohol)/Sulfosuccinic Acid (PVA/SSA) as Proton-Conducting Membranes for Fuel Cells: Effect of Cross-Linking and Plasticizer Addition 29

*J. Zhang, L. Liu, C. Ma, Y. Liu, J. Qiao*

### **Chapter 2** **Lithium Ion Batteries - Characterization/Design**

Effect of Cooling the Cathode Grid Tab Stack on the Thermal Characteristics of Lithium-Ion Pouch Cells under Various Discharge Rates of Constant Current 37

*S. Bazinski, X. Wang*

### **Chapter 3**

#### **Sodium and Redox Flow Batteries**

- Na<sub>x</sub>CoO<sub>2</sub> Cathode Material: Synthesized by Inverse Micro- Emulsion Method for Sodium Ion Batteries 49  
*B. Venkata Rami Reddy Jr., S. Gopukumar*
- Effect of Electrode Pretreatment on the Cyclic Voltammetry of VO<sup>2+</sup>/ VO<sub>2</sub><sup>+</sup> at a Glassy Carbon Electrode 59  
*A. Bourke, R. P. Lynch, D. N. Buckley*

### **Chapter 4**

#### **PEMFC - Catalysts**

- Electrochemical Reduction of CO<sub>2</sub> on Modified Cu Electrodes Resulting from Pre-Electroreduction Annealed Cu in Different Electrolytes 71  
*P. Jiang, J. Qiao, M. Fan, C. Ma, J. Liu*
- Synthesis of Core-Shell Co@Pt/C Electrocatalyst and Effects of Stabilizer and pH on Its Performance 79  
*C. Cao, R. Lin, T. Zhao, Z. Huang, J. Ma*
- Impact of Cathode Fabrication on MEA Performance in PEFCs 95  
*T. Tanuma, S. Kinoshita*
- Numerical Model of Platinum Dissolution in Polymer Exchange Membrane Fuel Cells with Slow Proton Transfer 103  
*N. Katayama, S. Kogoshi*

### **Chapter 5**

#### **Lithium Ion Batteries - Cathodes**

- High Performance LiNi<sub>0.5</sub>Mn<sub>1.5</sub>O<sub>4</sub> Spinel Li-Ion Battery Cathode Development 111  
*W. Xing, J. Buetner-Garrett, M. Krysiak, J. Kelly*
- Optimization of the Titanium Oxsulfides (TiO<sub>y</sub>S<sub>z</sub>) Performance Used as Positive Electrode in Lithium Microbatteries 121  
*E. Saoutieff, L. Le Van-Jodin, C. Secouard, M. Proust*

**Chapter 6**  
**Lithium Batteries - Anodes**

- Measurement of the Diffusion Coefficient of Lithium in Tin Thin Films Including Phase Transformation Effects 131  
*E. C. W. Fok, J. D. Madden*

**Chapter 7**  
**SOFC**

- Thermodynamics and Kinetics of Solid Oxide Fuel Cells with Molten Tin Anodes 145  
*M. Colet Lagrille, G. H. Kelsall*

- Fabrication and Electrochemical Performance of Unit Anode Supported Intermediate Temperature Solid Oxide Fuel Cells by Single Step Process 159  
*V. Sivasankaran, L. Combemale, M. C. Pera, G. Caboche*

- Investigation of H<sub>2</sub>, CO and Syngas Electrochemical Performance Using Ni/YSZ Pattern Anodes 163  
*W. Yao, E. Croiset*

**Chapter 8**  
**Poster Session**

- Preparation and Characterization of La<sub>0.9</sub>Sr<sub>0.1</sub>Ga<sub>0.8</sub>Mg<sub>0.2</sub>O<sub>3-δ</sub> Thin Film Electrolyte Prepared by Spray Pyrolysis Deposition for Low-Temperature Operating μ-SOFC 175  
*K. Tomomichi, K. Sasaki, Y. Endo, K. Kikai, T. Terai*

- Characterization of Porous Thin-Film LSCF Cathode for Low-Temperature Operating μ-SOFC Prepared by Spray Pyrolysis Deposition 181  
*K. Sasaki, K. Tomomichi, Y. Endo, K. Kikai*

- Empirical Correlations to Predict In-situ Durability of Polymer Electrolyte Membranes in Fuel Cells 187  
*R. Yadav, G. DiLeo, N. Dale, K. Adjemian*

Titanium Oxide Anode in Inverse Structure for Dye Sensitized Solar Cell Applications by Electrophoretic Self-Assembly and Sol-Gel Processes <i>R. F. Louh, S. Huang, D. Ho</i>	201
Electrolyte Distribution and Discharge Time – A Combined Study of X-ray Tomography and Electrical Measurements of a Commercially Available Lithium-Ion Capacitor <i>F. Wieder, C. Kallfaß, I. Manke, A. Hilger, C. Tötze, C. Hoch, H. Schier, K. Graf, J. Banhart</i>	211
Investigation of HNO <sub>3</sub> -Treated Carbon Xerogel Electrodes for Capacitive Deionization Applications <i>X. Gao, J. Landon, J. K. Neathery, K. Liu</i>	219
Energy Recovery in Parallel Capacitive Deionization Operations <i>J. Landon, X. Gao, J. K. Neathery, K. Liu</i>	235
Semiconductors as Selective Redox Electrodes <i>A. R. Usgaocar, L. Wang, Z. Hong, J. D. W. Madden</i>	245
The Effect of Hot-Pressing on Performance of MEA Using Acid-Doped Bacterial Cellulose as Proton Exchange Membranes <i>G. Jiang, L. Liu, J. Zhang, F. Hong, J. Qiao</i>	255

## **Chapter 9** **Metal-Air Batteries**

Perovskite Ba <sub>0.5</sub> Sr <sub>0.5</sub> Co <sub>0.8</sub> Fe <sub>0.2</sub> O <sub>3-δ</sub> as a Bifunctional Air Electrode for Zinc-Air Batteries <i>X. Z. Yuan, W. Qu, J. Fahlman, D. G. Ivey, X. Zhang</i>	265
Author Index	273