

**Knowledge Foundation's International  
Conference on Next Generation  
Batteries 2012**

**Application Driven Development of New  
Battery Chemistries and System Designs  
– Lithium and Beyond**

**Boston, Massachusetts, USA  
19-20 July 2012**

ISBN: 978-1-62276-235-4

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2012) by the Knowledge Foundation  
All rights reserved.

Printed by Curran Associates, Inc. (2012)

For permission requests, please contact the Knowledge Foundation  
at the address below.

Knowledge Foundation  
18 Webster Street  
Brookline, Massachusetts 02446-4938

Phone: (617) 232-7400  
Fax: (617) 232-9171

[custserv@knowledgefoundation.com](mailto:custserv@knowledgefoundation.com)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2634  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# TABLE OF CONTENTS

<b>Blending Advanced Battery Chemistries Targeted at the Automotive Market</b> .....	1
<i>Rick Chamberlain</i>	
<b>Rechargeable Magnesium Batteries: Moving Beyond Lithium</b> .....	18
<i>David J. Eaglesham</i>	
<b>Next Generation High Energy Batteries: Sulfur Cathode vs. Silicon Anode</b> .....	32
<i>Markus Hagen, P. Fanz, R. Speck, D. Karabelli, J. Tubke, S. Dorfler, S. Thieme, H. Althues, E. Quiroga-Gonzalez, H. Foll</i>	
<b>Thin &amp; Flexible Battery: Novel Design and Application</b> .....	47
<i>Hyuk Chang, Seokgwang Doo, Jae-man Choi</i>	
<b>Thin Film &amp; Printed Rechargeable Li Ion Batteries</b> .....	56
<i>Helene Rouault, Julio A. Abusleme, S. Paillet, L. Picard, F. Fusalba, D. Gloesener</i>	
<b>EM1: A 5V Electrolyte Additive Package for Various High Voltage Cathodes</b> .....	77
<i>Bin Li, Vinay Bhat, Gang Cheng, Jen-Hsien Yang, Steven S. Kaye</i>	
<b>How the Coming Shortage in Critical Metals will Impact the Supply Chain for Next Generation Batteries</b> .....	93
<i>Michael Silver</i>	
<b>Tin Nanoneedles: A Cost Effective, Industry-Scalable Anode Technology for Lithium-ion Batteries</b> .....	99
<i>M. Grant Norton, David Mackay, Uttara Sahaym</i>	
<b>Development of Zinc-Air Batteries</b> .....	111
<i>Michael Oster</i>	
<b>Rechargeable Silver-Zinc Microbatteries</b> .....	127
<i>Trqy Renken</i>	
<b>Numerical Coupling and Multi-Scale Modeling for Batteries</b> .....	144
<i>John A. Turner, Sreekanth Pannala, Srikanth Allu, Partha P. Mukherjee</i>	
<b>A Virtual Li/S Battery: Modeling, Simulation and Computer-Aided Development</b> .....	168
<i>David N. Fronczek, Wolfgang G. Bessler</i>	
<b>Direct Dry Formation of Cathode Electrodes for Lithium-Ion Batteries Using a One-Step Combustion Process</b> .....	182
<i>Justin Roller, R. Jain, R. Maric, M. Gulbinska</i>	
<b>Nanofiber/Microfiber Lithium Ion Battery Separators for Higher Power and Faster Recharge</b> .....	199
<i>Brian Morin, Jim Schaeffer</i>	
<b>Surface-Mediated Cells (SMCs): Next Generation High-Power and High-Energy Batteries</b> .....	212
<i>Bor Z. Jang, Kenny Wang</i>	
<b>Simultaneously Enhancing Ionic Conductivity and Mechanical Properties of Solid Polymer Electrolytes (SPE) Via a Copolymer Multi-Functional Filler</b> .....	228
<i>Katie Zhong</i>	
<b>Simultaneous Ionic and Electronic Current Measurements of a LiCoO<sub>2</sub> Battery Cathode Material</b> .....	244
<i>Keith Jones, N. Balke, S. Kalinin, R. Proksch</i>	
<b>Hybrid Electrical Energy Storage Systems</b> .....	257
<i>Naehyuck Chang, Massoud Pedram</i>	
<b>Exploit New Pseudocapacitive Metal Oxide Materials for Supercapacitor Applications</b> .....	282
<i>Dongfang Yang</i>	
<b>Operando Studies of Electrode Materials for Li-Ion Batteries</b> .....	299
<i>Lorenzo Stievano</i>	
<b>Reducing Sugar-Air Batteries</b> .....	318
<i>Shengxi Li, Daniel M. Scott, Bor Yann Liaw</i>	
<b>Soy Protein-Based Ultra Elastic Polymeric Electrolyte</b> .....	337
<i>Katie Zhong</i>	
<b>Methods for Good Material Selection and Battery Lifetime Improvement</b> .....	349
<i>Sanjay Patel</i>	
<b>Intercalation Physics of Molybdenum Disulphide and Rational Designs</b> .....	368
<i>Jun Li</i>	
<b>State of Charge Estimation and Life Prediction of Lithium-Ion Batteries for Electric Vehicle Applications</b> .....	388
<i>Raghavendra Arunachala, Kamyar Makinejad, Andreas Jossen</i>	
<b>Author Index</b>	