

BATTERY POWER 2009

October 20 - 21 • Denver, Colo.

INTEGRATE NEW TECHNOLOGY

DISCOVER GROWTH OPPORTUNITIES

IMPROVE SYSTEM PERFORMANCE

NETWORK WITH INDUSTRY LEADERS

Presentations from Industry Experts Including:



Chris Turner
Nexergy, Inc.



Kevin Parmenter
Freescale
Semiconductor



Dr. Robin Tichy
Micro Power
Electronics, Inc.



Neil Maguire
Imara Corp.



Sam Jaffe
Energy Insights

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Battery Power 2009

Battery Power 2009, an international conference highlighting the latest developments and technologies in the battery industry, will be held October 20th - 21st in Denver, Colorado.

This seventh annual event will feature more than 30 presentations on portable, stationary and automotive battery technology, as well as battery manufacturing, materials and research & development. Topics will include new battery designs, emerging technologies, battery materials, power management, charging and testing systems, battery health, as well as the latest market trends affecting the industry.

The conference is designed for OEM design engineers, system engineers, technical and management professionals involved in battery powered products and systems, battery manufacturing, battery technology research and development and power management technology.

Our Commitment to You

Whether this is your first time participating at the Battery Power conferences, or if you have attended in the past, the 2009 event will provide you with the most up-to-date developments and technologies in the battery and power management market.

If you are involved in the battery industry or if your products and systems run on batteries, this is a must attend event.

Who Will be at Battery Power 2009:

- OEM design engineers of portable electronic products and battery-powered systems
- Developers and integrators of rechargeable battery products and systems
- System engineers of standby, backup and uninterruptible power systems
- System integrators, vendors, distributors
- Manufacturers of batteries and battery packs
- IC and chipset providers
- Manufacturers of charging, conditioning, monitoring and testing equipment
- System engineers of electric vehicles
- Product managers seeking new applications and partnering opportunities
- Charging and testing system component providers
- Specialized energy materials suppliers
- Battery component providers



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Schedule At-a-Glance

Monday October 19th

8:30	NREL Tour
9:00	Battery Design Workshop
11:00	Setaram Workshop
1:00	Texas Instruments Workshop

Tuesday, October 20th

8:00	Welcome and Introductions
8:05	Keynote Presentation
9:10	Featured Presentation
10:00	Networking Break
10:45	General Sessions
11:25	General Sessions
12:00	Networking Lunch
1:30	General Sessions
2:10	General Sessions
2:45	Networking Break
3:15	General Sessions
3:50	General Sessions
4:30	Featured Presentation
5:00	Cocktail Reception

Wednesday, October 21st

8:00	Keynote Presentation
9:00	Featured Presentation
10:00	Networking Break
10:30	General Sessions
11:10	General Sessions
11:50	Networking Lunch
1:00	General Sessions
1:40	General Sessions
2:15	General Sessions
2:45	Conclusion of Conference

Tour of the National Renewable Energy Laboratory (NREL)

Presented by: Ahmad Pesaran, NREL

Time: 8:30 a.m. to 11:30 a.m.

Registration: Free to full conference attendees; limit of 25 attendees.

Attendees will be given a tour of NREL's Battery Thermal Management Lab at the Thermal Test Facility, the Battery Material Research Lab at the Solar Energy Research Facility and Science and Technology Facility, as well as a tour of the Plug-In Hybrid Electric Vehicle and Solar Charging Station.

The tour is limited to the first 25 conference attendees that sign up. No registrations will be accepted after September 30th. Attendees must provide their own transportation to NREL, located in Golden, Colo.

To sign up for the tour or for any questions, please contact Shannon Given at 720-528-3770 or shannong@infowebcom.com.

Lithium-Ion Battery Design Tutorial

Presented by: Robert Spotnitz, Battery Design LLC

Time: 9:00 a.m. to 5:00 p.m.

Registration: Before September 18th: \$395; after September 18th: \$495

This full day course surveys all aspects of lithium-ion battery design ranging from materials and processes, to cells to packs. A thorough overview of the issues involved in life estimation, thermal behavior, and abuse tolerance is provided. How to design lithium-ion cells is discussed in detail with an emphasis on comparing different chemistries. The Battery Design Studio software is used to illustrate design techniques for cells and packs.

This course is aimed at managers, engineers and scientists interested in getting a good overview of lithium-ion technology as well as learning how to design lithium-ion cells. No prior knowledge of lithium-ion batteries is assumed.

Calorimetry and Thermal Analysis in Batteries, Cells and Materials Development

Presented by: Andre Levchenko, Setaram

Time: 11:00 a.m. to 3:00 p.m.

Registration: Free for full conference attendee (registration required); \$99 for non-full conference attendees.

This workshop is part of Setaram's 'Lunch & Learn' series designed to help understand the applications of calorimetry and thermal analysis in the assessment of batteries, cells and materials development. This half-day workshop is chaired by the head of Setaram USA Application & Testing Laboratory and contains data from customers worldwide in

the field of battery development. This includes everything from screening materials, to self discharge and of course abuse and overcharge testing. In addition, there will be an open discussion session that will allow attendees to ask questions and advice from the panel of experts with regards your specific work and challenges.

The agenda is a series of presentations that introduce the techniques, principles of operation and key measurement capabilities of different techniques as well as a review of data and publications in the recent months that describe experimental procedures being applied today throughout the battery world.

Li-Ion Battery Power Management: Chemistry Characteristics, Charging, Fuel Gauge and Cell Balance

Presented by: Doug Williams, Yevgen Barsukov and Jinrong Qian, Texas Instruments

Time: 1:00 p.m. to 4 :00 p.m.

Registration: Before September 18th: \$49; after September 18th: \$99.

Battery power management continues to play a critical role in battery powered devices. "How can I charge the battery safely and faster, make the system run longer, and fully use the battery capacity?" has plagued designers and users. This workshop addresses the issues surrounding battery power management for safely charging the battery, smartly monitoring the battery for improving protection, and accurately estimating battery remaining capacity.

The workshop provides the battery electrical behavior, charging and discharging characteristics, cycle life and safety protections including over-charging, over temperature, over-current and short circuit for Li-Ion and LiFePO4 batteries.

Attendees will learn about the new industry charging standards, review the battery charging system architecture, interaction between system and charger. Dynamic Path Management technology is going to be presented to maximize use of the AC adapter power while charging the battery and supplying the system simultaneously.

The presenters will discuss how to accurately monitor the battery remaining capacity. Too early shutdown the system will not fully use the energy from the battery for low accuracy fuel gauge. High accuracy fuel gauge is as important as the power conversion efficiency. We will review the most commonly used monitoring approaches: coulomb counting, voltage measurement based and 99 percent accuracy impedance track based fuel gauges. Both single cell and multi-cell fuel gauge examples will be presented.

Skip Maner joined Inverness Graham in 2002 and, along with the other Managing Principals, shares responsibility for all major operational functions of the firm, including investment sourcing, structuring, negotiating, divesting and working with portfolio companies. Skip serves on the Inverness Graham Investment Committee.

Abe Yokell is a Principal at RockPort Capital Partners and has worked in all realms of cleantech and on specific investments in solar, energy storage, water, transportation, green buildings, the smart grid, efficiency, wind, lighting and advanced materials, among other sectors.

Mark Iwanowski joined Trident Capital in 2005 as a Venture Partner and will be a Managing Director in Fund VII focusing primarily on CleanTech and Business Process Outsourcing. Mark has twenty-five years of experience successfully leading multiple global businesses in the high tech industry for both commercial and government customers.

Matthew Garratt joined Battery Ventures in 2008 and focuses on clean technology and advanced materials. Prior to Battery, he was Vice President of Plymouth Ventures, where he developed a cleantech focus for the fund. He has also worked for GE in their Renewable Energy group where he helped to set strategy for the wind and solar markets.



Chris Turner contributes more than 15 years of multi-disciplined battery industry experience to the strategic development of portable power solutions at Nexergy. For six years, he led battery research

and strategic planning in energy technology for Sony Ericsson Mobile Communications USA (SEMC). Chris holds a B.S. degree in Chemistry from the University of South Carolina.



Kevin Parmenter is the Applications Engineering manager for Freescale Semiconductor analog mixed signal and power division. Presently, he manages a global applications and product definition team for Freescale Semiconductor.

He has more than 25 years of experience in electronics, power electronics and semiconductor industry. Kevin serves on Board of Directors and as president of PSMA.

7:00 Registration Opens & Networking Breakfast

8:00 Welcome and Introductions

8:05 Keynote Presentation Venture Capital Investor Panel

Venture Capital investment in advanced battery companies is growing, with interest expanding all across the value chain. However, few have a long track record, essential in such a demanding field where a firm grasp of electrochemistry is needed to discern a lab project from a home run. This session will bring together some of the industry's leading VC investors with experience in the battery industry to share their insights, strategies and evaluation process. These investors will share their experience funding fast growing battery companies, and ample time will be made available for the audience to interact with the panel to answer your questions, and gain an insight into this keenly important topic.

Skip Maner, Managing Principal • Inverness Graham Investments

Abe Yokell, Principal • RockPort Capital Partners

Mark Iwanowski, Venture Partner • Trident Capital

Matthew Garratt, Senior Associate • Battery Ventures

9:10 Featured Presentation

Lithium Ion Cell Evaluation – Optimizing Battery Performance For Your Application

Today, Lithium ion batteries are commonly used in many non-consumer applications that include portable medical devices, commercial power tools, military devices, various wireless applications, server backup and industrial products of all types. These applications often have a set of unique requirements that require evaluation to verify performance under their specific conditions. These requirements might include operation outside of the typical temperature ranges, high discharge pulse rates, extreme cycle life, long calendar life in backup applications, fast charging and shallow cycling. This presentation will report on evaluations on Li-ion cells with various chemistries including lithium iron phosphate, as well as demonstrate the differences in lithium ion cylindrical, prismatic and polymer performance.

Chris Turner, Director of Battery Technology • Nexergy, Inc.

10:00 Networking Break

10:45

Ultra Low Voltage, High Efficiency Boost Converter for Battery Charging Applications

Conventional semiconductor technology has been inadequate at low voltages for battery charging in many electronics applications. These include boosting low-voltage sources, which by their very nature produce very low voltages and don't series connect well. These include thermal, biochemical, solar, chemical mechanical and other low voltage sources. To charge batteries it is desired to boost these voltages to higher voltage levels. Demonstrated and described will be a boost converter, which starts up and operates with nearly 90 percent conversion efficiency and operates at approximately one-third of a volt allowing charging from harvesting and unconventional sources.

*Kevin Parmenter, Applications Engineering Manager
Freescale Semiconductor*

Fuel Cells and Batteries: Achieving Grid-Like Power for Off-Grid Deployments

Fuel cells offer battery professionals grid-like power for off-grid deployments irrespective of the duration or location. Unlike batteries that need to be replaced or recharged, fuel cells offer extreme portability and some of the longest runtimes for unattended deployments. Hybrid systems consisting of reformed methanol fuel cells and batteries are a promising portable power solution that combines the high energy density and peak power capabilities of these two complementary technologies; a major requirement for unattended deployment of electronic sensing, computing and communications devices for critical remote or mobile operations.

Ian Kaye, CTO • UltraCell Corp.

Battery Pack Design to Prevent Cell Damage in Transient Thermal Gradients

Users in all markets are demanding increased functionality in ever lighter and smaller packages, but industrial, military and medical equipment is often exposed to more extreme temperatures than consumer electronics. Extremely high temperature operation or survival provides a significant challenge for cells based on lithium chemistry. Our thermal modeling demonstrates that a battery pack can be designed to protect the cells from temperatures well over 100°C for a short period of time. We will present a thermal model of cells enclosed in a battery pack and show how the packaging can be designed for protection in transient thermal gradients. The original dynamic heat transfer model will be discussed and verification of both the model and the battery pack design with a thermal chamber will then be presented.

*Robin Sarah Tichy, Technical Marketing Manager
Micro Power Electronics, Inc.*

11:25

Challenges and Solutions for LiFePO₄ State of Charge Indication

LiFePO₄ has recently emerged as a lead candidate for safe high-power capable battery chemistry for electric, hybrid vehicles and power tools. Its robustness to thermal run-away conditions and very good cycle life make it suitable for high rate of charge and discharge and wide temperature range. However, adoption of this chemistry in consumer electronics devices has been slow because of its lower energy density and the significant challenge for traditional voltage based capacity gauging. Explore an error analysis of voltage-based gauging if applied to LiFePO₄ battery. Further we will describe a solution to the problem in the 3rd generation Impedance Track algorithm that takes into account flatness of different portions of voltage profile to balance between coulomb counting and voltage correlation for achieving best overall accuracy.

Yevgen Barsukov, Sr. Applications Engineer • Texas Instruments, Inc.

Fixing the Frequency with Li-Ion: Demonstration Projects for Frequency Regulation of the Electric Grid

For a safe and efficient electrical grid, operators must maintain a steady 60 cycles per second on their lines. Failure to do so will cause voltage surges and sags and present an intolerable safety risk. The traditional method to regulate frequency is to ramp fossil fuel plants up and down for a matter of minutes in order to keep the lines steady. A new method of frequency regulation, utilizing energy storage devices, is gaining ground. This presentation would focus on three pilot projects that are providing frequency regulation for the grid utilizing lithium-ion batteries. The presentation will discuss the frequency regulation market and then will analyze the projects based on their technology, their economics and the real world lessons that have been learned.

Sam Jaffe, Senior Research Analyst • Energy Insights



Ian Kaye has been active in the fuel cell industry for more than 10 years and has more than 40 patents in fuel cells, fuel processors, fuel delivery and fuel cell systems. Ian is a founding member of the UltraCell team and invented UltraCell Corp.'s reformed methanol fuel cell technology platform, which is the core of the UltraCell XX25 fuel cell.



Dr. Robin Sarah Tichy is the Technical Marketing Manager with Micro Power Electronics, Inc. Robin has developed an expertise in translating market drivers into technical solutions in the battery and charger industry. Prior to joining Micro Power, she applied technical and project management skills to orchestrate and implement solutions to solve vital business problems at leading organizations like Hewlett Packard and International SEMATECH, in the semiconductor, nanotechnology and MEMS verticals.



Yevgen Barsukov is a senior applications engineer in the battery management group at Texas Instruments, Inc. Barsukov specializes in applying leading theoretical methods of battery analysis to improve the battery controlling technology used for fuel-gauging, health and safety information in notebooks, mobile-phones, PDAs and other portable devices.



Sam Jaffe is responsible for researching, writing and editing qualitative and quantitative reports and presentations evaluating a range of renewable energy, distributed energy, energy efficiency, demand response and environmental topics. His recent research includes analysis of the energy storage sector, renewable energy spending related to the American Recovery and Reinvestment Act and the impact of declining module prices on the solar photovoltaic industry.



Photo courtesy of Denver Metro CVB



David White has been designing state-of-the-art computer, seismic and battery systems for Texas Instruments, Halliburton, Input/Output, Southwest Electronic

Energy Group and others for more than 38 years. David's practical design experience is in large, high capacity, high reliability computer and system designs used in battery operated, man portable applications that must work in any environment above, on or under the earth.

Matthieu Dubarry is a research engineer at the Electrochemical Power Systems Laboratory of the Hawaii Natural Energy Institute (HNEI) leading the task on electric and hybrid vehicle data acquisition and the evaluation, analysis, modeling and simulation of lithium rechargeable batteries and fuel cells in the laboratory and in the field.



Dr. Bor Yann Liaw directs the Electrochemical Power Systems Laboratory to conduct research on advanced batteries, (bio)-fuel cells, and chemical sensors at

the University of Hawaii at Manoa. He has been involved in electric and hybrid vehicle R&D for the past 12 years, primarily focused on battery testing, model prediction and simulation, and vehicle operation data collection and analysis.

Battery Performance and Thermal Management: Cell, Module, Pack Calorimetry Testing

Current focus in the lithium battery world is firmly fixed on vehicle and high power draw applications. Knowledge on minimizing heat release and managing heat output is vital. To get such information requires knowledge of both effect of heat upon and amount of heat released from batteries and power packs of large size and capacity. This presentation will give examples of recent applications showing calorimeters results from cell and module level. The data will be applied at this level demonstrating how calorimetry allows battery performance, aging and lifecycle information to be obtained. Taken together all calorimetric data allow a thorough understanding of performance of for example the power pack in a hybrid vehicle providing the information to give inherent safety with optimum performance.

Martyn Ottaway, Managing Director • Thermal Hazard Technology

12:00 Networking Lunch & Round Table Discussions Advancements in Large Format Lithium-Ion Batteries

Large format prismatic lithium-ion cells have made considerable progress over the past several years and are now enabling a new generation of energy storage applications including electric vehicles and smart grid applications. This round table will discuss comprehensive battery management systems, and how energy storage systems utilizing large format cells are safer, more reliable and result in higher efficiency and system energy density.

Moderated by John Battaglini, Vice President – Business Development & Sales • International Battery

1:30

Combining Built-In Charge Control and Discharge Balancing to Balance Independent Series Connected Battery Modules

Cell balancing for higher voltage Li-Ion battery systems is critical in providing Li-Ion's expectation of reliable high capacity, high power, extended life and no compromise safety. Hear real life examples of simple and automatic cell and module balancing methods that extend Li-Ion battery pack voltage, allow multiple charge power sources, including green power sources, allow ultra flexible battery system design, and allow fast and simple replacement of weak battery modules instead of the whole battery system. This new automatic module balancing method uses off-the-shelf components, is robust, and is relatively inexpensive.

David A. White, Electrical Engineer • Southwest Electronic Energy Group

Battery System Management and Cell Variations

With renewable energy distributed power generation, plug-in hybrids, portable electronics and energy storage applications in sight, it is anticipated that the battery use will increase significantly in the foreseeable future. Among various electrochemical energy storage systems available to date, lithium ion batteries seem to attract the most attention because of the higher specific power and energy. Unfortunately, the requirements to safety and tolerance to abuse with the Li-ion batteries are more stringent than the others. Discover a unique approach that can take conventional battery test results through careful analysis to derive useful information about cell performance variations and attributes to degradation. A battery model that can accommodate such cell variations can accurately predict battery performance and monitor cell degradation to prevent undesirable pre-mature failure and effectively mitigate cell imbalance in a pack.

*Matthieu Dubarry and Bor Yann Liaw
Hawaii Natural Energy Institute, SOEST*

Cradle-to-Grave Clean Lithium-Ion Batteries

Lithium-ion batteries are fast becoming the next generation of automotive power systems. Breaking the tie between the source of energy generation and energy consumption through electrification is a fundamental change in transportation that represents a tremendous opportunity to include the environment as we reinvent the automobile. While historically, battery manufacturing has been known as a dirty business, lithium-ion cell production can be done with a far less environmental impact. It is important that the complete cycle of production, use and disposal be considered when evaluating alternative propulsion choices. This session will analyze cradle-to-grave concept applied to lithium-ion batteries, green production of lithium-ion batteries and environmental costs and the end value to OEMs and consumers.

Neil Maguire Vice President, Business Development • Imara Corp.

2:10

Battery Charging a Key to Improving Efficiency of Electric Cars

Battery powered cars are now starting to make a comeback as new battery technology, stylish designs and an increased desire by consumers to lower their carbon footprint is taking hold. While many of these vehicles are zero in local emissions, more can still be done to lower their overall electricity consumption especially while recharging, which has a significant impact on the environment and on the power bills of consumers. Examine the industry techniques and market developments in the electric automotive market and the benefits of the newest HE battery charging technologies.

Arne Steinbakk, Product Director • Eltek Valere

Rapid Development of Large Li-Ion Battery Packs Using Off-the-Shelf Battery Management Systems

When developing large Li-Ion batteries, such as traction packs for vehicles, using an off-the-shelf BMS will reduce the time to market significantly, and drastically cut down on development costs and risks. Advantages include ready made hardware, minimal (if any) NREs and software that leverages the BMS designers' experience and understanding of Li-Ion battery issues. Various commercially available BMS will be compared. Pros and cons of using an off-the-shelf BMS versus designing your own (from scratch or using specialized ICs) will be analyzed. The process of deploying a BMS will also be described.

Davide Andrea, Engineer • Elithion

Challenges to Bringing New Li-Ion Paradigms to High Reliability Markets

ABSL has pioneered the use of Li-ion technology for space applications for more than a decade. However, ABSL followed a different path from the traditional approach of employing cell balancing and protection electronics. Instead, arrays of closely matched small Li-ion cells have been used that rely on internal protection devices to achieve completely passive (no active electronics) battery systems. This reduced simplicity has proved very attractive to customers both within and outside aerospace but has required much testing to prove long-term reliability and safety.

Chris Pearson • ABSL Space Products

2:45 Networking Break



Neil Maguire is vice president, Business Development for Imara Corp. Neil is responsible for customer-facing activities, and brings more than 17 years of experience in the

automotive and tech industries, as well as a background in cleantech and entrepreneurship. Actively seeking to cast his lot with solutions to the world's environmental problems, Maguire researched the battery industry and knocked at Imara's (then Lion Cells') door.



Davide Andrea is the developer of Elithion's line of lithium ion battery management system. Previously, Davide co-founded Hybrids Plus, where he developed Prius and Escape PHEV

(Plug-in Hybrid) conversions.



Photo courtesy of Stan Obert for Denver Metro CVB



Dr. David Shen is currently the CEO of NEXcell Battery Co., Ltd. His battery research fields include rechargeable Li-TiS₂ battery, rechargeable Li-ion battery, rechargeable

Li-ion polymer battery and primary Li-SOCI₂ battery.

Dr. Kevin L. Gering from the Idaho National Laboratory (INL) is an established expert in the field of state-of-the-art molecular-based electrolyte models for electrochemical systems and has developed novel performance and life models for Li-ion systems covering aspects of kinetic limitations and performance fade over test life.

Gene Weaver is a 30 year veteran of the industrial and electronics sectors. He has been responsible management/executive level positions at Ford Motor Co., Teledyne, Cummins Engine company and Solar Gas Turbines.



Joe Carcone joined PowerGenix in 2006 where his duties include business development, product development and sales implementations for portable power applications. Before

joining PowerGenix, he was the vice president of Marketing and Sales for Sanyo Energy Corp.

3:15

A Hybrid Battery System for Electric Vehicles

Nickel Metal Hydride batteries (Ni-MH) are widely used on hybrid electric vehicle. Large capacity Ni-MH batteries can also be used on electric vehicle (EV) because of their safety factor and simple battery power management system. Zinc air batteries are a highly reliable metal air battery system and has very high energy density. Ni-MH zinc air batteries can be combined as a hybrid battery system to gain both power and energy for EV applications. This presentation will cover the design and performance of a EV hybrid battery system with a 10,000 Wh Ni-MH battery and a 30,000 Wh Zinc air battery.

David H. Shen, Ph.D., President • NEXcell Battery Co., Ltd.

Diagnostic Analysis, Modeling and Prediction of Capacity Loss In Li-Ion Cells

Capacity loss in Li-ion cells is due to a combination of mechanisms including loss of free available lithium, loss of active host sites and shifts in the potential-capacity curve. There are tandem needs for accurate interpretation of capacity at characterization conditions (cycling rate, temperature, etc.) and for robust self-consistent modeling techniques that can be used for diagnostic analysis of cell data as well as forecasting of future performance. To address these needs, a modeling capability was developed that serves to provide a kinetic analysis of the contributing factors to capacity loss and to act as a regression/prediction platform for cell performance. The presentation will cover mathematical and theoretical frameworks, and will demonstrate application to capacity data obtained for various Li-ion cells covering test periods up to 140 weeks, and will show model predictions well past the end of test periods.

Kevin L. Gering, PhD, R&D Scientist and INL Technical Lead for DOE-ABR, Energy Storage & Transportation Systems • Idaho National Lab

Extending the Battery Life Cycle with Ultra Caps

Battery life can be compromised due to a number of factors usually under the control of the user. As a consequence, a user with limited time or less interest in battery maintenance will appreciate a system to improve or increase battery life. Especially if the device requires no maintenance and operates in most any environment or space needing no conditioning. This describes the Ultra Cap and is installed on the same DC bus complimenting the batteries by extending their life.

Gene Weaver, VP Sales & Marketing • Renewable Power Systems, Inc.

3:50

Advances in NiZn Technologies for Light Electric and Hybrid Vehicle Applications

Nickel-Zinc offers distinct advantages for use in vehicle applications. First, compared to current technologies, such as NiMh, Li-ion and lead acid, NiZn offers benefits in high energy density, long cycle life, low cost, weight/size reduction, low internal resistance. The NiZn Rechargeable battery is an environmentally eco-friendly technology as well as inherently safe, with no toxins or flammable material used in its construction.

Joe Carcone, Vice President, New Business Development • PowerGenix

Supporting Organizations



Using Adiabatic Calorimetry to Design Inherently Safer Li-Ion Batteries

Adiabatic, along with other forms of Calorimetry such as Differential Scanning Calorimetry (DSC) and isothermal calorimetry have long been used by chemical and pharmaceutical companies for measuring the potential for thermal runaways in existing or proposed processes. More recently, the calorimetry methods have been applied to Li-ion development. In this presentation attendees will get examples of the wealth of information available from the field of chemical process safety and its applications to Li-ion development allowing the researcher to use some new techniques as well as being able to avoid some common mistakes and assumptions.

Peter Ralbovsky, Calorimetry Expert • Netzsch Instruments

Boosting Ultracapacitor Performances with Nanostructured Carbon Electrodes and Environmentally Friendly Ionic Liquid Electrolytes

Ultracapacitors have been developed to provide power pulses for a wide range of applications. However, to satisfy the rapidly increasing performance demands for these applications, performances of the current state-of-the-art ultracapacitors need to improve. This requires new electrode materials and new electrolyte materials. We utilized carbon nanotubes to develop a range of nanostructured electrodes and combined them with ionic liquid electrolytes to develop new ultracapacitors. Combining the unique properties of these new materials, the resultant capacitors showed significantly improved cell voltage, energy density and power density, outperforming the current ultracapacitor technology. Furthermore, difference in the cost, preparation procedure and capacitor performance of these electrode materials enables the best performance / cost value for the optimal capacitors.

*Wen Lu, Ph.D., Senior Research Scientist,
Energy Storage Program Manager • ADA Technologies, Inc.*

4:30 Next Generation Li-Ion Technology: Untethered and Environmentally Sustainable

In this presentation, Boston-Power, Inc.'s vision for a truly untethered mobile lifestyle will be examined, and the key enabling battery attributes and performance metrics discussed. Increased cycle life, fast charge and predictable runtime give users the confidence to be truly mobile. Other performance attributes of the latest technology platforms, including energy density, rate capability and low temperature performance, will be presented.

Eric Carlson, Director of Technical Sales • Boston-Power

Materials Joining Technologies for Battery Applications

Use of ultrasonic energy for the assembly of battery components such as inter-cell connections, pressure relief caps, termination of electrodes, battery separators as well as for the final assembly of battery packs provides battery manufacturers with multiple advantages over traditional methods. This presentation will discuss a range material joining technologies in relation to battery and fuel cell applications and thereby provide a detailed insight into how designers and manufacturers can use these technologies to produce better quality product in an efficient and cost effective manner.

*Nitin P. Phadnis, Worldwide Industry Segment Manager
Branson Ultrasonics Corp.*

5:00 Cocktail Reception



Peter Ralbovsky recently started working as a calorimetry expert for Netzsch Instruments in 2009. Working for Arthur D. Little, Inc. and TIAX LLC, Mr. Ralbovsky

has been conducting battery related thermal and calorimetry measurements for the past 20 years. He has developed new calorimeters, methodologies and other analytical instruments for industry, NASA and the military including those specific to battery calorimetry.



Dr. Wen Lu oversees ADA's R&D efforts in electrochemistry, electrochemical devices and materials science (inherently conducting polymers, electrolytes and

nano materials). His work is focused on the applications of electrochemistry and materials science to the development of electrochemical devices, including electrochemical sensors/biosensors, electrochromic devices, electromechanical actuators, energy storage devices (batteries and ultracapacitors), energy conversion devices (fuel cells and photoelectrochemical cells) and environmental remediation devices.



Nitin Phadnis directs and manages Branson Ultrasonics Corporation's business strategies for growth in the Electronics and Medical market segments. He has been engaged over the past several years in devel-

oping and implementing new applications for Branson's range of plastics joining technologies and works directly with R&D and Product Development teams for manufacturers of batteries, fuel cells, mobile phones, as well as medical devices. His prior experience has helped him successfully manage and coordinate transfer of development projects to manufacturing destinations in China and South Asia.



Dr. Ahmad Pesaran has worked at the National Renewable Energy Laboratory since 1983 on various energy efficiency technologies. Dr. Pesaran started working on batteries,

hybrid electric and fuel cell vehicles since 1995. He currently leads several projects for Department of Energy, NASA and industrial partners, with emphasis on thermal characterization and analysis of batteries, modeling and simulation of batteries and ultracapacitors for hybrid and plug-in vehicles and thermal and electrical abuse modeling of li-ion for safe design.

Ofira Varga is a senior consultant at 1WEEE Services GmbH, Germany, since 2006. She is an expert for electronics, battery and packaging take back and recycling as well as all auxiliary administrative proceedings such as registration and reporting. Her expertise covers the Member States of the European Union, the US and Canada. She is a project manager with 9 years of professional experience which is important as soon as compliance services for a variety of different topics and countries must be put in place for customers.



Jirong Dong is the deputy general manager and senior engineer in charge of research & development of battery separator and ultra-capacitor separator via characters modifying of high polymer by radiation cross-

link and radiation grafting.

8:00 Keynote Presentation

Battery Projects and Developments in Government Laboratories

This panel discussion will feature three of the country's leading government labs actively involved in fundamental battery research and development. Hear what battery projects they are currently working on and what exciting developments are on the horizon for electronics, renewable energy, automotive and other applications.

Ahmad Pesaran, Principal Engineer

National Renewable Energy Laboratory

George Andrews, Program Manager • Oak Ridge National Laboratory

Kevin Gering, R&D Scientist • Idaho National Laboratory

9:00 Featured Presentation

Basics of the EU-Directive on Batteries: The Legal Scope and Its Impacts

This presentation will outline the objectives and most important provisions of the European Union's Battery Directive 2006/66/EC. Attendees will receive an overview of the national implementation status in the 27 EU member states, and the Directive's definition of "producer" and "battery." Learn the details the originating obligations for "producers" (be it manufacturers, distributors, importers or distance sellers), such as registration, reporting, collection and treatment, labeling and other information requirements, ban of certain substances. Finally, the financial and organizational effort for compliance of an affected company is assessed.

Ofira Varga, Environmental Consultant • 1WEEE Services

10:00 Networking Break

10:30

Modular LFP Batteries for Electric Vehicle Applications

Lithium-ion batteries based on lithium iron phosphate cathode materials are a good choice for electric drive vehicle (EDV) applications because of their intrinsic safety, low cost, and long cycle life. Given the wide range of voltage, power, and capacity requirements for potential electric drive applications, from a battery manufacturer's perspective, a modular approach to EDV battery fabrication permits both design flexibility and rapid fabrication as well as providing the vehicle manufacturer with more options for utilizing available space within the vehicle chassis.

James D. Hodge, Ph.D, CTO • K2 Energy Solutions, Inc.

The Development of a Secondary Cylinder Alkaline Zn/MnO₂ Battery Separator

The primary, mercury-free cylinder Zn/MnO₂ battery has been widely used in various kinds of consumable electro-devices for years because of the abundance of Zinc and Manganese, low raw material cost and environment friendliness as well as a higher operating voltage. As the RoSH and WEEE regulations are brought into effect, which forbids the Ni/Cd battery in consumable market, a great opportunity of development is offered to the secondary alkaline cylinder Zn/MnO₂ battery. The session highlights the development of the separator of the secondary alkaline cylinder Zn/MnO₂ battery, relying on the unique secondary battery separator and the special additive of Zinc electrode.

Jirong Dong • Shanghai ShiLong Hi-Tech Co., Ltd.

11:10

Large-Sized Li-ion Cell Technology for Energy Storage System

Beyond conventional battery applications, energy storage systems become a crucial part for the expansion of green, renewable energy deployment and PHEV penetration in coming years. With its high energy density and good performance, Li-ion batteries are increasingly introduced to the MW-class energy storage market. Various types of Li-ion cell chemistry and design were reviewed with the point of cost, safety, energy density and cycle life. Based on this review, the optimized cell design solution will be proposed for the various energy storage applications.

*Sunam Lee, Director of Marketing and Business Development
Samsung SDI America, Inc.*

11:50 Networking Lunch

1:00

Pervasive Power: Integrating Energy Storage for Point of Load Delivery

Hear about several exciting new concepts in micro and nano power delivery solutions. Learn about the emergence of interconnected power grids from the Macro Grid to the Femto Grid, as well as the identification of new Point of Load power delivery techniques in the Pico Grid and the Femto Grid. Discover new thin film battery technologies that provide Point of Load powering with an introduction to the concept of Pervasive Power and a review of new applications that use Point of Load and Pervasive Power techniques.

Steve Grady, Vice President of Marketing • Cymbet Corp.

Mechanical Clamping of Battery Packages

Mechanical fasteners have advantages and disadvantages versus other joining techniques such as welding and adhesives and may be better suited to specific applications. This presentation will focus on the use of stainless steel clamps, primarily in the assembly of battery packages. Topics addressed will include common stainless steel materials and their properties, characteristics of clamped joints and the inclusion of a clamping system in a capable manufacturing process.

John Lippke, Applications Engineer • BAND-IT-IDEX, Inc.

1:40

Impact of Battery Pack Insertion and Removal on System Side Fuel Gauge

Host side fuel gauge has its advantages such as low cost, easy to implement and faster pack design cycle time. It also requires more system design consideration, particularly on battery pack interaction with the host side gauge when pack is inserted and removed from the system. The impact of battery pack insertion and removal is discussed in this presentation. Different cases are studied to provide system and gauge design consideration when using host side fuel gauge.

*Ming Yu, Application Engineer, Battery Management Solutions
Texas Instruments, Inc.*

Kim Hsu, Technical Marketing Manager • World Peace Industrial Co, Ltd.



Photo courtesy of Bob Ashe for Denver Metro CVB

Steve Grady is responsible for all strategic messaging, customer relationship development, e-initiatives, collateral creation and sales lead generation at Cymbet. He has more than 20 years of domestic and international experience in marketing, sales, business development, product management, engineering and general management in the networking, hardware and software industries.



John Lippke has been employed as an applications engineer at BAND-IT-IDEX, Inc. since 2007 with a focus on advanced vehicle applications. His previous experience was in the HVAC industry. John

holds a B.S. in Industrial Engineering from Purdue University and recently received his Masters of Business Administration degree from Colorado University, Denver with a specialization in operations management. John is a member of the Society of Automotive Engineers.



Ming Yu is a senior applications engineer at Battery Management Solution group at Texas Instruments. He joined this group in 2004 and has been working on

Impedance Track based battery management devices for handheld applications.



Arden Johnson is the Research and Development Manager for Electrochem Solutions. He holds a B.S. in chemistry from Yale University, and a Ph.D. in inorganic chemistry from Stanford University.

He has been engaged for the past 20 years in research on primary and secondary lithium batteries, with a special focus on high-energy batteries that operate under extreme conditions.

Jiucai Zhang is currently working toward the Ph.D. degree in the Department of Computer and Electronics Engineering, the University of Nebraska-Lincoln, Lincoln. His research interests include green computing and battery power management, dynamically reconfigurable embedded system design optimization, and cyber-enabled e-healthcare.

Song Ci is an assistant professor of computer and electronics engineering at the University of Nebraska-Lincoln. His research interests include: large-scale dynamic complex system modeling and optimization, green computing and battery power management, dynamically reconfigurable embedded system design optimization, quality-driven cross-layer optimized multimedia over wireless, cognitive network management and service-oriented architecture and cyber-enabled e-healthcare.

Contact Us

Registration: Julie Williams at 720-528-3770 ext 117 or juliew@infowebcom.com.

Exhibits: Jeremy Fleming at 720-528-3770 ext 121 or jeremyf@infowebcom.com.

Program: Shannon Given at 720-528-3770 ext 104 or shannong@infowebcom.com.

Improved Performance in Lithium Primary Batteries in Long-Term High Temperature Operation

The lithium oxyhalide primary batteries, lithium/thionyl chloride and lithium/sulfuryl chloride, are widely used in applications that require operation at temperatures above 100°C. However, the oxyhalide chemistries are subject to passivation and self-discharge, each of which can limit the life of these systems when they are exposed to high temperatures over prolonged periods. Learn about improvements in electrolyte formulations and in methods of battery operation that can allow the very high energy lithium oxyhalide primary systems to operate for extremely long times even under these harsh conditions.

Arden P. Johnson, R&D Manager • Electrochem Solutions, Inc.

2:15

A Novel Dynamic Reconfiguration Approach to Improve the Performance of the Multicell Battery

This session will explore a novel approach to dynamically reconfigure the battery configuration for improved energy conversion efficiency, safety and operating time. The proposed approach will jointly combine the system power management with battery nonlinear effects and non-uniform performances among battery cells to choose the optimal cell configuration and schedule computing tasks. A mathematical programming method has been used to optimize the configuration of a multicell battery in a real-time fashion. The experiment results show that the proposed method can significantly improve the battery energy conversion efficiency, operating time, and safety.

Jiucai Zhang and Song Ci, PhD., EE • University of Nebraska - Lincoln

Analysis of Battery Metals Supply

Emerging battery technologies and new applications of existing battery types have reinforced the battery industry's reliance on a wide range of mineral commodities. The USGS collects, analyzes and disseminates information on the domestic and international supply of and demand for minerals and materials that are essential to battery manufacturers. An analysis of the markets for cadmium, cobalt, lead, lithium, nickel and rare earth elements is essential to understanding their roles in the battery industry. The shifting focus of the battery industry, in response to increased demand for battery power, storage and transportation, is reflected in production, consumption trends, price movements and the global trade balance for these mineral commodities.

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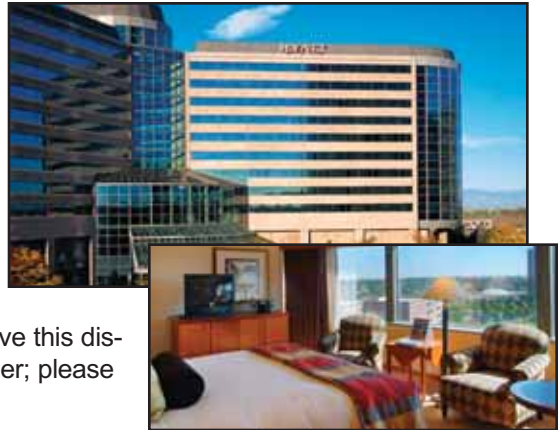
For more information on sponsoring and exhibiting, please contact
Jeremy Fleming at 800-803-9488 ext 121.

Hotel & Registration Information

Hotel Information

Battery 2009 will be held at the Hyatt Regency Tech Center. A limited number of rooms have been reserved for attendees who make reservations with the Hyatt Regency Tech Center. Mention Webcom Communications to receive a discounted room rate of \$175.00 per night. To receive this discount, reservations must be made by September 28th, 2009.

In order to receive this discount, you must enter this Code upon check out: "Battery2009_Hotel". Note: in order to receive this discount you must supply us with your hotel confirmation number; please email to: marshag@infowebcom.com.



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Registration Information

Two Day Pass - Provides access to both days of the conference. Includes all networking and expo activities and reception.

(1 person)	(2 people)	(3 people)
\$895	\$795	\$695

Single Day Pass - Provides access to either one of the individual days of the conference.

\$595

Half Day Pass - Provides access to half of either one of the individual days of the conference.

\$295

Federal Pass - Discounted rate for Federal, State, County and local entities, including military.

\$595

Pre Conference Workshops: See page three for pricing information.

Expo Only Pass - Provides access to the exhibit area only. Exhibit Only Pass does NOT include conference CD-ROM, admittance to conference sessions or food/beverage.

Expo Only Pass: \$50

Thermal Management and Technology Symposium Upgrade - Provides access to both days of the conference and all conference proceedings.

Thermal Management and Technology Symposium Upgrade: \$150

Ways to Register

By Phone: 800-803-9488

By Web: www.batterypoweronline.com

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To receive consideration, all cancellations must be received in writing. Upon receipt, a refund or credit will be issued towards a future event produced by Webcom Communications, less a 25 percent administrative fee. (Cancellations which do not indicate preference will be issued credit.) No refunds will be issued within two (2) weeks of the event. Webcom Communications, Corp. will not be held responsible for cancellations or delays in programming due to acts of God, war, government disorder, curtailment of transportation facilities, or other emergency making it inadvisable, illegal or impossible to hold the meeting.

Thermal Management & Technology Symposium 2009

Thermal Management and Technology Symposium is a conference highlighting the latest advancements in thermal technology for product design, system development and process management. This event will feature presentations on thermal manufacturing technology, materials and research & development. Topics will include new thermal technology as well as the latest market trends affecting the industry.

Thermal Management and Technology Symposium 2009 will feature next-generation thermal technology, thermal materials, heat transfer and worldwide technology trends.

The conference is designed for design engineers, system engineers, process engineers, material scientists and R&D managers with organizations in a variety of industries and markets whose products, operations and services depend upon sophisticated and precise control of thermal properties and states.

Thermal Management and Technology Symposium 2009 will be co-located with Battery Power 2009 and share a combined exhibit hall. For a nominal fee, Battery Power attendees can upgrade their registration pass and get access to the Thermal Management conference and the conference proceedings. See page 14 for registration information.

Program:

Creating Useful Mechanical Work through Effective Thermal Management Techniques

Gary Swanson, President • Thermotion Corp.

Smarter Solutions for Heat Treatment

Peter Sherwin, Business Development Manager, Heat Treatment • Eurotherm

Defense and High-End Commercial OEM Electronics

Matt Tracewell, Executive Vice President Tracewell Systems

Advanced Ceramic Thermal Control Options

PC Smith, President • Oasis Materials Corp.

Advanced Cooling Solutions for High Power Laser Diodes & IGBTs

Madhav Datta, Chief Scientist, Mark McMaster, Vice President, and Fred Rebarber, Director of Sales & Marketing • Cooligy, Inc.

Carbon Aluminum Composites – High Efficiency Thermal Management Materials

Nan Jiang, Scientist • Applied Nanotech, Inc.

Heat Pipe Assisted Spreader Plates

Scott Garner, Vice President Sales and Marketing Advanced Cooling Technologies, Inc.

Thermal Management Using Renewable Resources Such As Phase Change Materials, Solar, Wind & Biomass

Maurice Marongiu, Owner • PCM Thermal Solutions

Automating Semiconductor Package Thermal Characterization and Design

Sarang Shidore, Director • Mentor Graphics

Outstanding Problems in the Development of a Thermal Physical Properties Database for Solid And Liquid Materials: Research and Solutions

E. Litovsky, Head Thermophysical Division Integrity Testing Laboratory, Inc.

The complete Thermal Management and Technology Symposium program can be viewed online at www.thermalnews.com/conf_09/TN09_index.php

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