

4th International Conference

Next Generation Batteries

Batteries

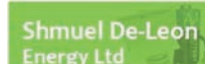
April 29-30, 2014

2014



Next Generation Batteries & Hybrid Energy Storage Systems

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Next Generation Batteries 2014

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Renewable Energy Storage Systems for
Automotive, Mobile & Hybrid Applications



Next Generation Batteries

Conference Agenda

2014

Tuesday, April 29, 2014

8:00 *Registration, Exhibit Viewing/Poster Setup, Coffee and Pastries*

8:50 **Organizer's Welcome and Opening Remarks**

9:00 **What We've Learned from Testing >250,000 Cells: New Cell Evaluation Methods and Data Mining Techniques Derived from High Throughput Screening**

**Steven Kaye, PhD, CSO,
Wildcat Discovery Technologies, Inc.**

Wildcat Discovery Technologies uses a proprietary high throughput synthesis and screening platform for battery materials. Wildcat's system produces materials in bulk form, enabling evaluation of its properties in a standard cell configuration. This allows simultaneous optimization of all aspects of the cell, including the active materials, binders, separator, electrolyte and additives. Over the past 3 years, we have screened over 250,000 cells, developing new cathodes, anodes, and electrolytes for a variety of battery types (primary, secondary, aqueous, non-aqueous). In this talk, I will discuss what we've learned from this work. Specifically, new analysis methods to extract more information from each cell, which performance metrics are most predictive of long term cycle life and other failure modes, and sensitivity of performance metrics to changes in cell components. I will also discuss new high throughput cell evaluation methods in use at Wildcat, including high precision coulometry and in-situ gas evolution measurement.

9:30 **One-Dimensional Tin Nanostructures for Lithium-Ion Batteries**

**M. Grant Norton, PhD, Professor,
School of Mechanical and Materials Engineering,
Washington State University**

Tin is an attractive anode for next generation lithium-ion batteries. The large volume change during cycling can be accommodated when the material is in the form of a 1-D nanostructure. Tin nanostructures are grown by electrodeposition and using electron microscopy we have determined the growth mechanism. This information has been used to control their formation on a range of substrates. In this presentation, we will also describe the results of in-situ lithiation/delithiation studies using a specially designed TEM holder and results obtained by combining the tin nanostructures with a flexible polymer electrolyte as a step toward a fully flexible battery.

10:00 **Solid State Li-Ion Batteries**

**Hélène Rouault, PhD, R&D Project Manager in Advanced Batteries,
French Alternative Energies and Atomic Energy Commission (CEA), France; and
Julio Abusleme, PhD, R&D Project Manager,
Solay S.A., Belgium**

The next generation of portable electronic devices which could revolutionize the smart communication access and control in very large domain of applications are requested to be unbreakable and bendable. Consequently, the components of such products as the display, the electronic circuit board and also the embedded power source have to offer flexible and resistant structure. CEA and Solvay jointly have so engaged a large program of development on innovative bendable lithium-ion batteries, using monolithic gelled structure from specific PVdF based inks, making them conformable and flexible.

10:30 *Networking Refreshment Break, Exhibit/Poster Viewing*

11:00 **Thermal Plasma CVD: An Economic Technology for Silicon Anodes**

**Roel C.M. Bosch, Manager Innovations,
Roth and Rau B.V., The Netherlands***

For over a decade Roth & Rau is manufacturing thermal plasma coating systems for ultrafast deposition of silicon based materials. We have currently several collaborations running on the development of silicon anodes with very good results on capacity and cycle life. Key aspect is that thermal plasma technology allows for high deposition rates of amorphous silicon (>1 μ m / min) and for very controlled growth in terms of density/porosity and the ability to follow complex 3D morphologies such as nanowires, CNT's and carbon fabrics. *In collaboration with: P. Kudlacek, W. Boonen, B. v. Gerwen, and D.M. Borsia

11:30 **New High Capacity Embedded Silicon-Graphene Composite Lithium ion Battery Anode Material**

**Junbing Yang, PhD, CTO,
California Lithium Battery, Inc.**

If significant improvements in electric vehicle (EV) lithium ion battery (LIB) specific energy (Wh/kg) or energy density (Wh/L) is to be achieved in a timely and cost effective manner, there must be a shift from graphite-based anodes to new, high specific capacity anode materials such as the new uniformly embedded and uniquely stable silicon-graphene composite anode material developed and produced by California Lithium Battery Inc.

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12:00 **Development and Characterization of a Multilayer Ceramic Battery (MLCB®)**

**Mark Wesselmann, President,
Polymer Innovations, Inc.**

The preliminary technology has been developed and prototypes made of a rechargeable, true solid state, non-flammable, lithium ion, Multilayer Ceramic Battery (MLCB®). This unique battery utilizes a Li ion conducting ceramic solid electrolyte and cell structure produced using tape casting processes, and shows promise to be transformational in terms of cell structure, high temperature use, zero volt capability, charging voltage conditions and safety.

12:30 *Luncheon Sponsored by the Knowledge Foundation*

2:00 **Reversible Overcharge Protection for Safer and Lasting Rechargeable Lithium Batteries**

**Guoying Chen, PhD, Research Scientist,
Environmental Energy Technologies Division,
Lawrence Berkeley National Laboratory**

With the growing demand of EV and grid storage, the existing \$11B Li-ion battery market worldwide is expected to exceed \$43B by 2020. Lithium cells are known to suffer from safety and lifetime issues upon abuse, particularly overcharge/overdischarge following which energetic venting, ignition, and even explosion can occur. Current protection methods of using electronic controls add significant weight and volume to the pack. The use of internal shutdown mechanisms reduces the usable capacity and adds to the burden of the remaining cells in parallel circuits. A novel approach was developed at LBNL where electroactive polymers capable of forming a voltage-regulated, reversible resistive shunt between the current collectors were introduced to prevent cells from overcharge damage. Recent progress, including the development of electroactive polymers that provide protection for high-energy cells intended for vehicular applications and novel electroactive-fiber membranes that drastically reduce the cost and improve the stability of overcharge protection, will be presented.

2:30 **Safety Standardization for Wireless EV Charging Systems**

**Joseph Bablo, Primary Designated Engineer,
Underwriters Laboratories**

As wireless charging innovation has gained momentum, so too has the development of safety standards that begin to address fire and shock hazards, as well as functional safety and interoperability. This presentation will discuss some of the key safety considerations with respect to wireless charging, as well as a unique collaboration between UL, SAE and IEC to promote safer wireless connections between electric vehicles and the electric grid.

3:00 **Integration and Safety in Commercial Energy Storage Applications**

**Brent Perry, CEO,
Corvus Energy Ltd., Canada**

I will be discussing the best way to approach the integration of energy storage technologies into commercial industrial applications from selection of best technologies, integration concerns and issues and the ongoing relationship with partners and customers. I will use case studies of our installations with several verticals to highlight the opportunities and the issues that are necessary to be successful.

3:30 *Networking Refreshment Break, Exhibit/Poster Viewing*

4:00 **ENERGY STAR and CEC Requirements for Battery Chargers**

**Rich Byczek, Global Technical Lead,
Electric Vehicle and Energy Storage, Intertek**

Meeting ENERGY STAR and California Energy Commission (CEC) requirements is key for market success. Product testing ensures electrical systems and components are compliant with international safety and electromagnetic compatibility (EMC) requirements, including pre-compliance and test plan development services. During this presentation, we will discuss the requirements and testing needed for small and industrial battery chargers, focusing on the requirements for ENERGY STAR and California Energy Commission (CEC).

4:30 **Increasing Scrutiny and Regulation of Small Lithium Batteries**

**Jim Powell, President,
Transportation Development Group LLC**

In 2014, stricter shipping regulations take effect for small lithium batteries that may now be considered "Dangerous Goods" requiring a hazard label and shipper's certification. This is a lot of work and expense to ship a few AA lithium cells or other batteries. New rules for ground transport have raised the penalty for an undeclared lithium battery shipment to \$20,000 and \$40,000 per violation for ground and air transport respectively.

5:00 **Exhibitor/Sponsor Showcase Presentations - I**

5:45 *End of Day One*



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Wednesday, April 30, 2014

8:00 *Exhibit/Poster Viewing, Coffee and Pastries*

9:00 **Analytical Investigation of the Failure Mechanisms of Lithium-Sulfur Cells**

Holger Schneider, PhD,
BASF Corporation*

Lithium-sulfur batteries are attractive candidates for post-Li-ion battery systems, offering both superior theoretical capacities and thus high energy densities. However, their practical application is hampered by several severe challenges. We were able to show that the cell performance is strongly influenced by both the amount of electrolyte and the sulfur active material. Moreover, we performed extensive analytical investigations on the decomposition products and gases formed upon cycling the cells. Our findings are discussed in detail in this presentation. **In collaboration with: K.Leitner, H.Sommer, J.Kulisch, T.Weissa, M.Safonta, BASF and Karlsruhe Institute of Technology*

9:30 **High Temperature Li-Ion Batteries Through Thermally Stable Separators**

Brian Morin, COO,
Dreamweaver International, Inc.

With recent fires in batteries for the Boeing Dreamliner and Tesla S, thermal stability in lithium ion batteries is of primary concern. In this talk, we present batteries made using a separator that is stable up to 300 C, and also stable through significant fire events, and show the additional safety that can be achieved in batteries using these separators.

10:00 **Modular Electrolyte Additives: Decoupling Uniform Deposition and Stability**

Steven Kaye, PhD, CSO,
Wildcat Discovery Technologies, Inc.

The stability and cycle life of lithium-ion batteries are limited by unfavorable reaction between the electrodes and electrolyte. To reduce this problem, electrolyte additives are used to passivate the cathode and/or anode with a protective coating. To function effectively, such additives must both deposit uniformly on the electrode surface and form an electrochemically inert coating. These dual constraints severely limit the set of viable additives. Wildcat Discovery Technologies has developed a new, modular additive concept in which additives are bound to a molecular core that enables uniform deposition on the electrode surface. Attachment of conventional additives to the core molecules provides improved SEI stability, increasing coulombic efficiency, cycle life, and thermal stability. Furthermore, by decoupling the requirements for uniform coating and chemical stability, new classes of additives can be used. In this talk, I will discuss the development of these modular additives as well as their

performance with both commercial and future cell chemistries.

10:30 *Networking Refreshment Break, Exhibit/Poster Viewing*

11:00 **Battery Aging: Using Modeling to Predict Battery Life**

Tom O'Hara, Global Business Manager,
Advisory Services for Energy Storage, Intertek

Battery modeling and simulation helps manufacturers analyze operating conditions and design parameters for batteries and other electrochemical systems and processes to understand how they affect battery life and performance. In this presentation we will discuss the benefits of modeling and simulation of lithium-ion batteries. He'll also explain how test results provide data to predict battery life, analyze implications of operating conditions and design parameters, and understand battery limitations.

11:30 **Title of presentation to be confirmed.**

Abstract is not available at time of publishing. Please go to www.KnowledgeFoundation.com for the latest Program updates.

12:00 **High Performance Direct Carbon Fuel Cell by Using Pyrolyzed Carbon from Biomass and Waste Sources**

Wenbin Hao, Dept of Chemical and Biomolecular Engineering,
The Hong Kong University of Science and Technology, Hong Kong

The promise of direct carbon fuel cell arises not only from diversity of available fuels and high operating efficiency, but also a solid infrastructure for scale-up, including transportation, storage, and processing of fuels. In our work, three kinds of carbon fuels from carbon black (CB), bamboo fiber (BC) and waste paper (WPC) are investigated as the anode fuels in the intermediate temperature direct carbon fuel cell (DCFC). The surface compositions of the prepared carbons are carried out by X-ray photoelectron spectroscopy. The experimental results indicate that the carbon from new carbonaceous waste paper shows more elemental rich in Al, Ca and Mg than the other two carbons. The prepared carbons are tested in anode support type DCFC by using samaria doped ceria (SDC) as the electrolyte at 650°C. The cell performance with the carbon generated from waste paper yielded a peak power density of as high as 225mW/cm², which is about 2 times higher than that with carbon black. **In collaboration with: Xiaojin He, Yongli Mi*

12:30 *Lunch on Your Own*



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2:00 **Lithium-Ion Batteries in Low Speed Electric Vehicles: A Case Study**

**Sam Lev, CEO,
Lithium Boost Technologies Inc.**

We will present case studies to illustrate the business advantages of using lithium-ion batteries in low speed electric vehicles/neighborhood vehicles. The speaker will demonstrate actual customers experience using advanced lithium-ion technology to archive superior performance at competitive cost. The presentation will include a technical description as well as describe the value proposition of this emerging technologies and how it can revolutionize the industry.

2:30 **The Economic Case for Choosing an Electric Vehicle**

**Mike Sanislo, PE, President,
High Energy Consulting, Inc.**

Everyone wants to be green. Except when it costs money. What is the economic case for purchasing an electric vehicle? It depends on the benefit set relative to the best competing alternatives. The speaker will show the economic value for current electric vehicle offerings relative to what else can be purchased in the market. Early adopters are not necessarily driven by economics---the large markets are dependent, in part, on a compelling value proposition---one that says that an

electric vehicle costs less than competing alternatives. The speaker will show the math as it exists with current commercial options and where the industry needs to go for the market to become large.

3:00 **Enabling Energy Mobility via the Cloud**

**Nick Reva, Manager,
PwC**

The advent of powerful computing services via the cloud has started to transform how society interacts with technology. As next-generation batteries make their way into vehicles and new infrastructure is rolled-out, demand for real-time management & monitoring systems will increase. Cloud Computing can play a big role in development of smart grids, real-time connectivity, charging infrastructure, management and monitoring systems. This talk will provide a primer on Cloud Computing services, why they matter and what they can do for the energy industry.

3:30 **Exhibitors and Sponsors Showcase Presentations - II/ Selected Oral Poster Highlights**

4:15 *Concluding Remarks, End of Conference*

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Automotive, Mobile & Hybrid Applications

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San Diego, CA USA

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Discount Accommodations and Travel: A block of rooms has been allocated at a special reduced rate. Please make your reservations by March 29, 2013. When making reservations, please refer to the The Knowledge Foundation. Contact The Knowledge Foundation if you require assistance.

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