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Approaches to Evaluating and Improving Lithium-Ion Battery Safety

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Advanced Power Sources R&D Department

Date: Thursday February 7th, at 3:30 PM
Location: ECCR 1B40 (Engineering Center)

Abstract:

As lithium-ion battery technologies mature, the size and energy of these systems continues to increase for emerging applications in transportation, grid storage, military use and aerospace. In fact, broadening the application space for lithium-ion batteries from the consumer electronics industries to these emerging markets increases their size from 1-50 Wh batteries for smart phones and laptops to >50 kWh for electric vehicles (EVs) and MWh scale for utility storage systems. As these energy storage systems grow, safety and reliability issues will become increasingly important. Moreover, as the application space changes for these energy storage devices, the failure modes and mitigations for hazards associated with these failures will also change and evolve. While system or use controls are often designed into large batteries to mitigate more predictable problem scenarios (overcharge, cell imbalance, high voltage short circuit, etc.), it is a significant challenge to design for unpredictable field failure safety incidents (internal short, failure propagation, etc.). Moreover, there are fundamental materials chemistry improvements that can be made in order to improve the overall inherent safety of a large battery (and therefore, the system), without the need for relying solely on ancillary external system control electronics.

This presentation highlights our work to better understand safety issues and abuse response of large-scale lithium-ion battery systems and development efforts to improve inherent lithium-ion battery safety.

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BIO:

Christopher J. Orendorff is the Principal Investigator of the Battery Safety R&D Program and Battery Abuse Testing Laboratory (BATLab) at Sandia National Laboratories. This program at Sandia is focused on developing inherently safe lithium-ion technologies for the transportation market through materials development, mechanistic understanding of battery abuse and failure, and full spectrum testing of cells and battery systems. Before joining Sandia in 2006, Chris earned B.S. degrees in Chemistry and Biochemistry from Purdue University in 1999, his Ph.D. in Analytical Chemistry from the University of Arizona in 2003, and was a post-doc at the University of South Carolina. Currently, he lives in Albuquerque with his wife, Judi, and their children, Eoin, Aoife, and Cian.

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