

# The Thermal Instability of Lithium-Ion Batteries – Causes, Effects, and Potential Solutions

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## With Guest Lecturer Todd Bandhauer

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Lithium-ion batteries have higher energy and power densities, higher specific energy and power, and increased cycle life relative to other secondary battery chemistries. However, these batteries are inherently thermally unstable, and, despite decades of efforts to mitigate the associated safety hazards, events continue to occur in a wide range of applications. Fundamentally new approaches are needed that stop these events before they become dangerous without adversely impacting weight and volume. This presentation will briefly overview the essential mechanisms associated with thermal runaway of lithium cells and packs, as well as safety mitigation strategies, ranging from cell chemical approaches to pack level management methods, that have been applied thus far. In addition to discussing the benefits and drawbacks of these approaches, several new methods that have the potential to dramatically improve safety of large lithium-ion packs are presented.



Todd Bandhauer

### Topics will include:

- Discussion of essential mechanisms associated with thermal runaway of lithium cells and packs as well as safety mitigation strategies
- New methods that may improve the safety of large lithium-ion packs

### Abridged Biography:

Dr. Todd Bandhauer is an Assistant Professor of Mechanical Engineering at Colorado State University, where he is the director of the Interdisciplinary Thermal Science Laboratory. He received a Ph.D. from Georgia Tech in while on a graduate research fellowship from Sandia National Laboratories, and has nearly 6 years of combined experience in industry (Modine Manufacturing Co.) and at a Lawrence Livermore National Laboratory, where he was responsible for the design, fabrication, and testing of various energy systems for the fuel cell, hydrogen production, battery, and high powered laser industries. He has executed complex multi-disciplinary research projects, including serving as PI for a DOE ARPA-e grant to develop a battery management system with distributed wireless sensors for large lithium-ion battery packs while at LLNL. Dr. Bandhauer's work has resulted in 8 refereed journal and conference publications, 6 issued patents, and 13 pending patents.

