

Look Inside Batteries - investigation into dendrite behavior -

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Numerous battery failure incidents have brought the discussion on battery safety to the forefront. Investigations of reports of battery incidents indicate that the batteries went through thermal runaway before catastrophic failures. One of the root causes of lithium battery failure is lithium dendrite formation. Lithium dendrites tend to develop when the lithium-ion battery is overcharged, fast charged, or charged far below the ambient temperature. They grow from the negative electrode toward the positive electrode. Once both the electrodes are short-circuited, a large amount of current passes through conductive lithium dendrites. The heating effect can trigger the exothermic reaction of the electrolyte and hence lead to thermal runaway.



Lithium-ion Battery Thermal Runaway



Dendrite-caused Internal Shorts

The investigation of dendrites is challenging because their evolution is the result of a combination of different factors, including electrolyte composition, temperature, and current density. The joint effects of these factors will cause that dendrite grow in different rate and morphology. More importantly, without an in-situ observation method to establish the relationship between dendrite evolution and the electrical signals, it is difficult to understand dendrite behavior under various conditions.

This talk will present an in-situ observation approach to investigate what really happen inside the battery based on the CALCE's experimental setup. The test results will be presented to show the capability of our setup used for a pre-warning of battery internal shorts.

About Presenter: [Dr. Yinjiao \(Laura\) Xing](#) is a post-doc research associate at CALCE, University of Maryland. Her research focuses on battery system monitoring, modeling and failure analysis for the purpose of improvement of battery system safety and reliability. She has published numerous articles on these subjects, including a research paper which won the 2015 Applied Energy Award for being the most cited. She serves as a member of the SAE International Lithium Battery Packaging Committee as well as the guest editor of the special issue on battery energy storage and management systems in IEEE Access. Before joining CALCE, she worked as a research engineer at Huawei Technologies Co. Ltd, China (2014-2015), as a researcher at City University of Hong Kong (2013-2014) and in the operations management leadership training program in GE Aviation, China.

