Pathway to Understanding Fading Mechanism in Lithium-Ion Batteries

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With high specific energy and power, and high energy and power densities, lithium-ion batteries are attractive for hybrid traction vehicle applications. Under the U.S. Department of Energy Advanced Technology Development Program, Sandia National Laboratories is involved in the development of accelerated life testing and thermal abuse tests to enhance the understanding of the power and capacity fade issues and to predict the life of the battery.

This paper will provide an update on the power fade and capacity fade behaviors of a Ni-oxide-based lithium-ion battery system. These cells comprise MAG-10 graphite, with 8 wt% PVDF binder / 1.2 M $LiPF_6$ in ethyl carbonate + ethyl methyl carbonate (3:7) / $Li_xNi_{0.8}Co_{0.15}Al_{0.05}O_2$, 8 wt% PVDF, 4 wt% SFG-6 graphite, and 4 wt% carbon black. We will discuss the analysis of the fading behavior associated with the cell performance and explain how a pathway for understanding the fading mechanism can be developed.

The methodology for the analysis of the time-dependent, temperature-dependent and state-of-charge-dependent data obtained from the accelerated life and calorimetric measurements will be explained and the observed correlations discussed.

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