Lithium Ion Battery Degradation due to Anode-Electrolyte Reaction

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The performance of batteries must be maintained during charge and discharge over a variety of conditions. Understanding of the degradation behavior is critical to effectively control or limit the operational parameters to extend the useable performance life. One of the degradation mechanisms is associated with reactions between lithium and the electrolyte at the anode. This initial reaction leads to a solid-electrolyte interphase (SEI) layer which limits further reaction. However, growth of this layer or additional reaction can decrease capacity by consuming lithium and decrease power by increasing interfacial layer. In this paper, results from complementary modeling and materials characterization are used to understand the conditions under which these reactions degrade battery performance. The changes in resistance predicted by the model are correlated with characterization of the anodes used electron microscopy, x-ray photo electron spectroscopy and x-ray diffraction.