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POS-35 Tracking Liquid Electrolyte Changes Throughout Lithium-ion Cell Lifetime

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Liquid electrolytes are essential to all battery systems, yet little is known of the changes that occur during the lifetime of a cell. It is certain that dramatic changes to the electrolyte of a Li-ion cell occur during operation because sometimes cells opened at the end of life appear "dry"(i.e. no liquid remaining) even though they were filled with substantial liquid electrolyte upon construction. These electrolyte changes contribute strongly to reducing cell lifetime.

This presentation will discuss the changes to the electrolyte composition during Lithium-ion battery cell life. Data from systematically cycled NMC/graphite cells having various electrolyte compositions and tested at various temperatures and voltages will be included. Results from traditional analysis techniques such as Gas Chromatography-Mass Spectrometry (GC-MS), Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) will be presented with emerging analysis techniques such as Fourier-transformed Infrared spectroscopy (FTIR), and Li-ion cell Differential Thermal Analysis (Li-ion DTA). Observations include increased electrolyte degradation reactions at high upper cut-off voltages as well as increased salt (LiPF6) consumption. The results of these studies indicate the situations where electrolyte degradation is most severe and point to methods to mitigate against these problems. These solutions will lead to Li-ion batteries with longer lifetime.

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