Thermal Stability Studies of Li-ion Cells and Components Under Overcharged Conditions

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Li-ion batteries have become the rechargeable power source of choice for portable electronics because of their high energy density and long cycle-life. Abusive conditions can cause Li-ion batteries to self-heat and, in some cases, reach thermal runaway where cells may rupture and/or ignite. While several abuse situations exist, including short-circuit and mechanical abuse, protection against overcharge is the most critical for Li-ion products. Therefore, understanding the behavior and failure mechanisms of Li-ion cells during overcharge is extremely important.

This presentation will cover studies on the thermal behavior of $LiCoO_2$/carbon based cells and component materials at charge states between 50 and 200%. Experimental data from Accelerating Rate Calorimetery (ARC) for reaction onset temperatures, onset of thermal runaway, total heat generation, and reaction activation energies will be provided and discussed. While thermal runaway involves reactions of electrolyte at both the anode and cathode, the cathode material plays a critical role in the thermal stability of overcharged Li-ion cells.