Relationship of Mechanical Deformations and Electrochemical Properties of Lithium Ion Batteries-An Experimental Study

by

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Abstract

MIT's Impact & Crashworthiness Lab (ICL) has been conducting research into lithium-ion batteries in an effort to produce a computation model that can predict the impact of mechanical deformations on electrochemical properties of lithium-ion batteries. Experiments were conducted on two different types of lithium-ion battery cells in order to continue gathering data to refine and validate the ICL model. First, prismatic cells were cycled through a various number of charges and discharges, with one prismatic cell placed under a compressive load to measure how much force it would exert on its carriage throughout its cycling. Upon completion of the cycling, the prismatic cells were subjected to indentation to the point of mechanical failure. Second, pouch cells were subjected to three different four-point bending conditions, and cycled through 10 charges and discharges. Upon completion of the cycling, the pouch cells were removed from the four-point bending system to measure the deflection of the changed shape. Various voltage, current, and force measurements were taken throughout the experiments to help refine the ICL computational model, as well as allowing for additional observations to be made regarding the relationship between mechanical deformations and electrochemical properties.

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