Material Characterization and Axial Loading Response of Pouch Lithium Ion Battery Cells for Crash Safety

by

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Abstract

Recent research conducted at MIT's Impact and Crashworthiness Laboratory (ICL) has focused on material characterization of lithium ion battery cell components for use in the development of an accurate and practical computational model intended to predict mechanical deformation and related short circuit behavior of Li-ion battery cells and stacks in real world impact scenarios. In an effort to continue to refine and validate this modeling tool, characterization testing was conducted on battery cell pouch material using uniaxial stress and biaxial punch tests. At the full cell level, hemispherical punch indentation validation testing and internal electric short circuit testing was conducted on large, high energy pouch cells. Further investigations at the full cell level examined the buckling response of small pouch cells as a result of in-plane axial compression under varying degrees of confinement. To this end, a custom testing device was designed and constructed to provide controllable cell confinement for axial loading experimentation purposes. All experimentation results will feed into a computational model of the cell extended for use in comprehensive mechanical deformation simulation modeling.

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