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Characterization and Modeling of Lithium-Polymer commercial batteries

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Abstract:

Lithium-ion batteries are key for the modern society as they are present in many energy storage devices and have promising future perspectives in the field of electric cars and energy accumulators from renewable sources.

Herein, we present results from charge and discharge cycles on batteries with controlled conditions. The cyclability of commercial lithium-polymer "pouch" batteries, has been studied under different charge/discharge rate and temperatures. The relationship between the state of charge and the cell voltage has been obtained, and the degradation of the cell energy capacity after a number of cycles has been measured. Furthermore, the experimental results have been compared with simulations based on Newman's model for Lithium Ion Batteries, carried out using COMSOL Multiphysics software.

The results show the correlation between temperature, C-rate and degradation in lithium ion batteries. It is especially remarkable the decrease of the apparent capacity of batteries at low temperatures, and the increase of the degradation at higher temperatures. These results are essential for the design of control mechanisms that can prevent battery failure.

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