# ELECTROCHEMICAL-CALORIMETRIC STUDIES ON DIFFERENT LITHIUM ION POUCH CELLS

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For determination of operating life as well as for safety of lithium ion batteries it's important to know their thermal response under charging and discharging conditions. In this work, commercial lithium ion pouch cells of different dimensions and capacities from different manufacturers were tested to investigate their performance and their thermal behavior. Depending on their application in stationary energy storage as well as for electric vehicles (EV) and hybrid electric vehicles (HEV) the pouch cells were investigated under isothermal and adiabatic conditions. Tests under adiabatic conditions are important as they more accurately simulate the actual operating environment. An accelerating rate calorimeter (ARC) with an external battery cycler was used for these investigations.

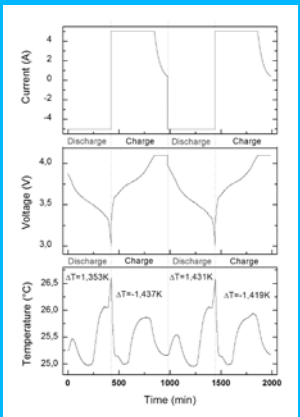


Figure 1: isothermal measurement of a 40 Ah pouch cell

The isothermal tests were performed at specific temperatures in the range from 20 to 50 °C. The results show that the applied environmental temperature did not greatly influence battery thermal behavior. Generally, an overall exothermic behavior for discharging half cycles and an overall endothermic behavior for charging half cycles was observed as can be seen in Fig. 1. However both consist of endothermic and exothermic parts. The total temperature increase over four half cycles was less than 2 °C. For the adiabatic measurement a completely different behavior was found, as demonstrated in Fig. 2. The results showed exothermic behavior for both charging and discharging half cycles and the total temperature increase over four half cycles was more than 15 °C. Heat capacities, and total generated heat were measured after calibration using Al alloy dummy cells and the latter was separated into reversible and irreversible parts by potentiometric and current interruption technique.

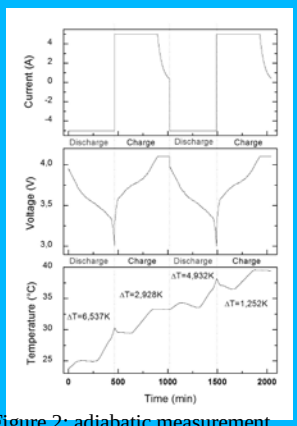


Figure 2: adiabatic measurement of a 40 Ah pouch cell

These data can be used both as input data for thermal modelling and for the development of an improved thermal management.

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