

Investigation of Lithium-Ion Cell Discharge Capacity and Temperature through Parameter Sensitivity Analysis of Single Particle Model Integrated with Energy Balance

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We integrated single particle model with energy balance to investigate temperature effects on the Lithium Ion Cell performance. In addition, we conducted parameter sensitivity analysis to evaluate the importance of each model parameter. The parameters affecting more than 1.5 % of the cell performance were selected as the dominant parameters and those should be estimated carefully. Based on the sensitivity analysis, there are 6 dominant parameters regarding the capacity and there are 7 dominant parameters on the temperature. If the dominant parameters on the capacity such as single particle radius and electrode surface area decrease, then the capacity decreases drastically. This is because those are directly related to the Li-ion amount that can be stored in the electrode. One of the dominant parameters on the temperature is the heat transfer coefficient, and its decrease affects the drastic increase of temperature. This work was supported by the National Research Foundation of Korea(NRF) grant funded by the Korea government(MSIT) (NRF-2021R1C1C1004217), and by Hyundai Motor Company as Development of Battery Thermal Model considering Battery Aging for Integrated Thermal Management