Measurements of Electric Performance and Impedance of a 75 Ah NMC Lithium Battery Module - DTU Orbit (05/12/2018)

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Detailed characterization of battery modules is necessary to construct reliable models that incorporate performance related aspects of the modules such as thermodynamics, electrochemical reaction kinetics and degradation mechanisms. Charge-discharge curves, temperature and battery impedance measurements can provide information about these aspects. Charge-discharge curves can be used to measure the battery open circuit voltage and the internal resistance. Temperature measurements provide information about the thermodynamic reactions and impedance spectra yield detailed information about the reaction kinetics. In this paper we present the measurement methods used to examine the internal resistance, the capacity and the impedance of a 75 Ah NMC battery module.

In order to measure the impedance of the battery module and of the individual cells in the module, we combine the single sine technique and the Laplace transformed excitation signal technique which each have pros and cons. By combining the two impedance measurement techniques we are able to reduce the measurement time by a factor of 20 relative to ordinary single-sine measurements.

Further we use the impedance measurements to calculate the overvoltage as a function of state of charge and the difference between charging overvoltage and discharging overvoltage and compare it with measurements.

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