Voltage Response of a Li-ion Battery Cell using OpenFOAM

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Abstract

The work involves the study of voltage response of Li ion cell and implementation using OpenFOAM for the evaluation of cell potential. The electrochemical response is implemented using the single particle model by modifications to the laplacianFoam and the ode-solver whereas the thermally coupled response has been modelled using the ode-solver utility. The model adopted considers the active material in each electrode is taken to be made of spherical intercalated particles and the charge/discharge cycle of Li cell is characterized by transport of Li ions and electrons. Using different strategies the discharge characteristics at different discharge currents have been obtained and the variation of the same with the radius of the particle have been plotted under the isothermal conditions. For the non-isothermal model, the temperature variations obtained using simulation have been compared with experimental results along with discharge characteristics at different discharge currents.