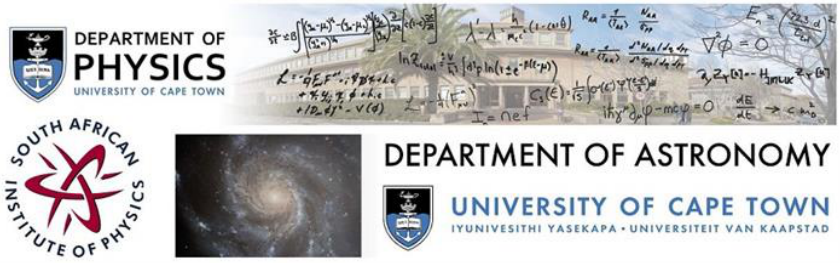

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Computational Model of solid-state lithium ion batteries

Wednesday, 6 July 2016 16:10 (1h 50m)

Abstract content
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It is important to have a simple but accurate model to evaluate the thermal behavior of batteries under a variety of operating conditions and be able to predict discharging currents as well. Theoretical models, which are usually based on a combination of electrochemistry and physics, can give accurate predictions even though they are complicated, need sophisticated measurements, estimation of transport properties and electrochemical reaction constants, to be accurately solved. To achieve this goal, one dimensional tertiary current distribution interface is used to model the electrolyte transport and the electrochemical reactions, solving for the electrolyte potential, the electrolyte concentration of Li ions, and the electric potential of the positive electrolyte-electrode interface boundary. In addition, the model is constructed in COMSOL MultiPhysics 5.2 with MATLAB R2012b to use optimization capabilities for validating the model with measured data. Transport of diluted species interface has been used to model the transport of lithium in the positive electrode, solving for the concentration of solid lithium. It is shown that the model can accurately predict various discharge currents and the different sources of voltage losses. Such models are well-suited for battery design purposes, though not optimal for the low computing-power environment of micro-controllers. Furthermore, it is believed that this modified model was adapted for implementation in battery management systems and can be used for the scale-up of large size batteries and battery packs.

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