

Three-dimensional multi-physics model for Li-ion battery

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Abstract

In this presentation, a method for the multi-geometry and multi-physics modeling of large-format Li-ion batteries is introduced. An example model developed for a battery module which includes three cells connected in series by electrical busbars will be presented to clarify our modeling method.

In this model, the electrochemical sub-model through the meso-scopic porous electrodes domains and the electrical/thermal PDEs in the macro-scopic cell domains are properly coupled to reduce numerical difficulties. The anisotropic transport properties in different cell regions where conductors are separately arrayed are discussed in this work.

This model can be used to predict the 3D profiles of the electrical potentials and temperature in the battery.

Key Words: Lithium-ion battery Multi-physics model Electrochemistry

References

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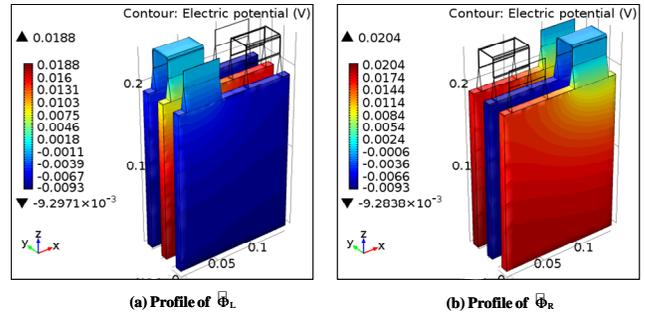


Figure 2 Profiles of modified potentials across the module at the end of 5C discharge.

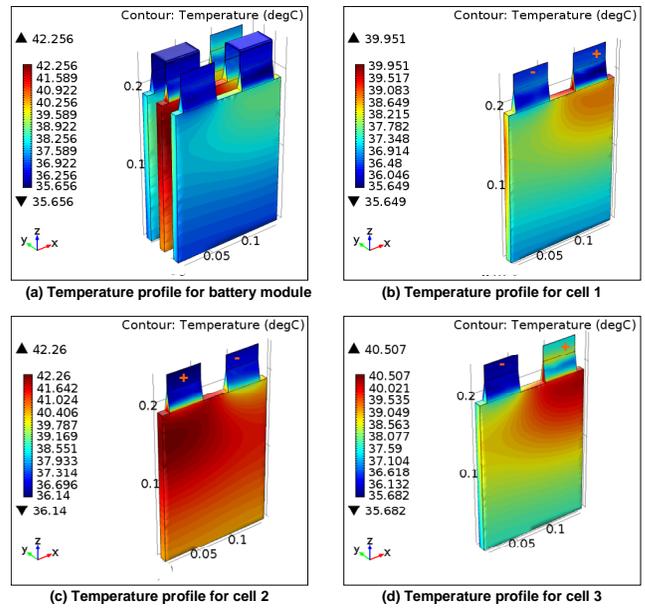


Figure 3 Profiles of temperature across the module and for individual cells at the end of 5C discharge

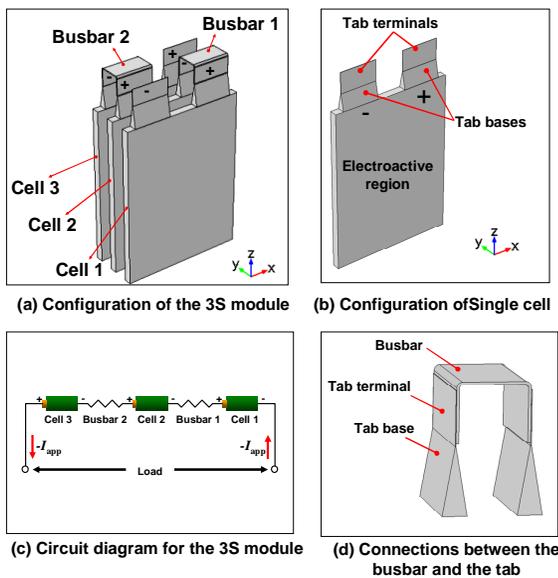


Figure 1 Configuration and circuit diagram for the 3S battery module