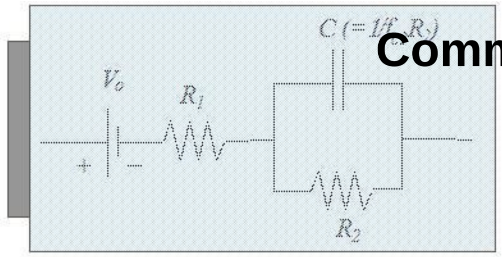
Commercial single cell modeling



Commercial single cell modeling

Focused Areas Main List [1]

Other Areas: Understanding Real Life Data [2] **-** Driving Cycle Analysis [3] **-** Commercial Cell Evaluation: Understanding Degradation Mechanisms [4] **-** Battery Pack Simulation [5]

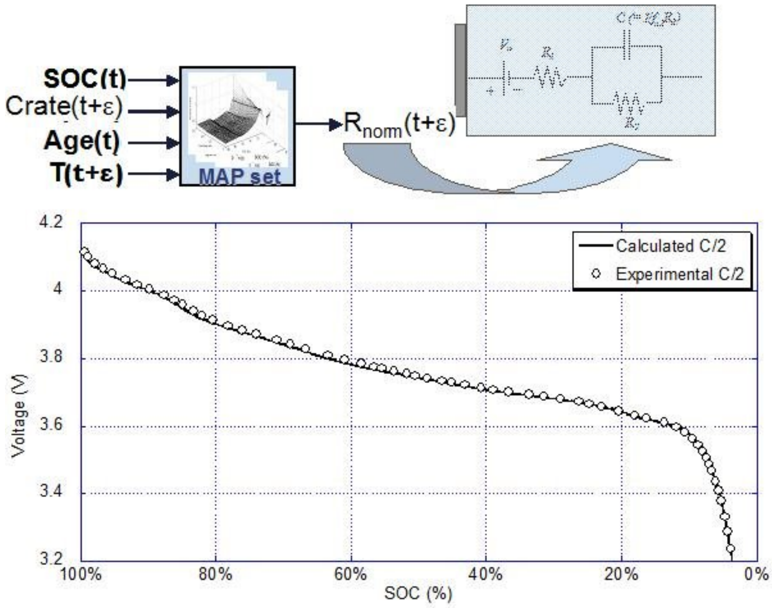
Predicting battery performance and service life is a very challenging task in the battery industry, but rewards for having such a capability could be quite significant in enhancing convenience, reliability, utility, and mobility of a power source system in real-life application and operation. Predicting battery service life remains problematic due to the lack of a well-established, reliable technique to enable such a prediction. This problem is even more troubling when considering the traction applications in hybrid and electric vehicles. The difficulty comes in several aspects. First, the driving cycles in real life induce rather sporadic nature in the duty cycle, which makes any predictions nearly impossible. Secondly, the battery modules? performance has a strong dependence on the pack configuration and resulting imbalance issues, which induces more complexity beyond laboratory testing.

In our thesis, we believe that a viable approach to enable battery performance and service life prediction is to develop a realistic computer simulation capability, through which any practical simulation and modeling can bridge the gap between laboratory test results and real-life situations.

In this work, we present an effort to develop a battery modeling tool that can be applied to simulate electric and hybrid vehicles battery packs.

The first step in our approach is to construct a reliable prediction model to predict single cell performance from the data collected in the laboratory tests on commercially available cells. This model comprises a universal framework and numerical procedure to simulate battery behavior of a cell chemistry based on parameters derived from cell testing with charge and discharge curves at different rates. The second step involves the simulation of a battery pack.

The generic model is based on an equivalent circuit technique commonly used in electrochemical impedance characterization. Therefore, the parameters used in the model can be easily parameterized from the electrochemical impedance derivations, which provide a convenient integration with experimental cell characterizations. Such integration offers the universality in this modeling approach.



More details? 1 publication:

[Development of a Universal Modeling Tool for Rechargeable Lithium Batteries.](http://www.sciencedirect.com) [6]
M. Dubarry and B.Y. Liaw, J. Power Sources, 174(2), p. 856 (2007).

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Links:
[1] http://www.hnei.hawaii.edu/facilities/electropower/electropower-focuses
[2] http://www.hnei.hawaii.edu/facilities/electropower/electropower-focuses/electropower_reallifedata
[3] http://www.hnei.hawaii.edu/facilities/electropower/electropower-focuses/electropower_drivecycle
[4] http://www.hnei.hawaii.edu/facilities/electropower/electropower-focuses/electropower-commcell
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[7] http://www.hnei.hawaii.edu/staff/bor-yann-liaw