

Live Simulations of Li-ion Cells: An Educational and a Design Tool.

Jan Reimers and Lars Ole Valøen
E-One Moli Energy (Canada) Ltd.,
20 000 Stewart Crescent Maple Ridge,
British Columbia V2X 9E7, Canada

Over the last ten years the commercial Li-ion industry has essentially been in a race to provide maximum cell capacity for a fixed cell size. In order to keep up, manufacturers must find clever ways to pack more active powder in the can, and to reduce the volume fraction of inactive materials. This powder packing game necessarily involves some trade-offs; in particular rate capability tends to suffer.

Using now well-established methods [1] for predicting dynamic cell behavior, coupled with recently measured electrolyte transport and thermodynamic properties, one can in principle calculate the dynamic response of any cell design. In addition, as is pointed out in ref [1], these calculations can also give a glimpse at the internal state as it evolves during charge/discharge.

In this talk we will show live simulations of a medium and high capacity Li-ion cell design, emphasizing the effects on rate capability. Some discussion of the effects of foil impedance will also be discussed.

[1] M. Doyle, T. F. Fuller, and J. Newman, *JECS* **140**, 1526 (1993). T. F. Fuller, M. Doyle, and J. Newman, *JECS* **141**, 1, (1994).