



The Electrochemical Society
Seminar Notice: Thursday, Mar 31, 2011

Continuum Modeling of Electrochemistry in Intercalation Batteries

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In this talk, a generalized Poisson-Nernst-Planck equation set based on non-equilibrium thermodynamics is introduced. It will be shown that application of this equation set leads to a hierarchical equivalent circuit that maps charge transport of different charge carriers in different components of an intercalation composite electrode. Volume averaging of the equation set on a de Levi straight pore model leads to micro-macro equations similar to Newman's model. Finally, current-voltage relations of a single particle are modeled with four different electrical signals corresponding to constant current charging/GITT, PITT, cyclic voltammetry, and impedance spectroscopy respectively. The thermodynamics and kinetics considered include a solid solution with constant diffusivity, a solid solution with variable diffusivity, and a phase transformation material, based on the regular solution model and a Cahn-Hilliard interfacial energy term. The numerical simulation results are compared with known small-signal solutions and experimental data from literatures.

Dr. Wei Lai is currently an assistant professor in the department of Chemical Engineering and Materials Science at Michigan State University (MSU). He received his B.S and M.S of Materials Science at the University of Science and Technology of China in 1998 and 2001. He received his Ph. D. in Materials Science at the California Institute of Technology in 2007. Before joining MSU, he was a postdoctoral associate in the Department of Materials Science and Engineering at the Massachusetts Institute of Technology. His research interests are focused on the advanced materials and electroanalytical methods for electrochemical energy storage and conversion applications.

Date: Thursday, *March 31, 2011*
Location: Lawrence Technological University
21000 West Ten Mile Road, Southfield, MI 48075
Building #5 (Taubman Welcome Center), 4th Floor, Room 406
Use Parking Lot A, C or D (Lots C & D are accessed off NW Highway)
Time: 5:30 pm Reception / 6:30 pm Dinner / 7:30 pm Speaker
Price: \$20 Members / \$22 Guests / \$10 Students **Payment:** Cash or Check
RSVP by: Tuesday, March 22, 2011 to Dr. Kimber Stamm
kimber.stamm_at_tema.toyota.com
<http://www.electrochem.org/ecs/sections/detr/detr.htm>

