Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Thin films with transvers concentration gradient as a model system to study core-shell cathodes for lithium ion batteries SHINTARO YASUI, ZHI-PENG LI, JOYSURYA BASU, DMITRY RUZMETOV, LEONID BENDERSKY, National Institute of Standards and Technology, ICHIRO TAKEUCHI, University of Maryland, ALEC TALIN, Sandia National Laboratries, FILM GROWTH AND CHARACTERIZATION TEAM, FILM GROWTH COLLABORATION, CHARACTERIZATION TEAM — Recently it has been reported that heterogeneous structures of cathode materials for high-energy, high-power lithium-ion batteries have improved electrochemical properties, especially thermal stability. As an example, the spherical core-shell (or concentration-gradient) cathode particles with a Ni-rich core and a Mn-rich shell of $Li(Ni_{0.8}Co_{0.1}Mn_{0.1})O_2$ have better retention of capacity in comparison to uniform materials1. In this work the $Li(Ni,Mn)O_2$ thin films with transverse compositional gradients were used as a model system to investigate and understand the reported improvements. Preparation of the films by multi-target pulse lased deposition (PLD) on single-crystal conductive $Nb:SrTiO_3$ substrates allowed great compositional control and ability to deposit different compositional profiles, ranging from continuous to discreet variations of the Mn/Ni ratio. The film structures were studied by XRD and analytical TEM to correlate the structural and compositional variations. The films were tested for their electrochemical cycling performance and for the effect of cycling on structural degradations. [1] Chen, Z., Lee, D.-J., Sun, Y.-K. and Amine, K., MRS Bull. 36, 498–505 (2011).

Shintaro Yasui
National Institute of Standards and Technology

Date submitted: 07 Nov 2012 Electronic form version 1.4