Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Polycrystalline TiO2(B) Nanosheet Films Deposited via Langmuir-Blodgett Method[1] LAURA BIEDERMANN, PAUL KOTULA, THOMAS BEECHEM, Sandia National Laboratories, ANTHONY DYLLA, KEITH STEVENSON, U. of Texas at Austin, CALVIN CHAN, Sandia National Laboratories — As an energy storage material, TiO_2 offers higher Li^+ capacities and smaller volume changes with lithiation than graphite electrodes. In particular, the bronze phase, TiO_2(B) has a higher lithiation capacity (1.0 Li^+/Ti) and faster lithiation kinetics due to its larger lattice parameters than other TiO_2 polymorphs. Direct observation of lithiation will require TiO_2(B) monolayers, such as those prepared via Langmuir-Blodgett deposition of the nanosheets (NS). Optical microscopy of the TiO_2(B)-NS Langmuir monolayer at the air/water interface shows that these nanosheets assemble into large (>1 mm) islands. These elastic TiO2(B)-NS monolayers are deposited on diverse substrates for further characterization. Electron diffraction in both transmission electron microscopy (TEM) and low-energy electron microscopy (LEEM) of these films confirm that their polycrystalline structure is predominately composed of TiO_2(B) nanocrystals, ∼10s nm across. Discrimination of monolayer and bilayer TiO_2(B) is evident in LEEM. Thermal stability of these nanosheets is investigated via in-situ TEM and ex-situ Raman spectroscopy. This monolayer TiO_2(B) deposition will allow future observations of lithiation and phase changes.

[1]Sandia is managed by Sandia Corp., a subsidiary Lockheed Martin, for the U.S. DOE NNSA (DE-AC04-94AL85000). Work was supported by an U.S. DOE BES EFRC (DE-SC0001091).

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Date submitted: 14 Nov 2013 Electronic form version 1.4