Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Local Lithiation via Nanobattery Probes: Battery Interfaces at the Nanoscale[1] JONATHAN LARSON, Univ of Maryland-College Park, Dept. of Physics, ALEC TALIN, Sandia National Labs-Livermore, Materials Physics Dept., ALEXANDER PEARSE, Univ of Maryland-College Park, Dept. of Materials Science Engineering, JANICE REUTT-ROBEY, Univ of Maryland-College Park, Dept. of Chemistry Biochemistry — Greater knowledge of interfacial charge/mass transport processes in battery materials - especially as a function of lithiation - is essential to understand and overcome materials limitations in performance. Increased use of nanostructured and/or nanoscale electrodes in energy storage systems, calls for research tools that allow for direct, local probes of materials interfaces and inhomogeneity. Here we present a new approach to measure local interfacial structure, electronics, and electrochemical properties as a function of local chemical changes, like lithiation. Building upon our laboratory's recent success in developing scanning probe techniques for energy storage science [1], we introduce novel probes layered with nanothin, functional energy-storage materials. We perform in situ measurements of the electronic properties of oxide-clad probes, via electron tunneling spectroscopy, determining effective electron transport gaps. We then utilize these probes as fine Li sources and as nanobattery probes for local cycling against a silicon anode substrate. Post lithiation, conventional in-situ STM and SEM reveal local physical changes in the cycled Si(111) anode surface. [1] J.M. Larson et al, Small, 2015, DOI: 10.1002/smll.201500999

[1]U.S. DOE, Energy Frontier Research Center; DESC0001160

Jonathan Larson
Univ of Maryland-College Park

Date submitted: 11 Nov 2016 Electronic form version 1.4