

Abstract Submitted
for the CAL11 Meeting of
The American Physical Society

Correlative Characterization of Li-S Batteries Using *In situ* TXM and XRD JOHANNA NELSON, SUMOHAN MISRA, Stanford Synchrotron Radiation Lightsource, SLAC National Accelerator Laboratory, YUAN YANG, ARIEL JACKSON, YI CUI, Materials Science and Engineering, Stanford University, JOY ANDREWS, MICHAEL TONEY, Stanford Synchrotron Radiation Lightsource, SLAC National Accelerator Laboratory — Sulfur is an attractive Li-ion battery cathode material candidate because of its high specific energy (2600 Wh/kg); however, it is well known that Li-S batteries suffer from capacity loss or fading. It is generally accepted that this is due to the loss of active material and the formation of nonconducting Li_2S as a thin film coating the electrode. Both phenomena stem from the dissolution of active sulfur particles in the non-aqueous electrolyte as soluble long chain polysulfides form during the early stages of cell discharge. Using *in situ*, high resolution transmission X-ray microscopy (TXM) at SSRL beam line 6-2 and *in situ* X-ray diffraction (XRD) at beam line 11-3, we have explored initial discharge and charge cycle of Li-S batteries in real time. By combining these complementary methods, we can characterize the morphological changes of the active material as well as changes in crystallinity and crystal structure. We can then correlate these changes and the electrochemistry to better understand the reduction of elemental sulfur and various adaptations employed to retain battery capacity over many cycles.

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Date submitted: 27 Sep 2011

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