2012 LANSCE Topical User Meeting
January 9 & 10

Abstract

Neutron Imaging and Energy: Intact Lithium Batteries and Hydrogen Storage Alloys

Les Butler
Department of Chemistry
Louisiana State University

At neutron imaging facilities at NIST, FRM II, PSI and SNS, procedures for energy resolved imaging as well as dynamic imaging have been tested. Small (145 mAhr), intact, commercial lithium ion batteries show a feature at 3.7 Å that is attributed to the LiC6 component of the charged battery. Diffraction and imaging up to 4.5 Å suggest the metal oxide may also be monitored in the intact battery. Transmission imaging is difficult due to ^{6}Li absorption and hydrogen scattering, especially with the high aspect ratio of prismatic batteries. In time-resolved 3D imaging of hydrogen uptake by LaNi5 grains, a novel angle sequence was used to give post-acquisition flexibility in setting the time windows for each 3D image. All imaging was done with continuous neutron source; the diffraction work was done with time-of-flight at SNS.

Both the battery and hydrogen storage work indicate the need for imaging at neutron wavelengths longer than 4 Å. In principle, time-of-flight imaging has distinct advantages as multiple components could be simultaneously monitored in charge/discharge cycles lasting several hours.