Observing Lithium Ion Battery Bonds During Charge Cycling Using Laboratory XAS

Andreas Bergner[1], Simon John[1]
[1]Quantum Design GmbH, Pfungstadt, Germany

X-Ray Absorption Spectroscopy (XAS) analyses of measurement results obtained with QuantumLeap H2000 of Lithium ion NMC batteries are presented. For the set of samples analyzed, Mn is largely electrochemically inactive and the octahedral coordination is retained. The Mn-O and Co-O bond lengths are shown to change minimally with cycling whereas the Ni-O bond suffers from Jahn-Teller distortion.

Graphic:

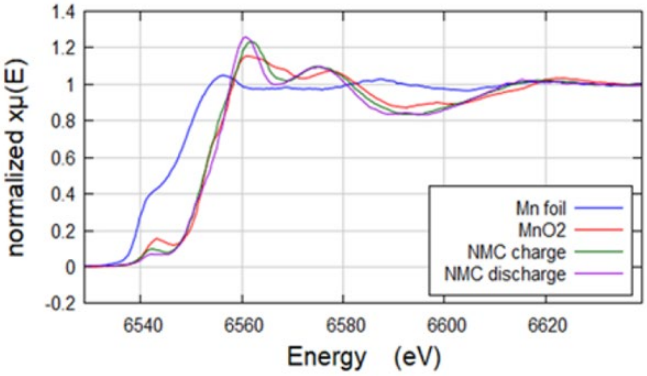

Figure 1: Mn-K edge of NMC electrodes fully charged and discharged. Comparison of the MnO2 model and Mn foil oxidation states shows that Mn in NMC are in an oxidation state of ~4+. The absorption edge energy does not change much showing that Mn acts as a spectator during cycling.

Keywords:

XAS battery lithium EXAFS x-ray