In situ EXAFS studies of MoS$_2$ for Li-ion batteries

N. M. Beaver, S. Aryal, J. P. Katsoudas, E. V. Timofeeva, C. U. Segre

Illinois Institute of Technology

X-ray absorption spectroscopy (XAS) is a valuable technique for studying electrode materials during in situ experiments. In a lithium-ion cell, electrode materials undergo phase transitions during lithiation and delithiation and may become partially amorphous, but XAS does not require long-range crystalline order, so it is a complementary technique to X-ray diffraction (XRD). In this study we report analysis of X-ray absorption near-edge spectroscopy (XANES) and extended X-ray absorption fine-structure spectroscopy (EXAFS) at the molybdenum K edge for a molybdenum disulfide (MoS$_2$) cell. XANES provides information about the oxidation state of the element, whereas EXAFS probes the local environment around the atom of interest, such as near neighbors and interatomic distances. Although ex situ XAS has been used to characterize MoS$_2$ materials before,[1][2] in this presentation for the first time we report the results of in-situ XAS characterization of MoS$_2$ lithiation and delithiation.
