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Neutron Diffraction of Li-Ion Battery Electrode Materials[1]
TYLER FEARS, Missouri University of Science and Technology, HELMUT KAISER, University of Missouri Research Reactor, HASKELL TAUB, University of Missouri - Columbia — The performance characteristics of Li-ion batteries are largely dependent upon the crystalline structure of the intercalation electrodes. Li insertion and de-insertion modify the crystal structure cyclically during charging and discharging; this process also induces irreversible changes to the structure which lead to capacity fade. Significant advancements have been made with synchrotron radiation which allow diffraction during electrochemical cycling. Unfortunately, Li (a very important component of Li intercalation materials) is transparent to x-rays. Neutron diffraction is sensitive to Li atoms but has its own drawbacks. Unlike intense synchrotron radiation, neutron characterizations are flux-limited and require large sample sizes and/or long data collection times. Additionally, while the transition metal electrode materials are often the strongest x-ray scatterers in typical electrochemical cells, neutrons interact strongly with other cell components, necessitating the use of non-traditional materials for in-situ experiments. In this presentation, we will discuss the advantages of neutron diffraction with in-situ electrochemical cycling, the hurdles that must be overcome for high-resolution pattern collection, and the various strategies for the next phase of the project.

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