In-situ X-ray Absorption and Powder Diffraction Studies of Cathode of Rechargeable Batteries

Beamlines: X18B, X14A

Technique: X-Ray Absorption and Powder Diffraction

Researchers:
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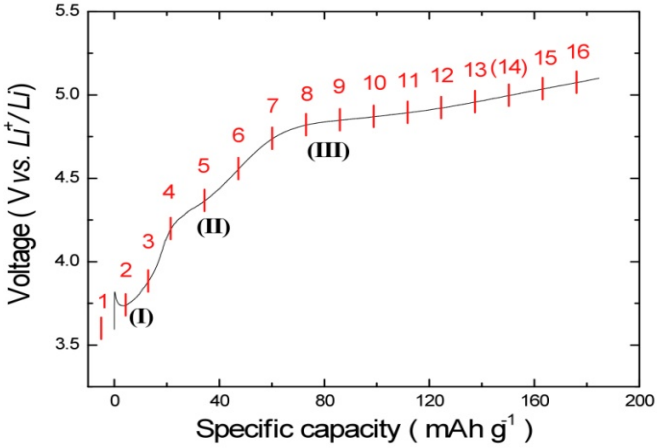
Publication:
K.-W. Nam et al. " *In situ X-ray absorption and diffraction studies of carbon coated $LiFe_{1/4}Mn_{1/4}Co_{1/4}Ni_{1/4}PO_4$ cathode during first charge,"* Electrochemistry Communications 11 (2009) 913–916

Motivation: The safety related issues have to be resolved before the high energy density and long life lithium-ion batteries can be used to power electric vehicles . A deeper understanding to the charge-discharge process into materials level helps in improving the safety characteristics of the lithium-ion batteries.

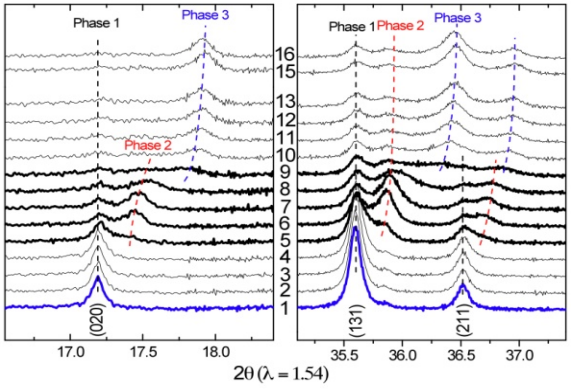
Results: In situ XRD results show interesting phase transition behaviors of C-$LiFe_{1/4}Mn_{1/4}Co_{1/4}Ni_{1/4}PO_4$ with the formation of an intermediate phase 2 and the solid solution regions for phase 2 and 3. Combined in situ XAS and XRD results show that the electronic structural changes follow the charge process well while the bulk crystal structural changes lag behind it in this system..

a. 1st charge curve of the C-$LiFe_{1/4}Mn_{1/4}Co_{1/4}Ni_{1/4}PO_4$ during *in situ* XRD measurement.

b. *In situ* XRD patterns of C-$LiFe_{1/4}Mn_{1/4}Co_{1/4}Ni_{1/4}PO_4$ during 1st charge



a



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