

Exploratory Studies of Novel Sodium-ion battery systems

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Technical Approach:

- A combination of time resolved X-ray diffraction (TR-XRD) and mass spectroscopy (MS), together with in situ X-ray absorption (XAS) during heating to study the thermal stability of the Na battery electrode materials.
- Synchrotron based XRD, XAS, transmission X-ray microscopic (TXM) to elucidate the contribution from each component to performance of electrode materials for Na-ion batteries.

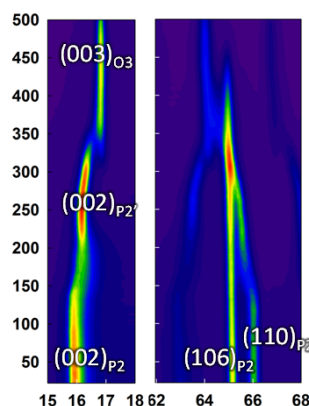
Status:

- Developed new synchrotron based in situ diagnostic tools and applied them to Na-ion battery studies.

Technology:

TR-XRD patterns of NaCoO_2 as cathode material for Na-ion battery During heating

Develop and apply the combination of synchrotron based in situ XRD, XAS and MS for diagnostic studies of new electrode materials for Na-ion batteries. Develop and apply transmission X-ray microscopic (TXM) to study electrode materials for Na-ion batteries



Objectives:

- Develop new advanced in situ material characterization techniques
- Support the development of new cathode and anode materials for sodium-ion batteries for plug-in hybrid electric vehicles

Deliverables: Complete and report the studies on:

- In situ XRD and XAS studies on $\text{Na}_{0.66}[\text{Mn}_{0.66}\text{Ti}_{0.34}]\text{O}_2$ during charge-discharge cycling
- In situ XRD and XAS studies on $\text{Na}(\text{NiCoFeTi})_{1/4}\text{O}_2$ during charge-discharge cycling

Funding:

- Duration one year from October 1, 2015
- Total - \$500,000.00 DOE - \$500,000.00

Milestones:

- Q1 Milestone: Complete the synchrotron based in situ x-ray diffraction studies of $\text{Na}_{0.44}[\text{Mn}_{0.44}\text{Ti}_{0.56}]\text{O}_2$ as anode material for Na-ion batteries during charge-discharge cycling
- Q2 Milestone: Complete the in situ x-ray diffraction of the $\text{Na}_{0.66}[\text{Mn}_{0.66}\text{Ti}_{0.34}]\text{O}_2$ cathode material for Na-ion cell during discharge/charge cycling
- Q3 Milestone: Complete the XANES) studies of $\text{Na}(\text{NiCoFeTi})_{1/4}\text{O}_2$ at Ni, Co, Fe, and Ti k-edge as cathode material for Na-ion batteries during charge-discharge cycling
- Q4 Milestone: Complete the in situ XRD studies of $\text{Na}(\text{NiCoFeTi})_{1/4}\text{O}_2$ as cathode material for Na-ion batteries .