Exploiting Co and Ni Spinels in Structurally-Integrated Composite Electrodes

U.S. DEPARTMENT OF ENERGY
Energy Efficiency & Renewable Energy

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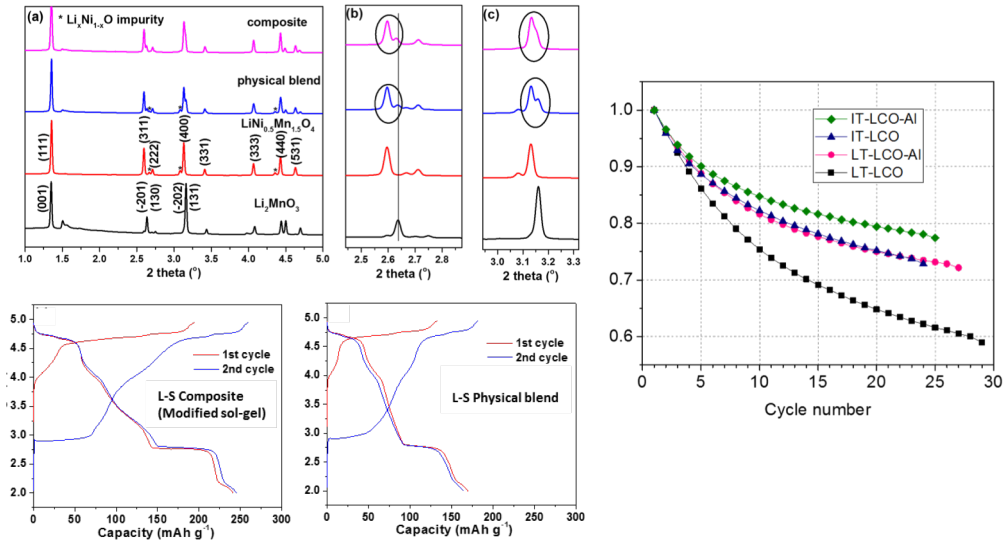
Objective:

- Understand the composition-structure-electrochemical property relationships in Co-based, lithiated-spinel cathodes
- Explore synthesis methods that enable incorporation of Co-based spinels into high-energy, layered oxides
- Develop advanced 'layered-layered-spinel' (LLS) cathodes via surface/bulk composites of Co-based spinels and high-energy, layered cathodes

Impact:

Advancement of DOE goals for safe, cost-effective, high-energy batteries by selective engineering of nano-domain structures of Li- and Mn-rich cathode materials

Improved performance via compositional modification and synthesis optimization



Accomplishments:

- Developed cation-doped $LiCo_{1-x}M_xO_2$ spinels that show modified lithium intercalation energetics with improved cycling stability
- Identified novel candidate compositions for new Co-based, lithiated-spinel compounds via ab-initio calculations
- Proved the concept of a modified sol-gel synthesis strategy to control the degree of integration between layered and spinel structures in a Li-Mn-Ni-O system

FY 18 Milestones:

- Elucidate the role of substituent cation, M, in determining the average voltage and cycling stability of $LiCo_{1-x}M_xO_2$ spinels
- Bulk and surface incorporation of Co-based spinels into high-energy, layered cathode materials

FY18 Deliverables:

Quarterly reports; Synthesis of advanced 'layered-layered-spinel' electrodes containing an integrated, Co-based spinel component

Funding:

— FY18: $450K, FY17: $500K, FY16: $500K