

# Exploiting Co and Ni Spinels in Structurally-Integrated Composite Electrodes

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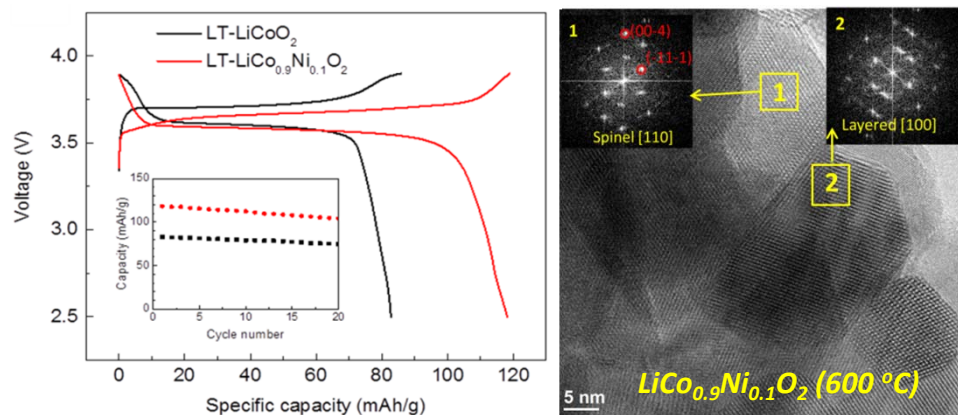
## Technical Approach:

- Design and synthesis of new Co- and Ni-based spinel compositions that operate between 3 V and 4 V
- Integration of the new spinel structures as stabilizers into high-capacity composite cathode materials

## Status:

- Explored wide range of Co- and Ni-based spinel compounds
- Down-selected to target spinel compounds,  $\text{LiCo}_{1-x-y}\text{Ni}_x\text{Mn}_y\text{O}_2$  ( $0.1 \leq x \leq 0.3$ ;  $0 \leq y \leq 0.2$ ), that show promising performance as possible integrated stabilizers

**Technology:** Co-based spinel synthesis and structures with demonstrated, improved electrochemistry



## Objectives:

- Exploration of structure and electrochemical performance of new Co- and Ni-based spinel materials
- Stabilization of high capacity 'layered-layered' composite structures by incorporation of the tailored spinel components
- Development of synthesis routes for control over 'layered-layered-spinel' composite compositions

**Deliverables:** Synthesis and electrochemical characterization of novel spinel and advanced composite cathodes

## Funding:

Duration: 3 yrs (Yr 1)  
FY16 Budget: \$500K

## Milestones:

- **Q1:** Solid-state synthesis of 'layered-layered-spinel' (LLS) composite cathode with cobalt in spinel arrangements
- **Q2:** Explore novel synthesis routes to integrate Li-Co-Ni-O spinel structures into LLS composite cathodes
- **Q3:** Theoretical modeling of Co-based spinel and integrated 'layered-layered-spinel' composite cathodes
- **Q4:** Synthesis of high capacity cathode core-stable Co-spinel, shell-type functional cathode particles