

# Discovery of High-Energy Cathode Materials for Li-ion Batteries

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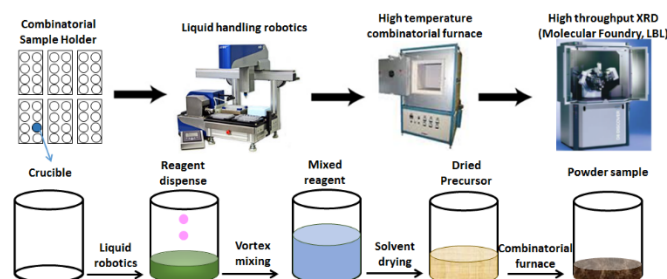
## **Technical Approach:**

- Combinatorial materials approach will be used to search for new high capacity cathodes for Li-ion batteries. Guided by percolation theory, material design focuses on compositions with Li excess that are structurally stable and enable reversible  $\text{Ni}^{2+}/\text{Ni}^{4+}$  redox couple during cycling.

## **Status:**

- Correlation between synthesis and electrochemical performance of  $\text{LiNiO}_2$  is under study.

**Technology:** Material synthesis is preferably carried out using a solution-based chemistry.



## **Objectives:**

- Investigate and understand the correlation between the synthesis and electrochemical performance of Ni based compounds.
- design, synthesize, and evaluate the potential new high-capacity cathodes within Li-Ni-O composition space using the percolation theory as a guideline.
- Coordinate with other team members (M. Doeff, B. McCloskey, C. Ban, R. Kostecki) for material characterization.

**Deliverables:** Develop a cathode that can cycle > 200 mAh/g while exhibiting minimal capacity and voltage fade.

## **Funding:**

Duration: 3 yrs, Start: 10/1/15, Total: \$1.5 M (DOE)

## **Milestones:**

- Q1:** Determine synthetic approach and identify the key synthetic parameters for  $\text{Ni}^{3+}$ -containing compounds (e.g.  $\text{LiNiO}_2$ )
- Q2:** Complete the structural and electrochemical characterization of  $\text{LiNiO}_2$
- Q3:** Determine synthetic approach and identify the key synthetic parameters for  $\text{Ni}^{2+}$ -containing compounds (e.g.  $\text{Li}_2\text{NiO}_2$ )
- Q4:** Complete the structural, and electrochemical characterization of  $\text{Li}_2\text{NiO}_2$  and down select the synthetic approach for the phase screening within Li-Ni-O chemical space