Novel Cathode Materials and Processing Methods

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

PI/Co-PI: Michael Thackeray /Jason Croy (ANL)

Technical Approach:

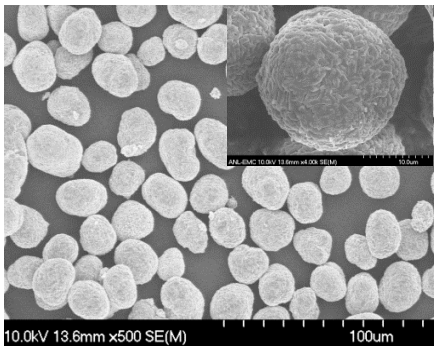
•Advance the performance and stability of high-capacity 'layered-layered' cathodes via integrated spinel components

•Explore spectrum of processing routes (0.01-1kg batches) to synthesize high-energy/power/life, layered-layered-spinel (LLS) electrodes

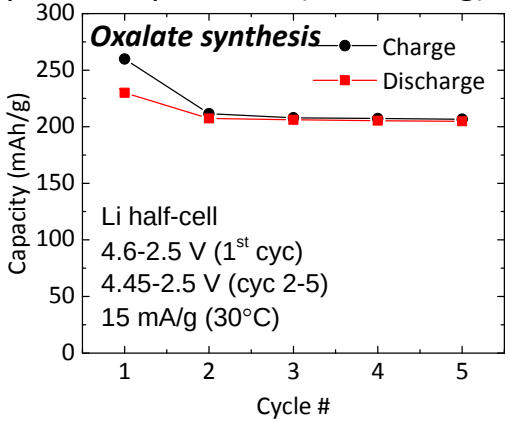
Status:

•Progress has been made in the development of composite, LLS electrodes that can deliver discharge capacities ≥200 mAh/g with high first cycle efficiencies (~90%)

Technology: Demonstration of 'Layered-Layered-Spinel' processing and high capacity LLS compositions (200 mAh/g)



LLS by CSTR (tap ~2.3 g/cm³)



Objectives:

•Development of low-cost, high-energy and high-power, Mn-oxide-based cathodes

•Improvement of design, composition and performance of advanced electrodes with stable architectures and surfaces

•Atomic-scale understanding of electrochemical and degradation processes enabling the rational design of new materials

Deliverables: Synthesis and electrochemical characterization of advanced, Mn-based, metal-oxide cathodes

Funding:

Duration: 3 yrs (Yr 1)

FY16 Budget: $500K

Milestones:

•**Q1:** Optimize the composition and cycling stability of structurally integrated materials with low Li_2MnO_3 contents

•**Q2:** Scale up promising materials to 10g-100g-1kg

•**Q3:** Identify unique surfaces and coatings

•**Q4**: Integrate milestones to deliver 200-230 mAh/g at greater than 3.5 V (~800 Wh/kg) on extended cycling