

Lithium-bearing Mixed Polyanion (LBMP) Glasses as Cathode Materials

PI/Co-PI: J. Kiggans / A. Kercher (ORNL)

Technical Approach:

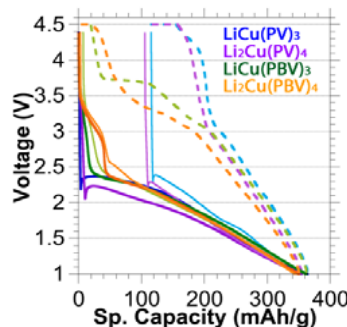
- Design mixed polyanion (MP) glass cathodes that can overcome the shortcomings of promising crystalline cathodes of a similar composition
- Develop optimal MP glass cathode materials using a combination of predictive thermodynamic modeling, glass processing, and battery testing

Status:

- Based on promising preliminary results, high capacity borate glass cathodes are being pursued.
- One additional boro-vanado-phosphate glass series is being developed to establish the synergistic effect of borate & vanadate substitution.

Technology:

- Combined vanadate/borate substitution improved 1st cycle reversibility in Cu- & Ag-based glasses.
- Molybdate substitution in phosphate glass produced high-capacity glass cathodes.
- Transmission electron microscopy showed the microstructure produced by a glass-state conversion reaction.



Objectives:

- Produce MP glass cathode with specific energy over 25% greater than LiFePO_4
- Demonstrate multi-valent MP glass cathode with specific capacity $>200 \text{ Ah/kg}$
- Establish cyclability and high power performance of MP glass cathodes

Deliverables: Produce MP glass cathodes with at least 25% greater specific energy than LiFePO_4 and minimal capacity fade for 100 cycles.

Funding:

Duration: 4 yrs (Yr 4)

FY16 Budget: \$0K (DOE) (FY15 carryover only)

Milestones:

- **Q2:** Produce glass compositions for high energy cathodes giving maximally oxidized transition metals upon first charge.
- **Q3:** Produce unconventional glass cathodes using alternative glass formers or partial crystallinity.