Improving the Stability of Lithium-Metal Anodes with Polymer and Hybrid Solid Electrolytes

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

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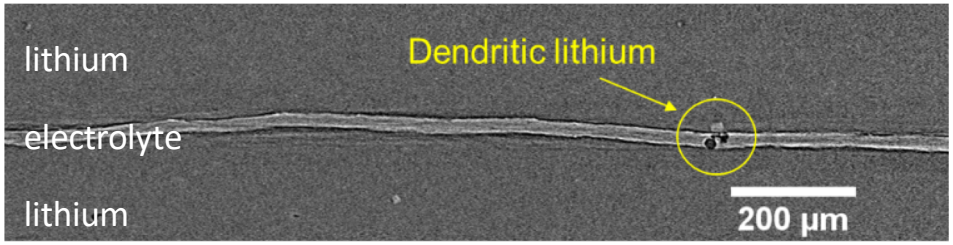
Objective:

To synthesize new hybrid electrolytes that will be stable against cells with a lithium metal anode.

Impact:

Polymer electrolytes offer increased stability in lithium batteries in comparison to more widely used liquid electrolytes. We aim to synthesize new electrolytes that simultaneously have high transport properties and have greater stability against lithium metal.

X-ray tomograph of Li-hybrid electrolyte-Li



Accomplishments:

- Synthesis of POSS-PEO block copolymer hybrid electrolyte
- Measurement of conductivity of the hybrid copolymer
- Measurement of diffusion coefficient and transference number of electrolytes
- Conducted the first Li-electrolyte-Li tomography experiments

FY19 Milestones:

- Determine limiting current in solid electrolytes (Q1)
- Determine the nature of lithium/electrolyte interface (Q2)
- Study the effect of lithium metal purity and failure mechanisms (Q3)
- Determine parametric range over which stable lithium electrodeposition is obtained (Q4)

FY19 Deliverables: Provide the foundation for building batteries with lithium metal anodes and solid electrolytes.

Funding:

— FY19: 400K, FY18: 500K, FY17: 500K