

Novel Chemistry: Lithium Sulfur and Selenium Sulfur Couple

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Technical Approach:

- Partially replacing S with Se
- Nano-confine the S_xSe_y in a nanoporous conductive matrix.

Status:

- The project started FY 2015
- Synchrotron study of charge storage mechanism of S and Se electrode was completed.
- The focus of FY16 is the confinement of cathode materials and the stabilization of solid-electrolyte interface.

Technology:

A home made high-precision electrochemical testing system will be utilized to quantify the impact of the dissolution of lithium polysulfide and lithium poly selenides.



Objectives:

- Develop a novel S_xSe_y cathode material for rechargeable lithium batteries with high energy density and long life as well as low cost and high safety.
- This new cathode will be optimized with the following goals:
 - A cell with nominal voltage of 2 V and energy density of 600 Wh/kg
 - A battery capable of operating for 500 cycles with low capacity fade.

Deliverables: NA

Funding:

- Duration – 4 yrs
- Total - \$2000K
- DOE - \$2000K
- Industry - \$0

Milestones:

- Q1 Investigate the phase diagram of S_xSe_y system and encapsulating Se_2S_5 in nanoporous carbon.
- Q2 Investigate the impact of fluorinated solvents.
- Q3 Stabilize materials with a higher S content for a higher energy density.
- Q4 Investigate the impact of the pore structure of carbon matrix.