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**Objective:** Develop new electrolyte materials to help overcome the challenges of low active material utilization and poor cycle life to enable high efficiency Li-S batteries for vehicle application.

**Impact:**
- Enable improved materials utilization and longer cycle life in Li-S batteries
- Li-S batteries have the potential to power long-range, low cost electric vehicles

**Accomplishments:**
- Designed, synthesized, and tested new ether solvents containing a pentafluorophenyl group in the structure to act as an anion receptors strongly interact with polysulfides
- *Ab initio* molecular dynamics simulations of the structures and binding energies of lithium polysulfides (Li2Sx) in the proposed new ether solvents with pentafluorophenyl groups

**FY19 Milestones:**
- Design and synthesis of new fluorinated borate electrolytes and baseline studies
- Quantum chemical calculations of the chemical stability and reactivity properties of new borate additives
- Electrochemical characterization of performance of the new fluorinated borate electrolytes in lithium-sulfur cells

**FY19 Deliverables:** Quarterly reports, new electrolyte additives and binders

**Funding:** FY19: $500,000 FY18: $500,000

*Figure: Snapshots from DFT calculations show Li2S4 species in the new electrolytes (a) TFE-PFPE:DOL and (b) TFE-PFBE: DOL [TFE-PFPE = pentfluoro(2,2,2-trifluoroethoxy)-benzene]; TFE-PFBE = ((pentfluoro(2,2,2-trifluoroethoxy) –methyl) -benzene]