# Statically and Dynamically Stable Lithium-sulfur Batteries

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

***PI/Co-PI:*** Arumugam Manthiram (UT – Austin)

***Technical Approach:***

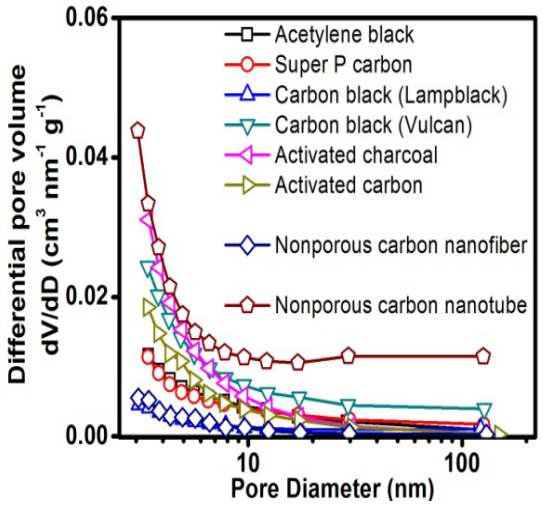
- Optimization of the electrochemical and engineering parameters of polysulfide (PS)-filter-coated separators
- Development of statically and dynamically stable Li-S cells with PS-filter-coated separators
- Cell design and optimization

***Status:***

- Investigation of 11 carbon materials, categorized as five different kinds of coating materials
- Fabrication of PS-filter-coated separators

***Technology:***

- Polysulfide (PS)-filter-coated separators fabricated with optimized porosity and microstructure of carbon materials, facilitating high sulfur capacities of > 1,200 mA h $g^{-1}$ with long cycle life




***Objectives:***

- Investigation of the electrochemical and engineering parameters for optimizing the PS-filter-coated separators
- Development of statically and dynamically stable Li-S cells by employing PS-filter-coated separators coupled with Li-metal protection through additives or $Li_2S$ cathode design/activation

***Deliverables:*** Li-S cells with sulfur capacities of > 1,000 mA h $g^{-1}$ and cycle life of > 500 cycles (dynamic stability) with good storage properties (static stability)

***Funding:***

- Duration - 3 yrs
- Total - $990,000.00
- DOE - $891,000.00
- Industry - $0

***Milestones:***

- **Q1:** Establish a database of coating materials and PS-filter coatings
- **Q2:** Establish a database of fabrication parameters and PS-filter-coated separators
- **Q3:** Complete capacity fade rate and self-discharge testing
- **Q4:** Demonstrate the lightweight design of PS-filter-coated separators and the electrochemical stability of Li-S cells