Statically and Dynamically Stable Lithium-sulfur Batteries

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**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 Li₂S 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