# NASA SBIR/STTR Technologies

## Proposal No. X8.02-9077 - Inorganic Polymer Nanocomposite Cathode for Long Cycle Life Lithium - Sulfur Batteries


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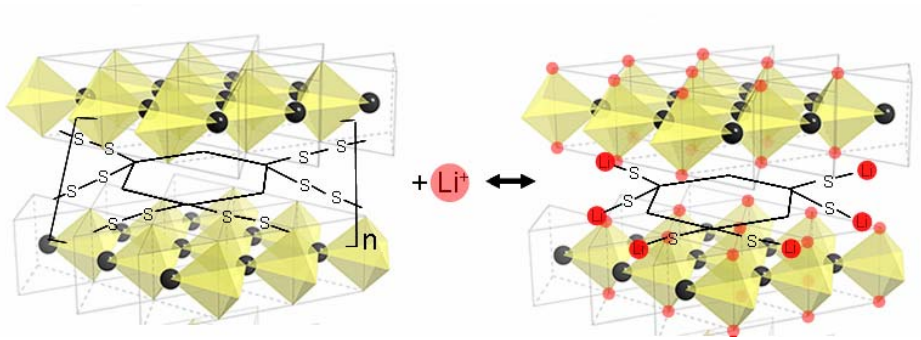
Identification and Significance of Innovation

Physical Sciences Inc. (PSI) proposes to develop a hybrid composite structure of molybdenum disulfide ($MoS_2$) with a class of polysulfide for lithium-sulfur rechargeable batteries. This cathode provides safety, improved cycle-life, and high capacity at a competitive cost. The nanocomposite design provides a synergistic improvement in conductivity and electrochemical cycling through the layered $MoS_2$ structure, provided by the intercalation of polysulfide.

Expected TRL Range at the end of Phase I Contract (1-9): **3**




Technical Objectives and Work Plan

1. Achieve filling capacity of poly(phosphazene disulfide) in molybdenum disulfide, [(NPS2)3](x)MoS2](1-x), where x is equal or greater than 0.5
2. Demonstrate [(NPS2)3](x)MoS2](1-x) nanocomposite electrical conductivity of greater than 0.01 S/cm.
3. Achieve reversible capacity of 350 mAh/g for the nanocomposite at a C/2 rate in 2mAh cells versus lithium.
4. Demonstrate capacity fade of less than 0.1%/ cycle for nanocomposite versus lithium.
5. Design 2 Ah cell with an energy density of 350 Wh/kg.

Work Plan Tasks: 1. Management and Reporting, 2. Nanocomposite Synthesis, 3.Conductivity Testing, 4. Half-Cell Fabrication and Testing

NASA and Non-NASA Applications

NASA application for energy storage: flight elements and planetary surface - human habitats, Extravehicular Activities (EVA), science measurements, landers, rovers, and astronaut equipment; storage systems for crew exploration vehicles and spacecraft; and stationary energy storage applications such as base power or peaking power applications.
Non-NASA applications include mobile telephones, lap-top computers, power tools, personal data assistants, portable entertainment devices.

Firm Contacts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