NASA SBIR/STTR Technologies

Safer Battery with Switchable Polymer Coating

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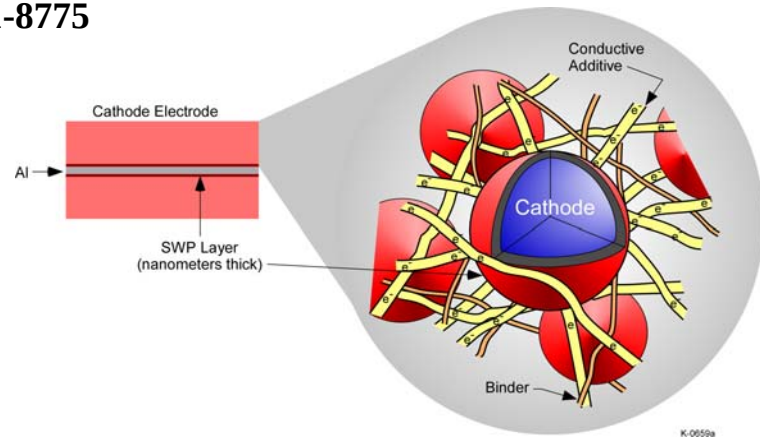
Identification and Significance of Innovation

Physical Sciences Inc. proposes to demonstrate a switchable polymer (SWP) coating capable of minimizing the localized heat generation during internal shorting of a cell thereby preventing unsafe conditions, including catastrophic failure. The SWP coating will be shown to improve cycle life by switching to an insulator during shorting or overdischarging thereby limiting excessive reduction of the cathode.

Estimated TRL (1 – 9) at beginning and end of contract:
beginning at TRL 2 and ending at TRL 3



Cathode with SWP coated active material and current collector.

Technical Objectives and Work Plan

With an electrode incorporating the SWP coating:

- Demonstrate two orders of magnitude reduction in charge passed on discharge to 0.6V versus lithium.
- Demonstrate less than 5% change in discharge capacity after discharge to 0.6V versus lithium.
- Exhibit less 1% capacity fade over 20 cycles.
- Demonstrate lack of fire or thermal runaway upon overdischarge and external shorting.

Work Plan Tasks: reporting; coating of cathode material and current collector; half cell electrochemical and abuse testing; pouch cell abuse testing.

NASA and Non-NASA Applications

NASA applications: for both orbital and planetary surface missions include the Lunar Lander or Lunar Surface Access Module (LSAM), robotic missions, and surface systems. Surface systems include human habitats, Extravehicular Activities (EVA), science measurements, and the utilization of in situ resources.

Non-NASA applications: hybrid electric vehicles and consumer electronics devices.

Firm Contacts

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NON-PROPRIETARY DATA