

NASA SBIR/STTR Technologies

Safer Battery with Switchable Polymer Coating

Physical Sciences Inc. – Andover, MA

PI: Dr. Christopher M. Lang

Proposal No.: X7.01-8775



Identification and Significance of Innovation

Advances in anode and cathode chemistries continue to increase the potential energy density of secondary lithium ion battery systems increasing the potential danger on catastrophic failure. Physical Sciences Inc. has demonstrated that switchable polymer (SWP) coatings may be applied to both the cathode current collector and the active cathode materials to prevent catastrophic failure due to internal shorting or overdischarge in lithium-ion batteries. The SWP can be reversibly “switched” from an insulator to a conductor upon oxidation permitting normal operation.

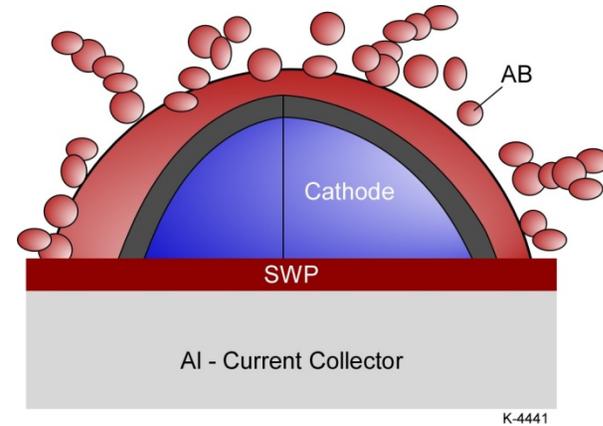
TRL at end of contract: 3

Technical Accomplishments and Work Plan

The Phase I accomplishments include:

- Application of active SWP coatings to both the aluminum current collector and cathode material.
- 95% reduction in the low voltage charge pass on overdischarge.
- 70% reduction in the initial short-circuit discharge current and 45% reduction in the cell heating rate.
- Demonstration of equivalent discharge capacity on coating of current collector and active cathode material.
- Development of scaleable coating techniques.

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



Cathode with SWP coated current collector and active material.

NASA and Non-NASA Applications

NASA applications: for both orbital and planetary surface missions including 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

Dr. Christopher M. Lang; Dr. B. David Green
20 New England Business Center, Andover, MA 01810
Phone: 978-689-0003; Fax: 978-689-3232
E-mail: lang@psicorp.com; green@psicorp.com

NON-PROPRIETARY DATA