

NASA SBIR/STTR Technologies

Silicon Whisker and Carbon Nanofiber Composite Anode Contract No.: NNX10CA51C

PI: Christopher M. Lang
Physical Sciences Inc., Andover MA



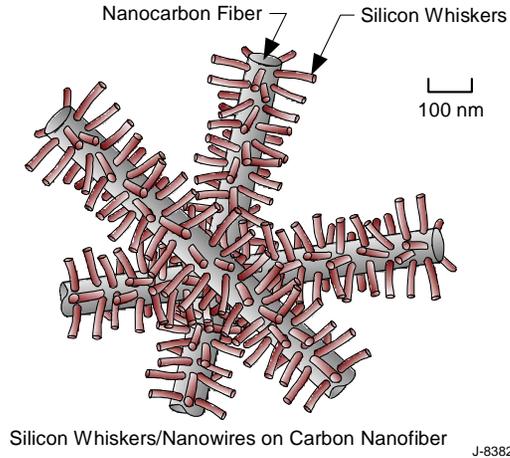
Identification and Significance of Innovation

Physical Sciences Inc. (PSI) developed a silicon whisker and carbon nanofiber composite anode for lithium ion batteries. As a result of this unique “whisker-on-fiber” architecture, the composite anode has been demonstrated to possess a specific capacity of greater than 1100mAh/g, rate capability of 1C, 80+% first cycle reversibility, and superior cycle life of over 200 cycles. During the Phase II, PSI scaled up production of this composite anode, refined the electrode fabrication procedures, and demonstrated continuous production of the silicon composite anode. Construction and testing of cells up to 2500mAh demonstrated lifecycle performance.

Current TRL Level (1-9): **4/5**

Accomplishments

- PSI has developed a silicon whisker and carbon nanofiber composite material capable of reversibly delivering >1000mAh/g at up to 1C rates.
- Demonstrated > 80% capacity retention over 200 cycles.
- Composite material production has been successfully scaled to the 50 gram scale with a clear path to the production of 250-500 gram batches.
- Electrode formulation optimized to produce electrodes delivering 1000mAh/g at loadings >20 mAh/in². Continuous electrode production demonstrated.
- Equivalent pouch and coin cell performance demonstrated.
- Demonstrated greater than 90% capacity retention at 0°C.
- Construction and delivery of 3 2.5Ah pouch cells to NASA.



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

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