

# NASA SBIR/STTR Technologies

Proposal No.: 08-2 X6.02-9113

## Silicon Whisker and Carbon Nanofiber Composite Anode

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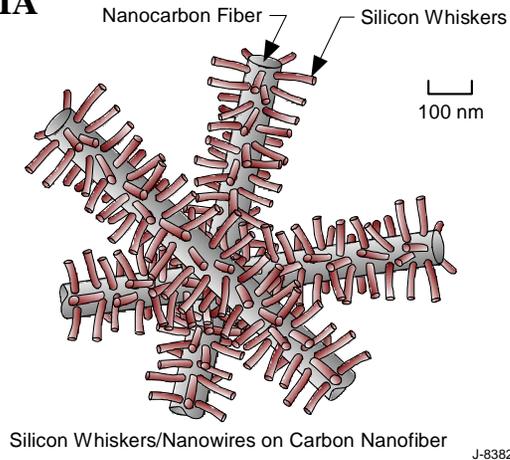
Physical Sciences Inc., Andover MA



### Identification and Significance of Innovation

Physical Sciences Inc. (PSI) proposes to develop a silicon whisker and carbon nanofiber composite anode for lithium ion batteries. The nanocomposite design provides a synergistic improvement in reversible capacity and electrochemical cycling as a result of the unique silicon architecture and structural reinforcement provided by the nanofibers.

Expected TRL Range at the end of Contract (1-9): 5



### Technical Objectives and Work Plan

1. Demonstrate 50-gram per batch production;
2. Demonstrate full cell anode capacity of >1000 mAh/g at C/10 & 0°C;
3. Demonstrate a full cell cycle life of over 300 cycles;
4. Demonstrate an operating temperature of -30°C to 30°C;
5. Demonstrate a rate capability of C/5 or higher;
6. Deliver to NASA three 2.5 Ah cells (energy density > 220Wh/kg);
7. Demonstrate the safety features of the anode and full cells;
8. Design a 1 kWh prismatic battery pack.

Work Plan Tasks: reporting; optimizing electrode fabrication; high loading anode fabrication; material scale-up to 50g/batch; full cell fabrication; anode electrochemical test; operating temperature and rate capability; build 2.5 Ah cells; safety tests; design a 1kWh battery pack.

### 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**