

Pre-Lithiation of Silicon Anode for High Energy Li Ion Batteries

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Technical Approach:

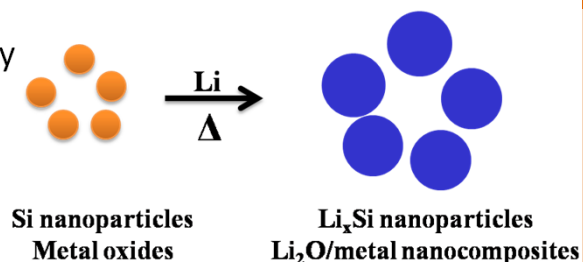
- Compensate 1st cycle anode capacity loss with anode prelithiation reagents (Li_xSi nanoparticles)
- Compensate the anode capacity loss with cathode prelithiation reagents (Li_2O /metal nanocomposite)
- Increase the air-stability of prelithiation reagents via different coatings

Status:

- Synthesize Li_xSi - Li_2O core-shell nanoparticles (>1200 mAh/g) for anode prelithiation
- Synthesize Li_2O /metal nanocomposite (>600 mAh/g) for cathode prelithiation

Technology:

1st cycle Coulombic efficiency can be increased by either mixing Li_xSi nanoparticles with anode materials or mixing Li_2O /metal nanocomposite with cathode materials.



Objectives:

- To increase 1st cycle Coulombic efficiency of lithium ion batteries
 - Anode prelithiation
 - Cathode prelithiation
- To increase stability of prelithiation reagents in the air
- To increase stability of prelithiation reagents in solvents

Deliverables: Compensate the anode capacity loss with pre-stored lithium, and significantly improve the efficiency and energy density of lithium ion batteries

Funding:

- Duration - 4 yrs
- Total - \$300 K/year
- DOE - \$300 K/year

Milestones:

- Q1 Milestone: Prelithiate anode materials with dry-air-stable Li_xSi - Li_2O core-shell nanoparticles
- Q2 Milestone: Synthesize artificial-SEI protected Li_xSi NPs with high capacity and humid-air-stability
- Q3 Milestone: Synthesize Li_2O /metal nanocomposite for cathode prelithiation with high capacity
- Q4 Milestone: Synthesize LiF /metal nanocomposite for cathode prelithiation with high capacity and humid-air-stability