**Abstract**

The focus of this project is to develop a silicon carbon core shell structure (Si/C) as anode material for lithium ion batteries. Silicon is considered a promising material for anodes because of a high theoretical charge capacity of over 4000 mAh/g [1]. Be that as it may, silicon is subject to great amounts of expansion during the (de)lithiation processes, and therefore is subject to large mechanical stress. This results in degradation of the electrode and improper SEI growth, resulting in low cycling stability [2]. Carbon coating is used to primarily promote volume retention of silicon, and to improve electrochemical performance. The ultimate goal of this project is to determine optimal Silicon to glucose ratio and carbonization temperature to produce an anode that maintains both high charge capacity as well as more efficient cycling stability.

**Results**

- Commercial silicon nanoparticles were carbon coated with varying ratios of glucose [3]
- Based on Raman spectroscopy, a greater glucose to Silicon ratio promotes better carbon coating
- Based on XRD analysis, the ideal annealing conditions are in nitrogen gas at milder temperatures due to severe Si reduction in argon atmosphere at elevated temperatures
- Amorphous silica present among active material, regardless of glucose content and carbonizing conditions
- Coin cell battery testing will be executed with a water in salt electrolyte using lithium bis(trifluoromethanesulfonyl)imide (LiTFSi) salt [4]

**Research Questions**

- What is the ideal silicon to glucose ratio for efficient carbon coating?
- What is the ideal annealing temperature and atmosphere for carbon coating silicon?
- Is the resulting carbon layer graphitic or amorphous?
- Is the resulting carbon layer adequate in hindering the expansion of the silicon core?
- What is the thickness of the carbon layer?

**Project Activities or Findings**

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**Citations**


XRD analysis was provided courtesy of Dr. Craig England.

Raman spectroscopy was provided courtesy of Muhammad Tariq.