Abstract

Recent results for the Silicon–Carbon Nanocomposite: (a) The addition of graphite to the silicon carbon composite anode allows for a drastic increase in capacity without any decrease in rate capability. (b) The true utilization of the silicon–carbon nanocomposite is far from realized. The silicon–carbon nanocomposite shows excellent rate capability and cycling life, but the apparent capacity is still far below the theoretical capacity. The second cycle capacity of the silicon–carbon nanocomposite is approximately 50% of the theoretical capacity. The high initial capacity and excellent rate capability make this material a promising candidate for use in high energy density lithium ion batteries. (c) The silicon–carbon nanocomposite shows excellent rate capability and cycling life, but the apparent capacity is still far below the theoretical capacity. The high initial capacity and excellent rate capability make this material a promising candidate for use in high energy density lithium ion batteries. (d) The silicon–carbon nanocomposite shows excellent rate capability and cycling life, but the apparent capacity is still far below the theoretical capacity. The high initial capacity and excellent rate capability make this material a promising candidate for use in high energy density lithium ion batteries.

Results for the Silicon-Carbon Nanocomposites

- Composites of silicon and graphite are synthesised using a range of precursors and processing conditions. The composites are characterised using a variety of techniques, including X-ray diffraction, scanning electron microscopy, and cyclic voltammetry. The composites show a high degree of intercalation and exfoliation, with a large portion of the silicon remaining in a nanocrystalline state.

Objective

The objective of this project is to develop a silicon-carbon composite anode material that has a high theoretical capacity of 3200 mAh/g and a high power density of 500 W/kg. The composite material is expected to have excellent rate capability and cycling life, and to be compatible with a variety of electrolyte solutions. The project will involve the synthesis of the composite material, characterisation of its electrochemical properties, and testing in a lithium-ion battery.

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References


First cycle irreversible capacity loss 50% of theoretical capacity due to poor contact between anode and SEI layer.