

## Fabrication of Graphene Encapsulated Silicon Composites from Silicon Sludge Waste for Lithium Ion Batteries

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High-purity silicon (Si) is consumed as sludge waste consisting of Si, silicon carbide (SiC) particles and metal impurities during Si wafer slicing in semiconductor and solar cell fabrication. Recovery of Si from the waste Si sludge has been a great concern because Si particles are promising high-capacity anode materials for Li ion batteries (LIBs). In this study, we report a fabrication of graphene (GR) encapsulated Si composites from Si sludge waste for Lithium Ion Batteries using a novel aerosol process. This process supports many advantages such as eco-friendly, low-energy, rapid, and simple method for forming Si-GR composite. The effects of the operating temperature, concentration of Si sludge powder and GO in the colloidal mixture on the particle properties were investigated. The morphology of the as-formed Si-GR composites looked like a crumpled paper ball and the micron-sized of the composites could be tuned with variation of the process variables. The electrochemical performance was then conducted with the Si-GR composites for LIBs.