

Synthesis, Characterization of Graphene Sheets and Their Composites with Silicon Nanoparticles for Li-ion Battery Anodes

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Graphene has attracted a great deal of interests due to its unique structural, electrical, thermal and mechanical properties. In particular, graphene can be produced in large scale from abundant natural and synthetic graphite, and offers extremely high specific surface area (2600 m²/g). Here, we hypothesize that such graphene sheets(GS) in the form of nanocomposites with silicon nanoparticles as a Li-ion battery anode may efficiently accommodate the mechanical stresses caused by Li-alloying and de-alloying processes while the electrical integrity of electrode is maintained thanks to the highest aspect ratio of known materials. In this study, solution oxidation process was employed to prepare graphene oxide (GO) sheets, and critical parameters and related chemistries to achieve stable GO and GS colloid were identified. Finally, graphene-silicon nanocomposites were fabricated by a simple solution process. The properties of GO/GS and nanocomposite were examined by XRD, TEM, SEM, TGA and DLS etc. The electrochemical performances of graphene-silicon nanocomposites as Li-ion battery anode will be presented.