# A $SiO_x$-Carbon-reduced graphene oxide nanocomposite as a high stability anode material for lithium-ion batteries

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## ABSTRACT

Nowadays, to meet requirements for various ranges of applications, including portable electronics, high power hybrid vehicles or electric vehicles, rechargeable solid-state batteries, such as lithium-ion batteries (LIBs) should be endowed with higher energy and power densities, lower cost, higher cycling life[1]. SiO-based anode is a promising high-capacity material for lithium ion batteries, but it usually exhibits poor cycling stability because of its huge volume variation during the lithium uptake and release process. In this work, $SiO_x$-C nanoparticles was fabricated by a modified Stöber synthesis approach[7,9]. A novel double protection strategy to improve the electrode performance of $SiO_x$ through the use of $SiO_x$-C core−shell nanostructures and reduced graphene oxide (RGO) networks has been developed. The nanocomposite were characterized by X-ray diffraction, field emission scanning electron microscopy and high resolution transmission electron microscopy. $SiO_x$-C nanoparticles with sizes of about 50-150 nm were homogeneously deposited and embedded in the RGO networks. The prepared $SiO_x$-C-RGO nanocomposite material exhibits a high initial specific capacity of 2375 mAh $g^{-1}$, excellent cyclic performance of 790 mAh $g^{-1}$ after 500th cycle and good rate capability, which was ascribed to the electronically conductive and elastic RGO net works in addition to the carbon shells and small particle sizes of $SiO_x$-C nanoparticles. Our results indicate that $SiO_x$-C-RGO nanocomposite is a good candidate for high performance lithium-ion battery anodes.

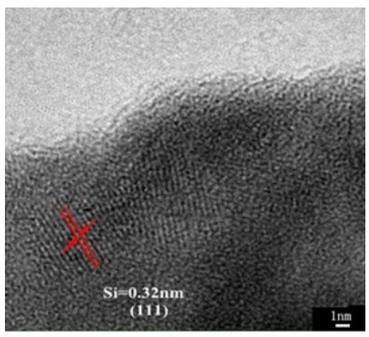


Figure 1. HRTEM image of SiOx-C-RGO nanocomposite

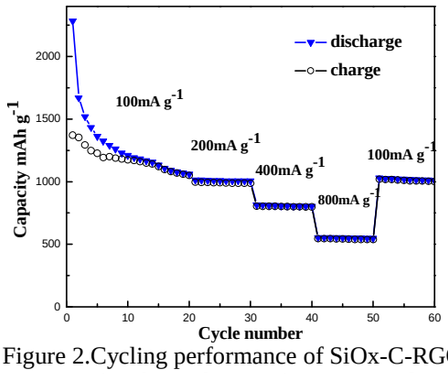


Figure 2.Cycling performance of SiOx-C-RGO nanocomposite electrode at various current densities

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