A Hybrid Si@C@CNT@C Anode by Anchoring Silicon Nanoparticles onto CNT for Enhancing Performance in Lithium Ion Battery

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We develop a facile method to anchor commercially available silicon nanoparticles (SiNPs) onto carbon nanotube (CNT) and fabricate the SiNPs and CNT based composite (denoted as Si@C@CNT@C) through a living polymerization reaction combined with a carbonization process. Si@C@CNT@C possesses a structure in which carbon coated SiNPs are anchored onto CNT linked by a carbon layer to enhance electron transfer. Anchoring structure helps to restrain SiNPs aggregating, and carbon layer as well as CNT network facilitates buffering the volume variation and stabilizing the SEI film. Hence, as an anode material for lithium ion batteries, Si@C@CNT@C demonstrates an improved initial discharge specific capacity ($\sim 4162 \text{ mAhg}^{-1}$) and coulombic efficiency (84%) as well as much enhanced rate performance.

Keywords: Silicon nanoparticle; Carbon nanotube; Anchor effect; Anode; Lithium ion battery

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