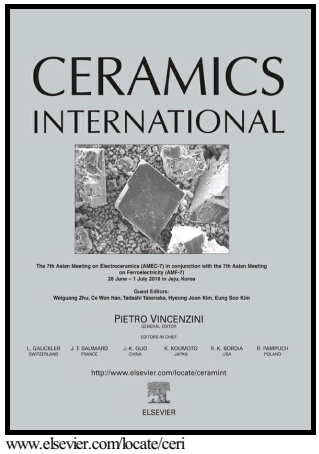

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Rational design of coaxial MWCNTs@Si/SiOx@C nanocomposites as extending-life anode materials for lithium-ion batteries

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Abstract

One-dimensional (1D) uniform multi-walled carbon nanotubes (MWCNTs)@Si/SiOx@C nanocomposites were prepared by the magnesiothermic reduction of MWCNT@SiO_2 nanocables and subsequent carbon coating process. Through simply altering the acid-treatment conditions, SiOx were reserved on the surface of MWCNTs to seal and fix the Si nanoparticles, along with the carbon coating layer, the reducted Si nanoparticles (Si NPs) were entirely encapsulated in the 1D coaxial nanocomposites. Due to the multiple volume expansion limit effects of inner Si nanoparticles, the cycling stability has been greatly improved. When workd as anodes for lithium-ion batteries, the MWCNTs@Si/SiOx@C electrode exhibits better electrochemical properties than bulk Si and MWCNTs, as well as an extending cycle life of 500 cycles in comparsion to our previous MWCNTs@Si nanocomposites. It is believed that the MWCNTs can provide structural support and enhance the electronic mobility, while the SiOx and carbon buffer component would anchor the Si NPs firmly