High performance Alloy Type Materials Based Anode with Nanotubular Structure for lithium Ion batteries

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Problems related to tremendous volume change of Si during cycling and low electron conductivity and ion diffusivity are the dominant obstacles to apply this material for a high capacity anode in lithium ion battery.[1] We have developed alloy type materials blended electrode, consisting of frame of Si nanotube and Ge shell layer (Figure 1), which enables improvements in structural stability and rate capability. A difference in volume change magnitude of Si and Ge, and high Li ion/electron conductivity of Ge contribute to favorable mechanics and kinetics during cycling, respectively.[2-3] Our designed Si-Ge core-shell nanotubes array electrode shows high initial coulombic efficiency of 83%, stable capacity-retention of 85% after 50 cycles, charge capacity of 60% at 3C rate as well as high energy density. Our electrode design approach in both electrode configuration and composition provides new avenues to develop high performance alloy type material electrode for next generation lithium ion battery.

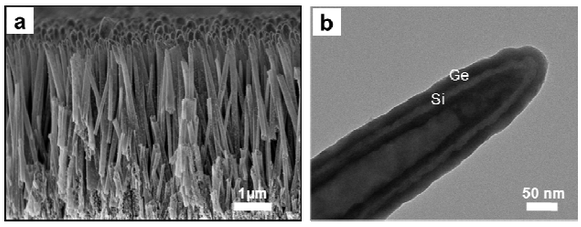

Figure 1. (a) Cross sectional scanning electron microscope image of Si-Ge Si-Ge core-shell nanotubes array (b) Transmission electron microscope image of Si-Ge Si-Ge core-shell nanotube

Reference

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