Journal of Electroanalytical Chemistry

Nano tin dioxide anchored onto carbon nanotube/graphene skeleton as anode material with superior lithium-ion storage capability

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Abstract

As a promising anode candidate for lithium-ion batteries (LIBs), SnO_2-based material has been extensively investigated. However, its practical application is still hindered due to the inherent drawbacks of poor conductivity, severe volume expansion, and unavoidable agglomeration of active material during repeated discharge/charge process as well as formation of unstable solid electrolyte interface (SEI) layer. In this paper, the SnO_2@carbon nanotube/reduced graphene oxide (SnO_2@CNT/RGO) composite is rationally designed and fabricated, in which nano SnO_2 nanoparticles (NPs, ~6 nm) are anchored onto three-dimensional (3D) conductive CNTs/RGO skeleton by first assembling SnO_2 onto CNT and then entangling SnO_2@CNT nanofibers in 3D graphene networks. The synergistic effect of CNT and RGO significantly increase the conductivity and prevent aggregation of active material. In addition, the mesopores structure constructed by CNT and RGO can accommodate the volume change of SnO_2 NPs and form more stable SEI layer during repeated discharge/charge process. Therefore, the SnO_2@CNT/RGO electrode exhibits not only more stable cycle performance but also more superior rate capacity. The

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