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Carbon Coated SnS2 Nanoparticles Synthesized by Arc-discharge Plasma and their behavior as Li-ion anode

Huang Hao[1], Gao Song[2], Gu ZeYu[2], Wu AiMin[2], Yu JieYi[2]

[1]Dalian University of Technology, DaLian, China [2]Dalian University of Technology, Dalian, China

huanghao@dlut.edu.cn

Song Gao [a], Hao Huang [a*], Ze-Yu Gu[a], Ai-Min Wu[a], Jie-Yi Yu[a]
a Key Laboratory of Materials Modification by Laser, Ion, and Electron Beams (Ministry of Education), School of Materials Science and Engineering, Dalian University of Technology, Dalian 116024, China

Abstract
Metal sulfides have been one of the hottest research topics on improving the stability of the electrode in lithium ion battery. In the present work, the SnS_2 (C) core-shell nanostructure Nanoparticles have been successfully produced by a two-step synthetic strategy. Firstly, DC arc discharge plasma method was adopted to produce Sn (C) NPs, then, Sn (C) nanocapsules are served as the starting material and, at low-temperature, rebuilt the core with sulfur (S) during the solid phase reaction process. According to the High Resolution Transmission Electron Microscope (HR-TEM), it is found that the single SnS_2 (C) particle presents a uniform structure of CNTs, with the average size of about 40 nm in diameter and 200-300 nm in length. The CNTs have multi walls of 5-7 graphene layers and are partially-filled with SnS_2. Serving as an active component of the anode in lithium-ion batteries, the electrochemical behaviors of Sn-M NPs were tested, including the cyclic voltammetric (CV) curves, electrochemical impedance spectroscopic (EIS) and cycling performance. It exhibits that the carbon shells coated on the surface of particles dose not only effectively accommodate the volume expansion from insertion and extraction between $SnS_2$and Li, but also improve mobility of carriers on the interfaces during cycling process.
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