High-cycling-stability of Nanosized Sandwich Structure Silicon/Graphene Composite as Anode for Lithium-Ion Batteries

Rui Yang^{*}, Yiding Shen, Xiaowu Yang, Liewei Qiu, Xin Li

Key Laboratory of Auxiliary Chemistry & Technology for Chemical Industry, College of Chemistry and Chemical Engineering, Shaanxi University of Science & Technology, Xi'an 710021, P.R.China

^{*}E-mail: ryanthony@163.com

doi: 10.20964/2017.08.81

Received: 15 May 2017 / Accepted: 22 June 2017 / Published: 12 July 2017

The nanosized sandwich structure silicon/graphene composite anode material was designed to enhance anode performance for lithium-ion batteries (LIBs) by a facile method of mechanical ball milling. The structure and morphology of the materials were investigated by X-ray diffraction (XRD) and field emission scanning electron microscope (FESEM). The electrochemical properties of this composite electrode were studied by a series of electrochemical tests. As anode of LIBs, the composite material exhibited a high initial reversible capacity of 2189.7 mAh·g⁻¹ at a current density of 1000 mA·g⁻¹, and showed an enhanced cyclic performance with a reversible capacity of 1212.9 mAh·g⁻¹ after 100 cycles. The performance improvement can be attributed to that as a good matrix, the graphene sheets mitigated the volume expansion/shrinkage of silicon during the lithiation/delithiation processes and increased electrical conductivity of anode materials.

Keywords: nano-Si powder, graphene nanosheets, lithium-ion batteries, composite anode material, electrochemical performance

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