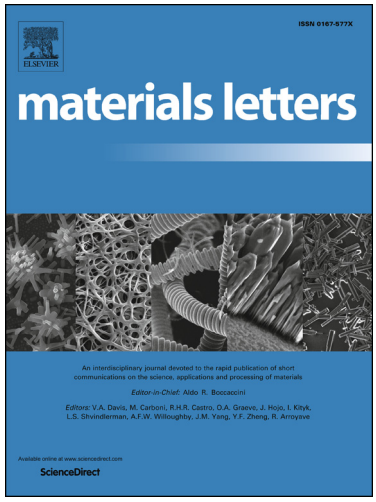

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Introducing reduced graphene oxide to improve the electrochemical performance of silicon-based materials encapsulated by carbonized polydopamine layer for lithium ion batteries

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Abstract: To improve the electrochemical performance of silicon-based anode material, the silicon/carbonized polydopamine/graphene (Si/PDAC/rGo) was prepared via pre-coating process in which graphene oxide was added and subsequent annealing process. The silicon particles with polydopamine (PDA) layer was encapsulated by graphene sheets due to interaction between the amine groups on PDA and the oxygen-containing groups on graphene oxide (GO), so the aggregation of silicon particles was hindered. The X-ray photoelectron spectroscopy (XPS) results present that most of the oxygen-containing groups were removed and the carbon layer contained nitrogen element. The initial coulombic efficiencies of Si/PDAC/rGo were 83.8%, 84.3%, 83.1% at 0.1, 0.3, 0.5 A g^{-1}, respectively. The cycle and rate performance of Si/PDAC/rGo was also enhanced ascribed to the synergistic buffer effects of carbonized polydopamine layer and graphene sheets.

Keywords: Lithium ion battery; Silicon; Carbon materials; Microstructure

1. Introduction

Lithium ion batteries have attract considerable attention to be a promising power source because of its high energy density, high power density and long cycle life [1-5]. Among all anode materials, silicon anode material is attractive to the lithium ion battery market due to its high theoretical specific capacity and rich resources [6-8]. However, the volume expansion of silicon results in poor cycling performance and the silicon exhibits inherent low electronic conductivity, which hinders the large application of silicon anode material [9]. Carbon material with good flexibility and electronic conductivity could compensate the drawback of silicon perfectly. Hence,

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