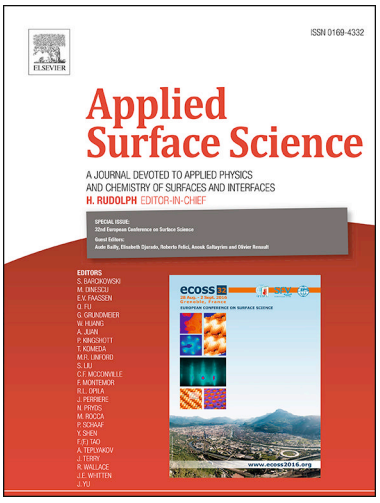

Full Length Article

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Preparation of SnO_2@rGO/CNTs/S composite and application for lithium-sulfur battery cathode material

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Abstract: In this paper, SnO_2 was introduced in to suppress the "shuttle effect" of lithium-sulfur battery for its efficient adsorption for lithium polysulfides, and a three-dimensional conductive network constructed by reduced graphene oxide (rGO) and carbon nanotubes (CNTs) was used to improve the composite conductivity and mechanical properties. Thus, a SnO_2@rGO/CNTs/S composite was prepared to use as the lithium-sulfur battery cathode material. The obtained samples were characterized by X-ray diffraction, scanning electron microscopy, energy dispersive X-ray spectroscopy, high-resolution transmission electron microscopy and thermogravimetric analysis. The electrochemical performance was characterized by cyclic voltammogram, constant current charge-discharge, rate performance, cycle life and electrochemical impedance spectroscopy after being assembled into lithium-sulfur battery. The results show that the obtained composite has a promising electrochemical performance: the initial discharge capacity is 1205.4 mAh g^{-1} at 0.1 C and there is a reversible capacity of 958.6 mAh g^{-1} after 50 cycles.

Keywords: Lithium-sulfur battery; cathode material; SnO_2; rGO; CNTs

1. Introduction

Lithium-sulfur (Li-S) battery has recently attracted considerable attention as a promising energy storage device due to its low cost, environmental friendliness, high theoretical capacity (1675 mAh g^{-1}) and energy density (2600 Wh kg^{-1})[1, 2], which is much higher than those of conventional lithium-ion batteries. However, the practical electrochemical performance of Li-S battery have been restricted by the low conductivity of sulfur and Li_2S/Li_2S_2 (discharge final products), and the shuttle effect of the lithium polysulfides (LiPSs) [3]. To address these problems, carbon materials and metal

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