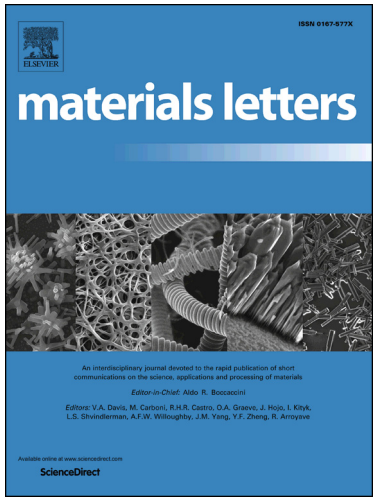

Polythiophene lamella wrapped sulfur as cathode for rechargeable lithium sulfur batteries

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Polythiophene lamella wrapped sulfur as cathode for rechargeable lithium sulfur batteries

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Abstract

We report the synthesis of a sulfur/polythiophene composite by wrapping micro-sized sulfur particles with polythiophene lamella. The polythiophene lamella with good conductivity and huge surface could help improve the cycling performance of micro-sized sulfur cathode. The first discharge capacity of sulfur/polythiophene was 1074.29 $mAh \cdot g^{-1}$, the remaining capacity was 595.49 $mAh \cdot g^{-1}$ after 90 cycles at a rate of 0.1C.

Keywords: Micro-sized sulfur; Polythiophene; composite materials; Energy storage and conversion

1. Introduction

Increasing demand for high energy density batteries requires the development of alternative cathode materials with high capacities, owing to the traditional transition metal oxide and phosphate cathodes such as $LiMn_2O_4$, $LiFePO_4$ only offer a capacity of < 200 $mAh \cdot g^{-1}$[1-2]. Rechargeable lithium-sulfur battery is a promising candidate owing to its high theoretical specific capacity of 1675 $mAh \cdot g^{-1}$ and high theoretical energy density of 2600 $Wh \cdot kg^{-1}$[3-5]. Sulfur as a cathode material also has other advantages such as low cost, nontoxicity, abundant, and environmentally friendly [6-7]. Nevertheless, it has been difficult to develop a practical Li-S battery by the problems of low electrical conductivity of sulfur, and volume expansion of sulfur during discharge[8-11]. Moreover, sulfur reaction with lithium ions involving the formation of sulfide Li_2S_x