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Facile One-step Synthesis of Uniformity Carbon-mixed Tin Sulfide Hexagonal Nanodisks as Low-cost Counter Electrode Material for Dye-sensitized Solar Cells

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Abstract:

Carbon-mixedtin sulfide hexagonal nanodisks were synthesized via a simple and environmentally friendly one-step hydrothermal route. To verify whether the introduction of carbon can improve the performance of the materials, the as-synthesized SnS_2 and carbon-mixed SnS_2 are fabricated as counter electrodes in dye-sensitized solar cells. Although the existence of the amorphous carbon reduces the short circuit current, the mixed structure may protect the active tin sulfide from corrosion by electrolyte. Compared with pristine tin sulfide hexagonal nanodisks, carbon-mixed tin sulfide hexagonal nanodisks exploited as CEs have also exhibited distinguished electrocatalytic activity for the reduction of triiodide and excellent chemical stability due to the introduction of carbon. The DSSC equipped with carbon-mixed tin sulfide hexagonal nanodisks counter electrode exhibited an excellent power conversion efficiency of 7.06%, which increasing value reached 15.3% comparable to that of the tin sulfide hexagonal nanodisks based DSSC (6.12%). This was also comparable to that of the Pt-based DSSC (7.09%).

Keywords: Electrical properties; Semiconductors; Solar energy materials.

1. Introduction

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