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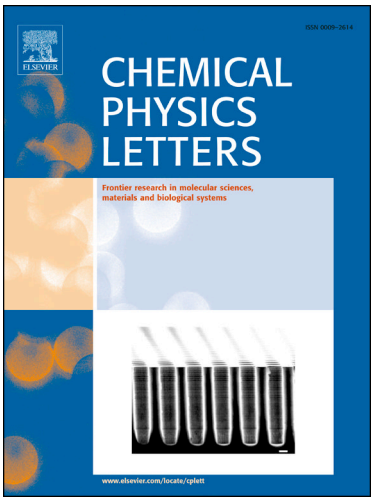

Research paper

Morphology controllable time-dependent CoSnanoparticle thin films as efficient counterelectrodeforquantumdot-sensitizedsolarcells

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Morphology controllable time-dependent CoS nanoparticle thin films as efficient counter electrode for quantum dot-sensitized solar cells

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Abstract

Cobalt sulfide (CoS) agglomerated nanoparticle thin films obtained by a facile chemical bath method at different deposition times. The CoS counter electrode (CE) deposited at 3 h deposition time (CC-3h) based quantum dot sensitized solar cells (QDSSCs) achieves higher power conversion efficiency (η) of 3.67% than those of CC-2h (1.83%), CC-4h (2.52%), and Pt (1.48%) CEs, under one sun illumination (100 mW cm^{-2}, AM 1.5 G). The electrochemical analysis revealed that CC-3h CE shows a smaller charge transfer resistance (9.22 Ω) at the CE/electrolyte interface than the CC-2h (23.34 Ω), CC-4h (19.73 Ω) and Pt (139.92 Ω) CEs, respectively.

Keywords: Time-dependent; CoS; Nanoparticle; Electrocatalytic activity; QDSSC;

Introduction

Over the past two decades, dye-sensitized solar cells (DSSCs) have been studied extensively due to their facile deposition approach and relatively large efficiency. As an alternative, quantum dot sensitized solar cells (QDSSCs) have gained tremendous interest because of outstanding properties of quantum dots (QDs), such as tunable bandgap [1], possibility of hot electron injection [2], multiple exciton generation [3], high absorption