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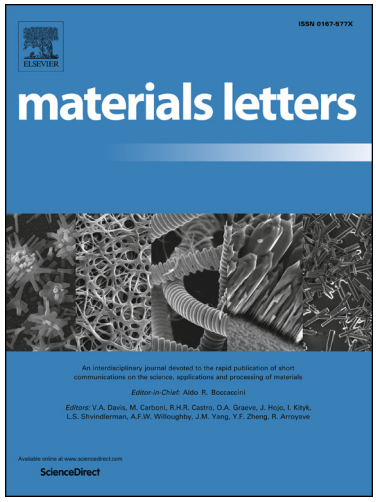

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Enhancement in efficiency of CdS/CdSe quantum dots-sensitized solar cells based on ZnO nanostructures by introduction of MnS layer

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Abstract: In this study, the formation of a MnS layer on the surface of ZnO films was investigated for improving the power conversion efficiency of CdS/CdSe co-sensitized quantum dot solar cells. The results showed that the MnS layer had a remarkable effect on the light-absorption characteristics and short-circuit current density of the solar cells by ensuring that a greater number of quantum dots were adsorbed and by reducing the charge-recombination rate. As a result, the CdS/CdSe/ZnS electrode based on the ZnO film modified with the MnS layer exhibited a power conversion efficiency of 3.45%, which was much higher than for the solar cells without a MnS layer (2.27%).

Key words: energy storage and conversion; nanocrystalline materials; quantum dot solar cells; ZnO photoanode; MnS; photoelectric performance

1. Introduction

Over the past few decades, quantum dot-sensitized solar cells (QDSSCs) have attracted widespread attention because of their outstanding optoelectronic properties in terms of their strong light absorption, tunable bandgap, and high exciton coefficients [1-2]. The theoretical power conversion efficiency (PCE) of these devices is as high as 44% [3]. However, the actual PCE of QDSSCs is still constrained to relatively low levels.

One of the key factors determining the PCE of QDSSCs is their light-harvesting