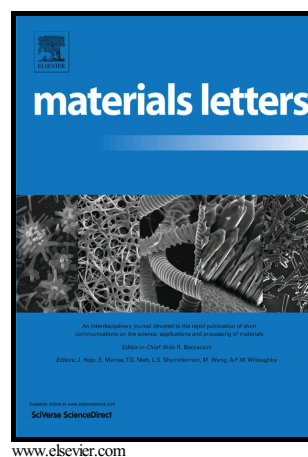


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Fabrication of $\text{Cu}_2\text{ZnSn}(\text{S,Se})_4$ thin film solar cells by selenization of reactively sputtered precursors

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Abstract

$\text{Cu}_2\text{ZnSn}(\text{S,Se})_4$ thin films were fabricated by selenization of reactively sputtered precursors. The precursors showed a fully sulfurized $\text{Cu}_2\text{ZnSnS}_4$ phase with compact surface and columnar structure. The evolutions of composition, morphology and phases for the selenized films were investigated. The selenization resulted in dramatic changes in morphologies, but demonstrated excellent stability on metallic composition and negligible volume expansion of the selenized films. The selenized films show densely packed large grains and single kesterite $\text{Cu}_2\text{ZnSn}(\text{S,Se})_4$ phase. The solar cell with the structure of ITO/i-ZnO/CdS/CZTSSe/Mo/Glass presents the highest power conversion efficiency of 4.3 %. The key limitation factor is due to low fill factor, which is mainly caused by a low shunt resistance and severe voltage-dependent photocurrent collection.

Keywords: CZTSSe, Thin films, Sputtering, Solar cells

1. Introduction

$\text{Cu}_2\text{ZnSn}(\text{S,Se})_4$ (CZTSSe) has attracted extensive attention as an ideal candidate for the scalable

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