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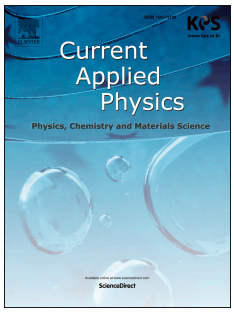

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Comparison of theoretical and experimental results for Band-Gap-Graded CZTSSe Solar Cell

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Abstract:

The simulation of CZTSSe solar cells is presented in this paper. The simulation results are in reasonable agreement with the experimental data, indicating the reliability of simulation results. New structure is proposed to increase the functionality of the cell. Improved functional performances are achieved by inserting a P-Silicon (P-Si) layer as back surface field. Simulation results suggest that by inserting this P-Si layer, efficiency of the CZTSSe solar cell increases from 12.6 % to 16.59 %, which is a significant improvement. For the champion cell J_{SC}=36.27 mA/cm^2, V_{OC}= 0.625 V and FF = 73.11 % has been achieved.

Keywords: CZTSSe solar cells; simulation; back surface field; P-type Silicon; S/(S+Se) weight ratio.

1. Introduction

Given the challenges related to climate and energy issues, there is a growing need for renewable energy sources [1]. Solar cells have the ability to convert large amounts of sunlight into electricity, and can be used in everyday life. High energy density with low cost is one of the advantages of solar cells. In this regard, various photovoltaic materials have been proposed and studied for use in PV devices [2, 3]. Thin-film solar cells have the potential for low-cost and large-scale photovoltaic applications. A number of semiconductor materials,