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NUMERICAL INVESTIGATION OF THE BEST EFFICIENT TANDEM SOLAR CELL STRUCTURES USING THE BASE CELL MODELS OF MZO/CdTe AND CdS/CIGS CELL STRUCTURES

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Abstract

Tandem solar cells have been researched to enhance the performance of second generation (II-VI) thin-film solar cells. In this study we have developed an efficient tandem solar cell model by optimizing the thickness of the (II-VI) layers. The tandem solar cell model consists of top cell, n-SnO_2/n-MZO/p-CdTe and bottom cell, n-CdS/p-Cu(In,Ga)Se_2(CIGS). The model layer parameters such as thicknesses of n-CdS, p-CIGS, and p-CdTe have been varied to improve the efficiency of the tandem solar cell and compared with the reported single junction thin-film solar cells. All the numerical experiments were conducted under one sun illumination condition with AM 1.5 G solar spectrum by using the Analysis of Microelectronic and Photonic Structures simulation software (AMPS-1D) and Solar Cell Capacitance Simulator (SCAPS 1-D) software. In this numerical simulation, the observed open circuit voltage was increased up to 1.413 V and efficiency was increased up to 28.84%.

Keywords: *AMPS-1D, SCAPS-1D, Multi junction solar cell, Photovoltaics, AM1.5g*