

عنوان مقاله:

Optimization of CIGS thin film Solar Cells by using non-cadmium buffer layer and Adjusting absorber Layer Thickness and doping density Using Silvaco-TCAD

محل انتشار:

سیزدهمین کنفرانس بین المللی مهندسی برق، الکترونیک و شبکه های هوشمند (سال: 1403)

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خلاصه مقاله:

Copper indium gallium selenide (CIGS)-based solar cells have exhibited greater performance than the ones utilizing cadmium telluride (CdTe) or hydrogenated amorphous silicon (a-Si:H) as the absorber. CIGS-based devices are more efficient, considering their device performance, environmentally benign nature, and reduced cost. This research designed and simulated the CIGS solar cells using the two-dimensional device simulator Silvaco-Atlas under standard AM1.5G illumination. The purpose of this work is to achieve the best efficiency of CIGS solar cell by replacing the CdS buffer layer with other nontoxic materials, varying the CIGS absorbing layer thickness and doping density. The simulation results revealed that only a doping density of $1 \times 10^{15} \text{ cm}^{-3}$ and $1.5 \text{ } \mu\text{m}$ thick-CIGS absorber layer with ZnSe buffer layer in this structure offers an outstanding conversion efficiency of 35.3% with an open-circuit voltage (V_{oc}) of 0.7 V a short circuit current density (J_{sc}) of 50.4 mA/cm^2 and a fill factor (ff) of 99%.

کلمات کلیدی:

CIGS solar cell buffer layer thickness ZnSe Silvaco-Atlas

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