

عنوان مقاله:

Novel Photonic Crystal Based Polycrystalline CdTe/Silicon Solar Cells

محل انتشار:

چهارمین کنفرانس بین المللی توسعه فناوری در مهندسی برق ایران (سال: 1399)

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خلاصه مقاله:

In this paper, a novel photonic crystal (PhC) polycrystalline CdTe/Silicon solar cells are theoretically explained that increase their short circuit current density and conversion efficiency. The proposed structure consist of a polycrystalline CdTe/Silicon solar cell that a photonic crystal is formed in the upper cell. Theoptical confinement is achieved by means of photonic crystal that can adjust the propagation and distribution of photons in solar cells. For validation of modeling, the electrical properties of the experimentally-fabricated based CdS/CdTe solar cell is modeled and compared that there is good agreement between the modeling results and experimental results from the litterature. The results of this study showed that the solar cell efficiency isincreased by about 25% compared to the reference cell by using photonic crystal. The open circuit voltage, short circuit current density, fill factor and conversion efficiency of proposed solar cell structure are 1.01 V, 40.7 mA/cm², 0.95 and 27% under global AM 1.5 conditions, respectively. Furthermore, the influence of carrier lifetime variation in the absorber layer of proposed solar cell on the electrical characteristics was theoretically considered and investigated.

کلمات کلیدی:

.Photonic crystal (PhC), Optical confinement, CdTe/Silicon, Solar cells

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