A highly efficient n-CdS/p-Ag2S/p+-SnS thin film solar cell: design and performance

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Abstract

Silver sulfide (Ag2S) could be a viable chalcogenide absorber layer in the applications of thin film solar cells due to its optimum band gap of 1.1 eV and high absorption coefficient. Here, we propose a novel Ag2S-based double-heterojunction n-CdS/p-Ag2S/p+-SnS solar cell structure. The numerical analysis has been performed with SCAPS-1D (Solar Cell Capacitance Simulator). In the case of single heterojunction, n-CdS/p-Ag2S manifests the efficiency of 19.75% where the VOC= 0.66 V, the JSC=36.99 mA/cm2, FF=81.50%. However, Ag2S-based double-heterojunction with optimized structure provides efficiency of 29.51% wherein VOC = 0.81 V, JSC = 42.81 mA/cm2 and FF = 85.24%. The noteworthy augmentation of VOC and JSC in double heterojunction results from the reduction in surface recombination velocity and rise in built-in voltage in the p-Ag2S/p+-SnS heterostructure.

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