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CLOSED SPACE SUBLIMATED CdS THIN FILMS FOR CdS/CdTe SOLAR CELLS: EFFECT OF CdS LAYER THICKNESS

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The target of photovoltaic systems has always been to reduce costs while increasing efficiency. Cadmium telluride (CdTe) has a narrow bandgap of 1.45 eV and is utilized as the absorber material in CdS/CdTe thin film solar cells, while cadmium sulfide (CdS), which has a wider bandgap of 2.42 eV, is used as the window material. There are numerous ways to deposit a CdS window layer, and among them, the close-spaced sublimation (CSS) technique is one of the most effective methods. The work reported here mainly focused on optimizing the thickness of CSS synthesized CdS window layer. To reach the desired thickness range, the deposition time duration was changed from 100 to 180 s. Temperatures for the source and substrate were set at 660 and 560°C, respectively. Around 2-3 Torr of an inert atmosphere was maintained using Ar gas. UV-visible spectroscopy was used for the optical characterization, and a PEC L01 solar simulator was used to study the electrical characteristics. The thickness of the CdS layer was measured using an X-ray fluorescence spectrometer. The highest average efficiency of 7.0% was obtained for the small area dot cells of 0.2 cm2, with an open-circuit voltage (VOC) of 692 mV, a short circuit current (JSC) of 20.2 mA/cm2, and a fill factor (FF) of 50.3% under the AM 1.5 illumination for the deposited CdS layer thickness of 310 nm.

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Keywords: CdS/CdTe solar cells, CdS window layer thickness, Close-spaced sublimation