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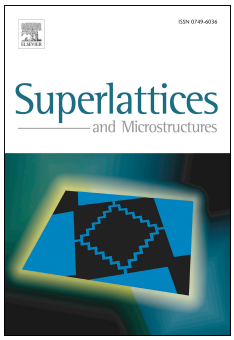

Effect of substrate temperature on the suitability of thermally deposited cadmium sulfide thin films as window layer in photovoltaic cells

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Effect of substrate temperature on the suitability of thermally deposited Cadmium Sulfide thin films as window layer in photovoltaic cells

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Abstract: Cadmium sulfide has been studied as an important material in solar energy research because of its energy band gap and attractive electrical characteristics. While thin films of cadmium sulfide have been found to be useful as window layer in a solar cell, the role of various deposition parameters is yet to be understood. In the current study, the role of substrate temperature on the characteristics of the CdS thin films is analyzed. Thin films of cadmium sulfide (~450 nm thick) were deposited at various substrate temperatures viz., 300K, 323K, 373K, and 423K onto clean glass substrates by vacuum thermal evaporation method. The structural, morphological, and opto-electrical properties of the deposited films were studied as a function of substrate temperature. X-ray diffraction (XRD) study revealed that the thin films are polycrystalline in nature and having a hexagonal wurtzite crystal structure along (002) plane. Scanning electron microscopy (SEM) along with energy dispersive spectroscopy (EDS) revealed that the grown films are homogeneous, uniform and pin-hole free. All the films deposited at various substrate temperature displayed high optical transmittance (>60%) in the visible range. The optical energy band gap of the films was estimated using Tauc's plot and was found to increase by a slight margin with an increase in the substrate temperature and decrease at higher substrate temperature. The photosensitivity was found to be highest for the CdS thin film grown at a substrate temperature of 373K.

Keywords: CdS thin films; substrate temperature; vacuum thermal evaporation; polycrystalline; homogeneous.