Tunable visible light absorption of MoO3-CdTe composite thin films

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Tunable visible light absorption of MoO_3-CdTe composite thin films

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Abstract

The development of a simple synthetic technique, based on thermal evaporation for tuning the band gap of molybdenum oxide (MoO_3) thin films by doping with cadmium telluride (CdTe) is presented. The pure MoO_3 and CdTe films had amorphous and polycrystalline structures, respectively, and the addition of CdTe to MoO_3 did not show any influence on the structure of the doped films. The surface roughness of the films increased slightly with CdTe concentration. Depth profile analysis demonstrated a uniform distribution of the constituent elements along the depth of the films. Optical measurements confirmed that the films had significant enhancement in the absorption coefficient in the visible region as the concentration of CdTe increased. The optical band gap was reduced from 2.9 eV for pure MoO_3 films to 2.6 eV for the films doped with 10% CdTe. Photolectrochemical characterization showed a steep increase in the photogenerated current densities of the CdTe-doped MoO_3 films due to the reduction of the band gap with CdTe concentration. Such doped films have potential applications in improving the photo-to-current conversion efficiency in solar cells.

Keywords: molybdenum oxide, cadmium telluride, thermal evaporation, band gap, photocurrent