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Synthesis and characterization of CdS Nanowires, and CdS/TIS Nanoflower Grown in a Polymer Matrix by Chemical Bath Deposition (CBD) Method

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Abstract

CdS (Cadmium sulphide) films and CdS/TIS (TIS-thallium sulphide) heterojunction were synthesized on the glass substrate by chemical bath deposition (CBD) within the pores of polyvinyl alcohol (PVA) at room temperature. The bath is made up of solutions of cadmium chloride (CdCl_2), ammonia (NH_3), thiourea ($\text{SC}(\text{NH}_2)_2$), and PVA for fabrication of CdS nanowires. TIS thin films were deposited on glass substrate using a bath that contains thallium nitrate, sodium citrate, sodium hydroxide, thiourea and PVA. For fabrication of CdS/TIS nanoflower CdS, thin films were deposited on the TIS thin films. A chemical synthesis process for the fabrication of CdS nanowires and CdS/TIS nanoflower are presented in this research. In this present work, these films were annealed in air at 373 K. These properties were studied by means of X-ray diffraction (XRD), scanning electron microscopy (SEM), and optical spectrophotometer. The optical properties revealed the presence of direct band gaps with energies 2.20eV for CdS and 1.80eV for CdS/TIS thin films. The films show poor transmittance in the visible and near infrared region of the solar spectrum.

Keywords: Chemical bath deposition, CdS/TIS heterojunction, nanowires, nanoflowers, structural and Optical studies

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