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Optical Properties and Structural Characterizations of Sb_2S_3 Thin Films Deposited by Chemical Bath Deposition Technique

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Abstract: Thin films of Sb_2S_3 were deposited on glass substrates at 300 K by chemical bath deposition (CBD) technique and annealed at various temperatures. The absorption coefficient α was determined using the absorbance and transmission measurements from a Unico UV-2102 PC spectrophotometer, at normal incidence of light in the wavelength range 200--1000 nm, and the structural characterization were done using XRD and photomicrograph. The films have high absorption, greater than 90%, in the UV region but with moderate transmittance of greater than 50% for as-deposited, and poor transmittance of less than 45% for the annealed throughout the entire spectrum. Plots of $(\alpha h\nu)^2$ against hv showed that the material has a direct band gap around 2.20 eV at 300 K, 1.70 eV at 453 K, and 1.60 eV at 473 K. The high absorbance of the films made them good materials for large area selective coatings for photothermal conversion of solar energy.

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