

Investigation of Optical and Thermo-Electrical Properties of SnSb_2S_4 Thin Layer Using the Photothermal Deflection Technique

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Sulfosalt SnSb_2S_4 films have been deposited on glass substrates by thermal evaporation and subsequently thermally annealed in vacuum at temperatures from 100 to 200 °C. Below a transition temperature of 140 °C., the films are highly resistive with a dominant amorphous component, however above this temperature, the samples exhibit p⁺-type semiconductor behaviour with a dominant crystalline component. In this work we have studied the thermal and optical properties of these films using the photothermal deflection technique. The thermal properties are determined by comparing the experimental amplitude and phase curves variations versus square root modulation frequency of the photothermal signal to the corresponding theoretical ones. The best theoretical fitting curves are obtained for well-defined values of thermal conductivity and thermal diffusivity. The optical absorption spectrum is obtained by comparing the experimental normalized amplitude of the photothermal signal curves variations versus wavelength to the corresponding theoretical curves variations versus optical absorption coefficient. We have determined the energy gap by using the Tock law. From a measure of the sample's resistance, one can deduce the electrical resistivity so that the electrical conductivity may be correlated to the thermal conductivity.