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OPTICAL PROPERTIES OF TIN-ANTIMONY-SELENIUM BASED AMORPHOUS THIN FILMS

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ABSTRACT

Tin-Antimony-Selenium (TAS) based amorphous belongs to the ternary chalcogenide compounds of IV-V-VI group, exhibiting semiconducting properties that could be applied for optical devices in photo-conductive sensors and infrared transmission detectors. The materials were previously studied with emphasize on the structural properties separating the amorphous, *a* and crystalline regions, *c*.This paper reports the optical properties of TAS measured using UV spectrophotometer observe the respective absorption spectrum over the visible and near infrared regions and determine the bang gap energies from the plot absorption edges. TAS samples were prepared from granular Sn, Sb and Se of purity 5N using a technique called solid-state reaction. In this method starting materials were thermally evaporated at a pressure of 10^{-5} mbar onto glass substrate as Sn/Se/Sb/Sn stacked at a substrate temperature of 240 ˚C. The system employed was a vacuum coater model E306. The spectrum observed from the absorption-wavelength plots appeared to be a steady decrease in the visible region followed by a sharp drop and a further gradual declining down to near infrared at 2100 nm, with absorption coefficient, α varying from 6.21×10^3 to 1.55×10^5 cm^{-1} for film thickness between 50 nm to 700 nm, respectively. The corresponding optical band gap, E_g obtained from the graph $(\alpha h\nu)^2$ versus $h\nu$ resulted in E_g between 1.47 eV to 1.69 eV which were dependent of film thickness. The value of other optical properties namely refractive indices, extinction coefficient, effective mass and dielectric constant was also being determined and were found to be 2.55–2.85, 0.1×10^{-2} – 1.1×10^{-2}, 1.42×10^{-33} kg and 0.006-8.094, respectively. These values varied with the film thickness.
s: Tin-Antimony-Selenium, Amorphous, Thin film.

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