

Optical Properties of $\text{As}_{45}\text{Te}_{33}\text{Ge}_{10}\text{Si}_{12}$ Thin Films

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Abstract

Several amorphous $\text{As}_{45}\text{Te}_{33}\text{Ge}_{10}\text{Si}_{12}$ thin films obtained by thermal evaporation onto glass substrates held at about 300 K during the deposition process. Optical transmittance and reflectance spectra, at normal incidence were obtained in the wavelength range 500 – 2500 nm. The optical constants (the refractive index n , the absorption index k and the absorption coefficient α) have been calculated. The refractive index has anomalous behavior in the region of the fundamental absorption edge. Analysis of the refractive index has yielded optical dielectric constant ϵ_2 . The allowed optical transitions responsible for optical absorption were found to be nondirect transitions, with an optical energy gap of 1.00 eV for samples under test. The band tail, obeys Urbach's empirical relation. The effect of annealing on the optical energy gap is interpreted in terms of the density of states proposed by Mott and Davis.