RIGIDITY PERCOLATION AND CHEMICAL THRESHOLD OBSERVED IN $Ge_{7.5}As_xTe_{92.5-x}$ CHALCOGENIDE GLASSES STUDIED FROM ITS THERMAL AND OPTICAL PROPERTIES

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The effect of rigidity percolation and chemical ordering on the thermal and optical properties of bulk $Ge_{7.5}As_xTe_{92.5-x}$ alloy glasses in the composition range, 17.5 ≤x≤ 60 [co-ordination number (<r>), 2.35 to 2.75] was investigated. The thermal diffusivity of the samples were determined using the Photoacoustic (PA) technique. In the present work, the PA technique was employed in the reflection configuration and the corresponding PA signal was analysed using the Rosencwaig-Gersho theory for the case of backing-sample-air system with the experimental data being fitted using c2 minimization procedure for determining thermal diffusivity (a). The maximum value of a, 0.85x10-2 cm2/s, was observed for the sample with = 2.4, with a monotonic decrease in a for higher and lower <r> values except for a small hump of a = 0.44x10-2 cm2/s observed at <r> = 2.67. The variation in optical band gap with the coordination number was also investigated using standard Fourier transform near-infrared (FT-NIR) Spectroscopy. This study also showed a similar variations at <r> = 2.4 and <r> = 2.67. These observed anomalies from the behaviour of thermal diffusivity and optical band gap at these two coordination numbers are correlated to the rigidity percolation and chemical threshold respectively.