

Turkish Journal of Physics

Turkish Journal

of

Physics

Dielectric Relaxation in Glassy $\text{Se}_{100-x}\text{Sb}_x$

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Abstract: Frequency and temperature dependence of dielectric constant ϵ' and dielectric loss ϵ'' are studied in glassy $\text{Se}_{1-x}\text{Sb}_x$ ($x = 0, 0.02, 0.04, 0.06, 0.08$ and 0.10) in the frequency range from 1--10 kHz and in the temperature range 290 K to 360 K. The experimental results indicate that no dielectric dispersion exist in glassy Se in the operating range of frequencies. However, when Sb concentration increases in $\text{Se}_{1-x}\text{Sb}_x$ ($x = 0.02, 0.04, 0.06, 0.08$ and 0.10) dielectric dispersion starts in the upper frequency and temperature range. The values of ϵ' and ϵ'' , as functions of temperature and frequency, increase with Sb concentration to $x = 0.08$; at which point a discontinuity is observed. Above 8%, ϵ' and ϵ'' decrease with Sb concentration. The discontinuity is explained in terms of the mechanically stabilized structure at a particular average co-ordination number. An analysis of the observed dielectric loss shows that the Guinini's theory of dielectric dispersion based on two electron hopping over a potential barrier is applicable in the present case.

Key Words: Chalcogenide glasses, Dielectric relaxation.

Turk. J. Phys., **29**, (2005), 119-125.

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