

## Effect of neodymium nanoparticles on elastic properties of zinc-tellurite glass system

### ABSTRACT

The aim of this work is to determine the effect of neodymium nanoparticles concentration on the elastic properties of zinc-tellurite glass. A series of neodymium nanoparticles doped zinc-tellurite glass systems (NdNPsZT) of composition  $[(\text{TeO}_2)_{0.70}(\text{ZnO})_{0.30}](\text{Nd}_2\text{O}_3 \text{ NPs})_{(x)}$ ,  $x=0.01, 0.02, 0.03, 0.04,$  and  $0.5$ , were synthesized by using conventional melt-quenching method. The amorphous nature of the glass system was confirmed by using XRD analysis. The density of the glass system was determined by Archimedes method. The elastic properties were calculated from the measured density and ultrasonic velocity at 5 MHz frequency. The experimental results showed that the elastic properties rely upon the composition of the glass systems and the impact of neodymium nanoparticles ( $\text{Nd}_2\text{O}_3$  NPs) within the glass network. The increase in ultrasonic velocities is due to the increase in rigidity and change in structural units of the glass system. The softening temperature and the microhardness increased with the increase in  $\text{Nd}^{3+}$  ions concentration from 0.1 to 0.2 mol and decreased when the  $\text{Nd}^{3+}$  ions concentration increased from 0.2 to 0.5 mol. Poisson's ratio and Debye's temperature decreased with the increase in the  $\text{Nd}^{3+}$  ions concentration from 0.1 to 0.2 mol and increased when the  $\text{Nd}^{3+}$  ions concentration was increased from 0.2 to 0.5 mol.

**Keyword:** Neodymium nanoparticles; Elastic properties; Zinc-tellurite glass system