

Synthesis and elastic properties of ternary ZnO-PbO-TeO₂ glasses

ABSTRACT

Tellurite glass systems in the form $[\text{ZnO}]_x [(\text{TeO}_2)_{0.7}\text{-PbO}]_{0.3}1-x$ ($x=0, 0.15, 0.17, 0.20, 0.22$ and 0.25 mol%) have been prepared by the conventional melt quenching technique. The amorphous and glassy characteristic of samples were confirmed by XRD technique. Both longitudinal and shear ultrasonic velocities were measured by using the pulse-echo method at 5 MHz resonating frequency at room temperature. Elastic moduli (longitudinal modulus, shear modulus, Young's modulus and Bulk modulus), Poisson's ratio have been calculated, and the correlation between elastic moduli with those of glass composition is discussed. All elastic constants of the glass system were estimated as well as the microhardness, acoustic impedance, thermal expansion coefficient, softening temperature, and Debye temperature has been determined using the experimental data. The experimental data of the elastic moduli for investigating glasses were compared with those of theoretically calculated values using Makishima-Mackenzie theory, bond compression model and Rocherulle model.

Keyword: Makishima-Mackenzie; Rocherulle model; Elastic moduli; Ultrasonic measurements