

Formation and elastic properties of lithium chlorophosphate glasses

ABSTRACT

Two series of glasses, $(\text{Li}_2\text{O})_x(\text{P}_2\text{O}_5)_{1-x}$ and $(\text{LiCl})_y((\text{Li}_2\text{O})_{0.4}(\text{P}_2\text{O}_5)_{0.6})_{1-y}$ were prepared by ordinary melt-quench technique. The range of x is from 0.1 to 0.5 with interval of 0.05 and the range of y is from 0.1 to 0.5 with interval of 0.1. The ultrasonic velocities for both series of glasses were measured at room temperature by using pulse echo technique at 10 MHz. The velocity data have been used to estimate the elastic modulus and Debye temperature for each composition. The density of $\text{Li}_2\text{O}-\text{P}_2\text{O}_5$ glasses increases with the addition of Li_2O but $\text{LiCl}-\text{Li}_2\text{O}-\text{P}_2\text{O}_5$ glasses shows the trend of decrement when the mole fraction of LiCl increases. The longitudinal, shear, bulk and Young's modulus for lithium phosphate glasses are found to increase with the addition of Li_2O whereas the elastic moduli for lithium chlorophosphate glasses are found to decrease with the concentration of LiCl ; these kind of characteristics are due to the variation of ultrasonic waves in different glass structures.

Keyword: Glasses; Ultrasonic velocities; Elastic modulus; Debye temperature