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Physical and optical properties for Nd₂O₃ doped lithium-zinc-phosphate glasses

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Abstract

The Nd³⁺-doped lithium-zinc-phosphate glasses were prepared by means of conventional melt quenching method. X-ray Diffraction results were confirmed the glassy nature of the studied glasses. The physical parameters such as the density, molar volume, ion concentration, polaron radius, inter-ionic distance and field strength were calculated using different formulae. The absorption, transmittance and reflectance spectra of glasses were recorded in the wavelength range 190-1200 nm. Bonding of Nd³⁺ ions with surrounding ligands is found to be covalent. Dispersion parameters such as: single oscillator energy, dispersion energy, the ratio of carrier concentration to the electron effective mass and the lattice dielectric constant are determined. Electronic polarizability of the oxide ion and optical basicity of these glasses are calculated from the values of optical band gap. Effects of doping Nd₂O₃ on these properties are investigated and interpreted.

Keywords: Oxide glass, Nd₂O₃, dispersion parameters, oxide ion polarizability and optical basicity.

1. Introduction:

Phosphate glasses have various applications such as an active media for lasers [1,2] glass-to-metal seals, energy storage devices, solid state batteries and high ultra violet and far infrared transmissions[3-7]. Poor chemical durability of phosphate glasses can be improved by adding some oxides such as Al₂O₃, ZnO, and Bi₂O₃ etc. [8].

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