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Role of zinc sulfate on thermal and mechanical properties of borovanadate glasses

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Abstract

Zinc sulfate doped boro-vanadate glasses have been synthesized using melt quenching method. Amorphous character of glasses is verified by X-ray diffraction studies. Scanning electron micrograph reveals good homogeneous glass formation but consists of SO_4^{2-} nano clusters randomly distributed in the amorphous tissue. Glass transition temperature estimated from differential scanning calorimetric studies vary with glass composition. Ultrasound velocities, elastic moduli and Debye temperature decrease whereas Poisson's ratio increase with $ZnSO_4$ content. This occurs due to reduced network connectivities and weakening of the glass network. The above studies suggest that $ZnSO_4$ do not participate in network formation but dissolves isotropically which results in volume expansion and loose packing of network structure. FTIR studies reveal presence of $[B_2V_2O_9]^{2-}$ (type I and II), $[BO_{3/2}]^0$ and $[VOO_{3/2}]^0$ structural units which are characteristic of modified boro-vanadate glasses.

Keywords:

Boro-vanadate glasses, Poisson's ratio, Elastic moduli, Debye temperature

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