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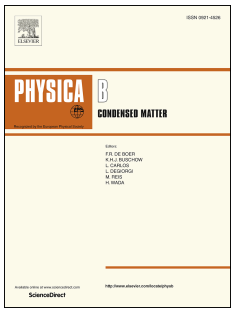

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Effect of alkaline earth modifier on the optical and structural properties of Cu^{2+} doped phosphate glasses as a bandpass filter

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Abstract

Glasses of composition [16RO–3Al_2O_3–6CuO–20Na_2O–55P_2O_5], where R is the alkaline earth (R= Mg, Ca, Sr and Ba mol. %), were prepared by conventional melt quenching technique. The glass samples were characterized by X-ray diffraction, infrared spectroscopy, and spectrophotometer. XRD patterns show no sharp peaks indicating the non-crystalline nature of the prepared glasses. The density and molar volume of the glass systems were determined in order to study their structures. These results revealed that addition of alkaline earth elements leads to the formation of non-bridging oxygens (NBOs) and expands (opens up) the structure. The infrared spectra were analyzed to quantify the present phosphate groups. The optical absorption spectra of Cu^{2+} ions show the characteristic broadband single of Cu^{2+} ions in octahedral symmetry. The band gap was estimated following two methodologies. The first method considers the band edge of the transmission, while the second approach relays on the estimated values of the optical constants. A decent agreement for the band gap values using the two methods was obtained.

Keywords: *Optical filters, Structure, Alkaline earth, phosphate glass.*

1. Introduction

Copper-doped phosphate glasses have interesting optical and electrical properties that make them suitable as color filters, solid state lasers, super-ionic conductors, and non-linear optics. The primary advantage of phosphate over other oxide glasses (e.g. silicate and borate) is their ability to accommodate high concentrations of transition metal ions and remain amorphous. In addition, phosphate glasses enjoy a range of compositional and structural possibilities (ultra, meta, pyro, and ortho) that facilitate tailoring chemical substance and physical behavior [1].

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