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Chair	Osman Burak Okan



Synthesis and Characterization of SiO₂-B₂O₃-Na₂O-K₂O-ZnO Glass System: The effect of SnO₂ on the Structural and Radiation Shielding Properties

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Biography

She was born in 1998 in Sakarya, Türkiye. She graduated from Eskişehir Technical University, Department of Chemical Engineering and Industrial Engineering in 2023. She started working as an assistant specialist in the Glass Coatings Research and Development department at Akcoat Advanced Chemical Coating Materials company in 2023. She is currently continuing her master's degree in the Chemical Engineering department of Yıldız Technical University.

Abstract

In this study, the physical, structural, thermal and radiation properties of [SiO₂-B₂O₃-Na₂O-K₂O-ZnO] glass system with 2.5%, 5%, 7.5%, 10% weight SnO₂ content were investigated. All glasses with these specific ratios are designated as Sn-X, where X represents the ratio value (Sn-0, Sn-2.5, Sn-5.0, Sn-7.5, Sn-10). Glass preparation was performed using the melt-quench technique. The densities of glasses were measured according to Archimedes' principle. The prepared glasses were characterized through X-ray diffraction (XRD), Fourier transform infrared (FT-IR) spectroscopy, and their radiation properties were evaluated. The amorphous structure of the material has been proven by X-ray diffraction analysis. FT-IR studies revealed the presence of two fundamental structural units: trigonal BO₃ units and tetrahedral BO₄ units. The radiation shielding properties of Sn-X glasses were determined by experimental measurements with a 3"x3" NaI(Tl) scintillation detector. The results were compared with the Geant4 simulation program and Phy-X/PSD results and validated with each other. The glass containing 10 wt.% SnO₂ (Sn-10) exhibited a significant gamma-ray shielding potential due to its high linear attenuation coefficient (LAC) value (0.2111(3) cm⁻¹ at 0.662 MeV, 0.1553(15) cm⁻¹ at 1.173 MeV, and 0.1532(22) cm⁻¹ at 1.332 MeV) and radiation protection efficiency (RPE), together with low half value layer (HVL), mean free path (MFP), and transmission factor (TF). A comparative analysis of the LAC values for the present Sn-X and some other glasses is also presented.

