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Influence of SrO Concentration on Radiation Shielding Efficiency of Boro-Tellurate Glasses at High Photon Energies

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In this study, the effect of radiation ionization on various glass compositions—40SrO–30B_2O_3–10TeO_2–20Bi_2O_3, 35SrO–30B_2O_3–10TeO_2–25Bi_2O_3, 30SrO–30B_2O_3–10TeO_2–30Bi_2O_3, 25SrO–30B_2O_3–10TeO_2–35Bi_2O_3, and 20SrO–30B_2O_3–10TeO_2–40Bi_2O_3—was investigated using Phy-X/PSD and XCOM simulation software, and validated with GEANT4 simulations. In the high-energy range of 1 MeV to 15 MeV, the mass attenuation coefficient (MAC), linear attenuation coefficient (LAC), and effective atomic number (Z_eff) were calculated for each glass sample. The results indicate that increasing the Bi_2O_3 concentration enhances the radiation shielding capability of the glasses. Additionally, parameters such as half-value layer (HVL), tenth-value layer (TVL), and mean free path (MFP) were analyzed. The findings show that glasses with higher Bi_2O_3 content attenuate more photons at smaller thicknesses. Notably, the 20SrO–30B_2O_3–10TeO_2–40Bi_2O_3 composition demonstrated superior radiation shielding performance compared to other materials previously studied.

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