

Effect of bismuth in lead germanate glass system on shielding properties for development of gamma-rays shielding materials

ABSTRACT

In this study, the shielding properties of bismuth lead germanate (BPG) glass system in composition $x(\text{Bi}_2\text{O}_3)40-x(\text{PbO})60(\text{GeO}_2)$ where $x = 0$ to 40 mol% have been investigated. The shielding parameters, mass attenuation coefficients (μ/ρ), mean free path (MFP) and half value layer (HVL) values have been computed using WinXCom program and variation of shielding parameters of the BPG glasses are discussed for the effect of photon energy and Bi_2O_3 addition into the glasses. The replacement of PbO by Bi_2O_3 causes an increase in mass attenuation coefficient, while the MFP and HVL values were decreased. The investigation would be very useful for shielding applications in nuclear technologies.

Keyword: Bismuth lead germanate glasses; Shielding parameter; Mass attenuation coefficient; WinXCom