Evaluation of Radiation Shielding Potential of Bismuth Boro-Tellurite Glasses

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Abstract:

The increasing demand for effective and environment friendly radiation shielding materials has led to the exploration of bismuth boro-tellurite glasses as potential alternatives to conventional lead materials. This study investigated the radiation shielding potential of bismuth tellurite glasses having composition $15B_2O_3$-xBi_2O_3-(85-x)TeO_2 where *x* =35, 40, 45, 50, 55 mol % & analyzed the mass attenuation coefficient (μ/ρ), effective atomic number (Z_{eff}) & electron density (N_e) over a wide photon energy range of 0.015 MeV to 15 MeV using WinXcom software**.** The dependence of Z_{eff} and N_e on photon energy and Bi_2O_3 concentration was evaluated to assess the material's radiation shielding efficiency. The results indicated that the increasing Bi_2O_3 content enhances the photon attenuation due to the high atomic number and density of bismuth**.** It has been observed that the G_5 glass sample exhibiting the maximum value of mass attenuation coefficient (μ/ρ), effective atomic number (Z_{eff}) & electron density (N_e) and can be used as a promising material for radiation protection applications in nuclear medicine, space technology and high-energy physics.

Keywords: Bismuth tellurite glasses, mass attenuation coefficient, effective atomic number, electron density, radiation shielding.