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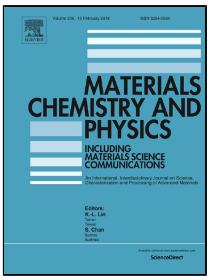

Photon shielding characterizations of bismuth modified borate –silicate–tellurite glasses using MCNPX Monte Carlo code

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Photon shielding characterizations of bismuth modified borate –silicate–tellurite glasses using MCNPX Monte Carlo code

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Abstract

In this study, the radiation mass attenuation coefficients of different bismuth-borate glass samples as shielding materials are calculated at 356, 662, 1173 and 1332 keV photon energies by using general purpose Monte Carlo code MCNPX (version 2.4.0). The obtained numerical results agreed well with previous experimental, theoretical results and with standard XCOM data. The validated simulation geometry has been used then to investigate the photon attenuation properties of B_2O_3–Bi_2O_3–SiO_2–TeO_2 glass system. The photon shielding parameters such as mass attenuation coefficients, effective atomic number, and mean free path have been calculated and the variation in these parameters was discussed in terms of both photon energy and Bi_2O_3 concentration. The maximum values of mass attenuation coefficients and effective atomic number were found for Bbi7 glass sample. The photon shielding properties for the B_2O_3–Bi_2O_3–SiO_2–TeO_2 glasses have been compared in terms of half value layer with some commercially-available shielding glasses developed by SCHOTT company. Also, the mean free path for the present glasses have been compared with those of different glass samples and steel-magnetite concrete. The comparison reveals that the B_2O_3–Bi_2O_3–SiO_2–TeO_2 glass system can be used for photon shielding applications.

Keywords: *MCNPX; XCOM; glass; photon; attenuation*