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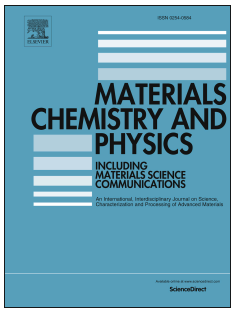

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Mechanical and gamma-ray shielding properties of TeO_2-ZnO-NiO glasses

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Abstract

In this work, the mechanical and γ-ray shielding properties of TeO_2-ZnO-NiO glass system have been studied. The mass attenuation coefficients (μ_m) of the present glasses have been obtained in the energy range 0.112-1.33MeV using XCOM software, MCNP5 and GEANT4 simulation codes. The obtained results are found to be in good agreement. The effective atomic number (Z_{eff}), effective electron density (N_e), mean free path (MFP) and half value layer (HVL) have also been calculated. The shielding efficiency of the present glasses has been compared to the standard shielding concretes. The lower values of MFP and HVL indicate that the present glasses possess better shielding properties. The molar volume, oxygen molar volume, oxygen packing density, number of bonds per unit volume, average cross-link density and packing density have been obtained. The various modulus of elasticity such as Young, bulk, shear, longitudinal modulus and Poisson's ratio, fractal bond connectivity and hardness of the samples are calculated using Makishima and Mackenzie model and Rocherulle model and compared among themselves. The 0.04ZnO-0.864T (S4) glass possesses highest value of elastic modulus.

Keywords: Radiation; shielding**;** glasses; mechanical.

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