Novel tellurite glass (60-x) TeO2–10GeO2-20ZnO–10BaO-xBi2O3 for radiation shielding

ABSTRACT

In this article, high dense glasses based heavy metal former and modifier have been synthesized. The glass system with composition formula of (60-x)TeO2–10GeO2 -20ZnO–10BaO - xBi2O3 (where x = 2.5, 5, 7.5, and 10 mol. %). The glasses have been produced using the usual melt, quenching, and annealing process. Many physical features were investigated. To confirm the amorphous nature of theses glasses, we examined the samples with X-ray diffraction in the range of between 10° and 80°. Attenuated Total Reflectance Fourier Transform Infrared (ATR-FTIR) transmission spectrum for the current glass samples within the range of 400–1500 cm−1 has been recorded to study the behavior of the obtained glasses that is mixed between tellurium and germanium glass phase. To study the transparency and cut-off wavelength and other optical properties, Ultraviolet–Visible spectrometer (UV–Vis) was utilized between 200 and 800 nm. Radiation shielding ability of the (60-x) TeO2–10GeO2-20ZnO–10BaO-xBi2O3 glasses was examined. Monte Carlo simulation method was applied to estimate the shielding parameters for gamma photons with various energies varied in rang from 0.015 to 15 MeV.

Keyword: Tellurite-Germanate-Bismuth glasses; XRD; FTIR; Optical absorption; Radiation shielding