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Determination of structural features of different Perovskite ceramics and investigation of ionizing radiation shielding properties

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ABSTRACT

Recently, the use of ionizing radiation in various fields leads to an increased demand for shielding materials. This work aims to study the structural and radiation shielding properties of two groups of perovskite ceramics. Fourier transform infrared and X-ray diffraction were utilized to investigate current samples' structure, and various radiation shielding parameters were determined to explore the current samples' ability to absorb radiation within an energy range from 0.284 to 2.506 MeV using the Phy-X program. The Fourier transform infrared results revealed one vibration band for $BaTiO_3$–ZrO_2 located at 507 cm^{-1}, two bands centered at 835 and 520 cm^{-1} for the $BaTiO_3$-Mo sample, and five bands located at 435, 520, 539, 615, and 775 cm^{-1} for $SrMnO_3$–ZnO and $SrMnO_3$–TeO_2. Simultaneously, the X-ray diffraction displays the hexagonal phase for $SrMnO_3$ and the tetragonal phase for $BaTiO_3$ samples. The $BaTiO_3$-Mo sample has the highest density, packing density, and Poisson's ratio compares with other samples. According to gamma shielding results, the $SrMnO_3$–ZnO and $BaTiO_3$–ZrO_2 samples appear the lowest and highest absorption ability, respectively. On another side, the $SrMnO_3$–TeO_2 sample has the highest removal cross-section for fast neutrons. From obtained results, it can be concluded that

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