

Photon parameters for gamma-rays sensing properties of some oxide of lanthanides

ABSTRACT

In the present research work, the mass attenuation coefficients (μ_m) representing the interaction of gamma photons with some oxide of lanthanides ($\text{Lu}_2\text{O}_3\text{Yb}_2\text{O}_3$, Er_2O_3 , Sm_2O_3 , Dy_2O_3 , Eu_2O_3 , Nd_2O_3 , Pr_6O_{11} , La_2O_3 and Ce_2O_3) were investigated using WinXCom software in the wide energy range of 1 keV–100 GeV. The calculated values of μ_m afterwards were used to evaluate some gamma rays sensing properties as effective atomic effective atomic numbers (Z_{eff}), effective electron densities (N_{el}), half value layer (HVL) and mean free path (MFP). The computed data observes that, the Lu_2O_3 shown excellent γ -rays sensing response in the broad energy range. At the absorption edges of the high elements present in the lanthanide compounds, more than a single value of Z_{eff} were found due to the non-uniform variation of μ_m . Comparisons with experiments wherever possible have been achieved for the calculated μ_m and Z_{eff} values. The calculated properties are beneficial expanded use of designing in radiation shielding, gas sensors, glass coloring agent and in electronic sensing devices.

Keyword: Oxide of lanthanides; Gamma ray sensors; Effective atomic numbers; Half value layer