

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

### ABSTRACT

In the present research work, the mass attenuation coefficients ( $\mu_m$ ) representing the interaction of gamma photons with some oxide of lanthanides ( $\text{Lu}_2\text{O}_3\text{Yb}_2\text{O}_3$ ,  $\text{Er}_2\text{O}_3$ ,  $\text{Sm}_2\text{O}_3$ ,  $\text{Dy}_2\text{O}_3$ ,  $\text{Eu}_2\text{O}_3$ ,  $\text{Nd}_2\text{O}_3$ ,  $\text{Pr}_6\text{O}_{11}$ ,  $\text{La}_2\text{O}_3$  and  $\text{Ce}_2\text{O}_3$ ) were investigated using WinXCom software in the wide energy range of 1 keV–100 GeV. The calculated values of  $\mu_m$  afterwards were used to evaluate some gamma rays sensing properties as effective atomic numbers ( $Z_{\text{eff}}$ ), effective electron densities ( $N_{\text{el}}$ ), half value layer (HVL) and mean free path (MFP). The computed data observes that, the  $\text{Lu}_2\text{O}_3$  shown excellent  $\gamma$ -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  $Z_{\text{eff}}$  were found due to the non-uniform variation of  $\mu_m$ . Comparisons with experiments wherever possible have been achieved for the calculated  $\mu_m$  and  $Z_{\text{eff}}$  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