

Measurement of mass attenuation coefficients around the K absorption edge of some Ce compounds

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Accurate data of total mass attenuation coefficients for gamma rays required in many fields such as dosimetry, radiation biophysics, tomography, spectrometry and crystallography. The total mass attenuation coefficient parameter is theoretically determined using WinXCOM program, a Windows version of XCOM. This program is used the mixture rule. The mixture rule is a practice to assume that the contribution of each element to the attenuation is additive. The mixture rule is valid when the effects on the atomic wavefunction of molecular bonding and chemical or crystalline environment are negligible. This study was realized to observe the chemical effect.

The total mass attenuation coefficients for element Ce and compounds $CeCl_3 \cdot 7H_2O$, $Ce(SO_4)_2$, $Ce(OH)_4$ and Ce_2O_3 were measured at the different energies between 31.817-51.698 keV range by using secondary excitation method. Ba, La, Ce, Pr, Nd, Sm, Eu, Gd and Tb were chosen as secondary exciter. 59.54 keV gamma rays emitted from an Am-241 annular source were used to excite secondary exciter and $K\alpha_2$, $K\alpha_1$, $K\beta_1$ and $K\beta_2$ lines emitted of secondary exciter were counted by a Si(Li) detector with a resolution of 160 eV at 5.9 keV. The validity of mixture rule was discussed around the absorption edge for compounds. Obtained values were compared with theoretical values.

Keywords: Total mass attenuation coefficient, EDXRF, Mixture rule.