Measurements of XRP cross sections and Li (i=1,2) sub-shell fluorescence yields for Ho at 22.6 keV incident photon energy

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Abstract

The L_k(k= l, α, $\beta_{1,4}$, $\beta_{3,6}$, $\beta_{2,15,9,10,7}$, $\gamma_{1,5}$ and $\gamma_{2,3,4}$) X-ray production (XRP) cross sections have been measured for $_{67}$Ho at 22.6 keV incident photon energy. These measurements were performed using a sealed point (3mm ϕ) radioactive source of Cd^{109} (20 mCi) as a photon source and Peltier cooled X-ray detector (XR-100CR; 6mm^2x500μm; FWHM 155eV at 5.9 keV) arranged in reflection geometry. The pressed pellet of Ho_2O_3 of thickness~101.7 mg/cm^2 was used as experimental target. The incident photon intensity, detector efficiency and geometrical factors have been determined from the K X-ray yields emitted from elemental targets with $20 \leq Z \leq 42$ in the same geometrical setup and from knowledge of the K XRP cross sections.

The L_1 and L_2 subshell fluorescence yields have been deduced from the present measured L_k XRP cross sections using theoretical photoionization cross sections. The present deduced ω_1(exp) value, is found to be in good agreement with those tabulated by Campbell (*Atom. Data Nucl. Data Tables 95 (2009) 115*), where as higher by 27% and 28% than those based on the Dirac-Hartree-Slater (DHS) model (*X-ray Spectrometry 22 (1993) 358*) and the semi-empirical value compiled by Krause (*J. Phys. Chem. Ref. Data 8 (1979) 307*), respectively. The present deduced ω_2(exp) value is found to be in good agreement with those based on the Dirac-Hartree-Slater (DHS) model and is higher by ~10% than the semi-empirical value for the element under investigation.