Measurement of angular distributions of K x-ray intensity of Ti and Cu thick targets following impact of 10-25 keV electrons

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We present new results on angular distributions of the relative intensity of K_α and K_β x-ray lines of thick targets of Ti (Z=22) and Cu (Z=29) pure elements following impact of 10-25keV electrons. The angular measurements of the K x-radiations were accomplished by rotating the target surface with respect to the electron beam direction. The x-rays emerging from the target surface in reflection mode were detected by an energy dispersive Si P-I-N photodiode detector. The resulting variation of the relative intensity of the characteristic lines as a function of angle of detection and impact energy has been found to be anisotropic and it is considered to arise due to change in path lengths at a given incidence angle α for the photons generated by direct as well as by indirect K shell ionization processes. The measured angular variations of relative intensity of K_α and K_β x-ray lines of both targets are found to increase by about 60-70% in going from $\theta = 105^0$ to 165^0 at a given impact energy; however there is a slight indication of impact energy dependence of Cu K_α x-ray line as also noted by the earlier workers. We compare the experimental results with those obtained by Monte Carlo simulations using PENELOPE calculations; the agreement between experiment and theory is found to be satisfactory within uncertainties involved in the measurements and the theoretical results

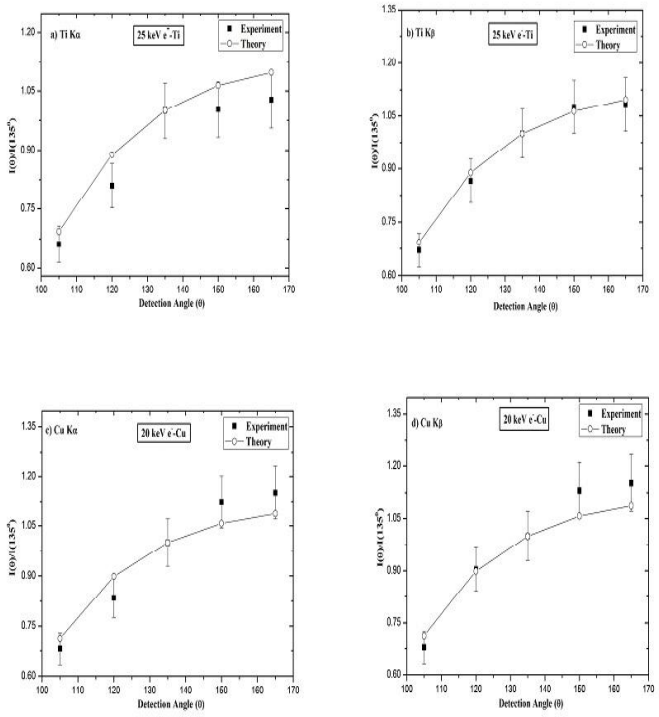

Figure 1 : Variation of relative intensities $I(\theta)/I(135^0)$ for K_α and K_β x-ray lines of Ti excited by electrons at 25keV and that of Cu at 20keV impact energies as a function of photon detection angle θ. (a) Ti K_α ; (b) Ti K_β ; (c) Cu K_α (d) Cu K_β . The filled squares are the experimental data points whereas open circles connected with a continuous line represent the data from MC calculations. Typical error bars are shown on the experimental data points.

References

[1] N. Yadav et.al. Journal of Electron Spectroscopy and Related Phenomena. 185 (2012) 448–452..

[2] N. Yadav et.al. Journal of Electron Spectroscopy and Related Phenomena. 185 (2012) 23–26.

[3] B.Singh et.al. (Accepted, Journal of Electron Spectroscopy and Related Phenomena 2107)

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