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Quantitative Analysis of Reflecting Electron Energy Loss Spectra for Fe, Ni and their Compound

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Experimental cross sections of Fe, Ni and their compound from reflection-electron-energy-Loss spectroscopy (REELS) spectra are presented. Quantitative analysis of REELS spectra were carried out by using Tougaard-Yubero QUEELS-$\varepsilon(k, \omega)$-REELS software. Theoretical inelastic scattering cross section K_{SC} from simulated energy loss function (ELF) and experimental cross section from REELS spectra at four primary electron energies of 500eV, 1000eV, 1500eV and 2000eV have been investigated. Theoretical inelastic scattering cross section determined through a dielectric-response of solid-electron interaction using Drude-Lindhard oscillator were compared with experimental cross section from REELS spectra. Good quantitative agreement is found between the theoretical predictions and the experimental findings for the inelastic scattering cross section. The theoretically calculated inelastic mean free path (IMFP) is found to depend on both primary energy and the amount of Fe and Ni. The IMFP for Fe, Ni and their compound increase with increasing the primary energy and decrease with reducing the amount of Fe in compounds, such as; at 500eV is about 8.71 Å, 8.63 Å, 8.31 Å, 7.94 Å and 7.66 Å and increasing to 33.04 Å, 32.87 Å, 32.05 Å, 31.27 Å and 30.18 Å at 2000eV for Fe, $Fe_{77.7}Ni_{22.3}$, $Fe_{50.6}Ni_{49.4}$, $Fe_{27.6}Ni_{72.4}$ and Ni, respectively.