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Remarks on Some Reference Materials for Applications in Elastic Peak Electron Spectroscopy

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The quantification of results of electron spectroscopies, AES and XPS, requires knowledge of the inelastic mean free path (IMFP) of signal electrons in solids. This parameter determines the surface sensitivity of both techniques. There are two methods of determining the IMFPs that provide these parameters in agreement with the definition: (i) calculations based on the experimental optical data, and (ii) calculations based on measurements of the electron elastic backscattering intensity. The latter method requires the use of some reference material for which the IMFP is known. In 1999, an extensive analysis of the published IMFPs has been performed; the results indicated that there is a very good agreement between the calculated and measured IMFPs for four elemental solids: Ni, Cu, Ag and Au. The averaged IMFPs for these elements are known under the name of the recommended IMFPs. However, no preference among these four elements has been established. In the present work, an attempt is made to select an element for which the recommended IMFPs result in the best agreement between the calculated and measured intensities of elastic electron backscattering. For this purpose, the elastic backscattering intensity has been measured at eight electron energies varying from 200 to 1500 eV. At each energy, the intensity was measured over a wide range of emission angles from 35° to 74°. The experiments were accompanied with Monte Carlo calculations of the elastic backscattering probability for the same energies and experimental configurations. It has been found, from comparison, that the best agreement is observed for Au, and this element is thus recommended as the reference material. It has been shown that the shape of the emission angle dependence of the elastic backscattering intensity is noticeably influenced by

the surface energy losses.

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