Fundamental aspects of quantitative surface analysis by AES and XPS
A. Jablonski

Institute of Physical Chemistry, Polish Academy of Sciences,
ul. Kasprzaka 44/52, 01-224 Warsaw, Poland

e-mail: ajablonski@ichf.edu.pl

Practical analyses of solid surfaces are of considerable importance in surface science and in numerous manufacturing sectors. Two techniques, X-ray photoelectron spectroscopy (XPS) and Auger-electron spectroscopy (AES), are commonly used analytical tools due to their surface sensitivity, with XPS now being much more popular. Quantitative applications of both methods are founded on theoretical models that relate measured spectral features and intensities with needed characteristics of a surface region (surface composition, overlayer thickness, sampling depth, etc.). Complete descriptions of electron transport may be complex, and the relevant computational tools would be inconvenient in practical analysis. For this reason, simplified theoretical models have been developed which are further improved by suitable correction parameters. An attempt has been made to systematize different schemes of quantification and the parameters that facilitate practical analyses. In particular, some confusion about proper applications of certain correction parameters will be addressed, e.g. the issue of the effective attenuation length in AES and XPS. Furthermore, we presently observe the growing availability of synchrotron facilities. An important issue is the development of quantitative models for XPS with linearly polarized X-rays and energies up to 10 keV. Selected problems encountered in modeling the transport of electrons emitted by polarized synchrotron radiation will be addressed. Finally, different sources of parameters recommended for quantitative analyses will be briefly overviewed: (i) extensive tabulations available in the literature, (ii) simple predictive formulas, and (iii) published source codes. Verified data are distributed by the Standard Reference Data (SRD) program of National Institute of Standards and Technology.