AUGER ELECTRON SPECTROMETRY DATA BANK

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Following the detailed development of a traceable AES calibration system for electron spectrometer intensity [1,2,3] and energy [4] scales a data bank of AES spectra for the elements and a range of compounds has been established. This data bank involves spectra for the elements except hydrogen, the rare gases and radioactive materials, and is recorded for 5 keV and 10 keV electron beam energies. True spectra in the direct spectral mode are provided with intensities traceable to the eV^{-1} sr^{-1} scale [3].

The spectra for each element are available in both n(E) and En(E) formats with widescan ranges from 20 eV to 2500 eV at 1 eV resolution and 1 eV steps and at 0.25 eV resolution and 0.1 eV steps over the regions of the peak structures. The narrowscan structures are recorded with signal-to-rms noise ratios of 1000 or greater so that excellent signal quality is maintained throughout. Traceable differential spectra are also provided with signal-to-rms noises of typically 10000. The data bank thus involves over 1000 spectra or spectral regions.

A theoretical analysis of the predicted intensities for both high and low energy peaks shows an excellent correlation with the recorded data with no arbitrary scale constants. The measured and theoretical peak areas are derived in units of sr^{-1}, ie a fractional intensity per unit solid angle. In early comparisons of theory and experiment certain discrepancies were observed. By eliminating arbitrary fitting parameters it becomes clear which aspects of theory need development. Thus, the full traceability has allowed us to improve our understanding of quantitative AES and, incidentally XPS, whilst also enhancing our use of practical AES for analytical purposes.

The peak areas and other intensity parameters are tabled as sensitivity factors for use in quantitative analysis. Traceable parameters are provided so as to allow their use in new theories as they develop. Tables are also provided of the positions of spectral peaks.

By using the traceable AES calibration system any measurements recorded by an analyst on their instrument may be converted to absolute measurements. The present data bank is recorded for 5 keV and 10 keV electron beams at 30^{o} to the sample surface normal and so any measurements recorded by the analyst under these conditions will relate directly to the data bank spectra. The data bank spectra are recorded at very high energy resolution and so any experimental resolution may be simulated by convolution with the relevant linewidth. Measurements with, say,

the elastic peak lineshape allow the instrumental resolution to be defined so that the full data bank is then appropriate to any calibrated instrument.

REFERENCES

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