Some Unsolved Problems in XPS Qualitative Analysis

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The problems of obtaining reasonable qualitative analysis results for AES/XPS spectra are apparently easy but actually very difficult to solve. We have come to obtain generally good analysis results for AES spectra, although some minor problems are still left for complex spectra. As for XPS spectra, however, we have encountered some peculiar situation where our statistical approach to detect peaks is not satisfactory applicable. This difficulty may be probably caused by any of the following reasons:

① The spectral dada is already processed (e.g. background subtracted).
② The spectral data of XPS dose not rely on the counting statistics of the detector.
③ The spectral data of XPS consists of countless number of very minor unknown transition lines.

Among these reasons, ① and ③ can be obviously excluded. So, the remaining ② may be the cause of this difficulty. In order to solve it, we must make clear the counting mechanism of the XPS detector and analyze the physical phenomena whether we can reasonably apply the statistical theory or not. Such an approach may be the orthodox one but extremely difficult to succeed. Therefore, in this topic, we will introduce some phenomenological approaches to cope with this difficulty. One of them is to use smoothing spectrum before making the peak search. The smoothing of a spectrum certainly reduce the random noises of the spectrum but seriously distort the true signal peaks. We are trying to find a new adaptive smoothing method which effectively reduce the random noises without largely distorting the signal peaks [1]. We will report the merit and demerit of some kinds of the smoothing methods.

Another problem is how to distinguish the chemical states of substance [2]. This problem is very delicate and probably beyond the scope of the present work. However, if we restrict the problem simply to analyzing the spectra, many ingenious methods to help to analyze the chemical states of the substance will be devised. We hope to make many stimulating discussions relating this topic.

References

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2. S. W. Garrenstroom, Appl. Surf. Sci. **70/71**, 261 (1993)