

## THE USE OF VARIOUS PEAK DECONVOLUTION MODELS FOR ED-XRF ANALYSIS OF LAYERED MATERIALS

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Peak deconvolution methods, based on Least-Squares fitting using either Gaussian peak models or reference spectra, can be applied for coating thickness analysis using ED-XRF (a comprehensive review of both approaches can be found in [1]). Gaussian peak fitting does not require measured profiles of individual elements. This is an advantage when the layered sample contains “unexpected” elements, or when significant changes occur in the peak positions, widths and line ratios, as this is much easier to handle when all the peaks can be treated separately. However, tailing and pulse pileup effects, which depend on the detector type and amplifier electronics, can cause serious deviation from a purely Gaussian peak model.

Least-Squares fitting methods based on experimental reference spectra require measured profiles of each element. Depending on the resolution of the detector, it is not guaranteed that peak lines of an element can be separated. For example, a single Cu peak profile acquired with a proportional counter shows a single peak with overlapping  $K\alpha$  and  $K\beta$  peaks. In cases where elements of an overlying layer have their absorption edge between the major lines (e.g., if a Ni layer is deposited above Cu), the peak profile changes dramatically, depending on the thickness of the overlying layer.

In this paper, both of the methods mentioned above will be discussed for several multilayer applications measured with various types of solid-state detectors (e.g., Si{Li}, Si pin diode, and the Si drift detector) and gas-filled proportional counters. We will focus more on the practical aspects and feasibilities of the respective approaches. Finally, a combination of both models, which uses the advantages of each technique, will also be discussed for some applications.

### References:

- [1] P. Van Espen and K. Janssens, “Handbook of X-Ray Spectrometry,” 1<sup>st</sup> Edition, Marcel Dekker, Inc, 181-293 (1993).