

New Reference Samples for X-ray Spectrometry

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X-ray spectrometry methods such as XRF, TXRF as well as GIXRF and GEXRF are non-destructive technologies permitting the determination of element composition of unknown bulk and layered samples. However, usually a well-defined standard or reference sample is required if quantitative information about layer thickness (in nm) or mass deposition (in ng/mm²) shall be deduced from the fluorescence radiation (in counts per second). Internal or external standards in the form of dried droplets or $\mu\text{L}/\text{nL}$ droplets [1] are used for this quantification but numerous problems can occur in sample preparation, measurement and evaluation [2]. The fluorescence signal from the sample carrier may further increase the signal background and decrease sensitivity especially for low concentrations.

Ultrathin silicon nitride membranes have been used as low-background reference sample substrates [3] for several years. Further, PVD methods as used in multilayer fabrication can be applied to provide laterally extremely homogeneous layered multi-element reference samples of well-defined mass deposition in the range of few nm [3] and even much below the mass deposition of atomic monolayers.

As fabrication and characterization of such reference samples is only cost-efficient for large production batch sizes, market research and evaluation of demand in research and industry is essential. Several suggested new reference systems will be presented. There are options focussing on the photon energy region between 3 keV and 8 keV (mainly period 4 transition metals) or between 8 keV and 20 keV (K- and L-lines of period 5 and 6 transition metals). Further, multi-element sub-monolayers in the pm range will be discussed.

References:

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