

SAMPLE MORPHOLOGY: INFLUENCE ON TOTAL REFLECTION X-RAY FLUORESCENCE ANALYSIS

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Total Reflection X-ray Fluorescence Analysis (TXRF) is a method for qualitative and quantitative analysis of trace elements. In general TXRF is known to allow for linear calibration typically using an internal standard for quantification [1,2]. Absorption effects concerning exciting and detected radiation are usually disregarded. This is justified because mostly small sample amounts are used. The thin film approximation in particular assumes a very thin sample and therefore differential absorption for photons with different energies can be ignored. Furthermore the elements in the sample are assumed to be homogeneously distributed. Hence the loss of the fluorescence signal due to absorption of the primary beam equally affects all elements and quantification by using an internal standard is justified. However, for higher total amounts of samples deviations from the linear relation between fluorescence intensity and sample amount have been observed [3].

The topic of the presented work is an investigation of the parameters influencing the absorption phenomenon. A simulation model was developed to calculate the influence of the absorption effects. Samples with different total amounts of arsenic have been prepared to determine the upper limit of sample mass where the linear relation between fluorescence intensity and sample amount is no longer guaranteed. It was found that the relation between fluorescence intensity and sample amount is linear up to ~100 ng Arsenic. The parameters necessary for the simulation (sample dimensions and volume) were determined by analyses with a confocal white light microscope. Even though the results of the simulations are not satisfying yet it could be shown that the key parameters for the absorption effect are the density of the investigated atom in the dried residues and the shape of the residue. Difficulties for the simulation appeared due to the determination of the density of the arsenic atoms in the sample. To improve the simulation model further investigations are necessary.

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[3] D. Hellin, J. Rip, S. Arnauts, S. De Gendt, P.W. Mertens, C. Vinckier, Spectrochimica Acta Part B: Atomic Spectroscopy 59 (2004) 1149-1157.

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