ACCURACY AND TRACEABILITY IN X-RAY FLUORESCENCE MEASUREMENTS

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Standards free X-ray Fluorescence Analysis (XRF) determines the mass per unit area of layered coating systems (or for infinitely thick samples relative mass per unit areas = mass fractions)[1]. Controlling any process requires the measured values to observe certain tolerance limits, therefore it is required that the measurement itself yield the true value. In practice systematic measurement errors are often overlooked. Standard tolerances and how they effect the uncertainty of the actual control measurement are not considered. Systematic errors can be determined and therefore corrected by calibration measurements with standards of well known mass per unit areas. In the case where sample and standard values are nearly equal, systematic errors can be directly corrected and eliminated (taking into account also the tolerance of the standards and random errors). If the measured values differ significantly between sample and standard one has to expect an additional systematic error depending on how large the difference between the measured sample and the standard is. We will present a method that will allow an error estimation that takes into account the difference in sample and standard values. The amount of the correction, thus the deviation of the standards free measurement value from the true value, determines the contribution of this error. The closer the standards free measurement comes to the true value the more accurate the measurement values will be outside the range of the standard. Empirical test series show very good correlation with the presented error estimation method.

[1] In general XRF determines only mass per unit areas or relative mass per unit areas for thick samples. The usual reported values of layer thickness and/or concentration are calculated from it.