

TXRF- A VERSATILE TOOL FOR TRACE ELEMENT ANALYSIS: A REVIEW

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Total reflection x-ray fluorescence analysis (TXRF) is basically an energy dispersive technique using a special geometry for the excitation of the sample, namely in grazing incidence of the exciting X-ray beam. The detection limits are in the range of pg using X-ray tubes for excitation so concentrations of ng/g can be detected using only few μl 's of sample volume. Synchrotron radiation as excitation source extends the detectable traces down to fg, thus pg/g concentrations can be analyzed. TXRF is a tool for trace element analysis specially applicable where only small sample volumes are available. This feature is applied while aerosols are directly collected on a TXRF reflector as sample carrier. Due to the high sensitivity a drastically reduced sampling time of a few minutes is enough to accumulate detectable element masses. Therefore a high time resolution of atmospheric events is possible. In combination with synchrotron radiation and a high resolution crystal monochromator, TXRF can be combined with XANES to determine the oxidation state of elements at trace levels. Examples of As in cucumber xylem sap and Fe as contamination on Si wafer will be given. Besides the chemical analysis, where various types of samples are deposited intentionally on a quartz reflector an important application is the wafer surface analysis which allows detection of slightest contaminations at the 10^9 atoms/cm² level for metals. Using a special ED detector with an ultra thin window of 300 nm and a Cr tube for excitation, the detectable element range can be extended to light elements down to Carbon. Examples of this application will be shown and a review of TXRF spectrometers with various excitation sources and applications is presented.