Total-Reflection X-Ray Spectroscopy as a Tool for Element Screening in Food Samples

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Abstract : The analytical demands on modern instruments for element analysis in food samples include the analysis of major, trace and ultra-trace essential elements as well as potentially toxic trace elements. In this study total reflection, X-ray fluorescence analysis (TXRF) is presented as an analytical technique, which meets the requirements, defined by the Association of Official Agricultural Chemists (AOAC) regarding the limit of quantification, repeatability, reproducibility and recovery for most of the target elements. The advantages of TXRF are the small sample mass required, the broad linear range from µg/kg up to wt.-% values, no consumption of gases or cooling water, and the flexible and easy sample preparation. Liquid samples like alcoholic or non-alcoholic beverages can be analyzed without any preparation. For solid food samples, the most common sample pre-treatment methods are mineralization, direct deposition of the sample onto the reflector without/with minimal treatment, mainly as solid suspensions or after extraction. The main disadvantages are due to the possible peaks overlapping, which may lower the accuracy of quantitative analysis and the limit in the element identification. This analytical technique will be presented by several application examples, covering a broad range of liquid and solid food types.

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