COMBINED MULTIPLE-EXCITATION FP METHOD FOR MICRO-XRF ANALYSIS OF DIFFICULT SAMPLES

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Accurate minor and trace element analysis via micro-XRF can be more difficult to accomplish in single crystal and poly-crystalline materials due to diffraction phenomena which obscure elemental peaks and distort the spectral background. For example, trace elemental micro-XRF analysis is used extensively for colored gemstones and other geological samples with mostly aluminosilicate matrices for identification and provenance. Sample rotation is commonly used in large area XRF to reduce these effects, but its use in micro-XRF is more limited due to the constraints imposed by making a targeted, small spot analysis on a sample that may be completely inhomogeneous in the analysis plane.

A primary beam filter is commonly used to reduce or eliminate diffractive artifacts as well as tube characteristic lines, but this dramatically reduces the sensitivity to Na, Mg, Al and Si, complicating the compositional analysis for the major elements in aluminosilicates and, thereby, trace elements. One way around this is to collect an XRF spectrum with unfiltered excitation to obtain the low energy region, i.e. Na, Mg, Al and Si, and then collect other portions of the spectrum under more optimized conditions (e.g. – with various filters to obtain elemental intensities free from diffractive artifacts). The fundamental parameters method is capable of using multiple spectra together to quantify the complete element suite of the sample. By unifying the quantification for several spectra taken under different excitation conditions (each optimized for a particular set of elements), the overall results can be improved.

We will apply this method to selected cases for geological samples, such as gemstones, and metal alloys such as silicon-containing steels.