OPTIMIZATION OF BACKGROUND FITTING USING MULTI-ELEMENTAL REFERENCE MATERIALS FOR XRF ANALYSIS OF AIR SAMPLES

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Multi-elemental reference materials (ME-RMs)[1,2,3] developed and generated at the University of California-Davis are utilized for optimization of analytical protocols, particularly background fitting parameters, for analysis of air samples using EDXRF (Panalytical Epsilon 5, Almelo, The Netherlands).
The quantification of 33 elements on air samples is achieved with selected eight secondary targets. A set of field blanks is analyzed along samples, and the median loadings of that set are subtracted from corresponding samples to report the final elemental loadings.
Blank measurements with good precision seems to be highly affected by selection of background fitting parameters for used secondary targets and therefor critical in accurate determination of measured ambient concentrations.
In this study, the optimization of background fitting parameters to achieve accurate measurements for Al, Si, S and K using CaF2 secondary target, is demonstrated. The background fitting parameters (e.g. logarithmic and squared-root) and tailing fitting parameters (e.g. width and delta) were studied by analyzing a blank multiple times to obtain the best precision, and by analyzing ME-RMs with known elemental loadings to achieve the best accuracy. The key factor of the optimization is to analyze materials with known loadings mimicking air samples.
The preliminary results of this study indicate the need of instrument specific optimization of background fitting parameters. Furthermore, the measurement of K seems to be particularly sensitive to the background fitting parameters (Fig. 1), mainly due to K Ka line falling on the tail of Ca Ka line of the target where the more curved background makes fitting difficult, particularly at low loadings. At high loadings, the differences between background fitting methods are insignificant.

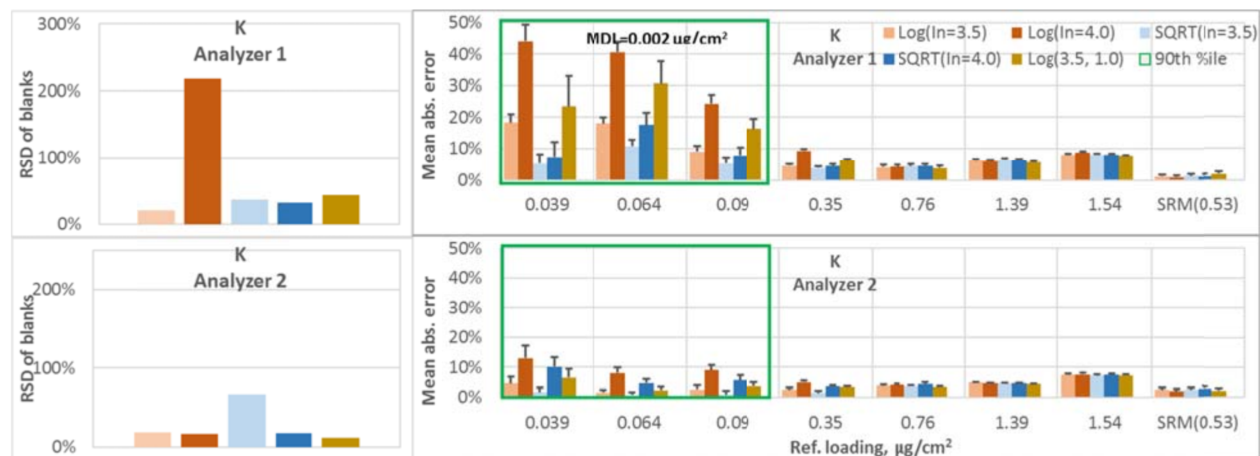

Fig.1. The results of different background fitting parameters for, *left)* precision of blanks (relative standard deviation-RSD); *right)* mean absolute error of many ME-RMs with 90th %ile of network samples and method detection limit (MDL). Log and SQRT refer to logarithmic and squared-root fitting, respectively, while the numbers in the parentheses refer to tailing parameters.

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