INTERLABORATORY COMPARISON OF REFERENCE MATERIALS AND AIR SAMPLES ANALYZED BY XRF AND ICP-MS

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Inter-laboratory comparison exercises are carried out to check the reproducibility of different analytical methods, which serve as the quality control measure for analytical laboratories. The non-destructive nature of x-ray based methods allows analyzing the same samples with many XRF laboratories. For air samples with relatively low mass loadings, comparison between XRF measurements and ICP-MS is applied to verify quantification by XRF with another established method. This paper describes recently performed inter-laboratory comparison study between 2 independent laboratories, University of California-Davis (UCD) and Environment and Climate Change Canada (ECCC). The XRF and ICP-MS analysis were performed on multi-element reference materials (ME-RMs) simulating air filters and single compound RMs with loadings close to ambient air levels produced in UCD, and ambient air samples. The reference loadings used for reference materials were previously assigned[1] (certificate) and when possible, determined gravimetrically[2].

The bias of two XRF laboratories from the reference loadings of single compound RMs were within 10% for all tested elements, namely Al, Si, S, Zn and Pb (Fig.1). For ME-RMs, two laboratories were within 20% of the reference loadings with very few exceptions.

Good comparison between XRF laboratories on air samples were obtained for S, Ca, Fe and Zn. For trace elements, most of the results were lower than quantification limits (QLs), however, the results from two XRF laboratories were similar for loadings higher than QLs. There is ~15% bias between two XRF laboratories for K and Si. The ICP-MS results (reported for Z>22 only) confirmed the agreements between XRF laboratories for Fe and Mn whereas most of the trace elements were below the QL of either XRF or ICP-MS.

Both, the single compound materials with loadings determined gravimetrically at levels close to ambient air and the multi-element materials with loadings simulating the ambient air profile, have shown to be excellent, stable materials and can be utilized for calibration of XRF analyzers and quality checks (QC) of XRF laboratories' performance.

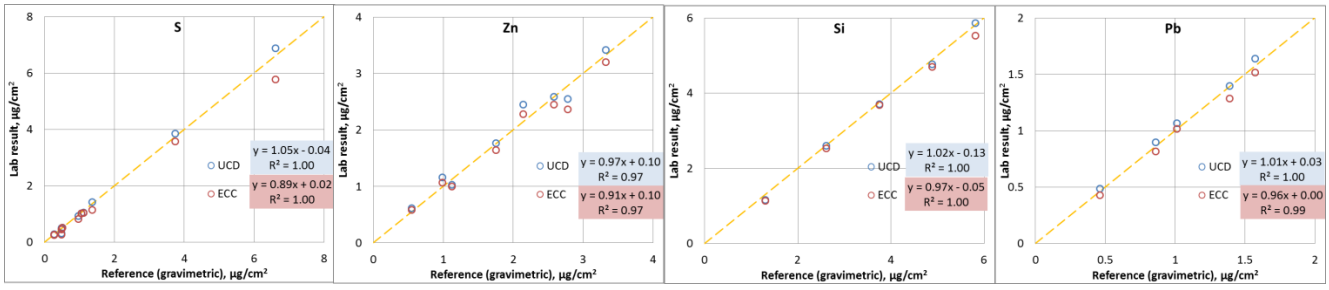

Fig.1 Comparison of results for XRF laboratories with gravimetrically determined reference loadings of single compound reference materials.

[1] Yatkin, S., Trzepla, K. , White, W., Hyslop, N. Evaluating EDXRF measurements of atmospheric aerosols with multi-elemental reference materials. Air and Waste Management Association - Air Quality Measurement Methods and Technology Conference 2016, Pages 36-41.
[2] Yatkin, S., Trzepla, K. , White, W., Hyslop, N. Development of single-compound XRF calibration standards on PTFE filters for analysis of aerosol samples. Air and Waste Management Association - Air Quality Measurement Methods and Technology Conference 2016, Pages 31-35.