



Assessing the performance of four leading-edge pXRF devices for trace metal measurement on contaminated soils in industrial and mining context (Wallonia, South Belgium).

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In many countries, large areas where mining and smelting activities took place in the past now exhibit elevated soil metal concentration levels. In Belgium, as in many European countries, soil assays are performed by aqua regia digestion and ICP measurement which is a cost- and time-expensive protocol. The aim of this study is to assess if this protocol could be approximated or replaced by portable XRF measurement as this method is fast, low cost and can be used in situ.

This study first focused on the evaluation of the performance of four leading-edge pXRF devices for measuring metal concentrations in a collection of Belgian soil samples from industrial and mining context and non-contaminated areas. Four soil preparation protocols were then tested with one device, involving (1) measurement on fresh soil, (2) in situ sample drying and sieving, (3) in laboratory sample drying and sieving and (4) in laboratory sample drying, sieving and crushing.

The comparison of the pXRF devices showed that the performance of each device varies depending on the element measured. The precision of the XRF measurement and correlation with aqua regia measurement protocol both increased for most of the elements when drying and sieving soil samples. However, for Cu and Pb, the four devices provide good measurement results whatever the sample preparation protocol. Finally, we proved the suitability of pXRF devices on a real-world case study by delineating the extent of Pb soil contamination by in situ pXRF measurement on fresh soil.