

Some remarks on the interpretation of sequential chemical extraction methods in soil samples contaminated by mining activity

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In the context of metal(loid)s mobility prediction, sequential chemical extraction procedures (SEPs) have been extensively employed. These methodologies, with a great variety of methods depending on the element of concern, are based on the attack to a solid sample (essentially soil) with successive increasing-strength extractants. Each fraction can be ideally associated to a mode of occurrence of the element, like a compound-type speciation. Although the scientific community usually accepts the usefulness of SPEs, these procedures have also been criticized, in such way that their accuracy is under question.

Taking the above into consideration, a soil sampling campaign has been carried out in the surroundings of an inactive Pb-Zn mine in NW Spain. Soil samples were prepared and analyzed following the SEP proposed by Hall (1998). In parallel, selected samples were studied by conventional mineralogical techniques to perform micro-analysis at a grain scale (SEM-EDX and HRTEM). Results obtained by both methodologies were subjected to comparison, particularly for As, Cd, Cu, Pb and Zn, and some notable disagreements have been identified.

SPEs results indicate a decreasing environmental mobility in the following order: Pb>Zn>Cu>Cd>>As. The results of the microanalysis can be considered objective, although they are difficult to extrapolate to the total sample. They indicate that the used sequential extraction method generally overestimates the role of organic matter in the adsorption of metals and metalloids. On the other hand, retention on clay surfaces depends on the element: it is overestimated for Pb and underestimated for As. Considering the Fe/Mn ratio, it is also very likely that the action of Mn oxides are also overestimated, with the consequent decrease in the relevance that Fe oxides really have.

References

Hall, G.E.M. (1998), *Journal of Geochemical Exploration* 61, 1–20.