

Comparison of two sequential extractions differ in extractants for leaching of reducible fraction from forest soil

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The sequential extraction scheme have been applied to assess the mobile fraction of different elements, as well as their relative proportions in various host phases of soils, sediments, and urban road materials. The comparison of the results obtained for the same set of samples in different extraction procedures can be a source of information about biding trace elements in the soil.

The aim of this work was to analyse and compare the results of two very similar schemes. The five step sequential extraction procedure have already been applied to forest soils (*parabraun*) deposited in the German Environmental Specimen Bank. The six step sequential extraction is a modification of the five step scheme. The extraction of elements with reducible reagent was split into two steps. Easily (MnOx) then moderately reducible (FeOx) fractions were leached. It is known that in the environment Mn- and Fe-oxides are differently soluble as a result of changes on the oxidation-reduction conditions and the pH.

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The fractions of elements: exchangeable with 0.01 M NH₄Ac, bound to carbonate with 0.1 M HAc, bound to oxides with 0.05 M NH₂OH·HCl in 25% HAc or bound to MnOx with 0.05 M NH₂OH·HCl then bound to FeOx with 0.1 M ascorbic acid in 0.2 M oxalate buffer, bound to organic matter with 30% H₂O₂ + 0.5 M NH₄Ac and residual with nitric acid were leached. Based on three sets of extraction Ca, Fe, Mg, Mn, and Zn were determined with ICP-AES, and the remaining trace elements (As, Cd, Co, Cr, Cu, Ni, Pb, Zn) with ICP-MS.

The study shows that under extraction conditions the trace elements are mainly bound to Fe-oxides and insoluble minerals (residual) whereas the elements bound to Mn-oxides and organic matter form a major mobile fraction. For such elements as Co, Ni, and Zn, carbonate and Mn-oxides fractions, whereas for Cr organic matter are particularly important. The reducible fraction of Co is preliminarily bound to Mn-oxides, but reducible fractions of As and Pb are mainly bound to Fe-oxides. In addition it is important to note that the splitting into two step extraction from reducible fractions did not change the sum of leaching.