

Soil mercury speciation: Chemical reagents applied for the metal extraction

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Mercury speciation, aiming at quantitative identification of the metal species in a medium, provides useful information in toxicological, bioavailable and biogeochemical terms that are inaccessible even with only total mercury determination. We are particularly interested in soil because it is considered as a sink for punctual polluted sources and for deposited atmospheric mercury. Accordingly, this environment becomes an important provenance of mercury in plants, ground waters, rivers, and atmosphere (re-emission). However, it is crucial to note that although the “key” to speciation determination is the appropriate choice of reagent used in extraction step, neither specific extractants nor standard protocols exist for the isolation of particular soil-mercury forms. Consequently, a sequential extraction approach with its operational interpretation is widely referred in literature while a single extraction study, more specific approach, seems to be rare.

By using the single extraction approach, several reagents, based on their stability constant with the target metal, such as EDTA, DTPA, cysteine and sodium-thiosulfate, were selected for extracting mercury in our experiments. Besides, all possible interferences caused by such reagents and soil matrix had been studied. We found that the extraction of mercury was independent on the stability constant values, probably due to high organic matter content in the soil samples. Among these reagents, sodium-thiosulfate seems to be relatively the best soil-mercury extractant. As the matter of fact, we demonstrated the favoured reagent and its convenient operational conditions for soil mercury extraction. Finally, once the pertinent chemical reagent had been defined, a kinetic fractionation methodology and its associated experimental results were also applied as a specifying tool for soil mercury mobility.

Keyword: contaminated soil; kinetic fractionation; mercury; single extraction, speciation.