Determination of mercury and its forms in soils, sediments and tailings by atomic absorption spectrometry

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Abstract

Many circulating organic and inorganic pollutants are involved in the global environmental contamination. The mercury of anthropogenic origin represents a serious issue nowadays. The combustion of fossil fuels and industrial production cause an enormous increase of atmospherically transported mercury which is deposited in all parts of the ecosystem. The mercury contained in the soil stands in research focus due to potential threat to the biosphere.

The aim of this thesis is primarily the suggestion of comprehensive analytical procedure for speciation analysis of the mercury in soils, sediments and tailings including the sequential extraction of individual mercury forms and the use of thermal desorption analysis. This research is also aimed to relevant interpretation of the data with regard to the development of mercury speciation.

The mercury forms were observed using sequential extraction: mercury releasable in water; mercury releasable under acidic conditions; mercury bound to humic substances; elemental mercury, mercury bound to complexes and amalgams; mercury sulphide and residual mercury. Furthermore, the thermal behavior of the six mercury species (Hg^0, $HgCl_2$, HgO, $HgSO_4$, HgS and humic bound Hg) was studied by means of thermal desorption analysis from the solid phase. Sequential extraction and thermal desorption used are complementary methods and their implementation brings all basic knowledge about mercury fractionation in the sample. Suggested work procedures were verified on the samples of soils, sediments, tailings and peat. Based on the obtained results, the mercury speciation changes depending on natural conditions of the material were described.