

Adsorption behavior of organoarsenic compounds in soils

- Influence of organic matters -

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Anthropogenic originated organoarsenic compounds such as diphenylarsinic acid (DPAA) are a water pollution source as well as naturally occurring inorganic ones. For example, DPAA polluted well water caused serious health problems in Kamisu, Japan. However, their adsorption behavior in soils is still well unknown. In general, the adsorption property of chemical compounds influences its migration process in natural environments such as soil-water system. In soils, organic matters (OMs) affect adsorption behavior of trace metals on minerals. Thus, it is important to understand the adsorption mechanism of the arsenic compounds with taking account of influence of OMs to predict future fate of them in environment. In this study, we conducted adsorption experiments for several soils which have different contents of Fe/Al-(oxyhydr)oxides and OMs, and adsorption amounts and structures were analyzed by ICP-MS and As K-edge XAFS measurements. The same experiments and analysis were conducted with OM extracted soils to understand the influence of OMs.

The As K-edge EXAFS spectra for arsenic compounds adsorbed on soil samples were well fitted with corresponding EXAFS spectra As adsorbed on Fe- and Al-(oxyhydr)oxides. The fact indicates that these arsenic compounds adsorbed on these minerals mainly. The adsorption ratios for Fe- and Al-(oxyhydr)oxides were estimated by the fitting, and the deviation of the ratio from the Fe/Al content was larger with increasing the OM content in soils. In addition, in most cases, the adsorption amounts of arsenic compounds increased by removing OMs. Thus, it is considered that the OMs prevent arsenic compounds from being adsorbed on minerals by covering their surface. However, even though OMs were removed from soils, the adsorption ratios were still not always reflected Fe/Al content ratio by removing OMs depending on the arsenic compounds. This fact indicates that the affinity of arsenic compounds for Fe/Al-(oxyhydr)oxides is different.

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