

有機ヒ素化合物の土壌中における吸着挙動 Adsorption behavior of organoarsenic compounds in soils

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The arsenic pollution is a world problem. Natural originated inorganic arsenic compounds are predominant cause of the water-related disease. In addition, anthropogenic originated organoarsenic compounds such as phenylarsonic acid (PAA) and diphenylarsinic acid (DPAA) are also pollution source. For example, DPAA polluted well water caused serious health problems in Kamisu, Japan. These phenyl arsenic compounds are considered as a decomposition product of chemical warfare agents produced during World Wars I and II, and even now such compounds still remain in the ground. Recently, adsorption and mobility of these aromatic arsenic compounds in agricultural soils have been investigated. However, their adsorption mechanisms on soil are still unknown. In general, the adsorption property of chemical compounds influences its migration process in natural environments such as soil-water system. Thus, it is important to understand the adsorption mechanism of the arsenic compounds to predict future fate of them in environment. Recently, we reported adsorption structures of PAA and DPAA on ferrihydrite obtained by X-ray absorption fine structure (XAFS) analysis and quantum chemical calculations [1]. In this study, we conducted As K-edge XAFS measurements for organoarsenic compounds adsorbed on soil, as well as adsorption experiments, to understand their adsorption behavior in soils. The results of EXAFS analysis suggest that all arsenic compounds in this study adsorbed on Fe or Al (oxyhydr)oxide in the soil mainly regardless of the organic functional groups. This fact indicates that the Fe/Al-(oxyhydr)oxides can control the mobility of organoarsenic compounds in the ground.

References:

[1] Tanaka M, Togo Y S, Yamaguchi N and Takahashi Y 2014 J Colloid Interface Sci., 415, 13.

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