

Enhanced Stability of Arsenic Immobilized through Co-precipitation by *in situ* Synthesis of Ferrihydrite in Soil

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When stabilization technique is applied to remediate arsenic (As) in the environment, it is essential to evaluate the stability of the immobilized As since it can be re-released into the surrounding soil and water bodies, posing a significant risk to human health and the environment. In this study, the stability of As immobilized with ferrihydrite (*Fh*), through either adsorption or co-precipitation, was determined by desorption experiment and DGT-induced fluxes in soils (DIFS). For adsorption of As, ferrihydrite was synthesized in solution and As was then added. In contrast, for co-precipitation, the *Fh*-synthesizing solution was injected into an As-containing solution to incorporate the As simultaneously into the *Fh* being formed [1]. The molar ratios of As to Fe (As/Fe) tested were 1:1 and 1:5.

Overall, co-precipitation was more efficient than adsorption in As immobilization at both As/Fe ratios. Desorption experiment showed that co-precipitated As was more stable than adsorbed As at low As/Fe (i.e., 1:5) while more As was released from co-precipitated *Fh* compared to adsorbed *Fh* at high As/Fe (i.e., 1:1). DIFS results were consistent with the desorption experiment. At low As/Fe (1:5), the release rate of As from the soil containing co-precipitated *Fh* was found to be 10 times lower than that from the soil containing adsorbed *Fh*. In contrast, at high As/Fe (1:1), the release rate of As from the soil containing co-precipitated *Fh* was found to be 5 times higher than that from the soil containing adsorbed *Fh*. Moreover, the porewater As concentration was 25 times higher in the soil containing co-precipitated *Fh*. The results suggest that the stability of co-precipitated As with *Fh* is dependent on the As/Fe ratio, which needs to be taken into account for As stabilization to ensure long-term durability.

[1] Chiharu Tokoro, Yohei Yatsugi, Hajime Koga & Shuji Owada (2010), *Environ. Sci. Technol.* 44, 638-643.