Transformation of natural ferrihydrite aged in situ in As, Cr and Cu contaminated soil studied by reduction kinetics - DTU Orbit (16/12/2018)

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Several soil remediation techniques for As, Cu and Cr contaminated soil utilize adsorption of contaminants to ferrihydrite as the removal mechanism, even though ferrihydrite will transform to secondary iron oxides and part of the sorption capacity will be lost. Transformation of ferrihydrite following 4 yr of in situ burial at a contaminated site was examined in samples of impure (Si-bearing) ferrihydrite in soil heavily polluted with As, Cr and Cu. The samples are so-called iron water treatment residues (Fe-WTR) precipitated from anoxic groundwater during aeration. The extent of transformation of ferrihydrites in the field was evaluated in the lab through experiments where the kinetics of iron and contaminant release was studied in a pH 3 ascorbic acid solution. Compared to fresh controls the aged samples had scavenged significant amounts of contaminants (up to 9.2 mmolAs/molFe and 1.5 mmolCu/molFe) and the reactivity had decreased by one order of magnitude, indicating partial transformation of ferrihydrite to more crystalline iron phases. Iron crystallinity increased during the 4 yr of aging with XRD suggesting goethite, alpha-FeO(OH), to be the most prominent transformation products. The study clarifies the fate of ferrihydrite and associated contaminants during burial enabling an improvement of the methods for amending contaminated soil with Fe-WTR. (C) 2014 Elsevier Ltd. All rights reserved.