



Effect of Fe(II) Treatment on solid Phase Partitioning of Arsenic and Chromium

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The use of arsenic containing wood preservatives (e.g. chromated copper arsenate, CCA) has recently been restricted in many countries due to the well-known toxicity of As for humans and the environment. This study aimed at the characterisation of partitioning and release kinetics of arsenic and chromium at a former wood preserving site where the sandy podzolic soil had been contaminated by CCA for more than 70 years and where Fe(II) was applied to reduce highly mobile chromate. The soil profile was sampled to a depth of 200 cm. The determination of total concentration in the solid matrix yielded 10-384 mg kg⁻¹ As and 168-1086 mg kg⁻¹ Cr within the upper 65 cm of the profile. Partitioning of As and Cr to solid phases was investigated by IR-spectroscopy and X-ray microscopy, extraction with oxalate and dithionite, and titrimetrically. Cr and As redox speciation were studied colorimetrically, with ICP-MS and X-ray spectroscopy.

Chromium occurs mainly as Cr(III) due to reaction with Fe(II)-sulphate solution, the remainf chromate being almost completely leached into the groundwater. Oxidation of ferrous iron lead to accumulation of Fe(III) solid phases in the upper 30 cm, which significantly affect the retention of chromium. Chromium appears to form pure Cr(OH)₃ phases and mixed Fe(III)-Cr(III) phases as the direct reduction product. Additionally, sorption of Cr(III) to the ferric oxide's surface occurs, to which also little amounts of strongly binding chromate are bound.

Arsenic occurred as As(V) and appeared to be mainly associated with oxalate dissolvable Al in the podzolic Bs horizon, which we assume to be short-range ordered aluminosilicates. Kinetic experiments demonstrated that equilibrium concentrations of 0.2 μmol L⁻¹ (As) and 0.08 μmol L⁻¹ (Cr) established between the solution and

the solid phase for both species in the Al-rich layer not affected by Fe(II) after 10 hours. In contrast, the release of the two elements from the Fe rich topsoil layer did not stop within the experimental time of 25 h. These observations imply that vertical transfer from the top soil is possible, whereas the podsollic B_s horizon seems to efficiently retain Cr and As. Indeed their amounts distinctly decrease below this layer.