



Humic acids may favour the persistence of hexavalent chromium in soil

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Although naturally elevated levels of hexavalent chromium (CrVI) can be sometimes found in soils, distressing amounts of CrVI are largely restricted to sites contaminated from harsh anthropogenic activities.

Present knowledge about composition of humic acids (HAs) indicates that their basic binding block consists of a hydrophobic framework of aromatic rings linked together by more flexible carbon chains, with alcohol, amide, amine, carboxylic, carbonyl, phenolic, hydroxyl, quinone functional groups. Due to this polyfunctionality, HAs could hypothetically contribute to the reduction of several inorganic and organic contaminants, including CrVI.

Our work focused on the elucidation of interaction of CrVI with humic acids by using a cohort of complementary analytical techniques. UV-Vis spectroscopy revealed that the addition of HAs to the chromate solution stabilized the electronic external sphere of chromate, XANES confirmed that, at our experimental conditions, HAs did not exert any reduction of CrVI, EXAFS of Cr K-edge spectra indicated that Cr remained tetrahedrally coordinated at any Cr to HAs ratio, and DPS voltammetry revealed only weak interaction between HAs and CrIV.

From these results we hypothesised that the interaction between CrVI and HAs occurs via a supramolecular process leading to formation of CrVI-HAs micelles. This might

explain also the persistence of CrVI in neutral soils and its presence in groundwater.