Influence of Oxidation on the Metal-Ion Complexation of NOM with Respect to Remediation

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Natural organic matter (NOM) of a brown water lake was oxidized with UV irradi to elucidate the influence of oxidation on the metal ion complexation by NOM. UV/Vi fluorescence spectroscopy, as well as size-exclusion chromatography with online dete of UV absorption, fluorescence and metal concentration (ICP-MS) were used to inves the structural changes caused by oxidation. After oxidation, the fluorescence intensi NOM increased considerably despite a decrease in the UV absorption. The SEC experi showed a shift towards smaller molecular sizes after oxidation and a decrease of th NOM complexation in the systems with oxidized NOM. For Pb no such effect cou determined. Experiments performed to study the dissociation kinetics of metal ion- complexes revealed a slower dissociation of Al and Pb complexes with original compared to oxidized NOM. The dissociation rate constants determined from experiments were used to predict the migration of metal ion-NOM complexes in co experiments. For the divalent metals Pb and Zn, the experimental and modeling results in good agreement. However, the kinetic transport model under- and overestimated the breakthrough of Al in the presence of oxidized NOM and non-oxidized NOM, respectiv

The stability of the complexes with non-oxidized NOM decreased in the order Al > Zn. After UV-oxidation of NOM, its complexation ability towards metal ions decreased.

Consequences for the application of NOM in underground barrier systems with re to metal transport will be discussed. Furthermore, an investigation strategy leading bench scale experiments to polluted area remediation will be presented.

Mediation effects of humic substances in polluted environments: implications for development of remediation technologies

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Humic substances are multifunctional natural compounds that consist of aron backbone highly substituted with functional groups (carboxyl, hydroxyl, carbonyl, ar and of linked to it polysaccharidic and polypeptidic fragments. Due to such a wide varie functions, humic compounds can bind both heavy metals and organic ecotoxicants. affects mobility and bioavailability of the ecotoxicants released into soil and aq environments. Complexes of metals with low molecular weight HS – fulvic acids – are soluble and mobile, whereas the complexes with humic acids are much less soluble easily immobilized in the soil layer (Weber, 1988). The metals bound into humic comp become non-toxic that causes a net reduction in toxicity in polluted environments i presence of HS (McCarthy, 1989). In its turn, the transition metal complexes of HS mediate reductive dehalogenation of chlorinated hydrocarbons (O'Loughlin et al., 2000). The redox-mediating properties of HS are shown to play also an important role in oxidation of organic ecotoxicants under anaerobic conditions where they serve as an electron acceptor (Bradley et al., 1998). The above properties demonstrate a great potential of HS use in the remediation technologies. A spectrum of the mediating effects of HS can be even enhanced if the directed modification is used for obtaining humic derivatives with the wanted properties. So, sulfonation can be used to obtain much more soluble complexes of HS with transition metals, hydroxylation and amination can be used to increase chelating properties of HS, carbonylation – to enhance redox mediating properties, hydrolysis of HS can contribute in hydrophobization of HS and, hence, in increase of their affinity for organic ecotoxicants.

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Neosynthetic zeolites in soil remediation: preliminary study of trace metals sequestration

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The use of zeolites to remediate contaminated soils and sediments is a very interesting and widely applied technique to stabilize trace metals *in situ*. To date, due to their important cation exchange capacity, zeolites have being employed to reduce the mobility of trace metals in soils and, consequently, their bioavailability and the migration to other environmental compartments. The aim of this study is to assess the potential capability of zeolites to entrap selected heavy metals within their characteristic spatial structures during their synthesis at condition very close to the ambient. In particular, Zeolite X (zeolite from the series of Faujasite) has been synthesized starting from fly ash obtained from a thermoelectric power station at about pH 13 in four days at 60°C and one month at room temperature.

The synthesis of Zeolite X has been also obtained starting from silica and aluminum salts at pH 13 in solution containing 2500 ppm of Cu(II), Ni(II), Co(II), Cd(II), Pb(II) and Zn(II) in separate experiments. XRD and SEM-EDS analyses confirmed the crystallization of zeolite in the presence of each trace element even though after different incubation times.