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Vertical movement of iron-cyanide complexes in soils of a former Manufactured Gas Plant site

Magdalena Sut (1), Frank Repmann (2), and Thomas Raab (1)

(1) Brandenburg University of Technology, Chair of Geopedology and Landscape Development, Cottbus, Germany , (2) Brandenburg University of Technology, Chair of Soil Protection and Recultivation, Cottbus, Germany

In Germany, soil and groundwater at more than a thousand sites are contaminated with iron-cyanide complexes. These contaminations originate from the gas purification process that was conducted in Manufactured Gas Plants (MGP). The phenomenon of iron-cyanide complexes mobility in soil, according to the literature, is mainly governed by the dissolution and precipitation of ferric ferrocyanide, which is only slightly soluble (< 1 mg L-1) under acidic conditions. This study suggests vertical transport of a colloidal ferric ferrocyanide, in the excess of iron and circum-neutral pH conditions, as an alternative process that influences the retardation of the pollutant movement through the soil profile.
Preliminary in situ investigations of the two boreholes implied transport of ferric ferricyanide from the initial deposition in the wastes layer towards the sandy loam material (secondary accumulation), which possibly retarded the mobility of cyanide (CN). The acidic character of the wastes and the accumulation of the blue patches suggested the potential filter function of a sandy loam material due to colloidal transport of the ferric ferricyanide. Series of batch and column experiments, using sandy loam soil, revealed reduction of CN concentration due to mechanical filtration of precipitated solid iron-cyanide complexes and due to the formation of potassium manganese iron-cyanide (K2Mn[Fe(CN)6]).