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Metal Binding by Humic Acids

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Beamline: X18B

Introduction: Humic acids (HAs), the brown biomaterials in sediments, soils and waters, selectively bind plant nutrients such as Fe, Ca, Zn and Mn, and toxins such as Cd and Hg. Recent thermodynamic studies of metal binding by solid HAs from different countries indicate that selective metal binding is due to different capacities and affinities of HAs for different metals. Thermodynamic studies give no information on the structures of the different binding sites, which are needed to understand metal binding and release in natural systems. This XAFS study of solid HA-bound metals at different temperatures may detect different binding modes and will set the standard for future work on HA-metal binding.

Methods and Materials: X-ray absorption by the solid products is measured by fluorescence at the respective metal edges at beamline X18B at several temperatures from 300 K to 60K with partially and fully loaded HA samples.

Results: There are different sites for metal binding, depending on the HA and metal.
The data show different metal binding sites and structures.