

Ni SPECIATION IN A HUMIC ACID-KAOLINITE SYSTEM

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Partitioning reactions at the solid-water interface control the fate, bioavailability and mobility of trace metals in soils. Whereas much is known about metal sorption mechanisms on individual soil components (i.e. clay minerals, oxides and SOM), very few studies have been conducted on metal sorption to clay mineral-oxide-humus associations.¹ Recent time-resolved extended x-ray absorption fine structure spectroscopy (EXAFS) studies have shown that surface precipitation is an important sorption mechanism for some of the first row transition metals like Ni, Co or Zn on clay minerals and Al oxides under ambient soil conditions.² These surface precipitates show a dramatic stabilization over time in the model systems studied and thus may lead to an important long-term removal of the metal from solution. The objective of this work was to study the competing effects of SOM on metal surface precipitation processes. We performed kinetic sorption and desorption experiments of Ni to a kaolinite-humic acid complex (containing both 1 and 5 wt% HA). Selected samples were retained for EXAFS and diffuse reflectance spectroscopy (DRS) analyses to monitor sorption mechanisms at the mineral surface. Synchrotron based microspectroscopy³ and x-ray absorption near edge structure spectroscopy (XANES) studies will be used to describe interactions of humic acids with kaolinite and Ni. Ni sorption by kaolinite was found to be enhanced with increasing presence of HA. EXAFS and DRS studies indicate the formation of surface precipitates on the kaolinite surface, even in the presence of 5 wt% HA. More work to establish the identity of the reactive sites involved with metal/mineral binding using micro-XANES is being carried out and will be discussed.

References

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