Goldschmidt2017 Abstract

Macroscopic and microscopic study of the retention of contaminants by organo-mineral composites

A.OTERO-FARIÑA[1], C. PEACOCK[2], E. MOON[3], J. ANTELO[1], S. FIOL[1]

[1]University de Santiago de Compostela, Santiago de Compostela 15782, Spain. (*correspondence: alba.otero.farina@rai.usc.es)
[2]University of Leeds, Leeds LS2 9JT, UK.
[3]Southern Cross GeoScience (SCGS) Lismore, QLD, Australia.

Nanosize colloidal particles present in soil and aquatic systems, such as natural organic matter (NOM) and iron (hydr)oxides, can interact via different mechanisms and control the retention, bioavailability, and bioaccumulation of trace elements. Copper is considered an environmentally relevant inorganic pollutant involved in processes related to soil and water contamination. The study of the reactions between copper and different organo-mineral surfaces is important to understand its behaviour in natural systems.

Different organo-mineral composites were synthesized using iron (hydr)oxides (goethite and ferrihydrite) and NOM (humic acid and bacteria *Bacillus Subtilis)*. The adsorption of Cu to goethite, ferrihydrite and to the different organo-mineral composites was studied as a function of pH and % C. Cu uptake on these composites is the result of adsorption to both the mineral and organic fractions. The obtained results reveal that the presence of organic matter is an important factor capable of enhancing the adsorption of inorganic cationic contaminants, whereas the nature of the organic matter present in the composites seems to have little effect in this process. EXAFS was used to obtain a deeper knowledge on the interaction between the organic and the mineral phases with Cu. It was then possible to use a molecular-level surface complexation model to describe Cu adsorption on the different systems. By comparing observed Cu adsorption to that predicted by the composite model, it is possible to predict if the sorption behaviour can be explained with an additive approach. The results thus obtained, in combination with previous work on Cu sorption to bacteria, humic substances and iron (hydr)oxides coated with humics, demonstrate the importance of the carboxyl group for metal sorption and mobility in natural environments.