MECHANISMS OF ADSORPTION/DESORPTION REACTIONS OF HUMIC ACID WITH ALUMINUM OXIDE

Z. Z. Zhang*, Jigang Wu and D. L. Sparks, Department of PLant and Soil Sciences, University of Delaware, Newark, DE 19717

The surfaces of solid surfaces in natural aqueous systems are generally coated with some type of natural organic materials. The organic coating play an important role in reacting with trace metals in natural waters (1). Several researchers have studied the sorption reactions of humic substances on aluminum and iron oxides (2-4), but there is still a lack of understanding in the reaction mechanisms, and furthermore, the reversibility of the reaction and the extent of desorption still remain unknown.

The adsorption/desorption reactions of humic acid (HA) with aluminum oxide were examined in our study. Adsorption/desorption isotherms at several pH levels were determined using UV spectroscopy. The proton stoichiometry of the sorption reactions was determined by measuring the standard HCl solution consumed to maintain constant pH during batch sorption experiments and titration of aluminum oxide suspension with HA.

We found that the sorption reactions of HA with aluminum oxide involve two types of mechanisms. At low HA concentrations, specific adsorption of HA molecules through ligand exchange dominates, the reaction can be described by Langmuir equation. With increasing surface coverage, the adsorbed HA molecules also act as a partition medium. The partition mechanism is important at higher concentrations of HA. The adsorption reactions appear to be reversible, especially at higher concentrations of HA when the partition mechanisms are important.

References

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