

**Advances in Understanding the Mechanisms and Rates of Sorption
Phenomena for Inorganic Solutes in Soils**

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The reversibility of ion partitioning to soil components can change with time due to transformations in the structure of the sorption complex. This can significantly influence the mobility and bioavailability of contaminants and nutrients in the soil environment. In order to accurately model inorganic ion fate and transport in soils, one must understand the mechanisms and rates of these time-dependent chemical transformations. We will provide an overview of spectroscopic methods that can be employed to determine the speciation of inorganic ions sorbed to soil components. Examples will be provided to illustrate how determination of the microscopic sorption complex structure at the mineral/water interface can provide a rational explanation for observed changes in sorption reversibility. The rates of these microscopic processes will be discussed in the context of modeling solute fate and transport in soil systems.

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