Modelling of the mobility of metallic pollutants in the environment

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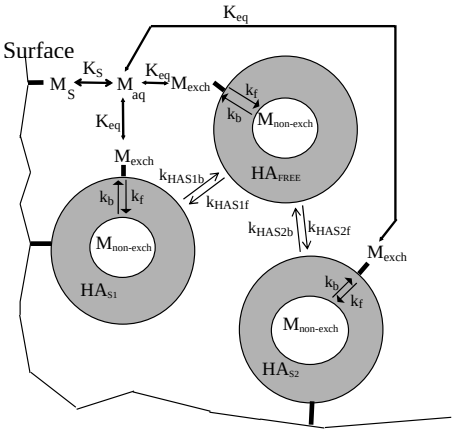
Humic substances control the behaviour of metal ions in the environment. They bind metal ions in two fractions, 'exchangeable' and 'non-exchangeable'. Metal bound in the 'non-exchangeable' is unavailable for interaction with mineral surfaces, and so will have increased environmental mobility.

There have been extensive studies of metal ion-humic binary interactions. However, to predict accurately the mobility of metallic pollutants in the environment, the ternary system where the mineral component is included must be studied.

Ternary systems have been studied experimentally, and the data used to develop a model that predicts the interactions of ternary systems (metal/humic/surface), the surfaces are quartz, goethite or magnetite and the metal is Eu^{3+}.

It was found that the interaction of humic acid with the quartz surface required only one kinetic component, however for both the goethite and magnetite surfaces, two kinetic components, one slow, and one fast were required. The interaction between metal ion and humic acid is described using two components. Initial uptake to the 'exchangable' fraction is instantaneous and described using an equilibrium constant, with subsequent first order kinetic (slow) transfer to a 'non-exchangeable' fraction. The interaction of the metal ions with the surface can be described with a single equilibrium constant. To model the ternary system, metal/humic complexes, interacting with the surface must be included. It has been assumed in the model that metal ion/humic interactions on the surface, are the same as metal ion/humic interactions in solution.



System of processes used to model the ternary system