

Adsorption behavior of molybdenum on ferrihydrite :dynamics analysis of Mo in Erdenet river, Mongolia

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Changes of molybdenum concentration in rivers in the Erdenet region of Mongolia may be caused by the adsorption and desorption reactions of molybdenum on ferrihydrite. In this study, we conducted molybdenum adsorption experiments on ferrihydrite and constructed the predictive model which can predict the adsorption behaviors of molybdenum by surface complex modeling. The result of the adsorption experiment showed that the adsorption was almost complete up to pH 7 at acidic condition, but desorption over pH 7, and almost completely desorbed at pH 10. The adsorption data was parameterized using an extended triple layer model, a submodel of surface complex modeling. We used one outer sphere complex ($>\text{SOH}_2^+ \text{HMoO}_4^-$) and two inner sphere complexes ($>\text{S}(\text{OH})_2\text{MoO}_3(\text{H}_2\text{O})$, $>\text{S}(\text{OH})_2\text{MoO}_3\text{OH}^-$). These complexes were consistent with spectroscopic results of molybdenum adsorption on ferrihydrite. The distribution coefficient K_d was calculated to compare with the measured value observed in the river-sediment system in Erdenet area. The comparison showed that the trends of the change of the observation can be captured by the theoretical model. This study suggests that the environmental behavior of molybdenum in rivers in the Erdenet region may be affected by the adsorption/desorption of molybdenum by ferrihydrite.

Keywords: molybdenum, ferrihydrite, surface complexation modeling