Arsenic binding mechanisms on natural red earth: A potential substrate for pollution control

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Abstract

Natural red earth (hereafter NRE) was used as a novel adsorbent to examine its retention behaviour in different inorganic arsenic species (As (III) and As (V)) that are abundant in natural water. Adsorption isotherms were constructed at pH ~5.5 for As(III) and As(V) in 0.01 M $NaNO_3$ at 298K for 5 g/L NRE system. The initial arsenic [As(III) or As(V)] concentrations varied between $\sim 10^{-5}$ and $\sim 10^{-4}$ M. The experimental data were quantified using single site or stepwise Langmuir models. Sorption maximum, was observed at ~0.173 mM of As(V). To reach the maximum surface coverage of red earth at pH ~5.5 As(III) requires ~0.308 mM of initial loading. When compared to As (III), As(V) shows strong affinity for NRE surface sites. This study suggests the potential of NRE as a starting material in decontaminating water polluted with As species.

Keywords: Natural Red Earth; Arsenite; Arsenate; Arsenic removal; Surface complexation; Water treatment