

Insights into the crystal and aggregate structure of Fe³⁺ oxide/silica co-precipitates

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ABSTRACT

Structural characteristics of Fe³⁺ oxide/silica co-precipitates were investigated. The association between these materials is relevant to practically all natural aqueous systems due to the prevalence of iron and silicon in the Earth's crust. Crystallographic information is very difficult to obtain from these precipitates due to the nanocrystalline nature of ferrihydrite and the amorphous structure of precipitated silica. Several previously undetermined key insights were gained into the structure of iron oxide/silica co-precipitates through this examination. The distribution of iron and silicon throughout co-precipitate particles is illustrated along with the influence of their association. Evidence to the governing factor behind differences in apparent crystallinity is also presented. This information culminates in the formulation of a precipitation pathway, displaying the formation of the co-precipitates.

Keywords: Ferrihydrite, silica, co-precipitation, pair distribution function