

## **Citrate-promoted dissolution of Yb-incorporated goethite**

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Rare earth elements (REEs) are critical for numerous modern technologies, including energy storage and generation, and there is consequently an increasing global demand for REE production. Weathering results in the release and migration of REEs, which then accumulate associated with secondary clay and iron (oxyhydr)oxide minerals in economically viable ion adsorption deposits (IADs). Given source rock chemistry, local climate, and tectonic settings, the fundamental geochemical processes that control the migration and potential enrichment of REEs during weathering may vary greatly. Of particular interest is the role of environmentally relevant organic ligands, such as citrate, that strongly complex REEs. To this end, we have investigated the role of iron (oxyhydr)oxides and organic ligands in controlling the migration and enrichment of the recalcitrant fraction of REEs in IADs. Here, we present results on the citrate-promoted dissolution of Yb-incorporated goethite. To simulate environmentally relevant conditions, Yb-goethite was reacted with solutions at pH 4 (within the typical range for the pedolith associated with IADs) containing 0 - 1 mM citric acid in a continuous-flow stirred tank reactor (CFSTR). By quantifying the aqueous Fe and aqueous Yb in the reactor effluent, we were able to quantify the goethite dissolution rate and probe the stoichiometry of REE release from the goethite. In particular, preliminary results showed a labile near-surface Yb fraction. Acid extraction steps of the remaining Yb-goethite were also performed to determine the fate of released Yb, including any possible re-incorporation or adsorption during the citrate-promoted dissolution reaction. Overall, this study provides further insight into the behaviour of REEs in weathering environments.