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How saline conditions affect the (ad)sorption behavior of manganese onto iron oxide surfaces

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Iron oxides, a strong environmental oxidant, are naturally found in sand and soil and can form reactive surface coatings on mineral surfaces [1]. The highly reactive surface can sequester trace metal contaminants found in aqueous systems from sources such as volcanic eruptions, weathering, and anthropogenic activity. The dissolution of Mn oxides contributes to the increase of trace metal contaminants in water sources and leaves a negative impact on human health and the ecosystem [2]. Therefore, it becomes of high interest to investigate the chemical properties of iron oxide coatings to predict aqueous Mn adsorption and Mn oxide precipitation behavior in environmentally relevant conditions such as salinity. Despite existing studies on different aqueous conditions, the effect of saline environments manganese adsorption onto iron oxides is yet to be known. This work presents a novel procedure based on work by Schwetmann and Cornell towards the solid synthesis of goethite, commonly occurring iron oxide, and goethite-coated sand [3]. To determine the amount of Mn uptake by iron oxide surfaces and differentiate between precipitation and sorption occurrences, the absorption experiments were done in both oxic and anoxic environments. To simulate a saline environment, the concentrations of NaCl were adjusted, ranging from 0.0 to 1.0M. Current results show that the amount of Mn uptake by goethite correlates with the concentration of NaCl in the oxic aqueous solution, indicating that saline environments promote Mn uptake. At 1.0M NaCl, beyond seawater salinity, Mn uptake reaches its peak at about 61%, while at freshwater salt content, only 15% of Mn uptake is observed, that saline condition is more ideal for Mn removal compared to a freshwater environment.

[1] Namgung, S. et al. Macroscopic and Microscopic Behaviors of Mn(II) (Ad)Sorption to Goethite with the Effects of Dissolved Carbonates under Anoxic Conditions. 2020

[2] Rudi, N., et. al. Evolution of adsorption process for manganese removal in water via agricultural waste adsorbents. *National Library of Medicine*, 2020

[3] Schwertmann, U.; Cornell, R. M. Iron Oxides in the Laboratory: Preparation and Characterization; *John Wiley & Sons*, 2008.