

## **Zn(II) and Cu(II) adsorption and retention onto iron oxyhydroxide nanoparticles: effects of chloride and sulfate**

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Nanoscale iron oxyhydroxides, which are frequently found in aqueous environments, can act as effective sorbents for dissolved metals because of their small size, high surface area, and natural reactivity, making them a relevant option for the remediation of contaminated waters. However, they aggregate under natural geochemical conditions, such as changes in ionic strength, pH, and temperature, thus affecting their metal sorption capabilities. Environmental changes following metal uptake can also impact metal retention, such as the increase in salinity associated with the migration from fresh water to seawater.

Synthetic iron oxyhydroxide particles are used in batch macroscopic zinc and copper uptake experiments, mimicking the transition from fresh water to seawater by increasing the environmental ionic strength following initial metal uptake. Chloride studies, which utilized concentrations of 0.1 M, 0.4 M, and 0.6 M chloride, improved zinc retention as the chloride concentration increased following a decrease in retention at 0.1 M chloride, and seemed to best support copper retention at 0.4M environmental chloride. Zinc retention behavior is likely explained by the formation of ternary surface complexes at higher chloride concentrations, and copper retention behavior is likely due to indirect interactions between sorbed copper and aqueous chloride.

The experiment will be repeated with sodium sulfate, using concentrations of 0.01 M, 0.02 M, and 0.03 M, as well as with both sodium chloride and sodium sulfate to investigate their effects on metal retention together as well as individually. Based on previous work [1, 2] we expect sulfate to form ternary surface complexes and stabilize sorbed zinc and copper.

[1] EXAFS study of Hg(II) sorption to Fe- and Al- (hydr)-oxide surfaces: II. Effects of chloride and sulfate, Kim, Rytuba, & Brown (2004), *Journal of colloid and interface science* 270 (1), 9-20 [2] Goethite adsorption of Cu(II), Pb(II), Cd(II), and Zn(II) in the presence of sulfate: Properties of the ternary complex, Swedlund, Webster, & Miskelly (2009), *Geochimica Et Cosmochimica Acta* 73 (6), 1548-1562