

## **OXIDATION STATUS OF SUBSOIL CLAY DURING Fe(II) SORPTION ALTERS THE COMPOSITION OF PRECIPITATED Fe(II)-BEARING LAYERED DOUBLE HYDROXIDES**

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Reduction and oxidation reactions common to flooded soils can greatly affect iron (Fe) cycling and cause complex Fe dissolution and sorption processes. In suboxic, slightly alkaline (pH 7-8) conditions, dissolved ferrous iron (Fe(II)) will sorb to soils and clays and can coprecipitate as layered double hydroxides (LDH), which have unique properties that make them highly reactive sorbents. The LDH sheet structure makes them important anionic sorbents and the Fe(II) acts as an abiotic reducing agent for many inorganic and organic contaminants. However, the cation and Fe(II) content can greatly alter particle size, sorption and reductive ability so it is important to know how environmental conditions will affect the LDH composition. One such condition is the redox status of the clay as Fe(III) within clays can transfer electrons to sorbed Fe(II) and increase the Fe(III) content of the LDH. It is our goal to determine the effects of sorption conditions on the composition and reactivity of Fe(II) LDH precipitates following Fe(II) sorption to the clay minerals and advance the understanding of Fe(II) LDHs in natural systems.

Clay minerals were isolated from the Ap and Bt horizons of a Matapeake silt loam in Newark, Delaware. Sorption of Fe(II) to these clay minerals was studied as a function of pH (6.5-7.5), reaction time (2 hours-16 weeks), loading of Fe(II)(aq) (0.5-3 mM) and with dithionite-reduced or natural clay in sorption experiments. Sorption products were characterized by X-ray absorption spectroscopy, X-ray diffraction (XRD), Fe<sup>57</sup> Mössbauer spectroscopy, and microscopy. Our findings have the potential to advance the understanding of Fe(II) cycling in soils and sediments which influence the fate and transport of a variety of trace metals and clay minerals via both redox and sorption reactions.