

## Do iron oxyhydroxide surfaces impact natural organic matter stability?

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Iron oxyhydroxides are of widespread occurrence in soils and sediments. As they are particularly strong sorbents for natural organic matter (NOM) they can play critical roles for organic carbon (C) storage in terrestrial environments, and therefore strongly impact global C cycling. Surface loadings and properties of NOM associated to iron oxyhydroxide surfaces can however vary widely depending on the biogeochemical history of an environment. In this study we tested the important question of whether NOM stability is affected when complexed to iron oxyhydroxides.

Bog water NOM were reacted with aqueous suspensions of synthetic goethite particles (69 m<sup>2</sup>/g) at C/Fe (w/w) ratios of 0.01-3.91 at pH 3, 4 and 6. The thermal stabilities of the resulting NOM-goethite samples were then studied *in vacuo* by temperature programmed desorption-Fourier transform infrared spectroscopy (TPD-FTIR). Vibrational attributes of the samples were monitored in tandem with thermally driven desorption of gases (*e.g.* CO<sub>2</sub>, H<sub>2</sub>O) by mass spectrometry.

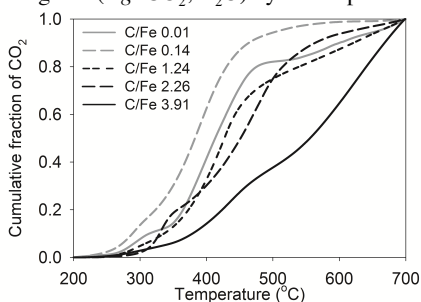


Figure 1 TPD results of net NOM sorbed on goethite at pH 4.

NOM loadings achieved at goethite surfaces lied in the 0.1-4.4 mgC/m<sup>2</sup> range. TPD results showed that decomposition temperatures relative to dry NOM were lowered at C/Fe ≤ 0.14 but increased at C/Fe > 0.14 (Figure 1). FTIR measurements revealed complex changes in the bonding environment of the NOM during TPD. The data suggest that low C/Fe loadings destabilize NOM stability by disrupting the otherwise inherent hydrogen bonding network of this compound. Higher C/Fe loadings regain the intrinsic NOM stability as goethite-NOM interactions become minor features of the bonding environment of this assemblage.