

## **Ligand-controlled Fe(hydr)oxide dissolution catalyzed by electron transfer**

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Exudation of iron specific ligands promoting the dissolution of Fe(hydr)oxide minerals is a key process in biological Fe acquisition. Co-exudation of organic reductants by plants and microorganisms under such conditions has also been observed. We have demonstrated that this can lead to synergistic effects between reductive dissolution and ligand-controlled dissolution. However the reductive mechanism accelerating ligand-controlled dissolution has not been elucidated so far.

In this study we determined dissolution rates for several Fe(hydr)oxide minerals (goethite, hematite and lepidocrocite) in batch experiments under anoxic conditions over an environmentally relevant pH-range. Fe(II) concentrations were varied and two organic ligands, DFOB (the microbial siderophore desferrioxamine B) or HBED (the synthetic ligand N,N'-di(2-hydroxybenzyl)ethylenediamine-N,N'-diacetic acid) were tested. We observed that addition of Fe(II) leads to a catalytic effect on ligand-controlled dissolution that required only sub-micromolar Fe(II) concentrations. This effect was observed, to varying extents, for all Fe(hydr)oxides under investigation. It was found over the complete pH range, but was strongest at circumneutral pH where Fe deficiency in plants and microorganisms is most common.