

Ferrihydrite mineral transformations in the presence of Fe(II) and organic ligands

Laurel ThomasArrigo

Ruben Kretzschmar

Soil Chemistry Group

Institute of Biogeochemistry and Pollutant Dynamics

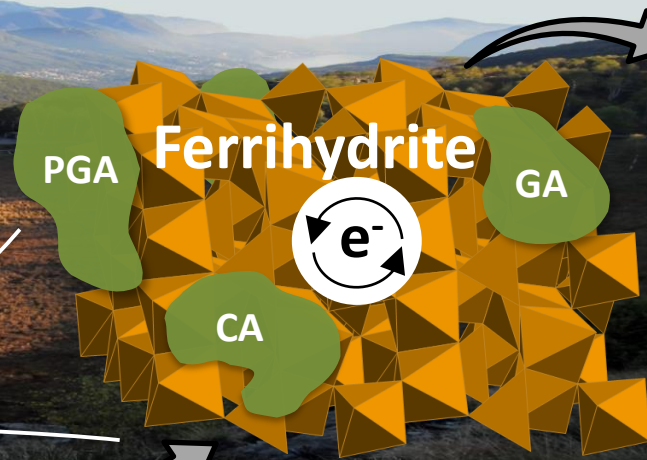
ETH Zurich, Switzerland

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$^{57}\text{Fe(II)}$

$^{56}\text{Fe(II)}$



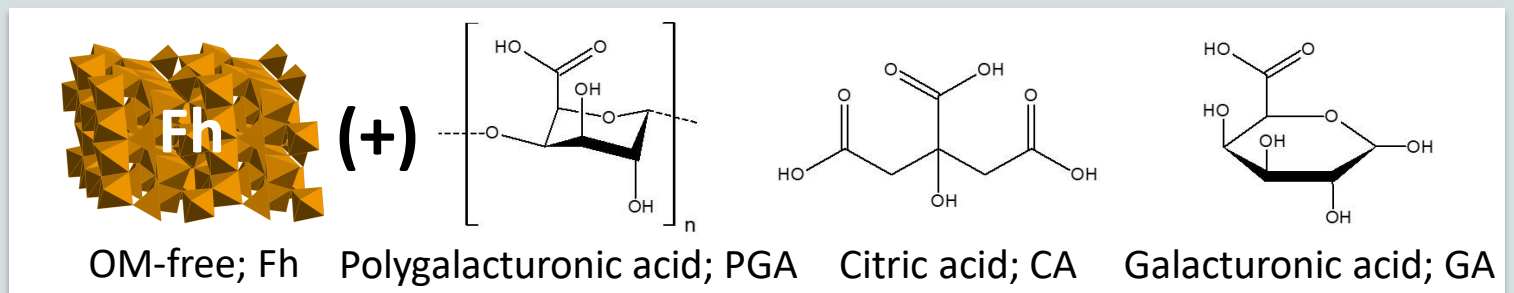
Laurel.Thomas@usys.ethz.ch

Motivation:

Ferrihydrite, a poorly-crystalline Fe(III)-oxyhydroxide, is an important sorbent for nutrients and trace metal(loid)s in soil and sediments. In nature, ferrihydrite often forms in the presence of OM, however the stability of OM-associated Fh during biogeochemical redox processes is not clear.

Conditions:

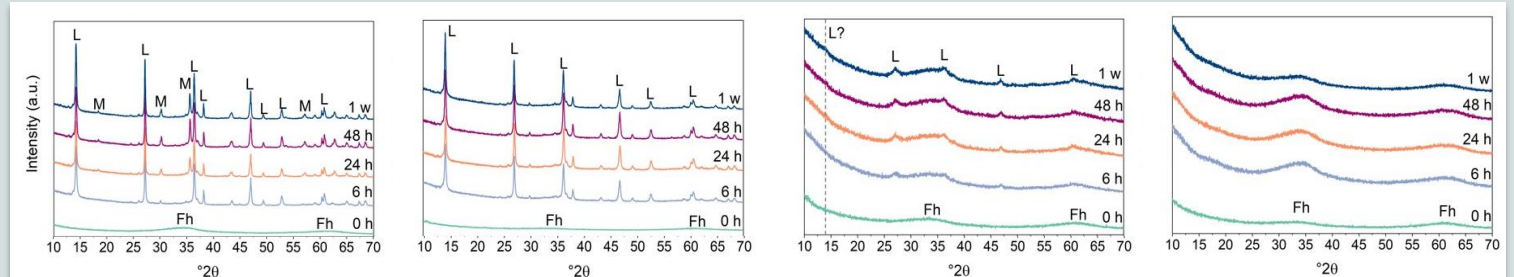
Anoxic batch study
Fh-OM coprecipitates
C/Fe mol ratio = 0.6
10 mM Fe(III) in Fh
+ 1 mM Fe(II)
pH=7, 1 week



Results: XRD

OM hinders transformation

No transformation with GA

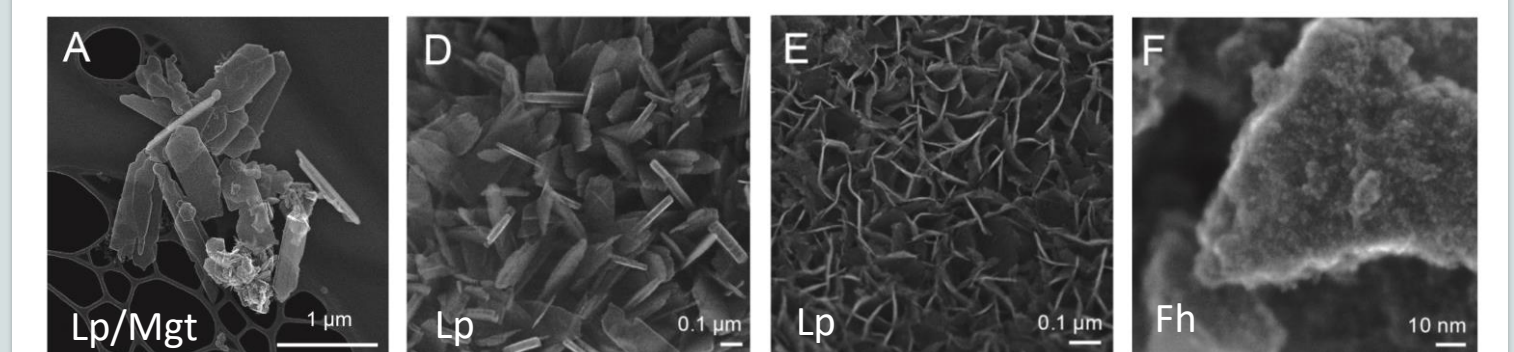


SEM (1 week)

Confirms high Lp fractions

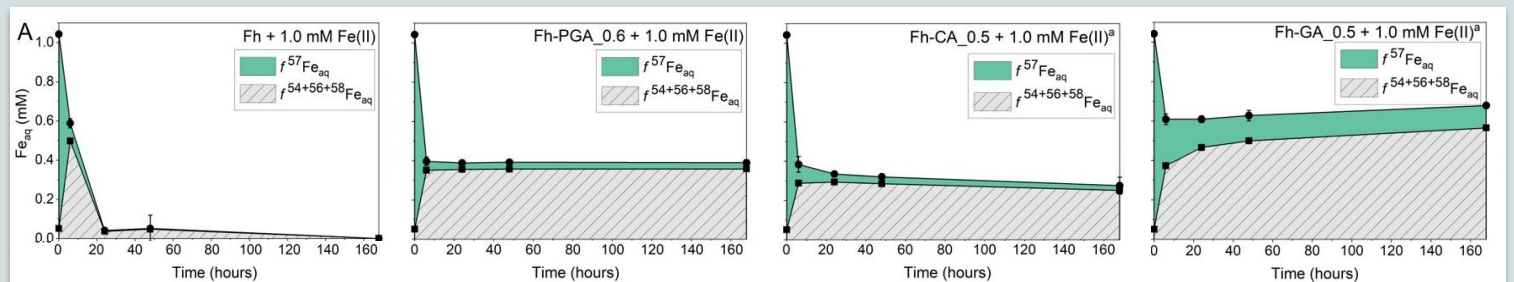
Lp size: Fh >>> PGA > CA

No transformation with GA



Atom exchange

All coprecipitates active in iron atom exchange



Conclusions:

Ferrihydrite-OM coprecipitates are dynamic phases; partaking in iron atom exchange

The presence of OM hinders crystalline mineral formation;

Secondary phase morphology depends on chemical structure of ligand:

Molecular weight (PGA >>> CA = GA), Carboxyl groups (PGA >>> CA > GA)

Fe(II)-induced release of Fh-sorbed constituents may be less in the presence of OM

ETH

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

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Ralf Kaegi (EAWAG) is recognized as co-author of this publication.