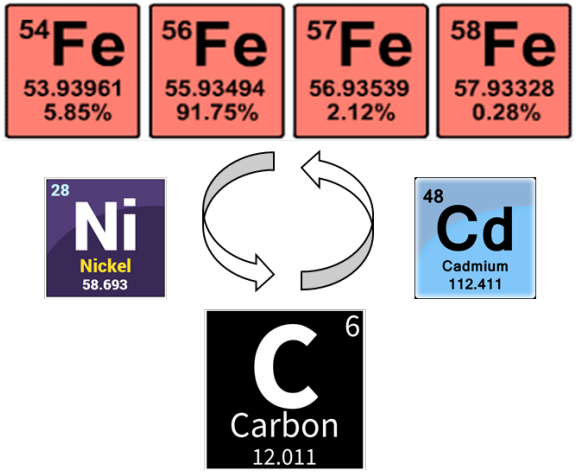
EBERHARD KARLS
UNIVERSITÄT
TÜBINGEN

CENTER FOR APPLIED
GEOSCIENCE (ZAG)

GEO MICRO BIOLOGY
Tübingen

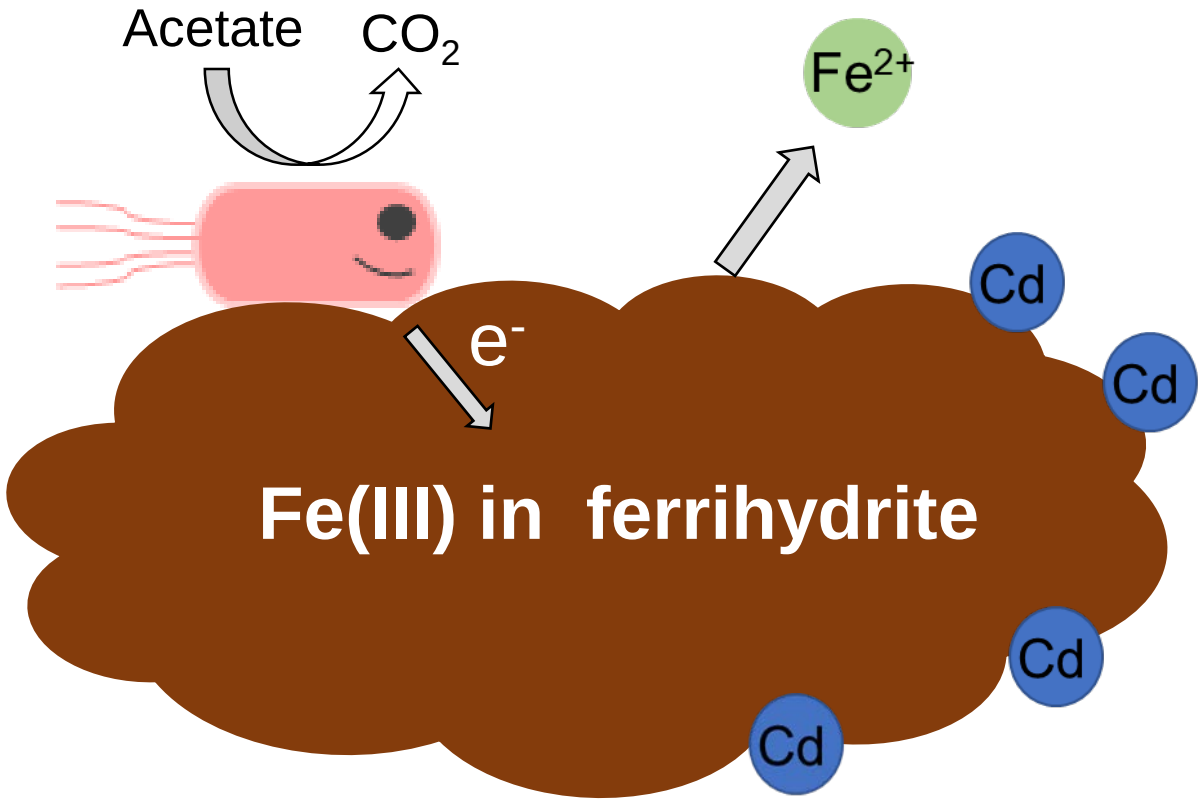


Influence of natural organic matter on the fate of Cd^{2+} during microbial ferrihydrite reduction

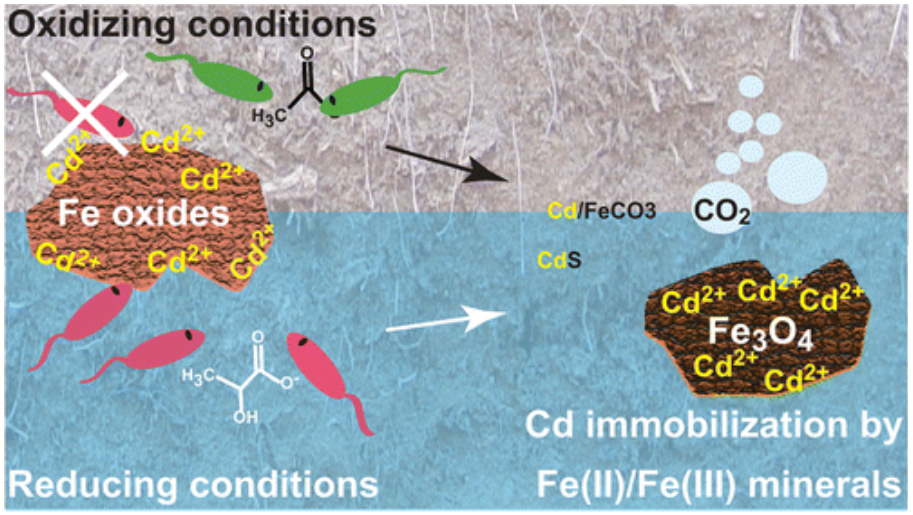
Zhe Zhou, E. Marie Muehe, Elizabeth J. Tomaszewski, Andreas Kappler, James M. Byrne

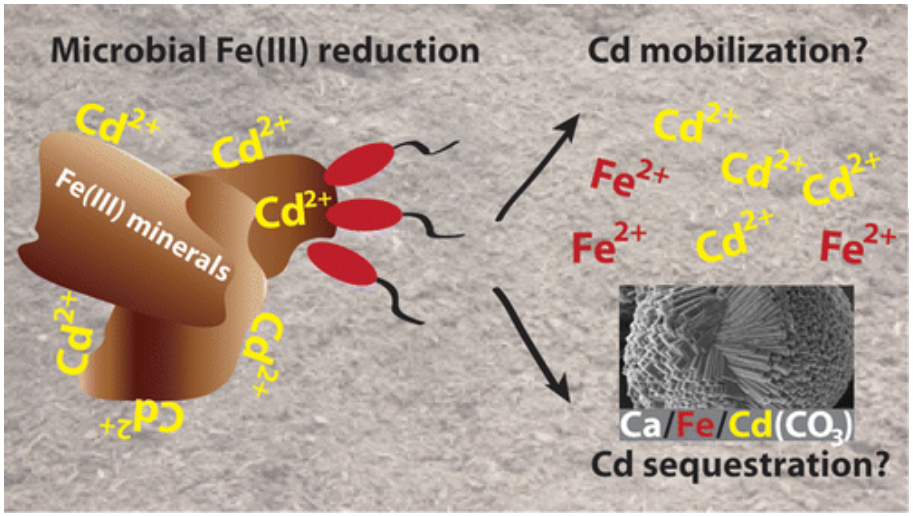
May 2020, Vienna

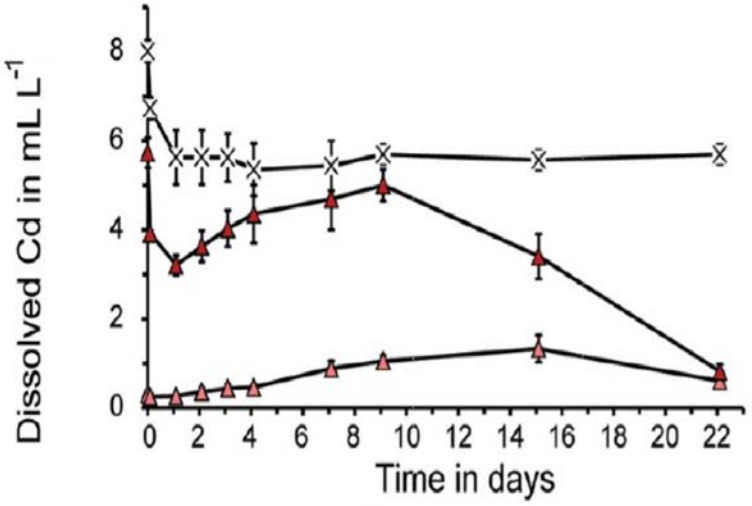
Dissimilatory Fe(III) reduction



Associated Cd was first mobilized and re-immobilized during microbial Fe(III) reduction

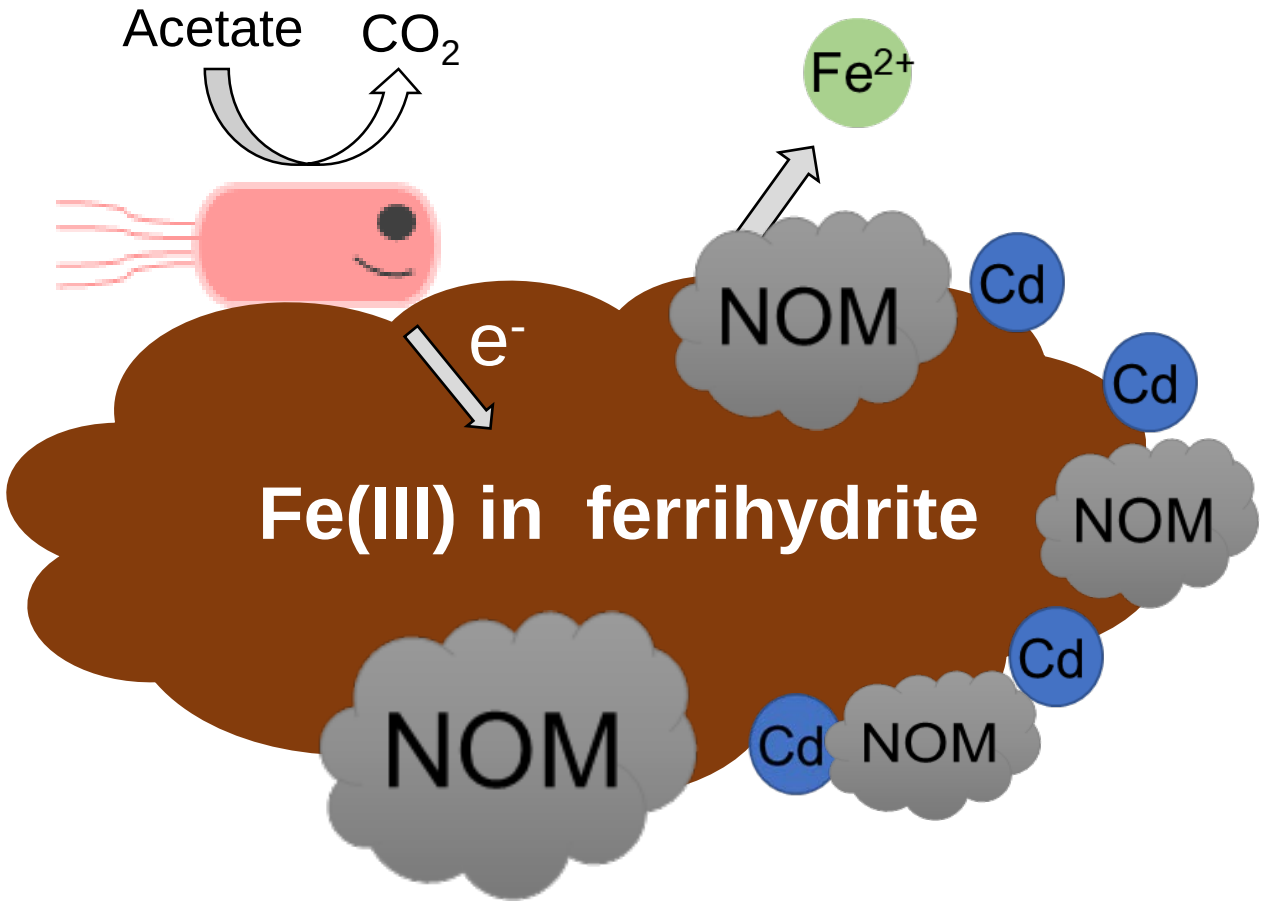






Muehe and Kappler, et al., ES&T, 2013

What is the effect of NOM on Cd fate during microbial Fh reduction?



Experimental set-up

Geobacter Sulfurreducens

Fh + Cd (C/Fe 0)

Fh + Cd + 25 mgC/L NOM (C/Fe 0.2)

Fh + Cd + 100 mgC/L NOM (C/Fe 0.8)

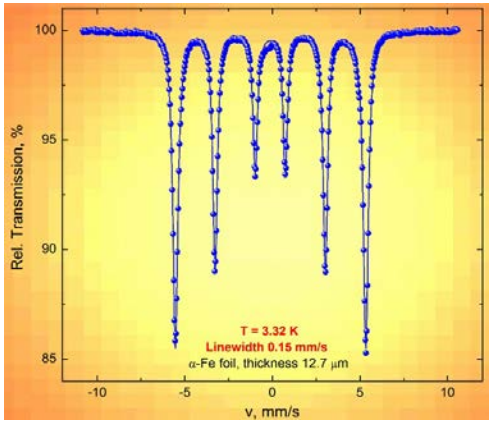
Fh + Cd + 200 mgC/L NOM (C/Fe 1.6)

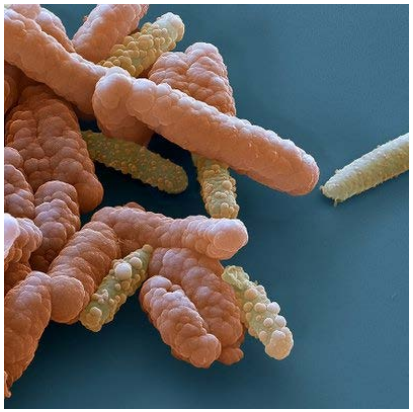
We tracked the following aspects in the set-ups

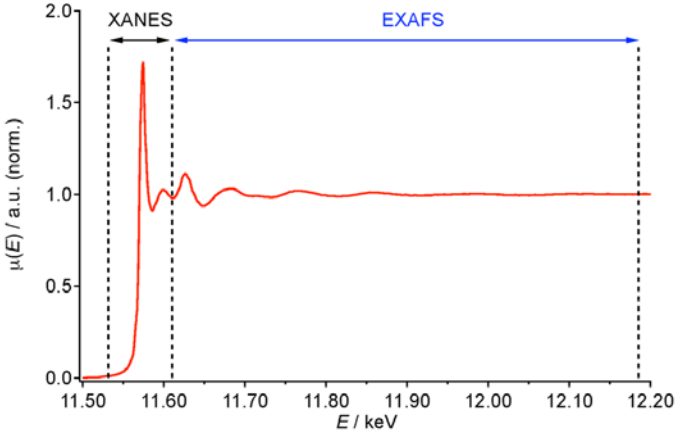
I. Microbial Fe(III) reduction.

II. Fe minerology change (XRD, SEM and Mössbauer spectroscopy).

III. Cd fate during microbial reduction (acid extraction and EXAFS).







Data is not shown as it has not been published

Main take home message

1. NOM enhanced the extent and rate of microbial Cd-ferrihydrite reduction.

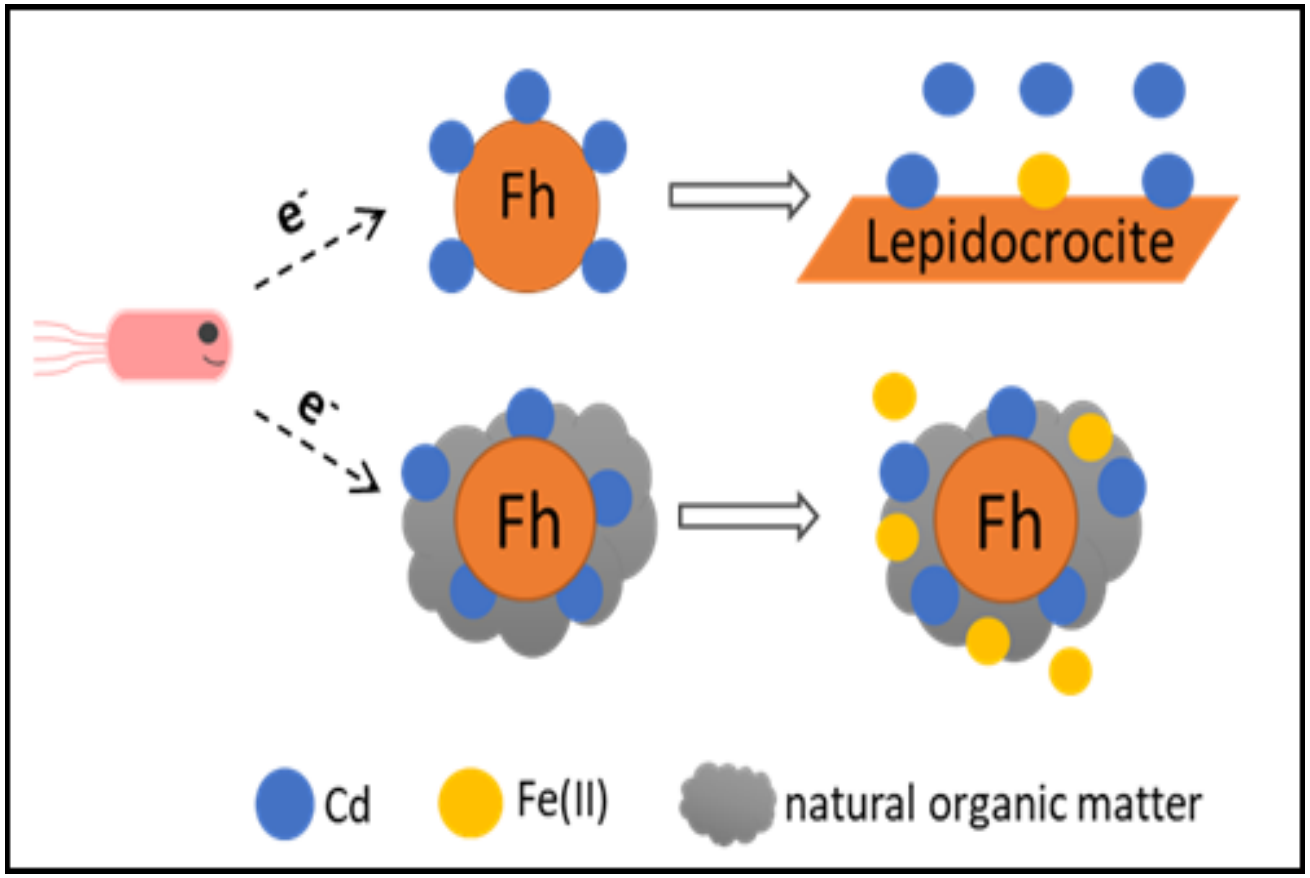
2. Ferrihydrite transformation was inhibited at high C/Fe ratios even though high percent of Fe(III) was reduced.

3. Less pre-adsorbed Cd was released into solution during microbial reduction with the increasing of C/Fe ratios.

4. At high C/Fe ratios, the percent of Cd-ferrihydrite association decreased after microbial reduction, indicates Cd redistribute in the solid phase.

5. NOM can benefit the stability of Cd associated with ferrihydrite under reducing condition by inhibiting ferrihydrite transformation and directly bonding Cd.

Graphic abstract



Acknowledgement

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