

Supplementary Information for
Influence of humic acids on Fe(II)-catalyzed ferrihydrite transformation
and the fate of Cd: Insights from microscopic characterization and stable
Cd isotopes

Bin Liang,^a Fu Liu,^a Qiao-hui Zhong,^b Rongda Yu,^b Jie Li,^b Hui Yin,^c and Zhenqing Shi^{*a}

^a School of Environment and Energy, South China University of Technology, Guangzhou, Guangdong 510006, People's Republic of China

^b Guangzhou Institute of Geochemistry, Chinese Academy of Sciences, Guangzhou, Guangdong 510006, People's Republic of China

^c College of Resources and Environment, Huazhong Agricultural University, Wuhan 430070, People's Republic of China

* Corresponding author: Zhenqing Shi

Email: zqshi@scut.edu.cn

Number of pages: 5

Number of tables: 3

Number of figures: 1

Table S1. The pH values during the Fe(II)-catalyzed ferrihydrite transformation.

	0 h	6 h	12 h	24 h	48 h	72 h	120 h	168 h
Fh+Cd _{experiment}	7.03	7.03	6.97	7.04	6.95	7.05	7.01	7.01
Fh+Cd _{Control 1}	7.03	7.05	7.04	7.01	6.97	6.98	6.95	7.02
Fh+Cd _{Control 2}	7.03	7.01	7.01	7.03	6.99	7.01	6.97	7.04
Fh+HA+Cd _{experiment}	7.02	7.04	7.02	7.05	7.02	6.98	6.97	6.99
Fh+HA+Cd _{Control 1}	7.01	7.06	6.99	7.07	6.99	6.99	6.97	7.01
Fh+HA+Cd _{Control 2}	7.02	7.05	7.01	7.03	7.03	7.01	6.98	7.00

Table S2. The protocol of purifying Cd solution for isotopic measurement ¹.

Column procedure	Eluant	Volume (mL)
AG-MP-1M (100–200 mesh)		1.9
Cleaning	2 M HNO ₃	10
Cleaning	Ultrapure water	3
Conditioning	2 M HCl	10
Loading	2 M HCl	2–3
Matrix removal (Mg, Ca, Nb, Fe, Ga, Ge, Ag, Zr, etc.)	2 M HCl	8
Matrix removal (Sn, Mo, and In)	2 M HCl + 4 M HF	16
Matrix removal (Zn)	0.05 M HCl	16
Matrix removal (residual)	0.04 M HCl + 2 M HF	10
Collecting Cd	0.005 M HCl + 2 M HF	14

Table S3. The proportion of Fe minerals during the Fe(II)-catalyzed ferrihydrite transformation.

	Time (h)	Fh (%)	Lp (%)	Gt (%)	Mt (%)
Fh+Cd	0	100.0	0.0	0.0	0.0
	6	2.2	43.8	54.0	0.0
	12	5.2	34.3	60.4	0.0
	24	2.6	17.8	79.6	0.0
	48	3.9	5.9	90.2	0.0
	72	2.3	0.0	97.7	0.0
	120	2.2	0.0	97.8	0.0
	168	1.2	0.0	96.9	1.9
Fh+HA+Cd	0	100.0	0.0	0.0	0.0
	6	5.6	94.5	0.0	0.0
	12	3.5	96.5	0.0	0.0
	24	4.8	95.2	0.0	0.0
	48	1.1	88.4	10.4	0.0
	72	8.1	77.2	14.7	0.0
	120	8.6	75.4	16.0	0.0
	168	2.4	60.7	36.8	0.0

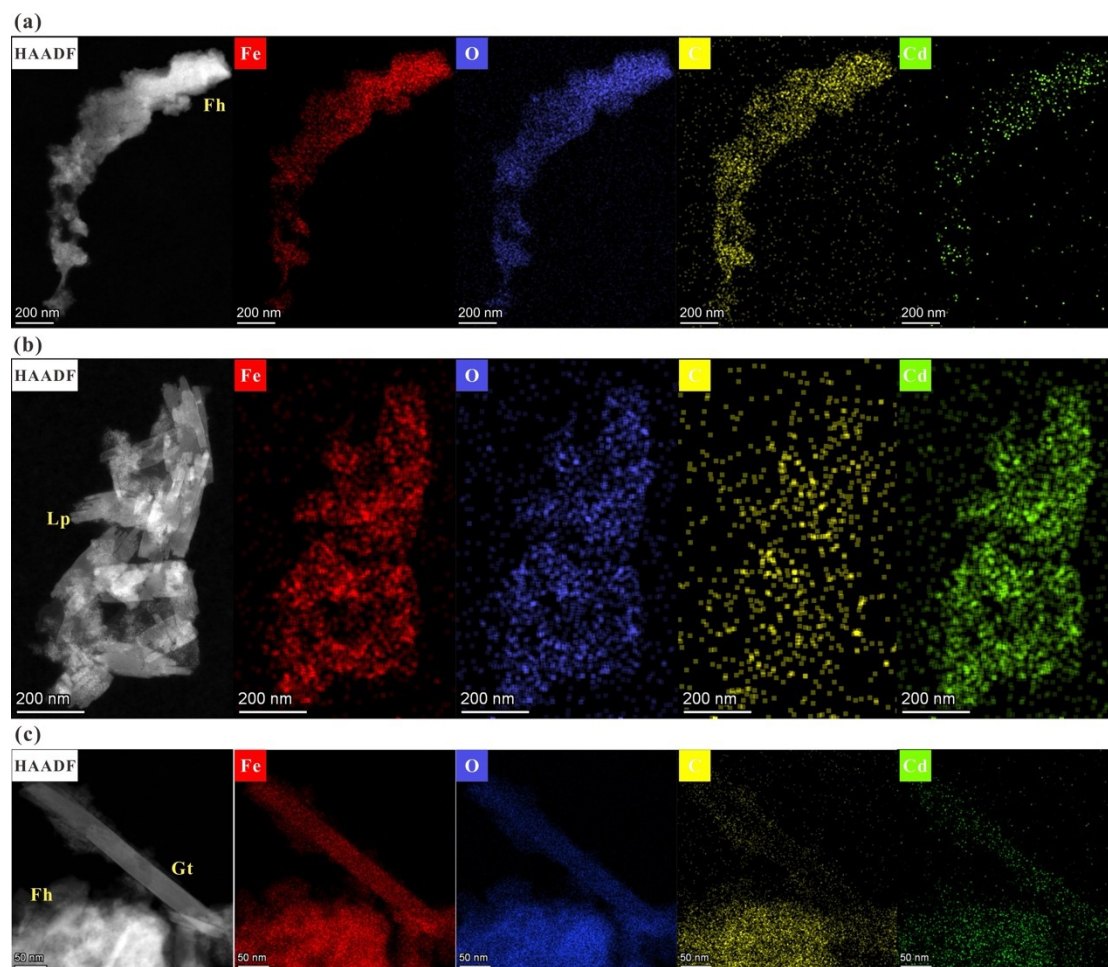


Fig. S1. The HAADF image and EDS mapping for (a) ferrihydrite (Fh, at 0 h), (b) lepidocrocite (Lp, at 168 h), and (c) goethite (Gt, at 168 h) during the transformation of Fh-HA-Cd coprecipitates. Red color: iron (Fe), blue color: oxygen (O), yellow color: carbon (C), green color: cadmium (Cd).

Reference

- 1 Q.-H. Zhong, L. Yin, J. Li, Y.-X. Feng, N.-P. Shen, B.-Y. Peng and Z.-Y. Wang, *J. Anal. At. Spectrom.*, 2023, **38**, 2291–2301.