

Supplementary materials

Insights on Pb(II) retention and immobilization by ferrihydrite in the presence of Al(III) and oxalic acid

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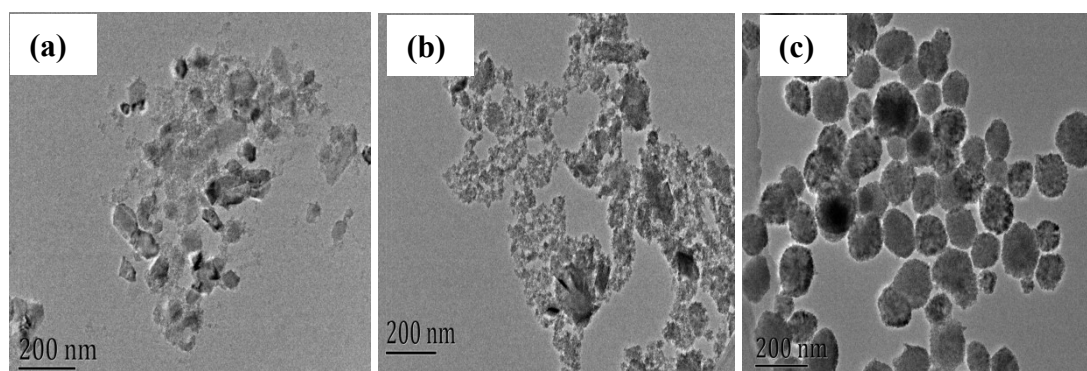


Fig. S1 TEM of (a) Fh-Pb, (b) Fh-Al-Pb in the absence of oxalic acid and (c) Fh-Al-Pb in the presence of oxalic acid after transformation (pH₀ 7.0).

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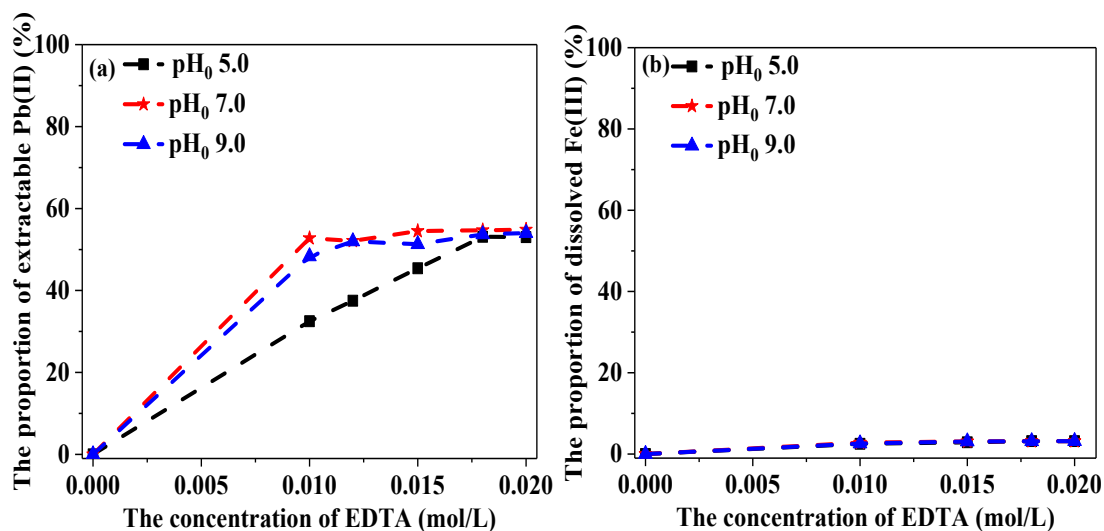


Fig. S2 The proportions of (a) extractable Pb(II) and (b) dissolved Fe(III) under different concentrations of EDTA during Fh-Pb aging.

According to Fig. S2(a), the proportion of extractable Pb(II) increased with the increase of EDTA concentration firstly and reached a stable level after 0.0175 M at all initial pH values. To extract more Pb(II) and reduce the use of EDTA, 0.02 M EDTA was chosen in this study.

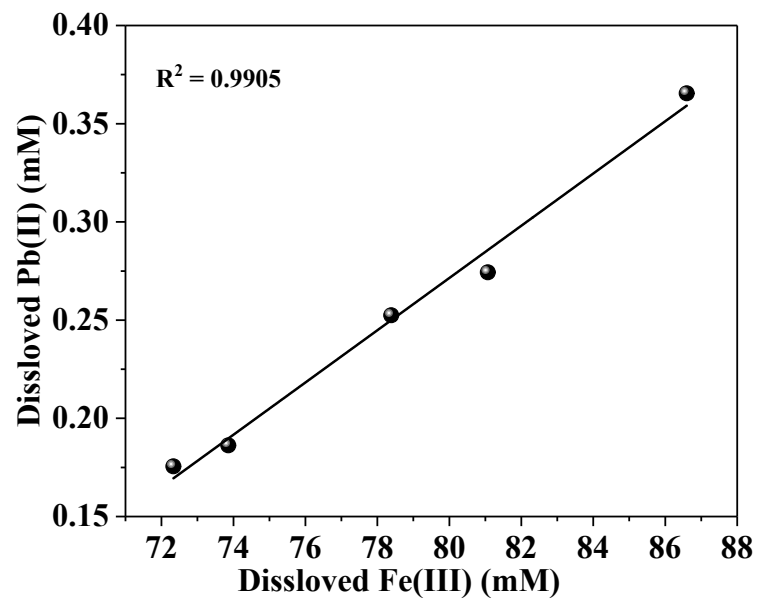


Fig. S3 Linear correlations between total dissolved Pb(II) and total dissolved Fe(III) during transformation of Fh-Al-Pb in the presence of oxalic acid for 120 min.

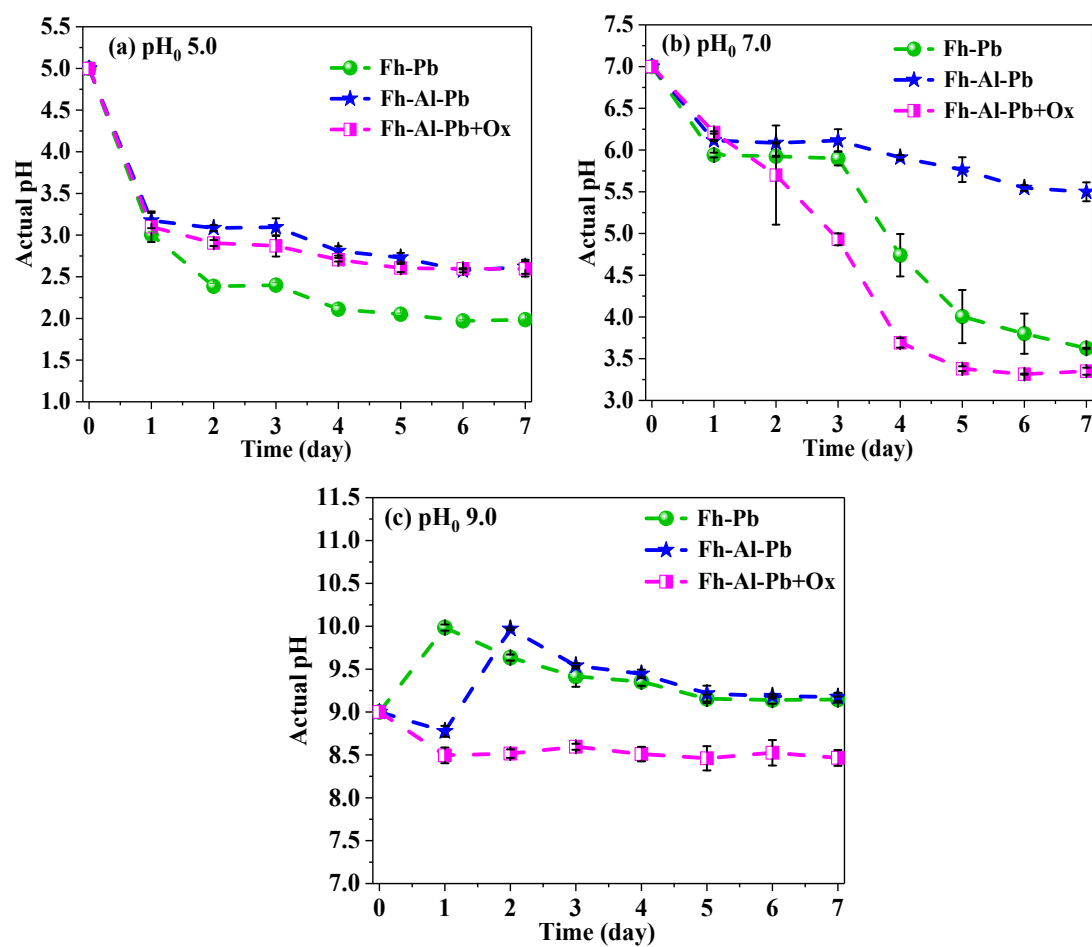


Fig. S4 The changes of pH values in solutions during transformation.

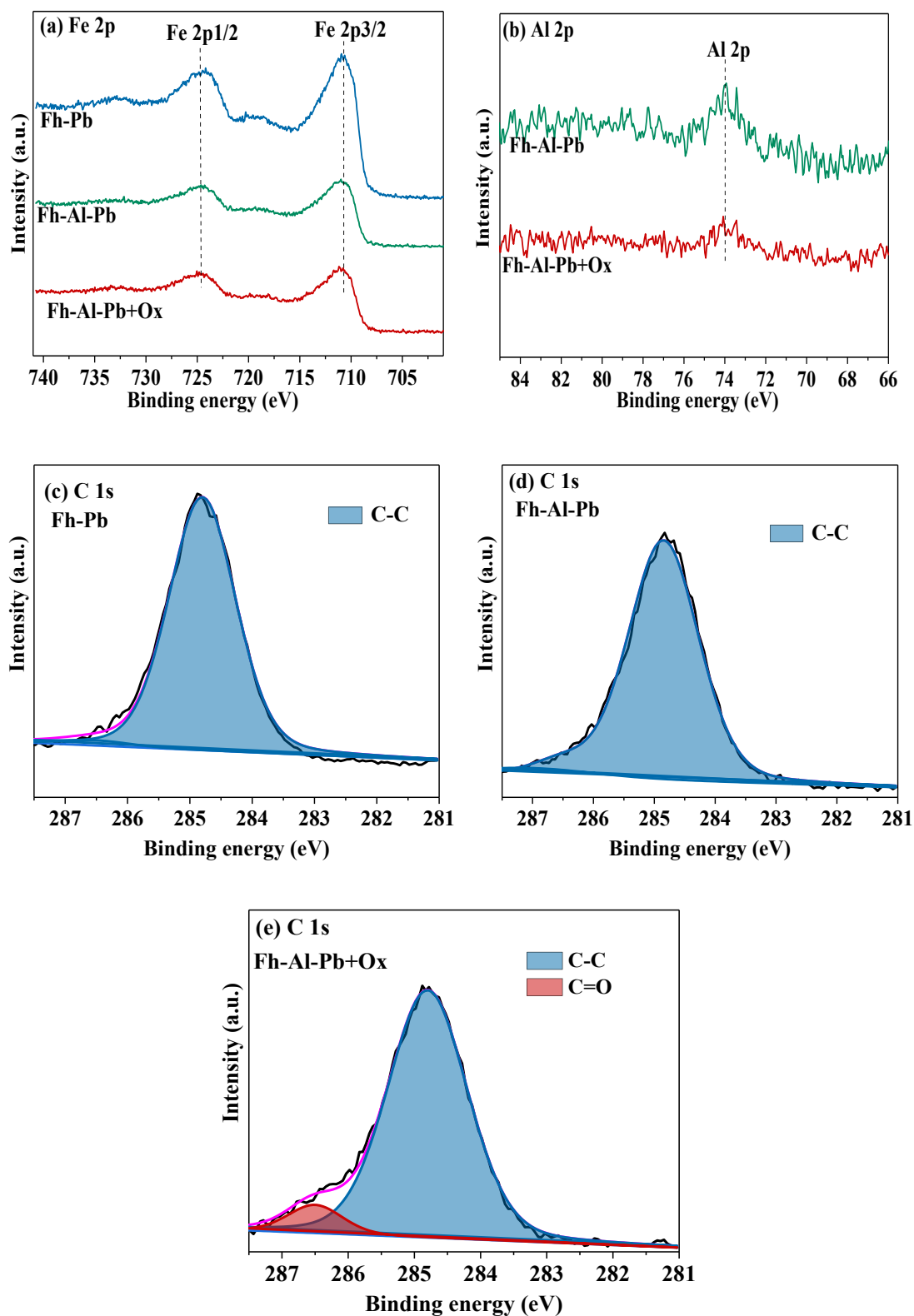


Fig. S5 (a) Fe 2p spectra, (b) Al 2p spectra, (c) C 1s spectra of Fh-Pb, (d) C 1s spectra of Fh-Al-Pb in the absence of oxalic acid and (e) C 1s spectra of Fh-Al-Pb in the presence of oxalic acid.

Table S1 Proportions of the transformation products of Fh-Pb, Fh-Al-Pb and Fh-Al-Pb with oxalic acid at initial pH of 5.0, 7.0 and 9.0.

| Sample | | Fh-Pb | | | Fh-Al-Pb | | | Fh-Al-Pb+Ox | | |
|---|-------|--------------|----------|----------|--------------|----------|----------|--------------|----------|----------|
| Mineral phase pH ₀ | Time | Ferrihydrite | Goethite | Hematite | Ferrihydrite | Goethite | Hematite | Ferrihydrite | Goethite | Hematite |
| | (day) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) |
| 5.0 | 0 | 100.0 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 |
| | 4 | 16.8 | 10.2 | 73.0 | 53.1 | 0.0 | 46.9 | 6.9 | 0.0 | 93.1 |
| | 7 | 3.9 | 9.3 | 86.8 | 17.7 | 0.0 | 82.3 | 1.8 | 0.0 | 98.2 |
| 7.0 | 0 | 100.0 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 |
| | 4 | 22.3 | 34.1 | 43.6 | 99.9 | 0.0 | 0.1 | 2.1 | 0.0 | 97.9 |
| | 7 | 5.1 | 22.1 | 72.8 | 55.9 | 0.0 | 44.1 | 1.8 | 0.0 | 98.2 |
| 9.0 | 0 | 100.0 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 |
| | 4 | 17.8 | 13.0 | 69.2 | 15.8 | 0.0 | 84.2 | 4.7 | 0.0 | 95.3 |
| | 7 | 0.1 | 15.3 | 84.6 | 1.9 | 0.0 | 98.1 | 1.7 | 0.0 | 98.3 |

Table S2 Oxygen-containing functional groups proportion of samples after ageing for 7 days.

| Oxygen-containing functional groups | After aging | | |
|--|-------------|--------------|-----------------|
| | Fh-Pb (%) | Fh-Al-Pb (%) | Fh-Al-Pb+Ox (%) |
| M-O | 43.0 | 45.6 | 46.3 |
| M-OH | 42.0 | 44.4 | 37.5 |
| H ₂ O | 15.0 | 10.0 | 16.2 |