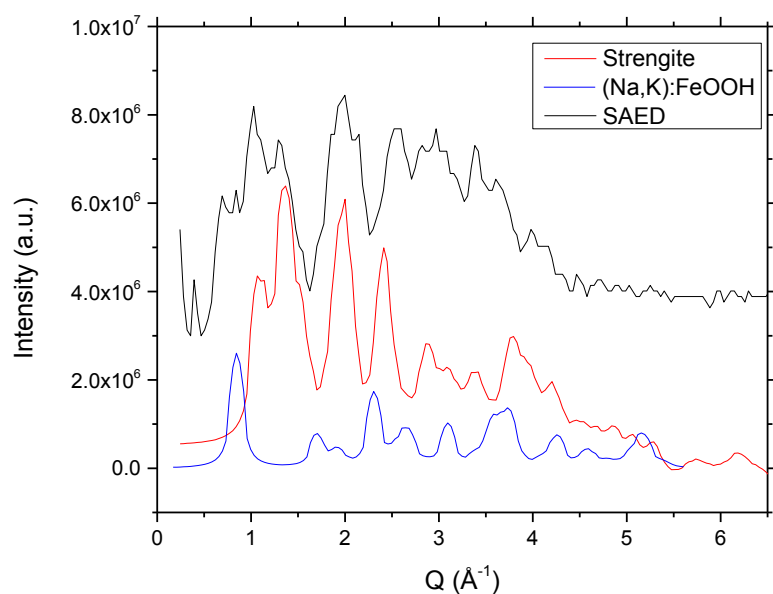


Appendix Figure 1. X-ray Diffraction patterns of amorphous material. (a) Synthesized amorphous Fe-phosphate and (b) Synthesized amorphous Al-phosphate. Peaks at $\sim 45^\circ$ and 50° are from the aluminum stub the powdered sample was mounted on.



Appendix Figure 2. HRTEM-SAED data of a nanocrystalline inclusion in the reacted iron-phosphate. The observed diffraction signal can be modeled as strengite and an Na^+K^+ -bearing iron oxyhydroxide structurally related to akaganeite and priderite. The calculated diffraction patterns are not corrected for crystal-shape and -thickness.

Table 1. Dissolution results from pH 3 amorphous Fe-phosphate experiment

Material: Amorphous Iron Phosphate Target pH: 3 Initial Material Mass: 1.0003 g Final Material Mass: 0.5745 g ID: Am.FePO4 BET: 1219128 (cm ² g ⁻¹)					
Sample Id	Time (seconds)	Conc Fe (mM)	Conc P (mM)	Flow rate (ml/min)	pH
Am.Fe.1	148882	0.0129	0.136	0.018	2.53
Am.Fe.2	179941	0.00561	0.164	0.042	2.83
Am.Fe.3	232620	0.00421	0.134	0.058	2.88
Am.Fe.4	263461	0.00390	0.108	0.044	2.90
Am.Fe.5	313980	0.00313	0.100	0.048	2.88
Am.Fe.6	349739	0.00449	0.0917	0.045	2.97
Am.Fe.7	444959	0.00562	0.0884	0.019	2.91
Am.Fe.8	486539	0.00514	0.0851	0.043	2.92
Am.Fe.9	535319	0.00525	0.0770	0.057	2.89
Am.Fe.10	566099	0.00549	0.0730	0.056	2.93
Am.Fe.11	614220	0.00454	0.0699	0.060	2.97
Am.Fe.12	650760	0.00527	0.0727	0.055	2.93
Am.Fe.13	697260	0.00538	0.0664	0.056	3.01
Am.Fe.14	735719	0.00417	0.0629	0.053	2.92
Am.Fe.15	782277	0.00546	0.0590	0.058	3.01
Am.Fe.16	823796	0.00253	0.0573	0.058	2.89
Am.Fe.17	868854	0.00514	0.0548	0.058	2.9
Am.Fe.18	903533	0.00483	0.0494	0.058	3.02
Am.Fe.19	946859	0.00597	0.0468	0.061	3.07
Am.Fe.20	984659	0.00588	0.0438	0.059	3.02
Am.Fe.21	1040999	0.00409	0.0419	0.062	3.01
Am.Fe.22	1076099	0.00420	0.0396	0.061	2.94
Am.Fe.23**	1130459	0.00535	0.0386	0.060	3.00
Am.Fe.24**	1213737	0.00594	0.0394	0.060	3.02
Am.Fe.25**	1317896	0.00608	0.0363	0.062	2.95
Am.Fe.26**	1414495	0.00564	0.0343	0.061	2.97
Average*		0.00575	0.0371	0.061	2.99
Standard Deviation*		0.00032	0.002	0.001	0.0311
Fe Atomic Absorbance Standards		P UV-Vis Colorimetric Standards			
Fe stds (ppms)	Fe stds Absorbance	P-stds (ppm)	P-std Absorbance		
0.3	0.0352	0.1525	0.0200		
0.6	0.0588	0.3125	0.0360		
1.2	0.0961	0.625	0.0660		
2.4	0.179	1.25	0.126		
4.8	0.352	2.5	0.249		

**Steady state conditions

*Averages and standard deviations were calculated for steady-state concentrations, flow rates, and pH.

Table 2. Dissolution results from pH 2.5 amorphous Fe-phosphate experiment.

Material: Amorphous Iron Phosphate	Target pH: 2.5	Initial Material Mass: 1.999g	Final Material Mass: 1.1825g	ID: 2.5Am-FePO4	BEI: 1219128 (cm ² g ⁻¹)
Sample Id	Time (seconds)	Conc Fe (mM)	Conc P (mM)	Flow rate (ml/min)	pH
2.5Am-Fe.1	81540	0.0239	0.413	0.056	2.48
2.5Am-Fe.2	170341	0.0171	0.299	0.016	2.45
2.5Am-Fe.3	197942	0.0178	0.329	0.046	2.47
2.5Am-Fe.4	244321	0.0188	0.243	0.034	2.48
2.5Am-Fe.5	304920	0.0185	0.230	0.046	2.47
2.5Am-Fe.6	330420	0.0190	0.217	0.050	2.45
2.5Am-Fe.7	389040	0.0200	0.187	0.053	2.42
2.5Am-Fe.8	428480	0.0218	0.151	0.054	2.48
2.5Am-Fe.9	481080	0.0236	0.134	0.053	2.48
2.5Am-Fe.10	576420	0.0258	0.132	0.051	2.49
2.5Am-Fe.11	667860	0.0298	0.119	0.050	2.48
2.5Am-Fe.12	748740	0.0350	0.109	0.041	2.44
2.5Am-Fe.13	822720	0.0320	0.0428	0.052	2.47
2.5Am-Fe.14	901020	0.0335	0.0395	0.054	2.49
2.5Am-Fe.15	941580	0.0335	0.0395	0.056	2.52
2.5Am-Fe.16	988800	0.0305	0.0262	0.048	2.5
2.5Am-Fe.17	1025580	0.0307	0.0262	0.050	2.52
2.5Am-Fe.18	1105080	0.0314	0.0295	0.055	2.49
2.5Am-Fe.19	1160880	0.0272	0.0328	0.055	2.52
2.5Am-Fe.20	1249681	0.0360	0.0851	0.053	2.38
2.5Am-Fe.21	1340520	0.0383	0.0785	0.055	2.38
2.5Am-Fe.22	1418940	0.0380	0.0785	0.056	2.33
2.5Am-Fe.23	1512479	0.0383	0.0818	0.056	2.31
2.5Am-Fe.24	1605779	0.0380	0.0753	0.055	2.39
2.5Am-Fe.25	1781819	0.0387	0.0733	0.052	2.33
2.5Am-Fe.26	1934159	0.0388	0.0700	0.042	2.46
2.5Am-Fe.27	2020139	0.0299	0.0697	0.045	2.53
2.5Am-Fe.28	2108339	0.0399	0.0697	0.045	2.45
2.5Am-Fe.29	2136959	0.0412	0.0632	0.062	2.46
2.5Am-Fe.30	2192759	0.0445	0.0665	0.065	2.43
2.5Am-Fe.31	2220899	0.0396	0.0665	0.065	2.45
2.5Am-Fe.32	2251798	0.0428	0.0697	0.065	2.43
2.5Am-Fe.33	2305197	0.0434	0.0632	0.066	2.41
2.5Am-Fe.34	2337175	0.0436	0.0668	0.064	2.42
2.5Am-Fe.35	2382175	0.0362	0.0635	0.061	2.45
2.5Am-Fe.36	2419195	0.0430	0.0668	0.061	2.48
2.5Am-Fe.37	2472415	0.0457	0.0668	0.060	2.5
2.5Am-Fe.38	2502535	0.0483	0.0668	0.060	2.46
2.5Am-Fe.39**	2552755	0.0480	0.0734	0.060	2.47
2.5Am-Fe.40**	2594695	0.0373	0.0628	0.061	2.49
2.5Am-Fe.41**	2641376	0.0390	0.0628	0.060	2.46
2.5Am-Fe.42**	2671375	0.0387	0.0628	0.056	2.49
Average*		0.0403	0.0665	0.059	2.48
Standard Deviation*		0.0039	0.00532	0.002	0.015
Fe Atomic Absorbance Standards		P UV-Vis Colorimetric Standards			
Fe stds (ppms)	Fe stds Absorbance	P-stds (ppm)	P-std Absorbance		
0.3	0.0352	0.1525	0.0200		
0.6	0.0588	0.3125	0.0360		
1.2	0.0961	0.625	0.0660		
2.4	0.179	1.25	0.126		
4.8	0.352	2.5	0.249		

**Steady state conditions

*Averages and standard deviations were calculated for steady-state concentrations, flow rates, and pH.

Table 3. Dissolution results from pH 2 amorphous Fe-phosphate experiment.

Material: Amorphous Iron Phosphate						Target pH: 2	Initial Material Mass: 1.0002g	Final Material Mass: 0.5114g	ID: 2Am.FePO4	BET: 1219128 (cm ² g ⁻¹)	
Sample Id	Time (seconds)	Conc Fe (mM)	Conc P (mM)	Flow rate (ml/min)	pH						
2Am.Fe.1	70740	0.117	0.246	0.094	2.02						
2Am.Fe.2	161568	0.123	0.206	0.030	2.06						
2Am.Fe.3	201528	0.125	0.193	0.056	2.10						
2Am.Fe.4	247846	0.129	0.186	0.056	2.02						
2Am.Fe.5	278143	0.130	0.186	0.055	2.05						
2Am.Fe.6	326862	0.126	0.186	0.056	2.09						
2Am.Fe.7	366160	0.130	0.179	0.054	2.07						
2Am.Fe.8	408337	0.134	0.179	0.055	2.02						
2Am.Fe.9	496055	0.134	0.186	0.055	2.07						
2Am.Fe.10	539255	0.136	0.173	0.053	2.01						
2Am.Fe.11	580115	0.138	0.183	0.053	2.06						
2Am.Fe.12	621695	0.132	0.173	0.052	2.06						
2Am.Fe.13**	668196	0.137	0.176	0.050	2.11						
2Am.Fe.14**	710737	0.128	0.169	0.049	2.10						
2Am.Fe.15**	768456	0.134	0.169	0.048	2.09						
2Am.Fe.16**	842556	0.127	0.166	0.045	2.10						
2Am.Fe.17***	917736	0.127	0.166	0.010	2.10						
		Average ^y	0.132	0.17	2.10						
		Standard Deviation ^y	0.005	0.0042	0.002	0.0082					
Fe Atomic Absorbance Standards			P UV-Vis Colorimetric Standards								
Fe stds (ppms)	Fe stds Absorbance	P-stds (ppm)	P-std Absorbance								
0.3	0.0352	0.1525	0.0200								
0.6	0.0588	0.3125	0.0360								
1.2	0.0961	0.625	0.0660								
2.4	0.179	1.25	0.126								
4.8	0.352	2.5	0.249								

**Steady state conditions

***Sample 2Am.Fe.17, filter inside reactor ruptured from air-bubble built-up beneath filter, therefore this data point is excluded from rate calculation.

^xAverages and standard deviations were calculated for steady-state concentrations, flowrates, and pH.

Table 4. Dissolution results from pH 1 amorphous Fe-phosphate experiment.

Material: Amorphous Iron Phosphate				Target pH: 1	Initial Material Mass: 2.9996 g	ID: 1Am.FePO4	BET: 1219128 (cm ² g ⁻¹)
Sample Id	Time (seconds)	Conc Fe (mM)	Conc P (mM)	Flow rate (ml/min)	pH		
1AmFe.1	12600	0.936	2.98	0.022	1.11		
1AmFe.2	20401	26.7	28.3	0.037	1.19		
1AmFe.3	25200	47.5	51.1	0.063	1.24		
1AmFe.4	35340	55.5	64.6	0.025	1.28		
1AmFe.5	40680	59.8	70.9	0.041	1.24		
1AmFe.6	45900	60.2	71.2	0.042	1.22		
1AmFe.7	53640	64.6	78.2	0.041	1.22		
1AmFe.8**	61422	58.7	68.5	0.052	1.19		
1AmFe.9**	69403	63.3	76.4	0.041	1.2		
1AmFe.10**	81705	70.7	69.9	0.030	1.24		
1AmFe.11**	95503	64.5	79.9	0.042	1.26		
Average [†]		64.3	73.7	0.041	1.22		
Standard Deviation [†]		4.96	5.39	0.009	0.033		
Fe Atomic Absorbance Standards			P UV-Vis Colorimetric Standards				
Fe stds (ppms)	Fe stds Absorbance	P-stds (ppm)		P-std Absorbance			
0.3	0.0352	0.1525		0.0200			
0.6	0.0588	0.3125		0.0360			
1.2	0.0961	0.625		0.0660			
2.4	0.179	1.25		0.126			
4.8	0.352	2.5		0.249			

**Steady state conditions were not achieved during dissolution of amorphous Al-phosphate due to material dissolving too quickly.

[†] Averages and standard deviations were calculated for steady-state concentrations, flow rates, and pH.

Table 5. Dissolution results from pH 3 amorphous Al-phosphate experiment.

Material: Amorphous Aluminum Phosphate Target pH: 3 Initial Material Mass: 1.0002g Final Material Mass: 0.2571g ID: Am.AIPO4 BET: 771550 (cm ² g ⁻¹)					
Sample Id	Time (seconds)	Conc Al (mM)	Conc P (mM)	Flow rate (ml/min)	pH
Am.A1.1	49079	0.407	0.850	0.018	3.06
Am.A1.2	80338	0.708	1.20	0.042	3.15
Am.A1.3	133016	0.429	0.706	0.058	3.25
Am.A1.4	207058	0.424	0.566	0.018	3.26
Am.A1.5	257576	0.404	0.520	0.048	3.33
Am.A1.6	293335	0.420	0.497	0.045	3.38
Am.A1.7	388555	0.422	0.471	0.019	3.35
Am.A1.8	430135	0.358	0.389	0.043	3.39
Am.A1.9	478915	0.335	0.366	0.043	3.37
Am.A1.10	510476	0.358	0.379	0.033	3.37
Am.A1.11	558598	0.309	0.343	0.045	3.4
Am.A1.12	595138	0.305	0.337	0.044	3.35
Am.A1.13	641638	0.349	0.379	0.047	3.49
Am.A1.14	680097	0.386	0.448	0.042	3.36
Am.A1.15	726655	0.393	0.425	0.044	3.46
Am.A1.16	768174	0.391	0.442	0.043	3.39
Am.A1.17	813232	0.404	0.425	0.045	3.26
Am.A1.18	847911	0.397	0.422	0.045	3.45
Am.A1.19	891237	0.385	0.389	0.046	3.5
Am.A1.20	929037	0.380	0.386	0.044	3.5
Am.A1.21	985377	0.382	0.383	0.042	3.38
Am.A1.22	1020477	0.372	0.363	0.041	3.43
Am.A1.23	1072374	0.367	0.370	0.049	3.44
Am.A1.24	1155653	0.361	0.378	0.048	3.43
Am.A1.25**	1259812	0.369	0.371	0.047	3.41
Am.A1.26**	1356411	0.379	0.378	0.048	3.38
Am.A1.27**	1523991	0.383	0.382	0.044	3.39
Am.A1.28**	1584049	0.419	0.371	0.046	3.49
Average ^x		0.387	0.376	0.046	3.42
Standard Deviation ^x		0.02	0.01	0.00	0.05
Aluminum UV-Vis Colorimetric Standards		P UV-Vis Colorimetric Standards			
Al stds (ppm)	Al stds Absorbance	P-stds (ppm)	P-std Absorbance		
0.1	0.23100	0.1525	0.0200		
0.2	0.40500	0.3125	0.0360		
0.3	0.5770	0.625	0.0660		
*pH range for UV-Vis Aluminum determination by catechol violet method as reported by (Dougan and Wilson, 1974): 6.0-6.2		1.25	0.126		
		2.5	0.249		

**Steady state conditions

^x Averages and standard deviations were calculated for steady-state concentrations, flowrates, and pH.

Table 6. Dissolution results from pH 2.5 amorphous Al-phosphate experiment.

Material: Amorphous Aluminum Phosphate		Target pH: 2.5	Initial Material Mass: 1 g	Final Material Mass: 0.1517 g	ID: 2.5Am.AlPO4	BET: 771550 (cm ² g ⁻¹)	
Sample Id	Time (seconds)	Concentration Al (mM)	Concentration P (mM)	Flow rate (ml/min)	pH		
2.5Am.Al.1	81540	2.63	3.85	0.044	3.17		
2.5Am.Al.2	174420	2.71	3.12	0.040	3.15		
2.5Am.Al.3	202021	2.60	2.83	0.044	3.15		
2.5Am.Al.4	248400	2.73	2.83	0.040	3.12		
2.5Am.Al.5	275580	2.54	2.75	0.043	3.13		
2.5Am.Al.6	335760	2.61	2.75	0.044	3.12		
2.5Am.Al.7	381260	2.68	2.63	0.042	3.11		
2.5Am.Al.8	419880	2.69	2.71	0.043	3.11		
2.5Am.Al.9	457320	2.55	2.63	0.043	3.14		
2.5Am.Al.10	511920	2.49	2.44	0.041	3.07		
2.5Am.Al.11	607260	2.61	2.59	0.042	3.14		
2.5Am.Al.12	698700	2.61	2.75	0.043	3.12		
2.5Am.Al.13	779580	2.60	2.72	0.043	3.07		
2.5Am.Al.14	853560	2.49	2.67	0.048	3.09		
2.5Am.Al.15	931860	2.34	2.67	0.048	3.15		
2.5Am.Al.16	972420	2.38	2.68	0.050	3.1		
2.5Am.Al.17	1019640	2.39	2.33	0.047	3.08		
2.5Am.Al.18**	1056420	2.40	2.30	0.048	3.15		
2.5Am.Al.19**	1135920	2.41	2.27	0.048	3.12		
2.5Am.Al.20**	1191720	2.32	2.62	0.046	3.14		
2.5Am.Al.21**	1280521	2.23	2.42	0.045	3.06		
Average [†]		2.34	2.40	0.047	3.12		
Standard Deviation [†]		0.04	0.16	0.0010	0.03		
Aluminum UV-Vis Colorimetric Standards		P UV-Vis Colorimetric Standards					
Al stds (ppm)	Al stds Absorbance	P-stds (ppm)	P-std Absorbance				
0.1	0.23100	0.1525	0.0200				
0.2	0.40500	0.3125	0.0360				
0.3	0.5770	0.625	0.0660				
		1.25	0.126				
		2.5	0.249				

*pH range for UV-Vis Aluminum determination by catechol violet method as reported by (Dougan and Wilson, 1974): 6.0-6.2

**Steady state conditions

[†]Averages and standard deviations were calculated for steady-state concentrations, flow rates, and pH.

Table 7. Dissolution results from pH 2 amorphous Al-phosphate experiment

Material: Amorphous Aluminum Phosphate							Target pH: 2	Initial Material Mass: 2.5003 g	Final Material Mass: 0.109 g	ID: 2Am.AlPO4b	BET: 771550 (cm ² g ⁻¹)
Sample Id	Time (seconds)	Conc Al (mM)	Conc P (mM)	w rate (ml/h)	pH						
2Am.Al.1b	58680	4.09	17.2	0.044	2.66						
2Am.Al.2b	81660	8.93	9.91	0.044	2.69						
2Am.Al.3b	101579	9.20	9.58	0.043	2.64						
2Am.Al.4b	142439	9.49	9.71	0.044	2.7						
2Am.Al.5b	162311	9.35	10.0	0.043	2.65						
2Am.Al.6b	183788	9.26	9.65	0.044	2.67						
2Am.Al.7b	230300	9.49	10.0	0.042	2.66						
2Am.Al.8b	250759	9.20	9.71	0.040	2.74						
2Am.Al.9b**	272600	9.24	9.98	0.038	2.76						
2Am.Al.10b**	330319	9.60	9.91	0.041	2.73						
2Am.Al.11b**	404419	9.09	10.0	0.039	2.66						
2Am.Al.12b**	479598	8.84	9.91	0.040	2.76						
Average [†]		9.19	9.96	0.039	2.73						
Standard Deviation [†]		0.32	0.06	0.0010	0.05						
Aluminum UV-Vis Colorimetric Standards				P UV-Vis Colorimetric Standards							
Al stds (ppm)	Al stds Absorbance		P-stds (ppm)	P-std Absorbance							
0.1	0.23100		0.1525	0.0200							
0.2	0.40500		0.3125	0.0360							
0.3	0.5770		0.625	0.0660							
*pH range for UV-Vis Aluminum determination by catechol violet method as reported by (Dougan and Wilson, 1974): 6.0-6.2			1.25	0.126							
			2.50	0.249							

**Steady state conditions

[†]Averages and standard deviations were calculated for steady-state concentrations, flow rates, and pH.

Table 8. Dissolution results from pH 1 amorphous Al-phosphate experiment

Material: Amorphous Aluminum Phosphate		Target pH: 1	Initial Mass: 3.0019 g	ID: 1Am.AIPO4	BET: 771550 (cm ² g ⁻¹)
Sample Id	Time (seconds)	Conc Al (ppm)	Conc P (mM)	Flow rate (mL/min)	outlet pH
1Am.AI.1	7801		4.04	0.04	1.13
1Am.AI.2**	18540	211	237	0.03	2.11
1Am.AI.3**	33480	165	148	0.02	2.36
1Am.AI.4**	40079	196	194	0.03	2.34
1Am.AI.5**	44939	198	237	0.03	2.3
Average [†]		193	204	0.03	2.28
Standard Deviation [†]		19.5	42.3	0.01	0.11
Aluminum UV-Vis Colorimetric Standards			P UV-Vis Colorimetric Standards		
Al stds (ppm)	Al stds Absorbance		P-stds (ppm)	P-std Absorbance	
0.1	0.23100		0.1525	0.0200	
0.2	0.40500		0.3125	0.0360	
0.3	0.5770		0.625	0.0660	
*pH range for UV-Vis Aluminum determination by catechol violet method as reported by (Dougan and Wilson, 1974): 6.0-6.2			1.25	0.126	
			2.5	0.249	

**Steady state conditions were not achieved during dissolution of amorphous Al-phosphate due to material dissolving too quickly.

[†]Averages and standard deviations were calculated for steady-state concentrations, flow rates, and pH.

Table 9. Results of Amorphous Fe-phosphate pH 1 PHREEQ-C solubility determination

With respect to Strengite			With respect to Hematite		With respect to Goethite	
Experiment ID	SI	log (IAP)	SI	log (IAP)	SI	log (IAP)
1Am.Fe.8	-4.5	-45.06	-15.94	-15.83	-8.45	-7.92
1Am.Fe.9	-4.3	-30.43	-15.91	-15.8	-8.44	-7.9
1Am.Fe.10	-4.34	-30.34	-15.3	-15.19	-8.13	-7.6
1Am.Fe.11	-4.3	-30.3	-15.58	-15.48	-8.27	-7.74
1Am.Fe.avg of 4	-4.4	-30.4	-15.7	-15.59	-8.33	-7.8
With respect to Vivianite			With respect to Maghemite		With respect to Ferrihydrite	
Experiment ID	SI	log (IAP)	SI	log (IAP)	SI	log (IAP)
1Am.Fe.8	-15.55	-20.28	-18.01	-15.83	-13.57	-7.92
1Am.Fe.9	-15.45	-20.17	-17.98	-15.8	-13.56	-7.9
1Am.Fe.10	-15.08	-19.81	-17.37	-15.19	-13.25	-7.6
1Am.Fe.11	-15.19	-19.92	-17.66	-15.48	-13.4	-7.74
1Am.Fe.avg of 4	-15.32	-20.05	-17.77	-15.59	-13.45	-7.8
With respect to 10nm Goethite			With respect to 10nm Maghemite		With respect to 10nm Hematite	
Experiment ID	SI	log (IAP)	SI	log (IAP)	SI	log (IAP)
1Am.Fe.8	-9.63	-7.92	-19.93	-15.83	-18.07	-15.83
1Am.Fe.9	-9.61	-7.9	-19.9	-15.8	-18.04	-15.8
1Am.Fe.10	-9.31	-7.6	-19.29	-15.19	-17.43	-15.19
1Am.Fe.11	-9.45	-7.74	-19.58	-15.48	-17.72	-15.48
1Am.Fe.avg of 4	-9.51	-7.8	-19.69	-15.59	-17.83	-15.59

Table 10. Results of Amorphous Fe-phosphate pH 2 PHREEQ-C solubility determination

With respect to Strengite			With respect to Hematite		With respect to Goethite	
Experiment ID	SI	log (IAP)	SI	log (IAP)	SI	log (IAP)
2Am.Fe.13	-6.35	-32.35	-13.75	-13.64	-7.36	-6.82
2Am.Fe.14	-6.41	-32.41	-13.87	-13.76	-7.41	-6.88
2Am.Fe.15	-6.41	-32.41	-13.89	-13.78	-7.43	-6.89
2Am.Fe.16	-6.42	-32.42	-13.87	-13.76	-7.42	-6.88
2Am.Fe.avg	-6.4	-32.4	-13.85	-13.74	-7.4	-6.87
With respect to Vivianite			With respect to Maghemite		With respect to Ferrihydrite	
Experiment ID	SI	log (IAP)	SI	log (IAP)	SI	log (IAP)
2Am.Fe.13	-20.92	-25.64	-15.82	-13.64	-12.48	-6.82
2Am.Fe.14	-21.08	-25.8	-15.94	-13.76	-12.54	-6.88
2Am.Fe.15	-21.06	-25.79	-15.96	-13.78	-12.55	-6.89
2Am.Fe.16	-21.1	-25.82	-15.94	-13.76	-12.54	-6.88
2Am.Fe.avg	-21.04	-25.76	-15.92	-13.74	-12.52	-6.87
With respect to 10nm Goethite			With respect to 10nm Maghemite		With respect to 10nm Hematite	
Experiment ID	SI	log (IAP)	SI	log (IAP)	SI	log (IAP)
2Am.Fe.13	-8.53	-6.82	-17.74	-13.64	-15.88	-13.64
2Am.Fe.14	-8.59	-6.88	-17.86	-13.76	-16.00	-13.76
2Am.Fe.15	-8.6	-6.89	-17.88	-13.78	-16.02	-13.78
2Am.Fe.16	-8.59	-6.88	-17.86	-13.76	-16	-13.76
2Am.Fe.avg	-8.58	-6.87	-17.84	-13.74	-15.98	-13.74

Table 11. Results of Amorphous Fe-phosphate pH 2.5 PHREEQ-C solubility determination

With respect to Strengite			With respect to Hematite		With respect to Goethite	
Experiment ID	SI	log (IAP)	SI	log (IAP)	SI	log (IAP)
2.5Am.Fe.39	-6.4	-32.4	-12.43	-12.32	-6.7	-6.16
2.5Am.Fe.40	-6.52	-32.52	-12.49	-12.38	-6.72	-6.19
2.5Am.Fe.41	-6.56	-32.56	-12.63	-12.53	-6.8	-6.26
2.5Am.Fe.42	-6.5	-32.5	-12.46	-12.35	-6.71	-6.17
2.5Am.Fe.avg	-6.49	-32.49	-12.4	-12.29	-6.68	-6.15
With respect to Vivianite			With respect to Maghemite		With respect to Ferrihydrite	
Experiment ID	SI	log (IAP)	SI	log (IAP)	SI	log (IAP)
2.5Am.Fe.39	-21.45	-26.18	-14.5	-12.32	-11.82	-6.16
2.5Am.Fe.40	-21.77	-26.49	-14.56	-12.38	-11.85	-6.19
2.5Am.Fe.41	-21.84	-26.56	-14.71	-12.53	-11.92	-6.26
2.5Am.Fe.42	-21.72	-26.44	-14.53	-12.35	-11.83	-6.17
2.5Am.Fe.avg	-21.5	-26.23	-14.47	-12.29	-11.8	-6.15
With respect to 10nm Goethite			With respect to 10nm Maghemite		With respect to 10nm Hematite	
Experiment ID	SI	log (IAP)	SI	log (IAP)	SI	log (IAP)
2.5Am.Fe.39	-7.87	-32.4	-16.42	-12.32	-14.57	-12.32
2.5Am.Fe.40	-7.9	-6.19	-16.48	-12.38	-14.62	-12.38
2.5Am.Fe.41	-7.97	-6.26	-16.63	-12.53	-14.77	-12.53
2.5Am.Fe.42	-7.88	-6.17	-16.45	-12.35	-14.59	-12.35
2.5Am.Fe.avg	-7.86	-6.15	-16.39	-12.29	-14.53	-12.29

Table 12. Results of Amorphous Fe-phosphate pH 3 PHREEQ-C solubility determination

With respect to Strengite			With respect to Hematite		With respect to Goethite	
Experiment ID	SI	log (IAP)	SI	log (IAP)	SI	log (IAP)
Am.Fe.23	-6.5	-32.5	-11.04	-10.93	-6	-5.47
Am.Fe.24	-6.41	-32.41	-10.83	-10.72	-5.89	-5.36
Am.Fe.25	-6.57	-32.57	-11.23	-11.12	-6.1	-5.56
Am.Fe.26	-6.59	-32.59	-11.17	-11.07	-6.07	-5.53
Am.Fe.avg	-6.51	-32.51	-11.04	-10.93	-6	-5.446
With respect to Vivianite			With respect to Maghemite		With respect to Ferrihydrite	
Experiment ID	SI	log (IAP)	SI	log (IAP)	SI	log (IAP)
Am.Fe.23	-22.54	-27.26	-13.11	-10.93	-11.12	-5.47
Am.Fe.24	-22.3	-27.03	-12.9	-10.72	-11.01	-5.36
Am.Fe.25	-22.63	-27.36	-13.3	-11.12	-11.22	-5.56
Am.Fe.26	-22.69	-27.42	-13.25	-11.07	-11.19	-5.53
Am.Fe.avg	-22.52	-27.24	-13.11	-10.93	-11.12	-5.46
With respect to 10nm Goethite			With respect to 10nm Maghemite		With respect to 10nm Hematite	
Experiment ID	SI	log (IAP)	SI	log (IAP)	SI	log (IAP)
Am.Fe.23	-7.18	-5.47	-15.03	-10.93	-13.17	-10.93
Am.Fe.24	-7.07	-5.36	-14.82	-10.72	-12.96	-10.72
Am.Fe.25	-7.27	-5.56	-15.22	-11.12	-13.36	-11.12
Am.Fe.26	-7.24	-5.53	-15.17	-11.07	-13.31	-11.07
Am.Fe.avg	-7.17	-5.46	-15.03	-10.93	-13.17	-10.93

Table 13. Results of Amorphous Al-phosphate pH 1 PHREEQ-C solubility determination

Experiment ID	With respect to Vars cite		With respect to Gibbs ite	
	SI	log (IAP)	SI	log (IAP)
1Am.Al.1	-1.9	-22.9	-7.44	0.32
1Am.Al.2	2.95	-18.05	-3.27	4.48
1Am.Al.3	3.19	-17.81	-2.59	5.17
1Am.Al.4	3.31	-17.69	-2.6	5.15
1Am.Al.5	3.32	-17.68	-2.72	5.03
1Am.Al.avg	3.21	-17.79	-2.79	4.97

Table 14. Results of Amorphous Al-phosphate pH 2 PHREEQ-C solubility determination

Experiment ID	With respect to Vars cite		With respect to Gibbs ite	
	SI	log (IAP)	SI	log (IAP)
2Am.Al.9b	2.19	-18.81	-2.12	5.64
2Am.Al.10b	2.14	-18.86	-2.2	5.56
2Am.Al.11b	1.99	-19.01	-2.42	5.33
2Am.Al.12b	2.18	-18.82	-2.13	5.63
2Am.Al.avg	2.12	-18.88	-2.21	5.54

Table 15. Results of Amorphous Al-phosphate pH 2.5 PHREEQ-C solubility determination

Experiment ID	With respect to Vars cite		With respect to Gibbs ite	
	SI	log (IAP)	SI	log (IAP)
2.5Am.Al.18	2	-19	-1.31	6.45
2.5Am.Al.19	1.94	-19.06	-1.4	6.36
2.5Am.Al.20	2.03	-18.97	-1.35	6.4
2.5Am.Al.21	1.82	-19.18	-1.6	6.15
2.5Am.Al.avg	1.95	-19.05	-1.42	6.34

Table 16. Results of Amorphous Al-phosphate pH 3 PHREEQ-C solubility determination

Experiment ID	With respect to Vars cite		With respect to Gibbs ite	
	SI	log (IAP)	SI	log (IAP)
Am.Al.25	1.14	-19.86	-1.15	6.61
Am.Al.26	1.1	-19.9	-1.23	6.53
Am.Al.27	1.12	-19.88	-1.19	6.56
Am.Al.28	1.34	-19.66	-0.86	6.9
Am.Al.avg	1.18	-19.82	-1.1	6.66

Table 17. Solution results from pH 2.5 amorphous Al-phosphate batch experiment and amorphous Fe-phosphate stopped flow-through/reactor experiment.

Material: Amorphous Fe- Phosphate Target pH: 2.5 Initial Material Mass: 2.0002 g ID: 2.5AmFeP.solb BET: 1219128 (cm ² g ⁻¹)					
Sample ID	Time (seconds)	Concentration Fe (mM)	Concentration P (mM)	pH	
2.5AmFeP.solb	1210000	0.124	0.474	2.04	

Material: Amorphous Al- Phosphate Target pH: 2.5 Initial Material Mass: 4.0005 g ID: 2.5AmAlP.solb BET: 771550 (cm ² g ⁻¹)					
Sample ID	Time (seconds)	Concentration Al (mM)	Concentration P (mM)	pH	
2.5AmAlP.solb.1	86400	1.24	1.18	2.7	
2.5AmAlP.solb.2	172800	2.07	2.75	2.8	
2.5AmAlP.solb.3	259200	2.40	3.03	2.91	
2.5AmAlP.solb.4	345600	2.85	3.78	2.98	
2.5AmAlP.solb.5	432000	3.06	4.33	2.93	
2.5AmAlP.solb.6	518400	3.11	4.95	3.01	
2.5AmAlP.solb.7	604800	3.41	4.32	3.04	
2.5AmAlP.solb.8**	691200	3.57	4.32	2.93	
2.5AmAlP.solb.9**	777600	3.56	4.49	2.89	
2.5AmAlP.solb.10**	864000	3.58	4.49	2.9	
2.5AmAlP.solb.11**	950400	3.61	4.49	2.91	
2.5AmAlP.solb.12**	1037000	3.64	4.49	2.86	
2.5AmAlP.solb.13**	1123000	3.58	4.32	2.79	
2.5AmAlP.solb.14**	1210000	3.73	4.15	2.85	
2.5AmAlP.solb.15**	1296000	3.80	4.49	2.84	
2.5AmAlP.solb.16**	1382000	3.62	4.32	2.88	

Aluminum UV-Vis Colorimetric Standards		P UV-Vis Colorimetric Standards		Fe Atomic Absorbance Standards	
Al stds (ppm)	Al stds Absorbance	P-stds (ppm)	P-std Absorbance	Fe stds (ppm)	Fe stds (mM)
0.1	0.23100	0.1525	0.0200	0.3	0.00537201
0.2	0.40500	0.3125	0.0360	0.6	0.0107440
0.3	0.5770	0.625	0.0660	1.2	0.0214880
*pH range for UV-Vis Aluminum determination by catechol violet method as reported by (Dougan and		1.25	0.126	2.4	0.0429761
		2.5	0.249	4.8	0.0859522

**Steady-state concentrations of amorphous Al-phosphate.