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Review

Arsenite Depletion by Manganese Oxides: A Case Study on the Limitations of Observed First Order Rate Constants

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Table S1. Compilation of reported observed first order rate constants and experimental conditions.

Mineral	pH	Initial As^{III} (M)	As^{III}/Mn	k_{OBS} (1/hr)	Reference	Notes*
Acid birnessite	4.2	1.00E-04	0.055	1557.36	[1]	0-15 min
Acid birnessite	7.2	1.00E-04	0.055	477.36	[1]	0-15 min
Acid birnessite	7.2	1.00E-04	0.055	477.36	[1]	0-15 min
Acid birnessite	7.2	1.00E-03	0.549	15.48	[1]	0-90 min, 10 °C
Acid birnessite	7.2	1.00E-03	0.549	47.16	[1]	0-30 min
Acid birnessite	7.2	1.00E-03	0.549	158.76	[1]	0-10 min, 40 °C
Acid birnessite	7.2	1.00E-02	5.495	51.48	[1]	0-30 min
Acid birnessite	9	1.00E-04	0.055	884.16	[1]	0-30 min
Acid birnessite	4.5	3.00E-04	0.261	1.16	[2]	
Acid birnessite	4.5	3.00E-04	0.261	3.49	[2]	
Acid birnessite	6	3.00E-04	0.261	0.37	[2]	
Acid birnessite	6	3.00E-04	0.261	2.12	[2]	
Biogenic	7.2	1.00E-04	0.055	14.04	[1]	0-30 min
Biogenic	7.2	1.00E-04	0.055	76.32	[1]	90-180 min
Biogenic	7.2	2.67E-07	0.033	13.8	[3]	Column treatment system, As^{III} oxidation during biogenic Mn oxide formation
Biogenic	7	1.50E-05	0.015	2.69	[4]	As^{III} oxidation during biogenic Mn oxide formation
Birnessite	6.5	1.00E-04	0.087	0.7834	[5]	
Birnessite	6.5	1.00E-04	0.035	10.896	[5]	
Birnessite	7.5	1.34E-03	0.016	0.023	[6]	0-64 hr, rate calculated from Moore Table 2
Birnessite	7	1.33E-03	0.081	0.126	[7]	5 °C
Birnessite	7	1.33E-03	0.081	0.267	[7]	
Birnessite	7	1.33E-03	0.081	0.533	[7]	45 °C
Birnessite	5	4.70E-04	0.204	0.07	[8]	Light
Birnessite	5	4.70E-04	0.204	0.04	[8]	Dark
Birnessite- nanoflower	6	1.00E-04	0.014	8.22	[9]	

Birnessite- nanosheet	6	1.00E-04	0.014	0.13	[9]	
Birnessite- nanowire	6	1.00E-04	0.014	0.84	[9]	
Cryptomelane	7	1.33E-03	0.081	0.054	[7]	5 °C
Cryptomelane	7	1.33E-03	0.081	0.189	[7]	
Cryptomelane	7	1.33E-03	0.081	0.318	[7]	45 °C
Cryptomelane	6.5	1.00E-05	0.001	0.06	[10]	
δ-MnO_2	7.2	1.00E-03	0.549	9.36	[1]	5-90 min, 10 °C
δ-MnO_2	7.2	1.00E-03	0.549	9.72	[1]	5-90 min
δ-MnO_2	7.2	1.00E-03	0.549	13.32	[1]	5-90 min, 40 °C
δ-MnO_2	7.2	1.00E-04	0.055	4926.24	[1]	0-5 min
δ-MnO_2	7.2	1.00E-03	0.549	8.424	[1]	5-90 min
δ-MnO_2	7.2	1.00E-02	5.495	3.96	[1]	5-60 min
δ-MnO_2	7.2	7.50E-05	0.130	1.33	[11]	
δ-MnO_2	4.5	1.00E-04	0.087	7.6	[12]	
δ-MnO_2	4.5	3.00E-04	0.261	5.4	[12]	
δ-MnO_2	6	1.00E-04	0.087	4.7	[12]	
δ-MnO_2	6	3.00E-04	0.261	2.4	[12]	
δ-MnO_2	4	**	**	4.62	[13]	0-90 min, calculated from half-life assuming first order rate law
δ-MnO_2	6.8	**	**	2.10	[13]	calculated from half-life assuming first order
δ-MnO_2	4.5	3.00E-04	0.261	1.2	[2]	
δ-MnO_2	6	3.00E-04	0.261	0.53	[2]	
Hexagonal birnessite	7.2	1.00E-04	0.055	160.56	[1]	0-5 min
Hexagonal birnessite	7.2	1.00E-04	0.055	1.08	[1]	5-2880 min
Hexagonal birnessite	5	0.011	0.440	0.02	[14]	
MnOOH	6.5	1.00E-05	0.001	0.11	[10]	
Pyrolusite	7	1.33E-03	0.081	0.00012	[7]	5 °C
Pyrolusite	7	1.33E-03	0.081	0.00044	[7]	
Pyrolusite	7	1.33E-03	0.081	0.00058	[7]	45 °C

Pyrolusite	6.5	1.00E-05	0.001	0.03	[10]	
Random stacked	7.2	1.00E-04	0.055	4.32	[1]	0-720 min

* Unless otherwise noted, experiment was conducted at 25 ±3 °C.

** Values not reported in reference.

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