Electronic Supplementary Information

Highly Selective and Efficient Heavy Metal Capture with Polysulfide Intercalated Layered Double Hydroxides

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Table S1. Adsorptive capacity and selectivity (K_d) toward metal ions (10 ppm) of S_2-LDH. [a]

S_2-LDH	mixed ions	Co^{2+}	Ni^{2+}	Cu^{2+}	Zn^{2+}	Ag^{2+}	Pb^{2+}	Cd^{2+}	Hg^{2+}
	C_0(ppm)	10.52	10.75	10.96	10.50	11.30	11.04	7.94	9.95
0.005 g	C_f-3h (ppm)	10.48	10.72	4.57	10.49	0.001	9.34	7.33	0.0008
	ion capacity (mg/g)	0.24	0.18	38.34	0.06	67.79	10.20	3.66	59.70
	Removal (%)	0.38	0.28	58.30	0.10	99.99	15.40	7.68	99.99
	Kd (ml/g)	22.90	16.79	8.4×10^3	5.72	6.8×10^7	1.1×10^3	499	7.5×10^7
	Selectivity order	Pb < Cu < Ag, Hg							
0.01 g	C_f-3h (ppm)	10.45	10.69	0.077	8.985	0.001	0.67	0.24	0.0008
	ion capacity (mg/g)	0.21	0.18	32.65	4.55	33.90	31.11	23.10	29.85
	Removal (%)	0.67	0.56	99.30	14.43	99.99	93.93	96.98	99.99
	Kd (ml/g)	20	17	4.2×10^5	506	3.4×10^7	4.6×10^4	9.6×10^4	3.7×10^7
	Selectivity order	Cd, Pb < Cu < Ag, Hg							
0.02 g	C_f-3h (ppm)	9.92	10.42	0.041	0.462	0.001	0.30	0.20	0.0008
	ion capacity (mg/g)	0.90	0.50	16.38	15.06	16.95	16.10	11.61	14.92
	Removal (%)	5.70	3.07	99.63	95.60	99.99	97.28	97.48	99.99
	Kd (ml/g)	91	48	4.0×10^5	3.2×10^4	1.7×10^7	5.4×10^4	5.8×10^4	1.9×10^7
	Selectivity order	Zn < Cd, Pb < Cu < Ag, Hg							
0.03 g	C_f-3h (ppm)	9.58	10.02	0.022	0.091	0.001	0.062	0.049	0.001
	ion capacity (mg/g)	0.94	0.73	10.94	10.41	11.30	10.98	7.89	9.95
	Removal (%)	8.94	6.79	99.80	99.13	99.99	99.44	99.38	99.99
	Kd (ml/g)	98	73	5.0×10^5	1.1×10^5	1.1×10^7	1.8×10^5	1.6×10^5	9.9×10^6
		Co, Ni << Zn, Cd, Pb < Cu < Ag, Hg							
0.035 g	C_f-3h (ppm)	9.43	10.10	0.006	0.152	0.001	0.006	0.008	0.0008
	ion capacity (mg/g)	0.93	0.56	9.39	8.87	9.68	9.46	6.80	8.53

	Removal (%)	10.36	6.05	99.95	98.55	99.99	99.95	99.90	99.99
	Kd (ml/g)	99	55	1.6×10^6	5.8×10^3	9.7×10^6	1.6×10^6	8.5×10^5	1.1×10^7
	Selectivity order	Co, Ni, << Zn < Cd < Pb, Cu < Ag, Hg							

[a] concentration: ~10 ppm each cation in the mixed solution, V: 30 ml, mass: 0.005 g-0.035 g.

The V/m ratios are: 860, 1500, 3000, 6000 mL/g.

Adsortion time: 3 h.

Table S2. Adsorptive capacity of S_4-LDH toward 2.5 mM metal ions. [a]

	Ions	C_0		C_f (after one day)		ion capacity	Removal	K_d
		mM	ppm	mM	ppm	(mg/g)	(%)	
Mixed ions [a]	Co^{2+}	2.236	131.70	2.038	121.51	10	7.74	42
	Ni^{2+}	2.309	135.54	2.002	114.70	21	15.37	91
	Cu^{2+}	2.720	172.72	0.002	0.32	172	99.82	2.7×10^5
	Zn^{2+}	2.388	156.18	1.641	109.02	47	30.19	216
Mixed ions [b]	Ag^{+}	2.354	254.00	0.001	0.11	254	99.96	1.2×10^6
	Pb^{2+}	2.327	482.15	1.965	406.11	76	15.77	94
	Cd^{2+}	2.653	298.20	2.456	276.05	22	7.43	40
	Hg^{2+}	2.200	441.32	0.001	0.20	441	99.95	1.1×10^6

[a] ~ mixed solution of Co^{2+}, Ni^{2+}, Cu^{2+} and Zn^{2+} (~2.5 mM per ion)

[b] ~ mixed solution of Ag^{+}, Pb^{2+}, Cd^{2+} and Hg^{2+} (~2.5 mM per ion).

V, 10 ml; m, 0.02 g; V/m ratio, 10 / 0.02 = 500.

Adsorption time: 1 d.