

New eco-friendly extraction of anionic analytes based on formation of layered double hydroxides

Sira Sansuk, Suwat Nanan and Supalax Srijaranai*

Materials Chemistry Research Center, Department of Chemistry and Center of Excellence for Innovation in Chemistry,

Faculty of Science, Khon Kaen University, Khon Kaen 40002, Thailand

E-mail: supalax@kku.ac.th

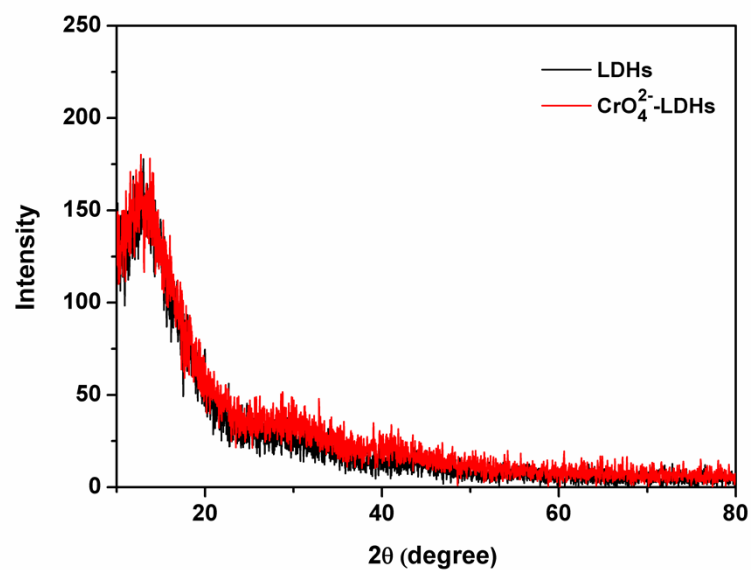


Fig. S1 XRD patterns of LDH and CrO₄²⁻-LDH

Table S1 The extraction rate and efficiency of 10 µg mL⁻¹ chromate solution

Time (min)	Absorbance at 373 nm			Extraction rate (A_t/A_0)				% Extraction			
	1 st	2 nd	3 th	1 st	2 nd	3 th	mean±SD	1 st	2 nd	3 th	mean±SD
0 (A_0)	0.3736	0.3786	0.3709	1	1	1	1±0	0	0	0	0
0.25	0.0968	0.0999	0.1039	0.2591	0.2674	0.2801	0.2674±0.011	74.10	73.60	71.98	73.23±1.11
0.50	0.0638	0.0609	0.0573	0.1708	0.1609	0.1545	0.1621±0.008	82.92	83.90	84.55	83.80±0.82
1.00	0.0453	0.0433	0.0395	0.1213	0.1144	0.1065	0.1141±0.007	87.87	88.56	89.34	88.59±0.74
1.50	0.0347	0.0284	0.0331	0.0929	0.0724	0.0892	0.0848±0.011	90.70	92.76	91.06	91.50±1.10
2.00	0.0294	0.0260	0.0242	0.0787	0.0687	0.0652	0.0709±0.007	92.13	93.13	93.48	92.91±0.70
3.00	0.0269	0.0257	0.0251	0.0693	0.0679	0.0677	0.0683±0.001	92.76	93.21	93.24	93.17±0.82
5.00	0.0254	0.0245	0.0262	0.0680	0.0647	0.0706	0.0677±0.003	93.18	92.54	92.93	93.22±0.31
10.00	0.0261	0.0244	0.0264	0.0699	0.0644	0.0704	0.0682±0.003	93.02	92.55	92.96	93.18±0.33
30.00	0.0310	0.0265	0.0266	0.0731	0.0702	0.0717	0.0716±0.008	91.70	93.01	92.82	92.51±0.71

Table S2 The effect of hydroxide ion on the extraction efficiency of 10 $\mu\text{g mL}^{-1}$ chromate solution

Amount of OH ⁻ (μmol)	Absorbance at 373 nm			% Extraction			
	1 st	2 nd	3 th	1 st	2 nd	3 th	mean \pm SD
No EISE (A_0)	0.3706	0.3746	0.3689	-	-	-	-
0	0.2982	0.2972	0.2995	19.53	20.67	18.80	19.67 \pm 0.94
50	0.2306	0.2287	0.2279	37.78	38.94	38.22	38.31 \pm 0.59
100	0.1487	0.1538	0.1408	59.88	58.94	61.82	60.21 \pm 1.47
150	0.0396	0.0411	0.0427	89.31	89.04	88.43	88.93 \pm 0.45
200	0.0227	0.0304	0.0292	93.86	91.88	92.07	92.60 \pm 1.09
250	0.0309	0.0323	0.0365	91.67	91.39	90.11	91.06 \pm 0.83
300	0.1414	0.1459	0.1384	61.84	61.05	62.49	61.79 \pm 0.72
400	0.2054	0.2158	0.2071	44.57	42.38	43.86	43.60 \pm 1.11
500	0.2215	0.2226	0.2248	40.14	40.58	39.06	39.93 \pm 0.78

Table S3 The effect of Mg²⁺-Al³⁺ on the extraction efficiency of 5 µg mL⁻¹ chromate solution

Mg ²⁺ :Al ³⁺ (µmol)	Absorbance at 373 nm			% Extraction			
	1 st	2 nd	3 th	1 st	2 nd	3 th	mean±SD
No EISE (A ₀)	0.1809	0.1872	0.1883	-	-	-	-
30:10	0.1569	0.1631	0.1617	13.22	12.86	14.15	13.41±0.67
60:20	0.1323	0.1340	0.1374	26.89	28.44	27.01	27.45±0.86
90:30	0.0991	0.1062	0.1037	45.24	43.29	44.91	44.48±1.04
120:40	0.0460	0.0495	0.0473	74.55	73.54	74.88	74.32±0.70
180:60	0.0126	0.0117	0.0158	93.02	93.75	91.60	92.79±1.09
240:80	0.0271	0.0316	0.0295	85.03	83.14	84.33	84.17±0.95
300:100	0.0181	0.0239	0.0210	90.01	87.18	88.83	88.67±1.42

Table S4 The effect of Mg²⁺-Al³⁺ on the extraction efficiency of 10 µg mL⁻¹ chromate solution

Mg ²⁺ :Al ³⁺ (µmol)	Absorbance at 373 nm			% Extraction			
	1 st	2 nd	3 th	1 st	2 nd	3 th	mean±SD
No EISE (A ₀)	0.3699	0.3750	0.3718	-	-	-	-
30:10	0.3029	0.3127	0.3083	18.10	16.62	17.09	17.27±0.76
60:20	0.2387	0.2357	0.2384	35.48	37.14	35.89	36.17±0.86
90:30	0.1734	0.1662	0.1735	53.12	55.67	53.33	54.04±1.41
120:40	0.0924	0.1012	0.1003	75.11	73.02	73.03	73.72±1.20
180:60	0.0245	0.0351	0.0268	93.38	90.65	92.80	92.28±1.44
240:80	0.0399	0.0338	0.0382	89.22	91.00	89.73	89.98±0.92
300:100	0.0513	0.0482	0.0445	86.14	87.15	88.04	87.11±0.95

Table S5 The effect of Mg²⁺-Al³⁺ on the extraction efficiency of 16.7 µg mL⁻¹ chromate solution

Mg ²⁺ :Al ³⁺ (µmol)	Absorbance at 373 nm			% Extraction			
	1 st	2 nd	3 th	1 st	2 nd	3 th	mean±SD
No EISE (A ₀)	0.5968	0.6041	0.6019	-	-	-	-
30:10	0.4679	0.4841	0.4833	21.60	19.86	19.71	20.39±1.05
60:20	0.3707	0.3747	0.3618	37.88	37.97	39.89	38.58±1.13
90:30	0.2178	0.2098	0.2111	63.51	65.27	64.93	64.57±0.93
120:40	0.1571	0.1735	0.1635	73.67	71.28	72.83	72.59±1.21
180:60	0.0407	0.0390	0.0313	93.18	93.55	94.80	93.84±0.84
240:80	0.0732	0.0721	0.0606	87.74	88.06	89.93	88.58±1.18
300:100	0.0582	0.0477	0.0745	90.25	92.17	92.09	91.50±1.09