

APPENDIX

1. Calibration of nitrate ion solutions

In order to determine the calibration curve of nitrate ion solutions, the various concentrations of potassium nitrate solutions were prepared. The absorbances of nitrate ion solutions were measured using UV-VIS spectrophotometer at 430 nm.

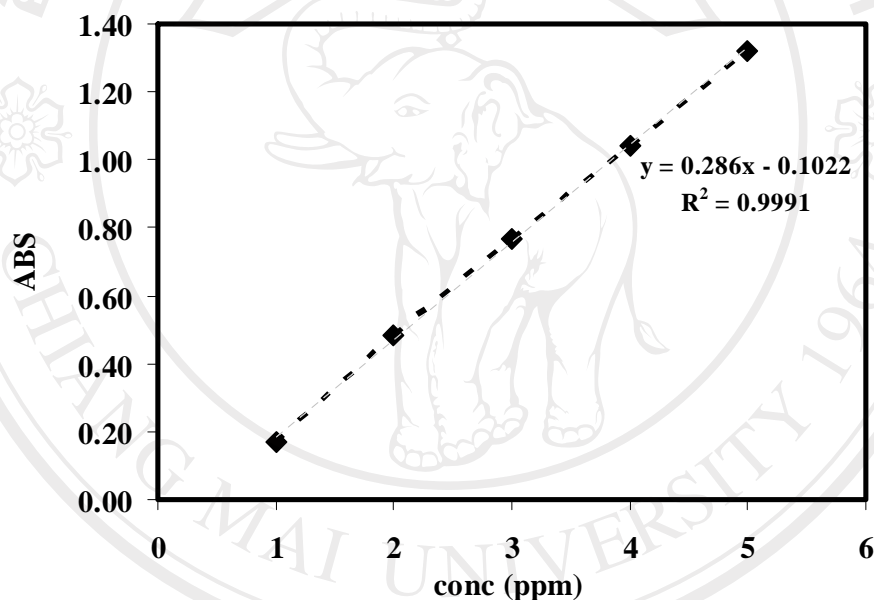


Figure. A Calibration curve of nitrate ion solution.

Calculation of nitrate ion concentration from calibration curve

Equation of calibration curve: $y = 0.286x - 0.1022$

where y = absorbance and x = nitrate ion concentration

$$\text{Diluted nitrate ion concentration} = \frac{\text{ABS} + 0.1022}{0.286}$$

2. Calibration of dihydrogenphosphate ion solutions

In order to determine the calibration curve of dihydrogenphosphate ion solutions, the various concentrations of dihydrogenphosphate ion solutions were prepared. The absorbance of dihydrogenphosphate ion was measured using UV-VIS spectrophotometer at 420 nm.

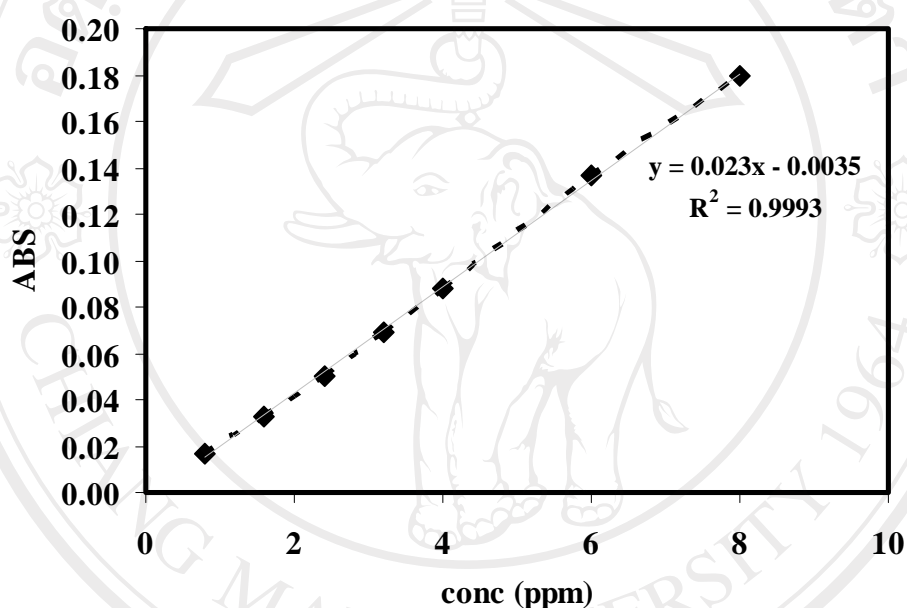


Figure. B Calibration curve of dihydrogenphosphate ion solutions.

Calculation of dihydrogenphosphate ion concentration from calibration curve

Equation of calibration curve: $y = 0.023x - 0.0035$

where y = absorbance and x = dihydrogenphosphate ion concentration

$$\text{Diluted dihydrogenphosphate ion concentration} = \frac{ABS + 0.0035}{0.023}$$

3. Calibration of potassium ion solutions

In order to determine the calibration curve of potassium ion solutions, the various concentrations of potassium chloride solutions were prepared. The absorbances of potassium ion solutions were measured using flame spectrophotometry.

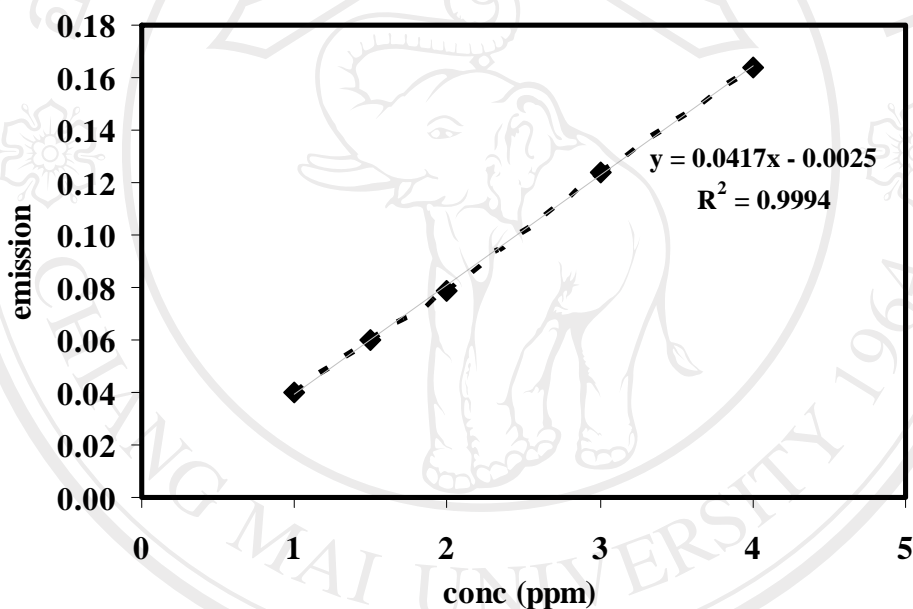


Figure. C Calibration curve of potassium ion solutions.

Calculation of potassium ion concentration from calibration curve

Equation of calibration curve: $y = 0.0417x - 0.0025$

where y = absorbance and x = potassium ion concentration

$$\text{Diluted potassium chloride concentration} = \frac{\text{emission} + 0.0025}{0.0417}$$

4. Calibration of cadmium ion solutions

In order to determine the calibration curve to determine cadmium ion solutions, the various concentrations of cadmium ion solutions were prepared. The absorbances of cadmium ion solutions were measured using atomic absorption spectrophotometry.

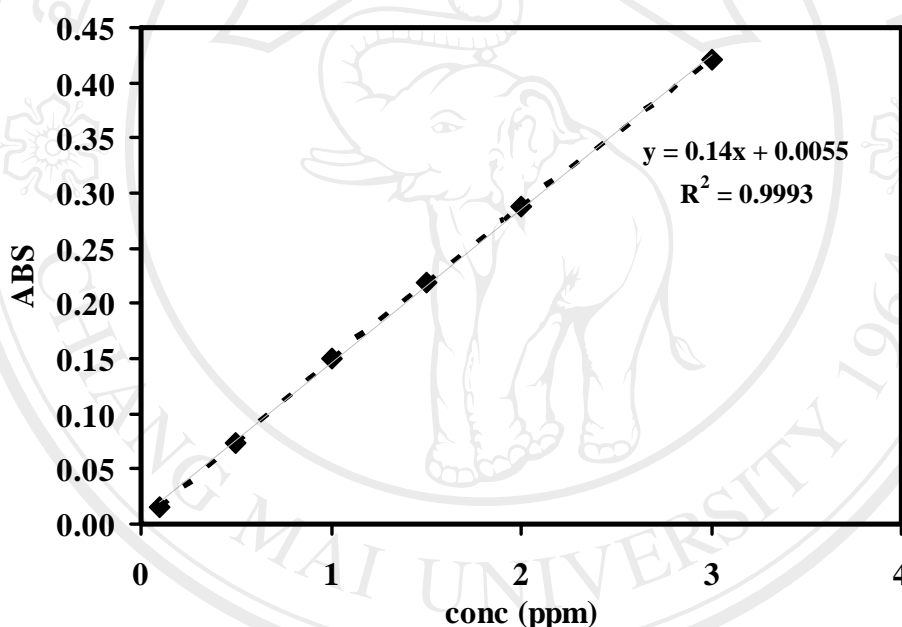


Figure. D Calibration curve of cadmium ion solutions.

Calculation of cadmium ion concentration from calibration curve

Equation of calibration curve: $y = 0.041x + 0.0055$

When y = absorbance and x = cadmium ion concentration

$$\text{Diluted cadmium ion concentration} = \frac{ABS - 0.0055}{0.041}$$

5. Calibration of nickel ion solution

In order to determine the calibration curve to determine nickel ion solutions, the various concentrations of nickel nitrate solutions were prepared. The absorbances of nickel ion solutions were measured using atomic absorption spectrophotometry.

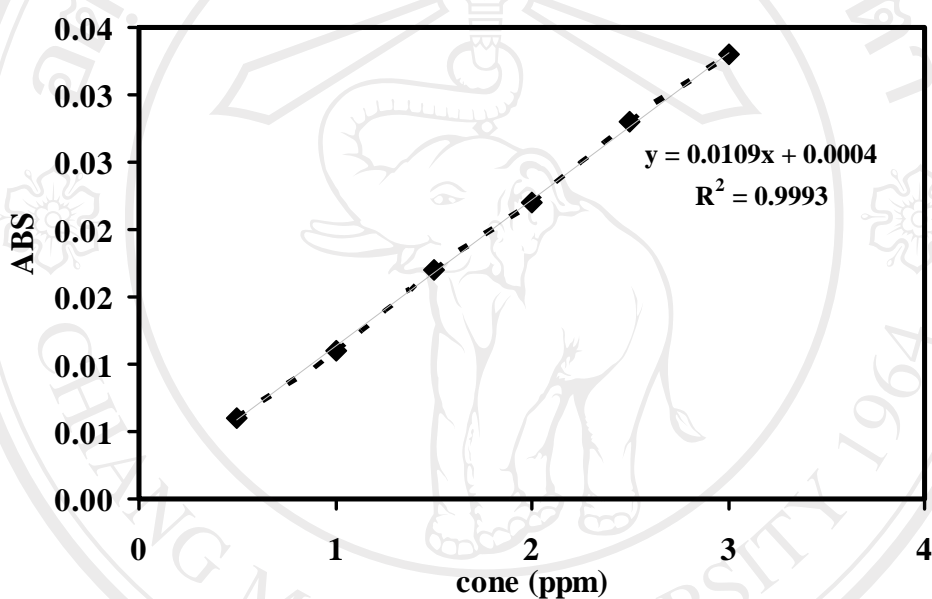


Figure. E Calibration curve of nickel ion solutions.

Calculation of nickel ion concentration from calibration curve

Equation of calibration curve: $y = 0.0109x + 0.0004$

When y = absorbance and x = nickel ion concentration

$$\text{Diluted nickel ion concentration} = \frac{ABS - 0.0004}{0.0109}$$

Table. Determination of NO_3^- on FPM at different solid/solution ratio.

Ratio	FPM					
	C_0 (mg/L)	C_e (mg/L)	q_e ($\mu\text{g/g}$)	$C_e/q_e \times 10^6$ (mg/L)	Log C_e (mg/L)	Log q_e ($\mu\text{g/L}$)
1:5	50	37	31	1.202	1.572	1.492
	100	85	67	1.281	1.931	1.824
	200	185	191	0.971	2.268	2.281
	300	255	261	0.977	2.407	2.416
	400	329	311	1.055	2.517	2.493
	500	446	404	1.105	2.649	2.606
1:10	50	37	68	0.547	1.572	1.834
	100	85	149	0.574	1.931	2.172
	200	192	217	0.888	2.284	2.336
	300	274	458	0.598	2.437	2.661
	400	361	601	0.600	2.557	2.779
	500	459	786	0.584	2.662	2.896
1:15	50	37	105	0.354	1.572	2.023
	100	85	230	0.372	1.931	2.361
	200	184	336	0.547	2.264	2.526
	300	275	639	0.430	2.439	2.806
	400	365	863	0.423	2.562	2.936
	500	458	1175	0.390	2.660	3.070

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Table. Determination of NO_3^- on HDB at different solid/solution ratio.

Ratio	HDB					
	C_0 (mg/L)	C_e (mg/L)	q_e ($\mu\text{g/g}$)	$C_0/q_e \times 10^6$ (mg/L)	Log C_e (mg/L)	Log q_e ($\mu\text{g/L}$)
1:5	50	38	6	6.152	1.580	0.791
	100	86	7	11.70	1.933	0.864
	200	196	17	11.33	2.292	1.238
	300	286	52	5.546	2.456	1.712
	400	359	114	3.143	2.555	2.058
	500	477	123	3.873	2.678	2.090
1:10	50	37	11	3.283	1.572	1.056
	100	95	25	3.744	1.979	1.406
	200	202	63	3.206	2.306	1.800
	300	284	148	1.922	2.453	2.169
	400	371	225	1.648	2.569	2.352
	500	479	262	1.829	2.681	2.418
1:15	50	37	24	1.560	1.572	1.379
	100	95	51	1.868	1.979	1.708
	200	204	91	2.243	2.309	1.958
	300	285	166	1.717	2.455	2.220
	400	385	248	1.550	2.586	2.395
	500	478	285	1.677	2.679	2.454

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Table. Determination of H_2PO_4^- on FPM at different solid/solution ratio.

Ratio	FPM					
	C_0 (mg/L)	C_e (mg/L)	q_e ($\mu\text{g/g}$)	$C_0/q_e \times 10^6$ (mg/L)	Log C_e (mg/L)	Log q_e ($\mu\text{g/L}$)
1:5	50	13	43	0.291	1.101	1.638
	100	20	113	0.182	1.310	2.051
	200	68	263	0.261	1.836	2.420
	300	97	376	0.257	1.986	2.576
	400	146	494	0.296	2.165	2.694
	500	269	663	0.405	2.430	2.822
1:10	50	17	67	0.250	1.222	1.824
	100	25	281	0.090	1.404	2.449
	200	78	665	0.117	1.890	2.823
	300	109	1032	0.105	2.036	3.014
	400	147	1413	0.104	2.167	3.150
	500	262	2126	0.123	2.419	3.328
1:15	50	17	270	0.064	1.239	2.431
	100	38	597	0.063	1.577	2.776
	200	89	1313	0.067	1.947	3.118
	300	114	1648	0.069	2.057	3.217
	400	193	2438	0.079	2.286	3.387
	500	273	3383	0.081	2.437	3.529

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Table. Determination of H_2PO_4^- on HDB at different solid/solution ratio.

Ratio	HDB					
	C_0 (mg/L)	C_e (mg/L)	q_e ($\mu\text{g/g}$)	$C_0/q_e \times 10^6$ (mg/L)	Log C_e (mg/L)	Log q_e ($\mu\text{g/L}$)
1:5	50	40	13	3.035	1.603	1.121
	100	90	38	2.376	1.954	1.578
	200	170	75	2.276	2.231	1.874
	300	270	135	2.007	2.432	2.129
	400	322	334	0.963	2.508	2.524
	500	405	360	1.125	2.608	2.556
1:10	50	44	33	1.313	1.643	1.524
	100	96	126	0.762	1.981	2.099
	200	176	287	0.615	2.246	2.457
	300	286	348	0.823	2.456	2.541
	400	328	573	0.572	2.516	2.758
	500	411	668	0.615	2.614	2.825
1:15	50	40	89	0.453	1.606	1.966
	100	91	198	0.457	1.957	2.355
	200	176	391	0.449	2.244	2.699
	300	277	802	0.345	2.442	2.911
	400	329	1075	0.306	2.517	3.045
	500	412	1185	0.348	2.615	3.114

Table. Determination of K^+ on FPM at different solid/solution ratio.

Ratio	FPM					
	C_0 (mg/L)	C_e (mg/L)	q_e ($\mu\text{g/g}$)	$C_0/q_e \times 10^6$ (mg/L)	Log C_e (mg/L)	Log q_e ($\mu\text{g/L}$)
1:5	50	37	75	0.489	1.566	1.877
	100	64	196	0.327	1.807	2.293
	200	112	449	0.249	2.047	2.652
	300	147	778	0.189	2.168	2.891
	400	191	1060	0.180	2.280	3.025
	500	240	1325	0.181	2.380	3.122
1:10	50	38	135	0.284	1.584	2.130
	100	65	379	0.173	1.816	2.579
	200	117	840	0.140	2.069	2.924
	300	159	1440	0.110	2.201	3.158
	400	212	1907	0.111	2.326	3.280
	500	271	2344	0.115	2.432	3.370
1:15	50	37	218	0.172	1.572	2.337
	100	65	570	0.115	1.815	2.756
	200	110	1363	0.081	2.043	3.135
	300	155	2220	0.070	2.190	3.346
	400	209	2910	0.072	2.319	3.464
	500	266	3583	0.074	2.425	3.554

Table. Determination of K^+ on HDB at different solid/solution ratio.

Ratio	HDB					
	C_0 (mg/L)	C_e (mg/L)	q_e ($\mu\text{g/g}$)	$C_0/q_e \times 10^6$ (mg/L)	Log C_e (mg/L)	Log q_e ($\mu\text{g/L}$)
1:5	50	43	39	1.111	1.636	1.590
	100	84	92	0.910	1.924	1.965
	200	162	199	0.812	2.208	2.299
	300	234	355	0.659	2.369	2.550
	400	306	497	0.616	2.486	2.696
	500	387	592	0.654	2.587	2.772
1:10	50	44	66	0.678	1.648	1.817
	100	85	172	0.494	1.930	2.236
	200	167	340	0.492	2.224	2.531
	300	250	553	0.451	2.397	2.743
	400	333	720	0.463	2.523	2.857
	500	412	933	0.441	2.615	2.970
1:15	50	45	93	0.485	1.652	1.966
	100	87	227	0.385	1.941	2.355
	200	168	500	0.336	2.225	2.699
	300	251	815	0.308	2.399	2.911
	400	331	1110	0.298	2.520	3.045
	500	418	1300	0.322	2.622	3.114

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- 1) K. Prasithichokekul, S. Wangkarn, S. Thiansem, P. Sooksamiti, and O. Arquero, "Appropriate composition of power plant wastes for preparation of fired planting materials" *KMITL Science Journal.*, 26 (2006) 479-485.
- 2) P. Dechprasithichoke, S. Wangkarn, S. Thiansem, P. Sooksamiti, and O. Arquero, "Adsorption behavior of potassium ion on planting materials" *Chinese Journal of Chemistry.*, 25 (2007) 1-10.

Conferences:

- 1) K. Prasithichokekul, S. Wangkarn, S. Thiansem, P. Sooksamiti, and O. Arquero, Production of Fired Ceramic Planting Materials from Power Plant Wastes, Poster presentation, 18-20 October, Congress on Science and Technology, Suranaree University of Technology, Nakhon Ratchasima, Thailand, 2005.
- 2) K. Prasithichokekul, S. Wangkarn, S. Thiansem, P. Sooksamiti, and O. Arquero, Appropriate composition of power plant wastes for preparation of fired planting materials, Poster presentation, 8-10 March, Congress on Science and Applied Science, Concord, Bangkok, Thailand, 2006.