

Appendix A

Mobile phase preparations for HPCL system

1) 95% EtOH/Acetate buffer

- Weighted sodium acetate trihydrate 0.544 g. in 200 mL of milli Q water after adjust pH to 5.5 with acetic acid then mixed 50 mL of the solution with 950 mL of EtOH then sonicated at 28°C for 15 min.

2) 30 mM Ascobic acid

- Weighted ascorbic acid powder 5.2 g. in 1,000 mL milli Q water and then filtered.

3) Imidazole buffer pH 7.6

- Weighted imidazole powder 0.68 g. in 1,000 mL milli Q water after adjust pH to 7.6 with perchloric acid and then filtered.



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Appendix B

Calculation of PM₁₀ mass concentration

To calculate the PM₁₀ mass concentration for a sample taken with the MiniVol Air Sampler, the volume of air that passed through the filter must be calculated.

1) Calculate the volume of air that through the filter during the sampling period at actual ambient conditions, V_{act} (m³)

$$V_{act} = \frac{60_{\text{min/hrs}} \times Q_{act} \times t_{hrs}}{1000L/m^3}$$

Where t_{hrs} is a sampling period (hours)

2) Calculate the mass concentration of PM₁₀, divide the net mass gain of the filter by the volume of air that passed through the filter

$$PM_{act} = \frac{M_{PM}}{V_{act}}$$

Where PM_{act} is a PM₁₀ mass concentration (μg/m³)

M_{PM} is a mass of PM₁₀ collected on the filter (μg)

Table B1 Concentrations of PM₁₀, individual and total PAH in TS site

Sample no.	1	2	3	4	5	6
Month	February	March	April	May	June	July
PM ₁₀ (µg/m ³)	115.28	135.65	70.37	64.81	36.57	18.98
PAHs (ng/m ³)						
Flu	0.40	0.42	0.10	0.01	0.07	0.04
Pyr	0.11	0.33	0.13	0.03	0.01	0.04
BaA	0.27	0.12	0.07	0.04	0.01	0.04
Chr	0.07	0.17	0.10	0.05	0.00	0.03
BbF	1.86	0.48	0.12	0.07	0.01	0.07
BkF	1.32	0.24	0.09	0.05	0.01	0.05
BaP	3.80	0.87	0.24	0.09	0.01	0.09
DBA	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
BghiPe	6.42	2.68	0.46	0.36	0.02	0.30
IDP	6.66	2.31	0.71	0.22	0.02	0.19
Total PAHs	20.90	7.62	2.02	0.93	0.15	0.85

Table B2 Concentrations of PM₁₀, individual and total PAH in SP site

Sample no.	7	8	9	10	11	12
Month	February	March	April	May	June	July
PM ₁₀ (µg/m ³)	121.76	161.11	73.15	58.33	43.06	35.65
PAHs (ng/m ³)						
Flu	0.61	0.22	0.06	0.02	0.03	0.05
Pyr	0.13	0.27	0.04	0.03	0.03	0.07
BaA	0.43	0.15	0.05	0.05	0.03	0.10
Chr	0.11	0.14	0.03	0.05	0.03	0.08
BbF	1.89	0.48	0.10	0.09	0.06	0.15
BkF	1.23	0.33	0.07	0.07	0.02	0.13
BaP	4.11	1.08	0.17	0.15	0.03	0.25
DBA	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
BghiPe	8.52	2.93	1.22	0.77	0.07	1.31
IDP	6.84	2.75	0.83	0.53	0.04	1.00
Total PAHs	23.87	8.36	2.59	1.75	0.34	3.13

Table B3 Concentrations of PM₁₀, individual and total PAH in MW site

Sample no.	13	14	15	16	17	18
Month	February	March	April	May	June	July
PM ₁₀ (µg/m ³)	151.85	148.15	81.94	76.39	24.07	29.17
PAHs (ng/m ³)						
Flu	0.58	0.20	0.05	0.02	0.13	0.04
Pyr	0.16	0.27	0.06	0.03	0.03	0.04
BaA	0.26	0.09	0.03	0.03	0.01	0.04
Chr	0.09	0.11	0.05	0.03	0.01	0.03
BbF	0.18	0.19	0.06	0.06	0.01	0.06
BkF	1.24	0.12	0.04	0.05	0.01	0.05
BaP	3.09	0.35	0.11	0.10	0.03	0.06
DBA	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
BghiPe	5.90	1.04	0.47	0.44	0.01	0.32
IDP	5.93	0.92	0.41	0.31	0.18	0.21
Total PAHs	17.42	3.31	1.28	1.06	0.42	0.84

Table B4 Concentrations of PM₁₀, individual and total PAH in MS site

Sample no.	19	20	21	22	23	24
Month	February	March	April	May	June	July
PM ₁₀ (µg/m ³)	110.65	174.07	56.02	75.93	28.24	40.74
PAHs (ng/m ³)						
Flu	0.34	0.23	0.11	0.04	0.01	0.05
Pyr	0.22	0.29	0.16	0.07	0.01	0.06
BaA	0.11	0.19	0.10	0.09	0.01	0.05
Chr	0.05	0.25	0.12	0.11	0.01	0.04
BbF	0.83	1.17	0.15	0.18	0.01	0.09
BkF	0.55	0.69	0.11	0.13	0.01	0.06
BaP	1.93	1.97	0.31	0.27	0.03	0.09
DBA	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
BghiPe	4.77	4.99	0.97	1.25	0.03	0.53
IDP	4.67	4.42	0.85	0.88	0.11	0.34
Total PAHs	13.48	14.19	2.86	3.02	0.23	1.32

Table B5 Concentrations of PM₁₀, individual and total PAH in SD site

Sample no.	25	26	27	28	29	30
Month	February	March	April	May	June	July
PM ₁₀ (µg/m ³)	97.69	162.04	68.98	65.28	32.87	28.24
PAHs (ng/m ³)						
Flu	0.32	0.25	0.09	0.02	0.02	0.04
Pyr	0.16	0.23	0.13	0.05	0.03	0.04
BaA	0.12	0.11	0.07	0.06	0.02	0.04
Chr	0.13	0.16	0.09	0.06	0.01	0.03
BbF	0.70	0.53	0.11	0.11	0.03	0.06
BkF	0.51	0.29	0.08	0.09	0.03	0.05
BaP	1.70	0.99	0.24	0.17	0.06	0.06
DBA	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
BghiPe	3.74	3.18	1.02	0.82	0.03	0.43
IDP	4.20	2.68	0.88	0.55	0.23	0.25
Total PAHs	11.57	8.42	2.72	1.93	0.45	1.00

Table B6 The number of PM₁₀ concentrations exceeded days obtained from PCD

AQM station	Number of exceeded day (day/month)		
	February	March	April
37T	8	16	3
38T	0	7	0
39T	2	15	0
40T	5	10	0

Table B7 Comparison of PM₁₀ concentration in this study with PCD data

Month	24 hour PM ₁₀ concentrations (µg/m ³)							
	MS ^a	37T ^b	SP ^a	38T ^b	TS ^a	39T ^b	MW ^a	40T ^b
February	110.65	124.95	121.76	130.85	115.28	79.37	151.85	91.83
March	174.07	166.89	161.11	153.55	135.65	159.07	148.15	162.25
April	56.02	63.57	73.15	50.43	70.37	60.50	81.94	81.32
May	75.93	60.42	58.33	52.52	64.81	49.11	76.39	77.50
June	28.24	14.79	43.06	12.59	36.57	10.31	24.07	14.00
July	40.74	19.80	35.65	21.11	18.98	20.30	29.17	23.17

^aThis study, ^bPCD data

Appendix C

Statistic analysis

Table C1 Comparison of PM₁₀ concentration in TS site between dry and wet season

Group Statistics										
		Season	N	Mean	Std. Deviation	Std. Error Mean				
PM10	Dry		3	107.1000	33.39991	19.28345				
	Wet		3	40.1200	23.12032	13.34852				
Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
PM10	Equal variances assumed	.561	.495	2.856	4	.046	66.98000	23.45281	1.86456	132.09544
	Equal variances not assumed			2.856	3.559	.053	66.98000	23.45281	-1.44614	135.40614

Table C2 Comparison of PM₁₀ concentration in SP site between dry and wet season

Group Statistics										
		Season	N	Mean	Std. Deviation	Std. Error Mean				
PM10	Dry		3	118.6733	44.06116	25.43872				
	Wet		3	45.6800	11.56477	6.67692				
Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
PM10	Equal variances assumed	2.455	.192	2.775	4	.049	72.99333	26.30038	-.02823	146.01489
	Equal variances not assumed			2.775	2.274	.095	72.99333	26.30038	28.04602	174.03269

Table C3 Comparison of PM₁₀ concentration in MW site between dry and wet season

Group Statistics										
		Season	N	Mean	Std. Deviation	Std. Error Mean				
PM10	Dry		3	127.3133	39.33798	22.71180				
	Wet		3	43.2100	28.84765	16.65520				
Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
PM10	Equal variances assumed	.726	.442	2.986	4	.040	84.10333	28.16418	5.90702	162.29964
	Equal variances not assumed			2.986	3.669	.045	84.10333	28.16418	3.04029	165.16637

Table C4 Comparison of PM₁₀ concentration in MS site between dry and wet season

Group Statistics										
		Season	N	Mean	Std. Deviation	Std. Error Mean				
PM10	Dry		3	113.5800	59.07952	34.10957				
	Wet		3	48.3033	24.72826	14.27687				
Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
PM10	Equal variances assumed	1.248	.326	1.765	4	.152	65.27667	36.97691	-37.38770	167.94104
	Equal variances not assumed			1.765	2.680	.187	65.27667	36.97691	-60.76594	191.31927

Table C5 Comparison of PM₁₀ concentration in SD site between dry and wet season

Group Statistics										
		Season	N	Mean	Std. Deviation	Std. Error Mean				
PM10	Dry		3	109.5700	47.65387	27.51298				
	Wet		3	42.1300	20.18170	11.65191				
Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
PM10	Equal variances assumed	2.361	.199	2.257	4	.087	67.44000	29.87860	-15.51630	150.39630
	Equal variances not assumed			2.257	2.695	.119	67.44000	29.87860	-34.03283	168.91283

Table C6 Comparison of PAHs concentration in TS site during dry and wet season

Group Statistics										
		Season	N	Mean	Std. Deviation	Std. Error Mean				
Total PAHs	Dry		3	10.1800	9.69684	5.59848				
	Wet		3	.7600	.22869	.13204				
Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Total PAHs	Equal variances assumed	8.373	.044	1.682	4	.168	9.42000	5.60003	-6.12818	24.96818
	Equal variances not assumed			1.682	2.002	.234	9.42000	5.60003	-14.64936	33.48936

Table C7 Comparison of PAHs concentration in SP site between dry and wet season

Group Statistics										
		Season	N	Mean	Std. Deviation	Std. Error Mean				
Total PAHs	Dry		3	11.6067	11.00524	6.35388				
	Wet		3	1.7400	1.39503	.80542				
Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Total PAHs	Equal variances assumed	7.320	.054	1.541	4	.198	9.86667	6.40472	-7.91569	27.64902
	Equal variances not assumed			1.541	2.064	.260	9.86667	6.40472	-16.88470	36.61803

Table C8 Comparison of PAHs concentration in MW site between dry and wet season

Group Statistics										
		Season	N	Mean	Std. Deviation	Std. Error Mean				
Total PAHs	Dry		3	7.3367	8.79121	5.07561				
	Wet		3	.7733	.32517	.18774				
Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Total PAHs	Equal variances assumed	13.252	.022	1.292	4	.266	6.56333	5.07908	-7.53845	20.66512
	Equal variances not assumed			1.292	2.005	.325	6.56333	5.07908	15.23314	28.35981

Table C9 Comparison of PAHs concentration in MS site between dry and wet season

Group Statistics										
		Season	N	Mean	Std. Deviation	Std. Error Mean				
Total PAHs	Dry		3	10.1767	6.34636	3.66407				
	Wet		3	1.5233	1.40607	.81179				
Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Total PAHs	Equal variances assumed	8.906	.041	2.306	4	.082	8.65333	3.75292	-1.76645	19.07311
	Equal variances not assumed			2.306	2.196	.136	8.65333	3.75292	-6.18947	23.49613

Table C10 Comparison of PAHs concentration in SD site between dry and wet season

Group Statistics										
		Season	N	Mean	Std. Deviation	Std. Error Mean				
Total PAHs	Dry		3	7.5700	4.48581	2.58988				
	Wet		3	1.1267	.74809	.43191				
Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Total PAHs	Equal variances assumed	4.777	.094	2.454	4	.070	6.44333	2.62565	-.84664	13.73331
	Equal variances not assumed			2.454	2.111	.127	6.44333	2.62565	-4.30262	17.18929

Table C11 Pearson correlation between PM₁₀ and total PAHs

Sample no.	PM ₁₀	Total PAHs
1	115.28	20.90
2	135.65	7.620
3	70.370	2.020
4	64.810	0.930
5	36.570	0.500
6	18.980	0.850
7	121.76	23.87
8	161.11	8.360
9	73.150	2.590
10	58.330	1.750
11	43.060	0.340
12	35.650	3.130
13	151.85	17.42
14	148.15	3.310
15	81.940	1.280
16	76.390	1.060
17	24.070	0.420
18	29.170	0.840
19	110.65	13.48
20	174.07	14.19
21	56.020	2.860
22	75.930	3.020
23	28.240	0.230
24	40.740	1.320
25	97.690	11.57
26	162.04	8.420
27	68.980	2.720
28	65.280	1.930
29	32.870	0.450
30	28.240	1.000

Descriptive Statistics			
	Mean	Std. Deviation	N
PM10	79.5680	47.29143	30
Total PAHs	5.2793	6.59495	30
Correlations			
		PM10	Total PAHs
PM10	Pearson Correlation	1	.704**
	Sig. (2-tailed)		.000
	N	30	30
Total PAHs	Pearson Correlation	.704**	1
	Sig. (2-tailed)	.000	
	N	30	30

** . Correlation is significant at the 0.01 level (2-tailed).

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Hydrocarbons (PAHs) Surrounding Mae Moh Power Plant,
Lampang province. Proceeding of the 1st Naresuan Conference on
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