

Supplemental Material Captions

Table S1

VOCs species within PAMS and their method detection limits ($\mu\text{g m}^{-3}$)

Table S2

Emission factors of 4 Lime and gypsum production enterprises

Table S3

Emission factors of 8 Iron and steel enterprises

Table S4

Emission factors of 19 large scale coal washing enterprises

Table S5

Emission factors of 37 medium scale coal washing enterprises

Table S6

Emission factors of 23 small scale coal washing enterprises

Table S1 VOCs species within PAMS and their method detection limits ($\mu\text{g m}^{-3}$).

Molecular Formula	Cas No.	Mole Weight	Detection Limit	Molecular Formula	Cas No.	Mole Weight	Detection Limit
C ₂ H ₂	74-86-2	26	0.3	C ₇ H ₁₆	591-76-4	100	0.5
C ₂ H ₄	74-85-1	28	0.4	C ₇ H ₁₆	565-59-3	100	0.6
C ₂ H ₆	74-84-0	30	0.4	C ₇ H ₁₆	589-34-4	100	0.7
C ₃ H ₆	115-07-1	42	0.2	C ₈ H ₁₈	540-84-1	114	0.7
C ₃ H ₈	74-98-6	44	0.4	C ₇ H ₁₆	142-82-5	100	0.5
C ₄ H ₁₀	75-28-5	58	0.3	C ₇ H ₁₄	108-87-2	98	0.7
C ₄ H ₈	106-98-9	56	0.2	C ₈ H ₁₈	565-75-3	114	0.8
C ₄ H ₁₀	106-97-8	58	0.4	C ₇ H ₈	108-88-3	92	0.2
C ₄ H ₈	107-01-7	56	0.3	C ₈ H ₁₈	592-27-8	114	0.7
C ₄ H ₈	590-18-1	56	0.2	C ₈ H ₁₈	589-81-1	114	0.4
C ₅ H ₁₂	78-78-4	72	0.4	C ₈ H ₁₈	111-65-9	114	0.5
C ₅ H ₁₀	109-67-1	70	0.2	C ₈ H ₁₀	100-41-4	106	0.3
C ₅ H ₁₂	109-66-0	72	0.5	C ₈ H ₁₀	108-38-3	106	0.6
C ₅ H ₈	78-79-5	68	0.3	C ₈ H ₁₀	106-42-3	106	0.6
C ₅ H ₁₀	646-04-8	70	0.5	C ₈ H ₁₀	95-47-6	106	0.3
C ₅ H ₁₀	627-20-3	70	0.3	C ₈ H ₈	100-42-5	104	0.5
C ₆ H ₁₄	75-83-2	86	0.1	C ₉ H ₂₀	111-84-2	128	0.3
C ₅ H ₁₀	287-92-3	70	0.3	C ₉ H ₁₂	68936-98-1	120	0.3
C ₆ H ₁₄	79-29-8	86	0.2	C ₉ H ₁₂	103-65-1	120	0.5
C ₆ H ₁₄	107-83-5	86	0.5	C ₉ H ₁₂	95-63-6	120	0.5
C ₆ H ₁₄	96-14-0	86	0.3	C ₉ H ₁₂	526-73-8	120	0.5
C ₆ H ₁₂	763-29-1	84	0.4	C ₉ H ₁₂	611-14-3	120	0.6
C ₆ H ₁₄	92112-69-1	86	0.5	C ₉ H ₁₂	620-14-4	120	0.4
C ₆ H ₁₂	96-37-7	84	0.4	C ₉ H ₁₂	622-96-8	120	0.4
C ₇ H ₁₆	108-08-7	700	0.3	C ₁₀ H ₁₄	141-93-5	134	0.4
C ₆ H ₆	71-43-2	78	0.6	C ₁₀ H ₁₄	105-05-5	134	0.7
C ₆ H ₁₂	110-82-7	84	0.4	C ₉ H ₁₂	108-67-8	120	0.3
C ₃ H ₆ O	67-64-1	58	1	C ₁₀ H ₂₂	124-18-5	142	0.4
C ₂ H ₄ O	75-07-0	44	0.9	C ₁₁ H ₂₄	1120-21-4	156	0.7
CH ₂ O	8013-13-6	30	0.8				

Table S2 Emission factors of 4 Lime and gypsum production enterprises.

	EF _I				EF _{II}				EF _{III}			
	SO ₂	NO _x	PM	VOCs	SO ₂	NO _x	PM	VOCs	SO ₂	NO _x	PM	VOCs
L1	1.37	1.40	8.41	1.05	825	843	5070	632	0.23	0.24	1.42	0.18
L2	1.54	1.71	4.47	1.18	2770	3080	8040	2120	0.23	0.26	0.67	0.18
L3	7.73	10.2	6.15	11.5	515	683	410	769	0.13	0.17	0.10	0.19
L4	2.19	2.38	1.37	0.18	2620	2860	1640	213	0.24	0.26	0.15	0.02

Table S3 Emission factors of 8 Iron and steel enterprises.

	EF _I			EF _{II}			EF _{III}		
	SO ₂	NO _x	PM	SO ₂	NO _x	PM	SO ₂	NO _x	PM
I1	15.5	19.3	26.0	812	1010	1360	1.97	2.46	3.31
I2	16.2	7.03	35.9	1450	628	3210	2.55	1.10	5.63
I3	11.0	19.4	32.5	1150	2030	3400	2.06	3.64	6.10
I4	1.41	1.87	10.3	2370	3140	17400	0.79	1.05	5.79
I5	4.67	11.8	56.5	219	554	2650	0.28	0.71	3.39
I6	13.5	3.06	30.9	271	61.1	617	0.96	0.22	2.19
I7	0.74	0.07	0.36	338	33.2	165	2.10	0.21	1.03
I8	15.4	5.15	34.1	457	152	1010	1.23	0.41	2.73

Table S4 Emission factors of 19 large scale coal washing enterprises.

	EF _I				EF _{II}				EF _{III}			
	SO ₂	NO _x	PM	VOCs	SO ₂	NO _x	PM	VOCs	SO ₂	NO _x	PM	VOCs
F1	2.94	2.40	4.77	0.18	32.0	26.1	51.8	1.95	0.01	0.01	0.02	1.00E-3
F2	3.17	3.97	4.37	0.18	64.8	81.1	89.4	3.68	2.52	3.15	3.47	0.14
F3	1.67	0.61	1.99	0.18	12.1	4.44	14.4	1.31	0.01	2.00E-3	0.01	1.00E-3
F4	1.92	6.30	3.22	37.9	0.47	1.53	0.78	9.16	2.00E-4	1.00E-3	4.00E-4	0.01
F5	1.06	0.82	2.44	7.64	12.9	9.92	29.6	92.9	0.01	0.01	0.01	0.04
F6	2.94	15.8	7.21	20.9	94.1	504	230	669	0.03	0.15	0.07	0.20
F7	2.94	0.68	2.68	38.1	35.1	8.13	32.0	454	0.02	4.00E-3	0.01	0.20
F8	3.23	7.10	1.11	73.1	7.34	16.1	2.52	166	3.00E-3	0.01	1.00E-3	0.07
F9	2.49	3.20	0.99	11.3	30.1	38.7	12.0	137	0.01	0.02	0.01	0.06
F10	3.04	2.70	4.53	0.18	26.3	23.3	39.2	1.58	0.01	0.01	0.01	4.00E-4
F11	4.18	9.08	5.10	0.06	17.9	38.8	21.8	0.26	0.01	0.02	0.01	1.00E-4
F12	2.70	3.98	3.69	0.20	31.1	45.8	42.5	2.29	0.01	0.02	0.02	1.00E-3
F13	1.62	1.83	2.39	0.20	7.68	8.69	11.3	0.93	4.00E-3	0.01	0.01	1.00E-3
F14	3.77	2.93	2.61	0.20	25.2	19.6	17.5	1.31	0.01	0.01	0.01	1.00E-3
F15	2.94	2.70	11.0	180	6.57	6.03	24.6	402	2.00E-3	2.00E-3	0.01	0.15
F16	2.94	2.70	9.55	180	25.8	23.7	83.8	1580	0.01	0.01	0.03	0.52
F17	2.94	2.70	8.33	180	19.4	17.8	54.9	1190	0.01	4.00E-3	0.01	0.29
F18	2.94	2.70	9.52	180	32.1	29.5	104	1970	0.01	0.01	0.02	0.42
F19	2.67	0.44	12.8	180	15.6	2.60	75.1	1050	0.01	1.00E-3	0.03	0.39

Table S5 Emission factors of 37 medium scale coal washing enterprises.

	EF _I				EF _{II}				EF _{III}			
	SO ₂	NO _x	PM	VOCs	SO ₂	NO _x	PM	VOCs	SO ₂	NO _x	PM	VOCs
F20	1.72	2.64	1.17	102	13.1	20.1	8.95	775	0.01	0.01	5.00E-3	0.39
F21	3.75	2.34	1.00	37.5	188	117	50.0	1880	0.01	0.01	4.00E-3	0.13
F22	1.31	2.16	1.11	22.9	20.0	33.0	17.0	350	0.01	0.01	0.01	0.14
F23	0.72	1.40	0.46	96.0	24.1	46.7	15.3	3200	0.01	0.02	0.01	1.44
F24	7.06	2.93	2.59	49.3	238	98.8	87.5	1660	0.06	0.03	0.02	0.44
F25	1.56	4.62	2.76	25.7	46.9	139	82.9	771	0.01	0.04	0.02	0.21
F26	1.29	1.68	0.79	49.4	43.1	56.0	26.4	1650	0.01	0.02	0.01	0.54
F27	3.16	0.32	0.38	32.4	65.2	6.52	7.93	668	0.03	3.00E-3	3.00E-3	0.27
F28	1.66	2.03	0.40	34.7	13.4	16.3	3.24	280	0.01	0.01	2.00E-3	0.14
F29	3.58	1.31	3.22	43.0	50.0	18.3	45.0	600	0.02	0.01	0.02	0.21
F30	7.57	4.23	4.14	42.9	68.0	38.0	37.2	385	0.04	0.02	0.02	0.20
F31	2.33	0.87	2.35	48.0	98.4	36.6	99.1	2030	0.04	0.01	0.04	0.83
F32	4.57	4.95	2.63	140	164	178	94.3	5060	0.02	0.02	0.01	0.48
F33	5.89	2.95	2.32	129	28.0	14.0	11.0	610	0.01	0.01	0.01	0.29
F34	3.56	2.77	2.67	167	24.2	18.8	18.2	1130	0.01	0.01	0.01	0.36
F35	1.41	2.83	0.62	20.3	14.1	28.4	6.17	204	0.01	0.01	3.00E-3	0.09
F36	4.49	2.94	17.5	56.6	46.2	30.3	180	583	0.02	0.01	0.06	0.20
F37	5.57	2.94	16.9	16.7	131	69.1	396	392	0.07	0.03	0.20	0.20
F38	1.83	4.72	1.20	24.0	18.0	46.2	11.7	235	0.01	0.04	0.01	0.20
F39	2.88	2.94	17.5	252	12.1	12.3	73.5	1060	2.00E-3	2.00E-3	0.01	0.20
F40	5.17	2.50	14.0	47.8	61.6	30.0	167	570	0.02	0.01	0.06	0.20
F41	2.78	8.60	1.64	48.1	39.2	121	23.0	676	0.01	0.04	0.01	0.20
F42	5.14	2.94	22.3	127	19.9	11.4	86.4	493	0.01	5.00E-3	0.03	0.20
F43	4.52	2.94	2.09	0.21	158	103	73.1	7.47	0.08	0.05	0.04	4.00E-3
F44	16.6	2.88	2.71	180	141	24.5	23.0	1530	0.06	0.01	0.01	0.61
F45	14.9	2.94	2.69	180	417	82.4	75.4	5040	0.09	0.02	0.02	1.14
F46	6.72	2.94	2.70	180	148	64.7	59.4	3960	0.06	0.03	0.02	1.56
F47	2.88	1.35	1.15	37.7	475	222	189	6220	0.30	0.14	0.12	3.90
F48	21.1	2.94	0.92	97.7	365	51.0	16.0	1700	0.08	0.01	4.00E-3	0.39
F49	17.6	2.94	4.38	109	55.6	9.29	13.8	346	0.03	0.01	0.01	0.20
F50	12.8	2.94	16.3	71.4	224	51.6	285	1250	0.07	0.02	0.09	0.39
F51	8.32	2.94	6.69	66.3	1800	635	1440	14300	0.05	0.02	0.04	0.39
F52	2.88	2.41	3.75	46.7	59.5	49.8	77.4	965	0.02	0.02	0.03	0.39
F53	4.21	2.94	5.47	145	52.9	36.9	68.7	1820	0.01	0.01	0.01	0.39
F54	1.93	2.94	10.0	103	24.3	36.9	125	1290	0.01	0.01	0.04	0.39
F55	17.9	2.44	14.4	65.9	150	20.4	120	552	0.05	0.01	0.04	0.20
F56	2.40	2.94	5.76	0.39	24.0	29.4	57.6	3.90	0.01	0.01	0.02	1.00E-3

Table S6 Emission factors of 23 small scale coal washing enterprises.

	EF _I				EF _{II}				EF _{III}			
	SO ₂	NO _x	PM	VOCs	SO ₂	NO _x	PM	VOCs	SO ₂	NO _x	PM	VOCs
F57	4.33	2.75	2.42	61.8	94.6	60.0	52.7	1350	0.03	0.02	0.02	0.39
F58	6.13	3.07	3.23	89.3	57.5	28.8	30.3	838	0.02	0.01	0.01	0.22
F59	6.26	7.52	2.79	33.8	40.5	48.7	18.1	219	0.02	0.02	0.01	0.11
F60	4.20	2.81	2.47	168	98.8	66.0	58.0	3940	0.03	0.02	0.02	1.12
F61	3.97	2.95	0.25	5.64	19.9	14.7	1.23	28.2	0.14	0.10	0.01	0.20
F62	3.83	2.94	9.45	114	23.5	18.1	58.0	699	0.01	0.01	0.02	0.20
F63	5.42	2.93	14.1	0.22	93.9	50.8	245	3.85	0.09	0.05	0.23	4.00E-3
F64	4.54	2.46	12.9	0.23	39.7	21.5	112	2.02	0.03	0.02	0.08	2.00E-3
F65	4.80	2.94	22.5	0.20	889	544	4170	37.0	0.27	0.16	1.25	0.01
F66	6.08	2.94	22.5	0.20	10.9	5.29	40.5	0.36	0.01	0.01	0.04	4.00E-4
F67	5.38	2.92	15.5	4.23	3330	1810	9520	2620	0.25	0.14	0.71	0.20
F68	9.51	2.94	2.70	180	134	41.4	38.0	2540	0.03	0.01	0.01	0.58
F69	7.20	2.94	2.70	196	41.5	17.0	15.6	1130	0.02	0.01	0.01	0.64
F70	7.21	3.24	2.71	196	217	97.6	81.6	5920	0.11	0.05	0.04	3.12
F71	7.20	2.94	2.70	196	68.6	28.0	25.7	1870	0.03	0.01	0.01	0.73
F72	7.21	2.96	2.71	196	28.4	11.7	10.7	771	0.01	4.00E-3	4.00E-3	0.28
F73	7.20	2.94	2.71	196	14.0	5.72	5.28	381	0.01	4.00E-3	4.00E-3	0.29
F74	4.28	2.94	7.66	76.0	686	471	1230	12200	0.22	0.15	0.39	3.90
F75	4.41	2.52	9.75	20.3	1090	620	2400	5010	0.08	0.05	0.19	0.39
F76	3.98	2.45	0.82	14.3	451	278	92.7	1610	0.11	0.07	0.02	0.39
F77	2.48	2.29	0.86	94.1	20.3	18.7	7.05	770	0.01	0.01	4.00E-3	0.39
F78	4.80	0.95	1.25	683	46.0	9.11	12.0	6540	3.00E-3	1.00E-3	1.00E-3	0.39
F79	1.68	2.93	2.88	6.83	1010	1760	1730	4100	0.05	0.08	0.08	0.20