Supplementary Material

Segment-based volatile organic compound emission characteristics from different types of coking plants in china

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Table S1 Methods, materials, and parameters of the analysis system

Methods or materials	Parameters
Preconcentration conditions	M1: -150 °C elevated to 10 °C M2: - 40 °C elevated to 180 °C M3: -170 °C elevated to above 60 °C
Oven temperature programming	35 °C, holding for 5 min; elevated to 170 °C at 4 °C·min^{-1}; holding for 2 min; elevated to at 10 °C·min^{-1}, holding for 3 min
Capillary column	DB-1(60 m×0.32 mm×1.0 μm) PLOT-Q (30 m×0.32 mm×20 μm)
Inlet temperature	250 °C
MSD	selected ion monitoring (SIM) mode
Ionization method	electron impacting (EI, 70 eV)
Temperature of ionization source	220 °C
Temperature of FID	280 °C
Air flow rate	400 mL·min^{-1}
Hydrogen flow rate	40 mL·min^{-1}
Carrier gas(helium) flow rate	1.0 mL·min^{-1}
Supplement gas(helium) flow rate	15 mL·min^{-1}

Table S2 VOCs species measured in emission samples

No	Alkanes	No	Alkenes	No	Aromatic hydrocarbons
1	Ethane	27	Ethylene	38	Benzene
2	Propane	28	Propylene	39	Toluene
3	n-Butane	29	1-Butene	40	Ethyl-benzene
4	n-Pentane	30	Trans-2-butene	41	m-Xylene
5	n-Hexane	31	Cis-2-butene	42	p-Xylene
6	n-Heptane	32	1-Pentene	43	Styrene
7	n-Octane	33	Isoprene	44	o-Xylene

8	n-Nonane	34	Trans-2-pentene	45	1,3,5-Trimethylbenzene
9	Isobutane	35	Cis-2-pentene	46	1,2,4-Trimethylbenzene
10	Isopentane	36	1-Hexene	47	1,2,3-Trimethylbenzene
11	2,2-Dimethylbutane	No	Alkynes		
12	2,3-Dimethylbutane	37	Acetylene		
13	Cyclopentane				
14	2-Methylpentane				
15	3-Methylpentane				
16	Methyl-cyclopentane				
17	2,4-Dimethylpentane				
18	2,3-Dimethylpentane				
19	2,2,4-Trimethylpentane				
20	2,3,4-Trimethylpentane				
21	Cyclohexane				
22	2-Methyl-hexane				
23	3-Methyl-hexane				
24	Methyl-cyclohexane				
25	2-Methyl-heptane				
26	3-Methyl-heptane				

Table S3 Coefficient of divergence (COD) between different pairs source profiles from varied emission segments in different types of coking plants

		Organized emission					Fugitive leakage						References
		SFN	SFM	Stack gas[a]	Stack gas[b]	Stack gas[c]	OLM	BLM	Gas of oven[d]	Gas of oven[e]	Gas of oven[f]	Gas of oven[g]	
Organized emission	SFN	0											This study
	SFM	0.68	0										This study
	Stack gas[a]	0.43	0.48	0									Shi *et al.*, 2015
	Stack gas[b]	0.17	0.42	0.52	0								EPA, 2016
	Stack gas[c]	0.77	0.48	0.61	0.13	0							He, 2006
Fugitive leakage	OLM	0.67	0.17	0. 52	0.53	0.49	0						This study
	BLM	0.75	0.51	0.63	0.57	0.30	0.47	0					This study
	Gas of oven[d]	0.69	0.34	0.45	-	0.49	0.53	0.57	0				EPA, 2016
	Gas of oven[e]	0.69	0.38	0.59	0.6	0.4	0.36	-	0.07	0			Jia *et al.*, 2009
	Gas of oven[f]	0.64	0.27	0.46	0.65	0.52	0.32	-	0.38	0.51	0		
	Gas of oven[g]	0.74	0.38	0.62	0.43	0.35	0.34	0.25	0.38	0.1	0.42	0	He, 2006

Organized emission: [a] Stack gas in coke production (Shi *et al.*, 2015); [b] Stack gas by coke oven (EPA, 2016); [c] Stack gas in coke production (He, 2006).

[d] downwind of a Chicago area coke oven (EPA,2016).

[e]&[f] Gas of coke oven during coke production, the campaign age of coke oven was about 30 years & 14 years, respectively (Jia *et al.*, 2009).

[g] Gas of the coking area about 10m distance from coke oven (He, 2006).

SFN: Stack flue gas in non-recovery coking plant; SFM: Stack flue gas in mechanical coking plant; OLM: Oven leaks in mechanical coking plant; BLM: Byproduct plant leaks in mechanical coking plant

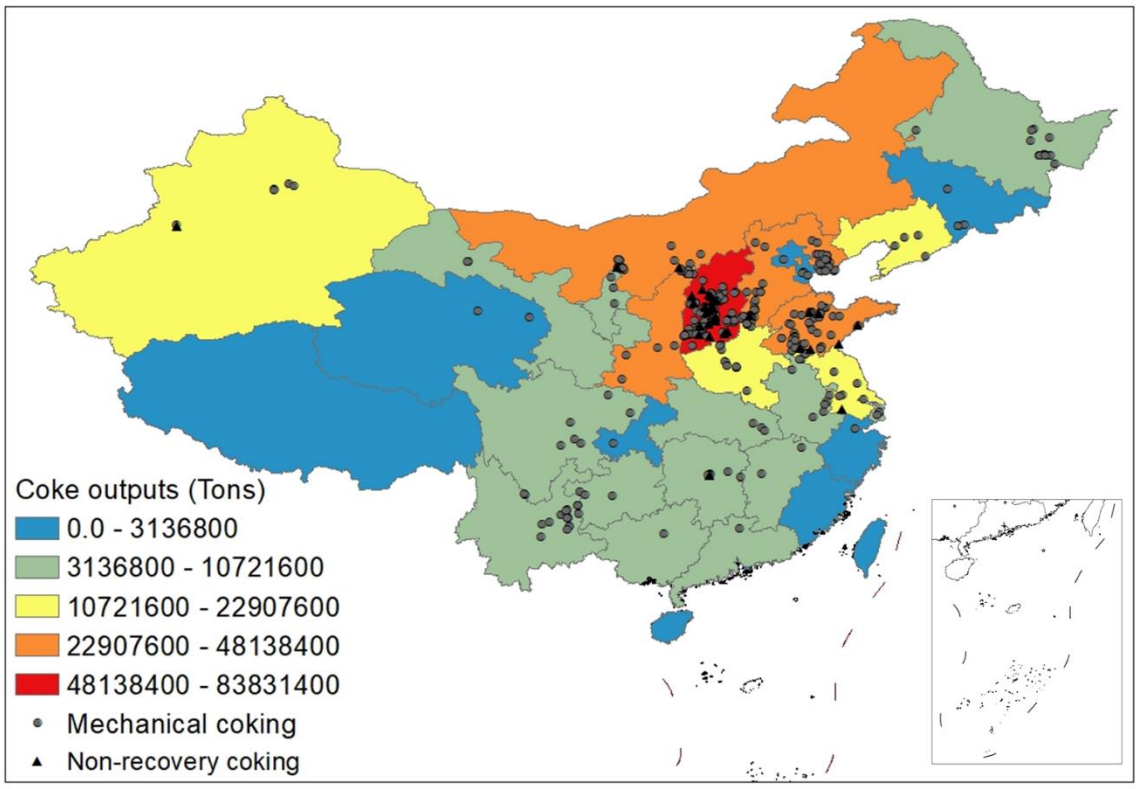

Fig. S1 Provincial coke outputs and coking plants distribution in 2017 in China

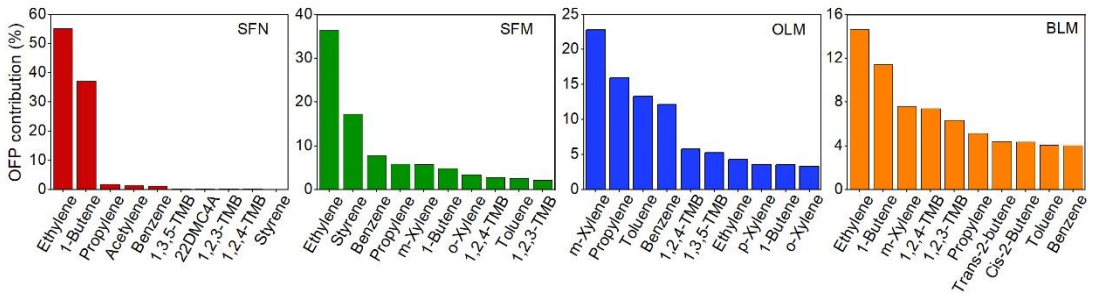

Fig. S2 OFP contribution of major VOCs species from SFN, SFM, OLM and BLM

(22DMC4A: 2,2-dimethylbutane; TMB: trimethylbenzene； SFN: Stack flue gas in non-recovery coking plant; SFM: Stack flue gas in mechanical coking plant; OLM: Oven leaks in mechanical coking plant; BLM: Byproduct plant leaks in mechanical coking plant)

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