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Impact of cooking style and oil on semi-volatile and intermediate volatility organic compound emissions from Chinese domestic cooking

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Table S1. Details of cooking procedures.

Domestic cooking	Material	Oil temperature [#]
Fried chicken	170 g chicken, 500 mL oil (corn, peanut, soybean, or sunflower oil), a few condiments	145 ~ 150 ℃
Kung Pao chicken	150 g chicken, 50 g peanut, 40 mL corn oil, a few condiments	Not stable
Pan-fried tofu	500 g tofu, 200 mL corn oil, a few condiments	100 ~ 110 ℃
Stir-fried cabbage	300 g chicken, 40 mL corn oil, a few condiments	95 ~ 105 ℃

[#] The oil temperature was measured by a thermometer placed in the oil. The thermometer was removed from the oil before placing the cooking materials. The temperatures listed in Table S1 were initial cooking temperatures and were maintained the same for each dish.

Table S2. Detailed instrumentation parameters of TD-GC×GC-qMS.

TDS		**CIS**	
Carrier gas	He, 50 mL/min	Initial temperature	-90 ℃
Split/splitless	splitless	Split/splitless	Split, ratio = 15
Temperature program	30℃_60℃/min_280℃ (10 min)	Temperature program	-90℃_12℃/s_320℃ (5 min)
GC×GC		**qMS**	
Carrier gas	He, 1.2 mL/min	Ion source	EI (70 eV, 230 ℃)
Columns	**1st** Shimadzu SH-Rxi-1ms (30 m × 0.25 mm × 0.25 μm) **2nd** BPX50 (2.5 m × 0.1 mm × 0.1 μm)	Mode	TIC
Temperature program	50 ℃(5min)_3 ℃/min_250 ℃(5min)_10 ℃/min_300 ℃(20 min)	Mass range	33-500 amu

Table S3. Chemials quantified, with chemical classes, R^2, MIR, kOH, yield, surrogates and references. The SOA yields of precursors were from literature (Algrim and Ziemann, 2016, 2019; Chan et al., 2009, 2010; Harvey and Petrucci, 2015; Li et al., 2016; Liu et al., 2018; Loza et al., 2014; Matsunaga et al., 2009; McDonald et al., 2018; Shah et al., 2020; Tkacik et al., 2012; Wu et al., 2017) or surrogates from *n*-alkanes in the same volatility bins (Zhao et al., 2014, 2017).

compound	class detail	class	R^2	MIR	OFP surrogate	kOH	kOH_reference	yield	yield_surrogate	Yield_reference
C6	alkanes	alkanes	0.98	1.24		5.20	Atkinson and Arey,2003	0.00		Wu et al., 2017
C7	alkanes	alkanes	0.98	1.07		6.76	Atkinson and Arey,2003	0.05		Wu et al., 2017
b-alkanes-C10	b-alkanes	alkanes	0.92	0.68	C10			0.22	C10	
b-alkanes-C11	b-alkanes	alkanes	0.90	0.61	C11			0.33	C11	
b-alkanes-C12	b-alkanes	alkanes	0.99	0.55	C12			0.02	C12	
b-alkanes-C13	b-alkanes	alkanes	0.94	0.53	C13			0.03	C13	
b-alkanes-C14	b-alkanes	alkanes	0.93	0.51	C14			0.05	C14	
b-alkanes-C15	b-alkanes	alkanes	0.98	0.50	C15			0.08	C15	
b-alkanes-C16	b-alkanes	alkanes	0.95	0.45	C16			0.12	C16	
b-alkanes-C17	b-alkanes	alkanes	0.92	0.42	C17			0.20	C17	
b-alkanes-C18	b-alkanes	alkanes	0.96	0.40	C18			0.30	C18	
b-alkanes-C19	b-alkanes	alkanes	0.89	0.38	C19			0.42	C19	
b-alkanes-C20	b-alkanes	alkanes	0.95	0.36	C20			0.56	C20	
Heptane, 2-methyl-	b-alkanes	alkanes	0.76	1.07		8.28	AopWin	0.06	C8	
b-alkanes-C8	b-alkanes	alkanes	0.76	0.90	C8			0.06	C8	
b-alkanes-C9	b-alkanes	alkanes	0.92	0.78	C9			0.14	C9	
Cyclohexane, propyl-	cyclo-alkanes	alkanes	0.92	1.29		13.40	AopWin	0.14	C9	
Cyclopentane, butyl-	cyclo-alkanes	alkanes	0.92	1.29	Cyclohexane, propyl-			0.14	C9	

Bicyclo[5.3.0]decane	cyclo-alkanes	alkanes	0.92	1.29	Cyclohexane, propyl-			0.22	C10	
Cyclohexene, 3-methyl-6-(1-methylethyl)-, trans-	cyclo-alkanes	alkanes	0.92	1.29	Cyclohexane, propyl-			0.22	C10	
Cyclohexene, 4-propyl-	cyclo-alkanes	alkanes	0.92	1.29	Cyclohexane, propyl-			0.14	C9	
Cyclopentene,3-hexyl-	cyclo-alkanes	alkanes	0.90	1.29	Cyclohexane, propyl-			0.33	C11	
alkenes-C12	n-alkanes	alkanes	0.99	1.48	alkenes-C13			0.47		Matsunaga, Aiko,2009
3-Dodecene, (E)-	n-alkanes	alkanes	0.99					0.47	alkenes-C12	
alkenes-C13	n-alkanes	alkanes	0.94	1.48		40.07	AopWin	0.46		Matsunaga, Aiko,2009
alkenes-C14	n-alkanes	alkanes	0.93	1.34		41.48	AopWin	0.50		Matsunaga, Aiko,2009
alkenes-C15	n-alkanes	alkanes	0.98	1.25		42.90	AopWin	0.53		Matsunaga, Aiko,2009
alkenes-C16	n-alkanes	alkanes	0.95	1.25	alkenes-C15			0.64		Matsunaga, Aiko,2009
alkenes-C17	n-alkanes	alkanes	0.92	1.25	alkenes-C15			0.49		Matsunaga, Aiko,2009
alkenes-C18	n-alkanes	alkanes	0.96	1.25	alkenes-C15			0.49	alkenes-C17	
C7	n-alkanes	alkanes	0.98	1.24		5.20	Atkinson and Arey,2003	0.00		Wu et al., 2017
C8	n-alkanes	alkanes	0.98	0.90		8.11	Atkinson and Arey,2003	0.06		Wu et al., 2017
C9	n-alkanes	alkanes	1.00	0.78		9.70	Atkinson and Arey,2003	0.14		Wu et al., 2017
C10	n-alkanes	alkanes	0.99	0.68		11.00	Atkinson and Arey,2003	0.22		Wu et al., 2017
C11	n-alkanes	alkanes	0.97	0.61		12.30	Atkinson and Arey,2003	0.33		Wu et al., 2017
C12	n-alkanes	alkanes	0.99	0.55		13.20	Atkinson and Arey,2003	0.02		Chan et al., 2009
C13	n-alkanes	alkanes	0.98	0.53		15.10	Atkinson and Arey,2003	0.03		Chan et al., 2009
C14	n-alkanes	alkanes	0.99	0.51		17.90	Atkinson and Arey,2003	0.05		Chan et al., 2009
C15	n-alkanes	alkanes	0.99	0.50		20.70	Atkinson and Arey,2003	0.08		Chan et al., 2009
C16	n-alkanes	alkanes	0.99	0.45		23.20	Atkinson and Arey,2003	0.12		Chan et al., 2009
C17	n-alkanes	alkanes	0.99	0.42		28.50	A. W. H. Chan et al,2009	0.20		Chan et al., 2009

C18	n-alkanes	alkanes	0.99	0.40		35.10	A. W. H. Chan et al,2009	0.30		Chan et al., 2009
C19	n-alkanes	alkanes	0.99	0.38		43.20	A. W. H. Chan et al,2009	0.42		Chan et al., 2009
C20	n-alkanes	alkanes	0.99	0.36		53.10	A. W. H. Chan et al,2009	0.56		Chan et al., 2009
C21	n-alkanes	alkanes	1.00	0.34		26.65	AopWin v1.92	0.77		Gentner, 2012
C22	n-alkanes	alkanes	1.00	0.33		28.07	AopWin v1.92	0.96		Gentner, 2012
C23	n-alkanes	alkanes	1.00			29.48	AopWin v1.92	1.08		Gentner, 2012
C24	n-alkanes	alkanes	1.00			30.89	AopWin v1.92	1.14		Gentner, 2012
C26	n-alkanes	alkanes	1.00			33.72	AopWin v1.92	1.14	C24	
C27	n-alkanes	alkanes	0.99			35.13	AopWin v1.92	1.14	C24	
C30	n-alkanes	alkanes	1.00			39.37	AopWin v1.92	1.14	C24	
alk-di-enes-C12	alkenes	alkenes	0.99					0.41	alpha-Pinene	
1-Heptene	alkenes	alkenes	0.95	4.43		40.00	Atkinson and Arey,2003	0.02		Wu et al., 2017
1-Octene	alkenes	alkenes	0.76	3.25		33.00	AopWin	0.05		Matsunaga, Aiko,2009
2-Octene, (E)-	alkenes	alkenes	0.76	6.00		61.83	AopWin	0.05	1-Octene	
3-Nonene	alkenes	alkenes	0.92	6.00	2-Octene, (E)-			0.15	1-Nonene	
1-Nonene	alkenes	alkenes	0.92	2.60		34.42	AopWin	0.15		
2-Nonene	alkenes	alkenes	0.92	6.00	2-Octene, (E)-			0.15	1-Nonene	
1,3-Nonadiene, (E)-	alkenes	alkenes	0.92	2.17	1-Decene			0.15	1-Nonene	
1-Decene	alkenes	alkenes	0.92	2.17		35.83	AopWin	0.32		Matsunaga, Aiko,2009
trans-3-Decene	alkenes	alkenes	0.92					0.32	1-Decene	
Dicyclopentadiene	alkenes	alkenes	0.92					0.34	1-Undecene	Matsunaga, Aiko,2009
1,10-Undecadiene	alkenes	alkenes	0.90	2.17	1-Decene			0.34	1-Undecene	
4-Undecene, (E)-	alkenes	alkenes	0.90	6.00	2-Octene, (E)-			0.34	1-Undecene	
trans,trans-2,9-Undecadiene	alkenes	alkenes	0.90					0.34	1-Undecene	
2-Undecene, (E)-	alkenes	alkenes	0.90	6.00	2-Octene, (E)-			0.34	1-Undecene	
2-Undecene, (Z)-	alkenes	alkenes	0.90	6.00	2-Octene, (E)-			0.34	1-Undecene	

(E,E)-1,3,5-Undecatriene	alkenes	alkenes	0.99	2.17	1-Decene			0.34	1-Undecene	
1,8,11-Heptadecatriene, (Z,Z)-	alkenes	alkenes	0.92	2.17	1-Decene			0.49	alkenes-C17	
alkenes-C17-UCM	alkenes	alkenes	0.92	2.17	1-Decene			0.49	alkenes-C17	
di-isoprenens	di-isoprenes	alkenes	0.92	4.51	alpha-Pinene			0.41	alpha-Pinene	
4,7-Methano-1H-indene, octahydro-,	di-isoprenes	alkenes	0.90					0.41	alpha-Pinene	
Bicyclo[3.1.0]hex-2-ene, 2-methyl-5-(1-methylethyl)-	di-isoprenes	alkenes	0.92	4.51	alpha-Pinene			0.41	alpha-Pinene	
Bicyclo[3.1.0]hex-2-ene, 4-methyl-1-(1-methylethyl)-	di-isoprenes	alkenes	0.92	4.51	alpha-Pinene			0.41	alpha-Pinene	
alpha-Pinene	di-isoprenes	alkenes	0.92	4.51		52.30	Atkinson and Arey,2003	0.41		Lee et al., 2006
beta-Pinene	di-isoprenes	alkenes	0.92	3.52				0.22	C10	
beta-Myrcene	di-isoprenes	alkenes	0.92	4.51	alpha-Pinene	215.00	Atkinson and Arey,2003	0.11		Lee et al., 2006
D-Limonene	di-isoprenes	alkenes	0.92	4.55		164.00	Atkinson	0.41	alpha-Pinene	
di-isoprenes	di-isoprenes	alkenes	0.92	4.51	alpha-Pinene			0.22	C10	
trans-beta-Ocimene	di-isoprenes	alkenes	0.92			252.00	Atkinson and Arey,2003	0.41	alpha-Pinene	

1,3,6-Octatriene, 3,7-dimethyl-, (Z)-	di-isoprenes	alkenes	0.92	4.51	alpha-Pinene	252.00	Atkinson and Arey,2003	0.41	alpha-Pinene	
Cyclohexene, 1-methyl-4-(1-methylethylidene)-	di-isoprenes	alkenes	0.90	6.36		225.00	Atkinson and Arey,2003	0.20		Lee et al., 2006
Copaene	tri-isoprenes	alkenes	0.93			90.00	Atkinson and Arey,2003	0.41	alpha-Pinene	
Longifolene	tri-isoprenes	alkenes	0.93			47.00	Atkinson and Arey,2003	0.41	alpha-Pinene	
alpha-Patchoulene	tri-isoprenes	alkenes	0.95					0.41	alpha-Pinene	
tri-isoprenes	tri-isoprenes	alkenes	0.95					0.41	alpha-Pinene	
3-Nonen-1-yne, (E)-	alkynes	alkynes	0.92					0.15	1-Nonene	
alkynes-C12	n-alkynes	alkynes	0.99					0.47	alkenes-C12	
alkynes-C13	n-alkynes	alkynes	0.94					0.46	alkenes-C13	
alkynes-C14	n-alkynes	alkynes	0.93					0.50	alkenes-C14	
alkynes-C15	n-alkynes	alkynes	0.98					0.53	alkenes-C15	
alkynes-C16	n-alkynes	alkynes	0.95					0.64	alkenes-C16	
alkynes-C17	n-alkynes	alkynes	0.92					0.49	alkenes-C17	
alkynes-C18	n-alkynes	alkynes	0.96					0.49	alkenes-C17	
Toluene	aromatics	aromatics	0.94	4.00		5.63	Atkinson and Arey,2003	0.10		Chan et al., 2009
Ethylbenzene	aromatics	aromatics	0.89	3.04		7.00	Atkinson and Arey,2003	0.10		Chan et al., 2009
p-Xylene	aromatics	aromatics	0.87	5.84		14.30	Atkinson and Arey,2003	0.06		Chan et al., 2009
Styrene	aromatics	aromatics	0.71	1.73		58.00	Atkinson and Arey,2003	0.22		Fang et al., 2017
o-xylene	aromatics	aromatics	0.71	5.84	p-Xylene			0.06	p-Xylene	
Benzene, (1-methylethyl)-	aromatics	aromatics	0.98	2.52		6.30	Atkinson and Arey,2003	0.03		Li et al., 2016

Benzene, 1-ethyl-4-methyl-	aromatics	aromatics	0.63	4.44		11.80	Atkinson and Arey,2003	0.10	Chan et al., 2009
Benzene, 1,2,3-trimethyl-	aromatics	aromatics	0.63	11.97		32.70	Atkinson and Arey,2003	0.08	Li et al., 2016
Benzene, 1-ethyl-2-methyl-	aromatics	aromatics	0.63	7.39	Benzene, 1-ethyl-3-methyl-			0.08	Benzene, 1-ethyl-2-methyl-
Benzene, 1,2,4-trimethyl-	aromatics	aromatics	0.63	8.87		32.50	Atkinson and Arey,2003	0.06	Chan et al., 2009
Benzene, 1-ethyl-3-methyl-	aromatics	aromatics	0.63	7.39		18.60	Atkinson and Arey,2003	0.10	Chan et al., 2009
o-Cymene	aromatics	aromatics	0.63	5.49		8.54	AopWin	0.06	Benzene, 1,2,4-trimethyl-
2-Methylphenylacetylene	aromatics	aromatics	0.63	1.73	Styrene			0.06	Benzene, 1,2,4-trimethyl-
Benzene, 1-methyl-2-propyl-	aromatics	aromatics	0.63	5.49		8.80	AopWin	0.06	Benzene, 1,2,4-trimethyl-
aromatics-C4-surrogate	aromatics	aromatics	0.63	2.36		8.72	AopWin	0.10	Benzene, propyl-
Benzene, 2,4-dimethyl-1-(1-methylethyl)-	aromatics	aromatics	0.63	8.87	Benzene, 1,2,4-trimethyl-			0.10	Benzene, propyl-
Benzene, hexyl-	aromatics	aromatics	0.63	2.12	Benzene, pentyl-			0.10	Benzene, propyl-
Benzene, (1-methylnonyl)-	aromatics	aromatics	0.97	7.39	Benzene, 1-ethyl-3-methyl-			0.10	Benzene, propyl-
1H-Indene, 2,3-dihydro-1,1,3-trimethyl-3-phenyl-	aromatics	aromatics	0.97	1.73	Styrene			0.10	Benzene, propyl-

2,4-Diphenyl-4-methyl-1-pentene	aromatics	aromatics	0.97	2.12	Benzene, pentyl-			0.10	Benzene, propyl-	
Benzene, 1,1'-(1,1,2,2-tetramethyl-1,2-ethanediyl)bis-	aromatics	aromatics	0.97	7.39	Benzene, 1-ethyl-3-methyl-			0.10	Benzene, propyl-	
2,4-Diphenyl-4-methyl-2(E)-pentene	aromatics	aromatics	0.97	2.12	Benzene, pentyl-			0.10	Benzene, propyl-	
Benzene, 1,1'-(3,3-dimethyl-1-butenylidene)bis-	aromatics	aromatics	0.97	7.39	Benzene, 1-ethyl-3-methyl-			0.10	Benzene, propyl-	
Benzene, propyl-	aromatics	aromatics	0.88	2.03		5.80	Atkinson and Arey,2003	0.10		Chan et al., 2009
aromatics-C3	aromatics	aromatics	0.63	2.03		5.80	Atkinson and Arey,2003	0.10		Chan et al., 2009
aromatics-C4	aromatics	aromatics	0.63	2.36		8.72	AopWin	0.10	Benzene, propyl-	
Benzene, pentyl-	aromatics	aromatics	0.63	2.12		10.14	AopWin	0.10	Benzene, propyl-	
Benzene, 1-methyl-3-propyl-	aromatics	aromatics	0.63	7.10		15.25	AopWin	0.10	Benzene, propyl-	
Indane	aromatics	aromatics	0.63	3.32		19.00	Atkinson and Arey,2003	0.08		Gentner, 2012
1H-Indene, 2,3-dihydro-4-methyl-	aromatics	aromatics	0.63					0.08	Indane	
Indane, 1-methyl-	aromatics	aromatics	0.63	3.32	Indane			0.08	Indane	
Phenol, 2-chloro-	chlorides	chlorides	0.95			9.87	AopWin v1.92	0.22	C10	
Bis(2-chloro-1-methylethyl) ether	chlorides	chlorides	0.82					0.22	C10	
Trichloroethylene	chlorides	chlorides	0.82	0.64		0.80	AopWin	0.06	C8	
Tetrachloroethylene	chlorides	chlorides	0.82	0.03		0.21	AopWin	0.06	C8	
Phenol, 4-chloro-3-methyl-	chlorides	chlorides	0.96					0.38	Phenol	

N-Nitrosodimethylamine	amines	nitrogen-containing compounds	0.76			0.06	C8
Cyclohexane, isocyanato-	CN	nitrogen-containing compounds	0.92			0.22	C10
Nitric acid, pentyl ester	nitrates	nitrogen-containing compounds	0.93			0.14	C9
Decanenitrile	nitriles	nitrogen-containing compounds	0.99	8.74	AopWin v1.92	0.03	C13
Benzonitrile	nitriles	nitrogen-containing compounds	0.75	0.34	AopWin	0.22	C10
o-Nitroaniline	nitro	nitrogen-containing compounds	0.89	13.45	AopWin v1.92	0.05	C14
Pentane, 1-nitro-	nitro-alkanes	nitrogen-containing compounds	0.92			0.14	C9
Benzene, 2-methyl-1,3-dinitro-	nitrophenols	nitrogen-containing compounds	0.96	0.27	AopWin v1.92	0.05	C14
Benzene, 1-methyl-2,4-dinitro-	nitrophenols	nitrogen-containing compounds	0.96	0.27	AopWin v1.92	0.08	C15

Pyridine, 2-pentyl-	pyridines	nitrogen-containing compounds	0.97					0.02	C12
Benzothiazole	SN	nitrogen-containing compounds	0.97					0.02	C12
Cyclohexane, isothiocyanato-	SN	nitrogen-containing compounds	0.97					0.02	C12
1,2-Benzisothiazole	SN	nitrogen-containing compounds	0.97					0.02	C12
Undecanoic acid	acids	oxygenated compounds	0.97			12.59	AopWin v1.92	0.05	C14
Tridecanoic acid	acids	oxygenated compounds	0.88			15.42	AopWin v1.92	0.12	C16
Acetic acid	acids	oxygenated compounds	0.32	0.68		0.62	AopWin		
Butanoic acid, 3-methyl-	acids	oxygenated compounds	0.92	4.23		4.10	AopWin	0.06	C8
Butanoic acid, 2-methyl-	acids	oxygenated compounds	0.92	4.23	Butanoic acid, 3-methyl-			0.06	C8
Pentanoic acid	acids	oxygenated compounds	0.32			4.11	AopWin	0.14	C9
Hexanoic acid	acids	oxygenated compounds	0.32			5.52	AopWin v1.92	0.22	C10
Heptanoic acid	acids	oxygenated compounds	0.81			6.94	AopWin v1.92	0.33	C11

Benzoic acid	acids	oxygenated compounds	0.32		1.24	AopWin v1.92	0.02	C12
Octanoic acid	acids	oxygenated compounds	0.32				0.02	C12
Nonanoic acid	acids	oxygenated compounds	0.32		9.76	AopWin v1.92	0.03	C13
Phenylmaleic anhydride	acids	oxygenated compounds	0.88				0.08	C15
2-Hexenal, (E)-	aldehyde-enes	oxygenated compounds	0.96	2-Hexenal			0.02	pentanal
Furfural	aldehyde-enes	oxygenated compounds	0.96		37.42	AopWin	0.02	pentanal
2-Hexenal	aldehyde-enes	oxygenated compounds	0.96		38.52	AopWin	0.02	pentanal
4-Heptenal, (Z)-	aldehyde-enes	oxygenated compounds	0.96	2-Hexenal			0.02	pentanal
2-Heptenal, (Z)-	aldehyde-enes	oxygenated compounds	0.96	2-Hexenal			0.02	pentanal
4-Oxohex-2-enal	aldehyde-enes	oxygenated compounds	0.96	2-Hexenal			0.02	pentanal
aldehyde-enes-trans-2-Dodecenal-surrogate	aldehyde-enes	oxygenated compounds	0.96	2-Hexenal			0.02	pentanal
2-Heptenal, (E)-	aldehyde-enes	oxygenated compounds	0.96	2-Hexenal			0.02	pentanal
2,4-Heptadienal	aldehyde-enes	oxygenated compounds	0.98	2-Hexenal			0.02	pentanal

2,4-Heptadienal, (E,E)-	aldehyde-enes	oxygenated compounds	0.98	2-Hexenal	0.02	pentanal
2-Octenal, (E)-	aldehyde-enes	oxygenated compounds	0.98	2-Hexenal	0.02	pentanal
4-Nonenal, (E)-	aldehyde-enes	oxygenated compounds	0.98	2-Hexenal	0.02	pentanal
2-Nonenal, (Z)-	aldehyde-enes	oxygenated compounds	0.98	2-Hexenal	0.02	pentanal
2-Nonenal, (E)-	aldehyde-enes	oxygenated compounds	0.98	2-Hexenal	0.02	pentanal
2,4-Nonadienal	aldehyde-enes	oxygenated compounds	0.98	2-Hexenal	0.02	pentanal
4-Decenal, (E)-	aldehyde-enes	oxygenated compounds	0.98	2-Hexenal	0.02	pentanal
2,4-Nonadienal, (E,E)-	aldehyde-enes	oxygenated compounds	0.98	2-Hexenal	0.02	pentanal
2-Decenal, (Z)-	aldehyde-enes	oxygenated compounds	0.98	2-Hexenal	0.02	pentanal
(Z)-3-Phenylacrylaldehyde	aldehyde-enes	oxygenated compounds	0.98		0.02	pentanal
2-Decenal, (E)-	aldehyde-enes	oxygenated compounds	0.98	2-Hexenal	0.02	pentanal
2,4-Decadienal, (E,Z)-	aldehyde-enes	oxygenated compounds	0.98	2-Hexenal	0.02	pentanal
cis-Undec-4-enal	aldehyde-enes	oxygenated compounds	0.98	2-Hexenal	0.02	pentanal
2,4-Decadienal, (E,E)-	aldehyde-enes	oxygenated compounds	0.98	2-Hexenal	0.02	pentanal

2-Undecenal, E-	aldehyde-enes	oxygenated compounds	0.98		2-Hexenal			0.02	pentanal	
2,4-Decadienal	aldehyde-enes	oxygenated compounds	0.98		2-Hexenal			0.02	pentanal	
2-Undecenal	aldehyde-enes	oxygenated compounds	0.98		2-Hexenal			0.02	pentanal	
2,4-Dodecadienal	aldehyde-enes	oxygenated compounds	0.98		2-Hexenal			0.02	pentanal	
2-Dodecenal	aldehyde-enes	oxygenated compounds	0.98		2-Hexenal			0.02	pentanal	
7,11-Hexadecadienal	aldehyde-enes	oxygenated compounds	0.98		2-Hexenal			0.02	pentanal	
Neophytadiene	aldehyde-enes	oxygenated compounds	0.96					0.41	alpha-Pinene	
Pentanal	aldehydes	oxygenated compounds	0.96	4.35	Hexanal	28.00	Atkinson and Arey,2003	0.02		Chan et al., 2009
2-Furanol, tetrahydro-	aldehydes	oxygenated compounds	0.96					0.02	pentanal	
Hexanal	aldehydes	oxygenated compounds	0.96	4.35		30.00	Atkinson and Arey,2003	0.02	pentanal	
Heptanal	aldehydes	oxygenated compounds	0.97	3.69		30.00	Atkinson and Arey,2003	0.02	pentanal	
Benzaldehyde	aldehydes	oxygenated compounds	0.96			12.00	Atkinson and Arey,2003	0.38		Fang et al., 2017
Octanal	aldehydes	oxygenated compounds	0.97	3.16		31.66	AopWin v1.92	0.02	pentanal	

3-Cyclohexene-1-carboxaldehyde, 1-methyl-	aldehydes	oxygenated compounds	0.98					0.02	pentanal	
Benzeneacetaldehyde	aldehydes	oxygenated compounds	0.98		Benzeneacetaldehyde	26.31	AopWin v1.92	0.38	benzaldehyde	
Nonanal	aldehydes	oxygenated compounds	0.98	3.16	Octanal	33.07	AopWin v1.92	0.02	pentanal	
Decanal	aldehydes	oxygenated compounds	0.98	3.16	Octanal	34.48	AopWin v1.92	0.02	pentanal	
2-Sec-Butylcyclohexanone	aldehydes	oxygenated compounds	0.98					0.02	pentanal	
4-Oxononanal	aldehydes	oxygenated compounds	0.98					0.02	pentanal	
Cyclohexanone, 2-butyl-	aldehydes	oxygenated compounds	0.98					0.02	pentanal	
Undecanal	aldehydes	oxygenated compounds	0.98	3.16	Octanal			0.02	pentanal	
Dodecanal	aldehydes	oxygenated compounds	0.98	3.16	Octanal			0.02	pentanal	
Tridecanal	aldehydes	oxygenated compounds	0.98	3.16	Octanal			0.02	pentanal	
1-Hexanol	alkanols	oxygenated compounds	0.96	2.69		15.00	Atkinson and Arey,2003	0.00	1-butanol	
1-Heptanol	alkanols	oxygenated compounds	0.95	1.84		14.00	Atkinson and Arey,2003	0.05	n-heptane	
1-Decanol	alkanols	oxygenated compounds	0.97	1.43	1-Octanol	15.37	AopWin v1.92	0.50		Lucas B. Algrim,2019

1-Butanol	alkanols	oxygenated compounds	0.78	2.88		8.50	Atkinson and Arey,2003	0.00	1-butanol	Wu et al., 2017
1-Pentanol	alkanols	oxygenated compounds	0.78	2.83		11.00	Atkinson and Arey,2003	0.00	1-butanol	
3,3-Dimethylbutane-2-ol	alkanols	oxygenated compounds	0.78					0.05	n-heptane	
Cyclopentanol, 2-methyl-, trans-	alkanols	oxygenated compounds	0.78					0.05	n-heptane	
2-Heptanol	alkanols	oxygenated compounds	0.84	1.84	1-Heptanol			0.05	n-heptane	
2-Octanol	alkanols	oxygenated compounds	0.80	1.43	1-Octanol			0.06	C8	
Cyclohexanol, 2,4-dimethyl-	alkanols	oxygenated compounds	0.80					0.06	C8	
3,4-Dimethylcyclohexanol	alkanols	oxygenated compounds	0.80					0.06	C8	
1-Octanol	alkanols	oxygenated compounds	0.99	1.43		14.00	Atkinson and Arey,2003	0.50	1-Decanol	
1-Nonanol	alkanols	oxygenated compounds	0.97	1.43	1-Octanol	13.96	AopWin v1.92	0.50	1-Decanol	
6-Undecanol	alkanols	oxygenated compounds	0.65	1.43	1-Octanol			0.10	5-Decanol	Lucas B. Algrim,2019
1-Undecanol	alkanols	oxygenated compounds	0.99	1.43	1-Octanol	16.78	AopWin v1.92	0.50	1-Decanol	
1-Octen-3-ol	alkanols	oxygenated compounds	0.84					0.05	1-Octene	
2-Octen-1-ol, (E)-	alkanols	oxygenated compounds	0.80					0.05	1-Octene	

alkenols-1-Tridecanol-surrogate	alkanols	oxygenated compounds	0.65				0.46	alkenes-C13
1,2-Heptanediol	di-ols	oxygenated compounds	0.84				0.05	n-heptane
Benzene, 1-methoxy-4-(1-propenyl)-, (Z)-	esters	oxygenated compounds	0.69				0.10	Benzene, propyl-
2(3H)-Furanone, dihydro-3-methyl-	esters	oxygenated compounds	0.93		2.72	AopWin v1.92	0.14	C9
2(3H)-Furanone, dihydro-5-methyl-	esters	oxygenated compounds	0.93				0.14	C9
2H-Pyran-2-one, tetrahydro-3-methyl-	esters	oxygenated compounds	0.66				0.33	C11
Methyl myristoleate	esters	oxygenated compounds	0.99	0.44	Hexadecanoic acid, methyl ester		0.20	C17
Benzoic acid, 2-ethylhexyl ester	esters	oxygenated compounds	0.89	0.98	11.54	AopWin	0.20	C17
Methyl (Z)-10-pentadecenoate	esters	oxygenated compounds	0.99	1.70	9-Hexadecenoic acid, methyl ester, (Z)-		0.30	C18
9-Hexadecenoic acid, methyl ester, (Z)-	esters	oxygenated compounds	0.98	1.70	71.89	AopWin	0.42	C19
Methyl gamma linolenate	esters	oxygenated compounds	0.98	2.32	180.96	AopWin	0.56	C20
9-Octadecenoic acid (Z)-, methyl ester	esters	oxygenated compounds	0.98	1.54	74.72	AopWin	0.77	C21
9,12-Octadecadienoic acid (Z,Z)-, methyl ester	esters	oxygenated compounds	0.98	1.84	127.81	AopWin	0.77	C21

9-Octadecenoic acid, methyl ester, (E)-	esters	oxygenated compounds	0.99	1.54	9-Octadecenoic acid (Z)-, methyl ester		0.77	C21
5,8,11,14,17-Eicosapentaenoic acid, methyl ester, (all-Z)-	esters	oxygenated compounds	0.95	1.84	9,12-Octadecadienoic acid (Z,Z)-, methyl ester		0.96	C22
5,8,11,14-Eicosatetraenoic acid, methyl ester, (all-Z)-	esters	oxygenated compounds	0.98	1.84	9,12-Octadecadienoic acid (Z,Z)-, methyl ester		1.08	C23
cis-11,14,17-Eicosatrienoic acid, methyl ester	esters	oxygenated compounds	0.97	1.84	9,12-Octadecadienoic acid (Z,Z)-, methyl ester		1.08	C23
4,7,10,13,16,19-Docosahexaenoic acid, methyl ester, (all-Z)-	esters	oxygenated compounds	0.95	1.84	9,12-Octadecadienoic acid (Z,Z)-, methyl ester		1.14	C24
13-Docosenoic acid, methyl ester	esters	oxygenated compounds	0.98				1.14	C24
15-Tetracosenoic acid, methyl ester, (Z)-	esters	oxygenated compounds	0.90				1.14	C24
Ethyl Acetate	esters	oxygenated compounds	0.93	0.63	1.70	AopWin	0.06	C8
Acetic acid, butyl ester	esters	oxygenated compounds	0.93	0.83	4.61	AopWin	0.06	C8
Formic acid, pentyl ester	esters	oxygenated compounds	0.93	0.83	Acetic acid, butyl ester		0.06	C8

Acetic acid, hexyl ester	esters	oxygenated compounds	0.66	0.83	Acetic acid, butyl ester			0.22	C10
n-Caproic acid vinyl ester	esters	oxygenated compounds	0.66	0.83	Acetic acid, butyl ester			0.22	C10
2(3H)-Furanone, 5-butyldihydro-	esters	oxygenated compounds	0.69					0.02	C12
Hexanoic acid, pentyl ester	esters	oxygenated compounds	0.69	0.44	Hexadecanoic acid, methyl ester			0.03	C13
Benzoic acid, 1-methylpropyl ester	esters	oxygenated compounds	0.69	0.98	Benzoic acid, 2-ethylhexyl ester			0.03	C13
Benzoic acid, pentyl ester	esters	oxygenated compounds	0.95	0.98	Benzoic acid, 2-ethylhexyl ester			0.08	C15
Hexadecanoic acid, methyl ester	esters	oxygenated compounds	0.97	0.44		18.85	AopWin	0.42	C19
1-Propene-1,2,3-tricarboxylic acid, tributyl ester	esters	oxygenated compounds	0.99					0.77	C21
n-Amyl ether	ethers	oxygenated compounds	0.90	2.15		27.52	AopWin	0.33	C11
Butyrolactone	furanones	oxygenated compounds	0.93	0.96		2.31	AopWin	0.14	C9
4-Methyl-5H-furan-2-one	furanones	oxygenated compounds	0.93					0.22	C10
2(3H)-Furanone, 5-ethyldihydro-	furanones	oxygenated compounds	0.93			5.45	AopWin v1.92	0.22	C10
2(5H)-Furanone, 5-(1-methylethyl)-	furanones	oxygenated compounds	0.66					0.33	C11

2(3H)-Furanone, dihydro-5-propyl-	furanones	oxygenated compounds	0.66					0.33	C11		
2(3H)-Furanone, dihydro-5-pentyl-	furanones	oxygenated compounds	0.69					0.03	C13		
3-Furanmethanol	furans	oxygenated compounds	0.78					0.06	C8		
Furan, 2-pentyl-	furans	oxygenated compounds	0.84					0.22	C10		
2-N-Octylfuran	furans	oxygenated compounds	0.65					0.03	C13		
1-Octen-3-one	ketone-enes	oxygenated compounds	0.58	1.40	2-Octanone			0.05	1-Octene		
trans-3-Nonen-2-one	ketone-enes	oxygenated compounds	0.58					0.15	1-Nonene		
2-Hexanone	ketones	oxygenated compounds	0.96	3.14		9.10	Atkinson and Arey,2003	0.06	C8	Lucas B. Algrim,2016	
Cyclopentanone, 2-methyl-	ketones	oxygenated compounds	0.96					0.06	C8		
2-Heptanone	ketones	oxygenated compounds	0.96	2.36		11.00	Atkinson and Arey,2003	0.14	C9		
3-Ethylcyclopentanone	ketones	oxygenated compounds	0.96	2.36	2-Heptanone			0.14	C9		
2-Octanone	ketones	oxygenated compounds	0.96	1.40		11.00	Atkinson and Arey,2003	0.22	C10		
Acetophenone	ketones	oxygenated compounds	0.96			1.88	AopWin v1.92	0.38	benzaldehyde		
Cyclopentanone, 3-butyl-	ketones	oxygenated compounds	0.96					0.33	C11		

1-Propanone, 1-phenyl-	ketones	oxygenated compounds	0.96						0.38	benzaldehyde
6-Dodecanone	ketones	oxygenated compounds	0.96	1.40	2-Octanone				0.42	Lucas B. Algrim,2016
1-Hexanone, 1-phenyl-	ketones	oxygenated compounds	0.96						0.38	benzaldehyde
2-Pentadecanone	ketones	oxygenated compounds	0.96	1.40	2-Octanone				0.20	C17
6-(p-Tolyl)-2-methyl-2-heptenol, trans-	oxgenated-tri-isoprenes	oxygenated compounds	0.98						0.12	C16
oxiranes-surrogate-Oxirane, decyl-	oxiranes	oxygenated compounds	0.98						0.33	C11
oxo-aldehyde-enes	oxo-aldehyde-enes	oxygenated compounds	0.98						0.03	C13
cis-4,5-Epoxy-(E)-2-decenal	oxo-aldehyde-enes	oxygenated compounds	0.98						0.03	C13
cis-2,3-Epoxyoctane	oxygenated-alkanes	oxygenated compounds	0.98						0.14	C9
3-Hydroxy-3-phenylbutan-2-one	oxygenated-aromatics	oxygenated compounds	0.96						0.38	Phenol
oxygenated-aromatics	oxygenated-aromatics	oxygenated compounds	0.96						0.38	Phenol
Estragole	oxygenated-aromatics	oxygenated compounds	0.96			54.26	AopWin		0.38	Phenol

1,2-Benzenedicarboxylic acid	oxygenated-aromatics	oxygenated compounds	0.96				0.38	Phenol
Benzeneacetic acid, methyl ester	oxygenated-aromatics	oxygenated compounds	0.96				0.38	Phenol
2,6-Di-tert-butyl-4-hydroxy-4-methylcyclohexa-2,5-dien-1-one	oxygenated-aromatics	oxygenated compounds	0.96				0.38	Phenol
o-Hydroxybiphenyl	oxygenated-aromatics	oxygenated compounds	0.96				0.38	Phenol
Benzophenone	oxygenated-aromatics	oxygenated compounds	0.96	3.55	AopWin v1.92		0.38	Phenol
Xanthoxylin	oxygenated-aromatics	oxygenated compounds	0.96				0.38	Phenol
Ethanone, 1,2-diphenyl-	oxygenated-aromatics	oxygenated compounds	0.96	7.32	AopWin v1.92		0.38	Phenol
3,5-di-tert-Butyl-4-hydroxybenzaldehyde	oxygenated-aromatics	oxygenated compounds	0.96				0.38	Phenol
1,7-Octadien-3-ol, 2,6-dimethyl-	oxygenated-bi-isoprenes	oxygenated compounds	0.80				0.41	alpha-Pinene
oxygenated-bi-isoprenes	oxygenated-bi-isoprenes	oxygenated compounds	0.80				0.41	alpha-Pinene
8-Oxabicyclo[5.1.0]octane	oxygenated-	oxygenated compounds	0.78				0.41	alpha-Pinene

	cycloalkanes									
Cyclohexanecarboxaldehyde	oxygenated-cycloalkanes	oxygenated compounds	0.78						0.41	alpha-Pinene
Eucalyptol	oxygenated-di-isoprenes	oxygenated compounds	0.80	5.43	Linalool				0.41	alpha-Pinene
oxygenated-di-isoprenes	oxygenated-di-isoprenes	oxygenated compounds	0.80						0.41	alpha-Pinene
Linalool	oxygenated-di-isoprenes	oxygenated compounds	0.80	5.43		119.64	AopWin		0.41	alpha-Pinene
3-Cyclohexen-1-ol, 4-methyl-1-(1-methylethyl)-, (R)-	oxygenated-di-isoprenes	oxygenated compounds	1.00						0.41	alpha-Pinene
3-Cyclohexene-1-methanol, alpha,alpha,4-trimethyl-, propanoate	oxygenated-di-isoprenes	oxygenated compounds	1.00						0.41	alpha-Pinene
2-Cyclohexen-1-one, 3-methyl-6-(1-methylethyl)-	oxygenated-di-isoprenes	oxygenated compounds	1.00						0.41	alpha-Pinene

2,4-Pentadien-1-ol, 3-pentyl-, (2Z)-	oxygenated-di-isoprenes	oxygenated compounds	1.00				0.41	alpha-Pinene	
Linalyl acetate	oxygenated-di-isoprenes	oxygenated compounds	1.00				0.41	alpha-Pinene	
2H-1b,4-Ethanopentaleno[1,2-b]oxirene, hexahydro-, (1a-alpha-,1b-bta-,4-bta-,4a-alpha-,5a-alpha-)-	oxygenated-di-isoprenes	oxygenated compounds	0.65				0.41	alpha-Pinene	
alpha-Terpinyl acetate	oxygenated-di-isoprenes	oxygenated compounds	0.65				0.41	alpha-Pinene	
1-Penten-3-ol	oxygenated-isoprenes	oxygenated compounds	0.78				0.41	alpha-Pinene	
Phenol	phenols	oxygenated compounds	0.96	2.76	33.47	AopWin v1.92	0.38		Fang et al., 2017
p-Cresol	phenols	oxygenated compounds	0.95	2.40	41.13	AopWin v1.92	0.38	Phenol	
Phenol, 2,4-dimethyl-	phenols	oxygenated compounds	0.98	2.12	50.49	AopWin v1.92	0.38	Phenol	
2H-Pyran-2-one, tetrahydro-	pyranones	oxygenated compounds	0.66				0.22	C10	
Furan, 2-butyltetrahydro-	tetrahydro-furans	oxygenated compounds	0.78	2.13	23.56	AopWin	0.22	C10	

Naphthalene, 2-methyl-	PAHs	PAHs	0.93	3.06		48.60	Phousongphouang and Arey, 2002	0.38		Chan et al., 2009
Acenaphthylene	PAHs	PAHs	0.99	3.34	Naphthalene	75.49	AopWin v1.92	0.03		Fang et al., 2017
Anthracene	PAHs	PAHs	1.00	3.34	Naphthalene	40.00	AopWin v1.92	0.49		Gentner, 2012
Naphthalene	PAHs	PAHs	0.98	3.34		23.00	Atkinson and Arey,2003	0.26		Chan et al., 2009
Naphthalene, 1-methyl-	PAHs	PAHs	0.93	3.06		40.90	Phousongphouang and Arey, 2002	0.33		Chan et al., 2009
Phenanthrene	PAHs	PAHs	0.99	3.34	Naphthalene	13.00	AopWin v1.92	0.49		Gentner, 2012
Silane, diethoxydiphenyl-	siloxanes	siloxanes	0.97					0.10	Benzene, propyl-	
UCM3	UCMs	UCMs	0.92	0.68	C10			0.22	C10	
UCMs	UCMs	UCMs	0.90	0.61	C11			0.33	C11	
UCM6	UCMs	UCMs	0.90	0.61	C11			0.33	C11	
UCM5	UCMs	UCMs	0.99	0.55	C12			0.02	C12	
UCM1	UCMs	UCMs	0.94	0.53	C13			0.03	C13	
UCM2	UCMs	UCMs	0.94	0.53	C13			0.03	C13	
UCM4	UCMs	UCMs	0.94	0.53	C13			0.03	C13	
UCM7	UCMs	UCMs	0.93	0.51	C14			0.05	C14	
UCM8	UCMs	UCMs	0.93	0.51	C14			0.05	C14	
UCM9	UCMs	UCMs	0.93	0.51	C14			0.05	C14	
2,5-Cyclohexadiene-1,4-dione, 2,6-bis(1,1-dimethylethyl)-	UCMs	UCMs	0.93					0.05	C14	

Table S4. The averaged emission rates (ER, μg min^{-1}), retention times and retention time shifts, bins of chemials (semi-)quantified.

compound	class	class_detail	ER	ER_sd	retention1	retention1_sd	bins	retention2	retention2_sd	bins_2D
1-Butanol	oxygenated compounds	alkanols	268.0	151.5	6.40	0.09	B8_before	0.57		P2
1-Decanol	oxygenated compounds	alkanols	13.2		32.80		B13	1.05		P3
1-Heptanol	oxygenated compounds	alkanols	25.8		18.80		B10	0.99		P2
1-Heptene	alkenes	alkenes	363.7		7.10		B8_before	1.77		P4
1-Nonene	alkenes	alkenes	8.0	5.7	14.60	0.19	B9	0.51	0.15	P2
1-Octen-3-ol	oxygenated compounds	alkanols	66.6	49.4	18.40	0.30	B10	1.08	0.02	P3
1-Pentanol	oxygenated compounds	alkanols	347.1		9.00		B8_before	0.78		P2
1-Propanone, 1-phenyl-	oxygenated compounds	ketones	8.4		27.10		B11	2.16		P5
1-Propene-1,2,3-tricarboxylic acid, tributyl ester	oxygenated compounds	esters	0.7	0.7	63.80	0.04	B21	1.92	0.01	P4
1-Undecanol	oxygenated compounds	alkanols	12.1		36.30		B13	0.99		P2
1,2-Benzisothiazole	chlorides and sulfur compounds	SN	48.7	35.2	30.10	0.19	B12	2.97	0.07	P6
1,3,6-Octatriene, 3,7-dimethyl-, (Z)-	alkenes	di-isoprenes	20.4	13.6	22.20	0.00	B10	0.93	0.02	P2
13-Docosenoic acid, methyl ester	oxygenated compounds	esters	0.2		73.30		B25	1.59		P4
15-Tetracosenoic acid, methyl ester, (Z)-	oxygenated compounds	esters	1.7		79.90		B27	1.29		P3
1H-Indene, 2,3-dihydro-1,1,3-	aromatics	aromatics	19.8	10.5	50.10	0.00	B17	2.07	0.02	P5

trimethyl-3-phenyl-										
1H-Indene, 2,3-dihydro-4-methyl-	aromatics	aromatics	3.5		26.50	0.05	B11	1.53	0.02	P4
2-Cyclohexen-1-one, 3-methyl-6-(1-methylethyl)-	oxygenated compounds	oxygenated-di-isoprenes	121.1		31.30		B12	1.86		P4
2-Decenal, (E)-	oxygenated compounds	aldehyde-enes	102.9		31.80		B12	1.44		P3
2-Decenal, (Z)-	oxygenated compounds	aldehyde-enes	53.0	42.1	31.20	0.41	B12	1.32	0.05	P3
2-Dodecenal	oxygenated compounds	aldehyde-enes	16.3	15.8	40.80	0.66	B14	1.29	0.13	P3
2-Furanol, tetrahydro-	oxygenated compounds	aldehydes	37.4		9.60		B8	1.20		P3
2-Heptanone	oxygenated compounds	ketones	11.9		13.80		B9	1.08		P3
2-Heptenal, (E)-	oxygenated compounds	aldehyde-enes	99.0	127.7	16.70	0.17	B9	1.59	0.02	P4
2-Heptenal, (Z)-	oxygenated compounds	aldehyde-enes	77.1	76.2	16.20	0.40	B9	1.35	0.09	P3
2-Hexenal	oxygenated compounds	aldehyde-enes	26.3	24.3	12.30	0.23	B8	1.23	0.09	P3
2-Hexenal, (E)-	oxygenated compounds	aldehyde-enes	56.9		11.60		B8	1.20		P3
2-Nonenal, (E)-	oxygenated compounds	aldehyde-enes	52.9		27.00		B11	1.35		P3
2-Octenal, (E)-	oxygenated compounds	aldehyde-enes	54.6	26.4	21.30	0.23	B10	1.35	0.01	P3
2-Octene, (E)-	alkenes	alkenes	18.0		11.20		B8	0.51		P2
2-Undecenal	oxygenated compounds	aldehyde-enes	46.5	39.9	36.40	0.52	B13	1.41	0.11	P3
2-Undecene, (E)-	alkenes	alkenes	21.5		25.70	0.45	B11	0.54	0.02	P2
2-Undecene, (Z)-	alkenes	alkenes	0.0		25.80		B11	0.69		P2
2(3H)-Furanone, dihydro-5-methyl-	oxygenated compounds	esters	0.3		17.10		B9	3.33		P7
2,4-Decadienal	oxygenated compounds	aldehyde-enes	109.6	122.2	36.10	0.49	B13	1.29	0.09	P3
2,4-Decadienal, (E,E)-	oxygenated compounds	aldehyde-enes	148.9	67.9	34.30	0.14	B13	1.98	0.02	P4

2,4-Decadienal, (E,Z)-	oxygenated compounds	aldehyde-enes	60.0	43.4	33.30	0.34	B13	1.68	0.06	P4
2,4-Diphenyl-4-methyl-1-pentene	aromatics	aromatics	11.1	12.5	52.50	0.00	B18	2.19	0.02	P5
2,4-Diphenyl-4-methyl-2(E)-pentene	aromatics	aromatics	25.8	22.4	54.00	0.08	B18	2.22	0.02	P5
2,5-Cyclohexadiene-1,4-dione, 2,6-bis(1,1-dimethylethyl)-	UCMs	UCMs	4.2	4.1	40.80	0.58	B14	1.41	0.13	P3
2,6-Di-tert-butyl-4-hydroxy-4-methylcyclohexa-2,5-dien-1-one	oxygenated compounds	oxygenated-aromatics	14.7	16.1	41.10	0.41	B15	1.23	0.10	P3
2H-Pyran-2-one, tetrahydro-3-methyl-	oxygenated compounds	esters	0.2		23.20		B11	3.51		P8
3-Cyclohexen-1-ol, 4-methyl-1-(1-methylethyl)-, (R)-	oxygenated compounds	oxygenated-di-isoprenes	27.3	27.4	28.20	0.20	B12	1.17	0.06	P3
3-Cyclohexene-1-carboxaldehyde, 1-methyl-	oxygenated compounds	aldehydes	28.1	7.8	20.50	0.00	B10	1.65	0.00	P4
3-Cyclohexene-1-methanol, alpha,alpha,4-	oxygenated compounds	oxygenated-di-isoprenes	31.6	19.3	28.90	0.21	B12	1.38	0.05	P3

trimethyl-, propanoate										
3-Dodecene, (E)-	alkenes	alkenes	31.2		29.40		B12	0.72		P2
3-Ethylcyclopentanone	oxygenated compounds	ketones	17.8	13.0	16.50	0.24	B9	1.71	0.03	P4
3-Furanmethanol	oxygenated compounds	furans	144.6	46.0	12.60	0.14	B8	1.50	0.00	P4
3-Hydroxy-3-phenylbutan-2-one	oxygenated compounds	oxygenated-aromatics	47.9	22.8	23.40	0.10	B11	1.89	0.06	P4
3,3-Dimethylbutane-2-ol	oxygenated compounds	alkanols	74.8		11.10		B8	1.14		P3
3,4-Dimethylcyclohexanol	oxygenated compounds	alkanols	36.7	8.9	21.00	0.00	B10	1.35	0.00	P3
3,5-di-tert-Butyl-4-hydroxybenzaldehyde	oxygenated compounds	oxygenated-aromatics	16.1	9.7	51.40	0.04	B17	2.10	0.02	P5
4-Methyl-5H-furan-2-one	oxygenated compounds	furanones	0.0		17.90	0.07	B10	3.21	0.06	P7
4,7-Methano-1H-indene, octahydro-, (3a¿ñ,4¿ñ,7¿ñ,7a¿ñ)-	alkenes	di-isoprenes	27.3	20.5	22.90	0.07	B11	1.08	0.03	P3
4,7,10,13,16,19-Docosahexaenoic	oxygenated compounds	esters	0.2		71.60		B24	1.98		P4

acid, methyl ester, (all-Z)-										
5,8,11,14-Eicosatetraenoic acid, methyl ester, (all-Z)-	oxygenated compounds	esters	0.2		67.50		B23	1.32		P3
5,8,11,14,17-Eicosapentaenoic acid, methyl ester, (all-Z)-	oxygenated compounds	esters	0.3		66.80		B22	1.71		P4
6-(p-Tolyl)-2-methyl-2-heptenol, trans-	oxygenated compounds	oxgenated-tri-isoprenes	20.7	11.9	45.10	0.00	B16	1.71	0.01	P4
9-Hexadecenoic acid, methyl ester, (Z)-	oxygenated compounds	esters	0.3		57.00		B19	1.20		P3
9-Octadecenoic acid (Z)-, methyl ester	oxygenated compounds	esters	0.5		61.90		B21	1.53		P4
9,12-Octadecadienoic acid (Z,Z)-, methyl ester	oxygenated compounds	esters	0.2		62.20		B21	1.35		P3
Acetic acid, butyl ester	oxygenated compounds	esters	1.5	1.1	10.70	0.07	B8	0.87	0.01	P2
Acetic acid, hexyl ester	oxygenated compounds	esters	1.0	0.5	20.20	0.16	B10	1.05	0.03	P3
Acetophenone	oxygenated compounds	ketones	50.4	40.7	22.00	0.32	B10	2.34	0.08	P5

aldehyde-enes-trans-2-Dodecenal-surrogate	oxygenated compounds	aldehyde-enes	20.2	8.9	16.40	0.05	B9	1.02	0.13	P3
alk-di-enes-C12	alkenes	alkenes	0.9		30.90	0.50	B12	0.84	0.15	P2
alkenes-C12	alkenes	alkenes	9.8	12.3	28.40	0.15	B12	0.60	0.02	P2
alkenes-C18	alkenes	alkenes	8.8	6.0	53.10	0.58	B18	0.84	0.05	P2
alkynes-C12	others	n-alkynes	7.1	5.1	32.40	0.34	B13	0.93	0.11	P2
alkynes-C16	others	n-alkynes	2.6		47.40	1.25	B16	0.99	0.08	P2
alkynes-C18	others	n-alkynes	5.8	4.3	54.30	0.94	B18	1.17	0.13	P3
alpha-Patchoulene	alkenes	tri-isoprenes	12.4	13.2	45.10	0.05	B16	1.41	0.01	P3
alpha-Pinene	alkenes	di-isoprenes	37.1	27.6	16.60	0.04	B9	0.72	0.02	P2
alpha-Terpinyl acetate	oxygenated compounds	oxygenated-di-isoprenes	24.1	20.0	36.00	0.36	B13	1.32	0.12	P3
Anthracene	PAHs	PAHs	1.5		52.60		B18	3.15		P7
aromatics-C3	aromatics	aromatics	55.3	29.5	20.60	1.54	B10	1.35	0.10	P3
aromatics-C4	aromatics	aromatics	46.3	37.9	25.60	1.51	B11	1.32	0.06	P3
aromatics-C4-surrogate	aromatics	aromatics	121.8	82.7	27.10	0.98	B11	1.44	0.17	P3
b-alkanes-C10	b-alkanes	b-alkanes	154.4	71.4	18.70	0.78	B10	0.57	1.11	P2
b-alkanes-C11	b-alkanes	b-alkanes	99.5	92.9	21.40	1.02	B10	0.54	0.02	P2
b-alkanes-C12	b-alkanes	b-alkanes	90.5	71.9	28.70	1.15	B12	0.60	1.04	P2
b-alkanes-C13	b-alkanes	b-alkanes	21.7	21.8	31.90	0.86	B12	0.60	0.10	P2
b-alkanes-C14	b-alkanes	b-alkanes	31.7	29.1	38.00	1.31	B14	0.63	0.06	P2
b-alkanes-C15	b-alkanes	b-alkanes	37.1	28.9	41.50	1.72	B15	0.63	0.07	P2
b-alkanes-C16	b-alkanes	b-alkanes	30.0	19.8	45.20	0.71	B16	0.69	0.12	P2
b-alkanes-C17	b-alkanes	b-alkanes	22.7	17.6	47.80	0.73	B16	0.72	0.05	P2
b-alkanes-C18	b-alkanes	b-alkanes	17.0	12.9	50.70	0.75	B17	0.69	0.06	P2

b-alkanes-C19	b-alkanes	b-alkanes	9.0	7.8	54.20	1.03	B18	0.72	0.09	P2
b-alkanes-C20	b-alkanes	b-alkanes	6.8	5.0	59.30	0.54	B20	0.72	0.07	P2
b-alkanes-C8	b-alkanes	b-alkanes	34.2	36.1	10.30	0.27	B8	0.45	0.05	P1
b-alkanes-C9	b-alkanes	b-alkanes	36.6	32.2	13.50	0.06	B9	0.45	0.02	P1
Benzaldehyde	oxygenated compounds	aldehydes	74.3	27.9	16.70	0.41	B9	2.25	0.09	P5
Benzene, (1-	aromatics	aromatics			15.80	0.07	B9	0.99	0.03	P2
methylethyl)-			15.3	18.0						
Benzene, 1-ethyl-	aromatics	aromatics			18.50	0.08	B10	1.20	0.02	P3
2-methyl-			11.9	10.3						
Benzene, 1-ethyl-	aromatics	aromatics			19.30	0.31	B10	1.17	0.03	P3
3-methyl-			30.6	45.6						
Benzene, 1-ethyl-	aromatics	aromatics			17.70	0.06	B10	1.11	0.01	P3
4-methyl-			43.0	34.5						
Benzene, 1-	oxygenated compounds	esters			32.90	0.30	B13	1.92	0.06	P4
methoxy-4-(1-										
propenyl)-, (Z)-			1.1	1.2						
Benzene, 1-	aromatics	aromatics			22.90	0.36	B11	1.26	0.10	P3
methyl-2-propyl-			5.3	3.9						
Benzene, 1-	nitrogen-containing	nitrophenols			43.50		B15	2.85		P6
methyl-2,4-dinitro-	compounds		15.2							
Benzene, 1-	aromatics	aromatics			22.20	0.00	B10	1.14	0.02	P3
methyl-3-propyl-			9.2							
Benzene, 1,1'-	aromatics	aromatics			52.50	0.04	B18	2.22	0.02	P5
(1,1,2,2-										
tetramethyl-1,2-										
ethanediyl)bis-			13.4	10.4						

Benzene, 1,1'-(3,3-dimethyl-1-butenylidene)bis-	aromatics	aromatics	20.7	14.8	54.00	0.05	B18	2.19	0.02	P5
Benzene, 1,2,3-trimethyl-	aromatics	aromatics	10.9	11.0	18.10	0.82	B10	1.08	0.07	P3
Benzene, 1,2,4-trimethyl-	aromatics	aromatics	39.7	33.3	19.30	0.06	B10	1.20	0.01	P3
Benzene, 2-methyl-1,3-dinitro-	nitrogen-containing compounds	nitrophenols	11.2		38.30		B14	3.45		P7
Benzene, propyl-	aromatics	aromatics	25.0	19.7	17.20	0.09	B9	1.11	0.01	P3
Benzeneacetaldehyde	oxygenated compounds	aldehydes	30.4	25.0	20.70	0.36	B10	2.43	0.09	P5
Benzoic acid, 1-methylpropyl ester	oxygenated compounds	esters	0.2	0.2	35.00	0.28	B13	1.68	0.07	P4
Benzoic acid, 2-ethylhexyl ester	oxygenated compounds	esters	1.2	1.4	49.90	0.25	B17	1.65	0.08	P4
Benzoic acid, pentyl ester	oxygenated compounds	esters	0.0		41.00		B15	1.80		P4
Benzonitrile	nitrogen-containing compounds	nitriles	31.4	4.4	17.80	0.29	B10	2.40	0.08	P5
Benzophenone	oxygenated compounds	oxygenated-aromatics	52.4	27.5	46.60	0.07	B16	3.09	0.02	P7
Benzothiazole	chlorides and sulfur compounds	SN	33.7	19.2	29.80	0.33	B12	3.09	0.10	P7
beta-Myrcene	alkenes	di-isoprenes	48.1	29.6	19.40	0.00	B10	0.84	0.02	P2
beta-Pinene	alkenes	di-isoprenes	56.8	74.7	18.40	0.04	B10	0.87	0.01	P2
Bicyclo[3.1.0]hex-2-ene, 2-methyl-5-(1-methylethyl)-	alkenes	di-isoprenes	7.2	5.7	16.30	0.15	B9	0.69	0.02	P2

Bicyclo[3.1.0]hex-2-ene, 4-methyl-1-(1-methylethyl)-	alkenes	di-isoprenes	22.1	8.4	16.30	0.13	B9	0.69	0.01	P2
Bicyclo[5.3.0]decane	cyclic compounds	cyclo-alkanes	17.6	15.9	20.60	0.16	B10	0.81	0.03	P2
Butanoic acid, 2-methyl-	oxygenated compounds	acids	6.3		12.70		B8	0.84		P2
Butanoic acid, 3-methyl-	oxygenated compounds	acids	41.3		12.30		B8	0.84		P2
Butyrolactone	oxygenated compounds	furanones	1.4		13.80	0.07	B9	3.69	0.11	P8
C10	n-alkanes	n-alkanes	13.2	8.5	20.20	0.04	B10	0.57	0.01	P2
C11	n-alkanes	n-alkanes	6.6	5.7	25.30	0.04	B11	0.60	0.01	P2
C12	n-alkanes	n-alkanes	7.9	5.2	30.10	0.03	B12	0.63	0.01	P2
C13	n-alkanes	n-alkanes	1.5	1.9	34.60	0.06	B13	0.66	0.02	P2
C15	n-alkanes	n-alkanes	2.0	1.6	42.90	0.03	B15	0.69	0.00	P2
C16	n-alkanes	n-alkanes	1.4	0.5	46.70	0.03	B16	0.72	0.00	P2
C20	n-alkanes	n-alkanes	0.4	0.3	60.10	0.07	B20	0.87	0.01	P2
C21	n-alkanes	n-alkanes	3.7	2.9	63.10	0.43	B21	0.87	0.04	P2
C22	n-alkanes	n-alkanes	3.9	3.3	66.00	0.10	B22	0.99	0.07	P2
C23	n-alkanes	n-alkanes	4.5	4.2	68.90	0.24	B23	0.99	0.07	P2
C24	n-alkanes	n-alkanes	6.5	8.0	71.30	0.16	B24	0.96	0.05	P2
C26	n-alkanes	n-alkanes	16.8	18.0	77.10	0.43	B26	1.29	0.17	P3
C27	n-alkanes	n-alkanes	7.1	4.7	80.20	0.57	B27	0.42	0.19	P1
C30	n-alkanes	n-alkanes	56.8	148.2	83.90	0.49	B30	0.66	0.09	P2
C8	n-alkanes	n-alkanes	362.8	378.7	10.70	0.11	B8	0.45	1.05	P1
C9	n-alkanes	n-alkanes	13.5	8.3	15.20	0.21	B9	0.51	0.05	P2

cis-11,14,17-Eicosatrienoic acid, methyl ester	oxygenated compounds	esters	0.2		68.10		B23	1.62		P4
Copaene	alkenes	tri-isoprenes	9.8	8.2	37.90	0.00	B14	0.99	0.01	P2
Cyclohexane, isocyanato-	nitrogen-containing compounds	CN	11.1	5.5	18.90	0.14	B10	1.38	0.09	P3
Cyclohexane, isothiocyanato-	chlorides and sulfur compounds	SN	16.7	16.6	30.00	0.12	B12	2.22	0.03	P5
Cyclohexanol, 2,4-dimethyl-	oxygenated compounds	alkanols	38.0	27.6	19.70	1.27	B10	1.23	0.08	P3
Cyclopentanol, 2-methyl-, trans-	oxygenated compounds	alkanols	38.0	7.2	11.70	0.45	B8	0.93	0.19	P2
Cyclopentanone, 2-methyl-	oxygenated compounds	ketones	24.3	12.4	11.30	0.19	B8	1.41	0.03	P3
D-Limonene	alkenes	di-isoprenes	77.0	41.5	21.30	0.05	B10	0.93	0.01	P2
Decanal	oxygenated compounds	aldehydes	20.3	13.3	29.40	0.19	B12	1.17	0.02	P3
Decanenitrile	nitrogen-containing compounds	nitriles	9.0		32.70		B13	1.26		P3
di-isoprenens	alkenes	di-isoprenes	18.7	14.8	20.90	0.37	B10	1.26	0.05	P3
di-isoprenes	alkenes	di-isoprenes	221.2	321.4	21.30	1.20	B10	0.93	0.04	P2
Dicyclopentadiene	alkenes	alkenes	8.9		20.90	0.00	B10	1.20	0.03	P3
Dodecanal	oxygenated compounds	aldehydes	12.4	9.9	38.50	0.31	B14	1.17	0.08	P3
Estragole	oxygenated compounds	oxygenated-aromatics	22.0	9.3	29.00	0.24	B12	1.74	0.06	P4
Ethanone, 1,2-diphenyl-	oxygenated compounds	oxygenated-aromatics	16.8	9.4	50.50	0.45	B17	3.24	0.14	P7
Ethyl Acetate	oxygenated compounds	esters	23.0	15.4	5.50	0.08	B8_before	0.42	3.00	P1
Ethylbenzene	aromatics	aromatics	50.8	51.3	12.80	0.20	B8	1.02	0.08	P3

Eucalyptol	oxygenated compounds	oxygenated-di-isoprenes	26.7	25.2	21.20	0.30	B10	1.14	0.12	P3
Formic acid, pentyl ester	oxygenated compounds	esters	0.6	0.1	11.20	0.00	B8	0.87	0.02	P2
Furan, 2-pentyl-	oxygenated compounds	furans	92.2	57.6	19.20	0.05	B10	0.99	0.02	P2
Furfural	oxygenated compounds	aldehyde-enes	76.5		11.60		B8	1.71		P4
Heptanal	oxygenated compounds	aldehydes	64.6	59.2	14.40	0.48	B9	1.08	0.06	P3
Heptane, 2-methyl-	b-alkanes	b-alkanes	163.7	22.2	9.40	0.00	B8	0.39	0.00	P1
Heptanoic acid	oxygenated compounds	acids	258.7		23.80		B11	1.11		P3
Hexadecanoic acid, methyl ester	oxygenated compounds	esters	0.2	0.4	57.30	0.05	B19	1.20	0.00	P3
Hexanal	oxygenated compounds	aldehydes	140.9	81.0	9.80	0.12	B8	0.99	0.02	P2
Hexanoic acid	oxygenated compounds	acids	2597.6	2077.4	19.00	0.93	B10	1.23	0.08	P3
Indane	aromatics	aromatics	4.9	5.5	21.20	0.06	B10	1.53	0.02	P4
Linalool	oxygenated compounds	oxygenated-di-isoprenes	104.0	71.4	24.60	0.11	B11	1.08	0.04	P3
Linalyl acetate	oxygenated compounds	oxygenated-di-isoprenes	29.5		31.90		B12	1.08		P3
Longifolene	alkenes	tri-isoprenes	1.2		39.00	0.00	B14	1.20	0.01	P3
Methyl (Z)-10-pentadecenoate	oxygenated compounds	esters	0.1		54.30		B18	1.14		P3
Methyl gamma linolenate	oxygenated compounds	esters	0.3		61.20		B20	1.68		P4
Methyl myristoleate	oxygenated compounds	esters	0.3		49.80		B17	1.14		P3

Naphthalene, 1-methyl-	PAHs	PAHs	47.3		33.40	0.25	B13	2.13	0.09	P5
Neophytadiene	oxygenated compounds	aldehyde-enes	2.6	2.1	55.00	0.24	B18	0.84	0.06	P2
Nitric acid, pentyl ester	nitrogen-containing compounds	nitrates	0.6		15.30		B9	1.05		P3
Nonanal	oxygenated compounds	aldehydes	136.0	83.6	24.40	0.20	B11	1.29	0.03	P3
o-Cymene	aromatics	aromatics	1.4		20.80	0.00	B10	1.14	0.00	P3
o-Hydroxybiphenyl	oxygenated compounds	oxygenated-aromatics	13.5	8.3	42.70	0.46	B15	2.64	0.14	P6
o-xylene	aromatics	aromatics	25.5	22.0	14.20	0.08	B9	1.11	0.02	P3
Octanal	oxygenated compounds	aldehydes	39.3		19.30		B10	1.20		P3
oxygenated-aromatics	oxygenated compounds	oxygenated-aromatics	35.5	35.3	23.50	0.13	B11	1.86	0.03	P4
oxygenated-bi-isoprenes	oxygenated compounds	oxygenated-bi-isoprenes	27.9		23.60		B11	1.47		P3
p-Cresol	oxygenated compounds	phenols	29.0		23.70		B11	1.47		P3
p-Xylene	aromatics	aromatics	40.9	37.2	13.20	0.05	B9	0.99	0.01	P2
Pentanal	oxygenated compounds	aldehydes	114.7	54.8	6.90	0.28	B8_before	0.66	0.04	P2
Pentane, 1-nitro-	nitrogen-containing compounds	nitro-alkanes	39.2	29.0	14.90	0.17	B9	1.23	0.06	P3
Pentanoic acid	oxygenated compounds	acids	1165.4	922.5	14.40	0.46	B9	0.90	0.09	P2
Phenanthrene	PAHs	PAHs	5.8	5.8	52.40	0.27	B18	3.24	0.10	P7
Phenol	oxygenated compounds	phenols	35.4	16.6	18.90	0.41	B10	1.59	0.05	P4
Phenol, 2-chloro-	chlorides and sulfur compounds	chlorides	30.5		20.50		B10	1.77		P4
Phenol, 2,4-dimethyl-	oxygenated compounds	phenols	21.0		27.20		B11	1.77		P4

Phenol, 4-chloro-3-methyl-	chlorides and sulfur compounds	chlorides	38.5		34.10		B13	1.68		P4
Styrene	aromatics	aromatics	14.0	8.4	14.10	0.28	B9	1.26	0.05	P3
Tetrachloroethylene	chlorides and sulfur compounds	chlorides	52.6	39.6	10.70	0.03	B8	0.78	0.00	P2
Toluene	aromatics	aromatics	1920.4	2633.8	9.10	0.21	B8	0.51	0.20	P2
trans-beta-Ocimene	alkenes	di-isoprenes	16.8	11.4	21.60	0.00	B10	0.93	0.00	P2
Trichloroethylene	chlorides and sulfur compounds	chlorides	56.7	46.8	7.20	0.10	B8_before	0.57	0.16	P2
Tridecanal	oxygenated compounds	aldehydes	16.9	0.2	42.60	0.72	B15	1.17	0.13	P3
tridecanoic acid	oxygenated compounds	acids	82.5		47.70		B16	1.17		P3
Undecanal	oxygenated compounds	aldehydes	20.3	11.0	34.10	0.35	B13	1.17	0.15	P3
Undecanoic acid	oxygenated compounds	acids	40.3		40.60		B14	1.02		P3
Xanthoxylin	oxygenated compounds	oxygenated-aromatics	17.6	12.5	48.70	0.35	B17	2.61	0.11	P6

Table S5. The calibration curve, R^2, linear range, and RSD of different concentration levels of authentic standards.

compound	**slope**	**intercept**	**R^2**	**linear_range**	**RSD(n=5)**				
					4ng	**20ng**	**40ng**	**60ng**	**200ng**
acids									
Benzoic acid	250343	-6847795	0.971	4-200ng	n.d.	n.d.	28.9%	n.d.	4.3%
Heptanoic acid	2131	-3755	0.805	4-200ng	n.d.	n.d.	n.d.	n.d.	n.d.

compound	slope	intercept	R^2	linear_range	RSD(n=5)				
					4ng	20ng	40ng	60ng	200ng
Phthalic anhydride	231389	22202135	0.981	4-200ng	n.d.	n.d.	6.3%	n.d.	36.0%
Undecanoic acid	812	5935	0.970	4-200ng	n.d.	n.d.	n.d.	n.d.	n.d.
aldehydes									
Hexanal	428427	9717187	0.972	4-200ng	n.d.	n.d.	2.5%	n.d.	3.3%
Heptanal	465836	8589705	0.961	4-200ng	13.7%	n.d.	1.0%	n.d.	3.3%
Benzaldehyde	440370	13599045	0.968	4-200ng	24.4%	n.d.	1.9%	n.d.	4.4%
Octanal	559030	6559260	0.992	4-200ng	2.6%	n.d.	5.2%	n.d.	3.3%
Nonanal	281558	13319080	0.977	4-200ng	5.1%	n.d.	1.5%	n.d.	2.4%
Decanal	338030	15966783	0.975	4-200ng	0.8%	n.d.	1.8%	n.d.	2.5%
Citral	338504	4634663	0.988	4-200ng	n.d.	n.d.	4.0%	n.d.	1.8%
Dodecanal	829420	7367850	0.980	4-200ng	4.9%	n.d.	1.4%	n.d.	5.8%
alkanols									
1-Butanol	173641	18107050	0.973	4-200ng	n.d.	n.d.	2.1%	n.d.	6.2%
1-Butanol, 3-methyl-	539780	8579677	0.996	4-200ng	18.1%	n.d.	1.5%	n.d.	5.1%
1-Hexanol	448439	3807097	0.991	4-200ng	n.d.	n.d.	6.7%	n.d.	3.9%
Benzyl alcohol	464912	8209089	0.979	4-200ng	n.d.	n.d.	4.3%	n.d.	1.9%
1-Hexanol, 2-ethyl-	34496	27524926	0.963	4-200ng	7.2%	n.d.	24.9%	n.d.	3.8%

compound	slope	intercept	R^2	linear_range	RSD(n=5)				
					4ng	20ng	40ng	60ng	200ng
Phenylethyl Alcohol	502037	20235693	0.973	4-200ng	n.d.	n.d.	5.1%	n.d.	1.6%
1-Dodecanol	1030789	2210803	0.996	4-200ng	67.7%	n.d.	1.9%	n.d.	2.5%
alkenols									
Linalool	46187	5109924	0.979	4-200ng	n.d.	n.d.	15.2%	n.d.	6.8%
Citronellol	552899	4042779	0.989	4-200ng	16.5%	n.d.	3.5%	n.d.	3.8%
amides									
Caprolactam	495849	14426984	0.958	4-200ng	n.d.	n.d.	22.7%	n.d.	4.8%
Hexadecanamide	83503	-646915	0.961	4-200ng	n.d.	n.d.	n.d.	n.d.	n.d.
aromatics									
Toluene	443121	4846746	0.998	4-100ng	5.7%	5.2%	n.d.	4.1%	n.d.
Ethylbenzene	415866	9506163	0.996	4-100ng	6.6%	3.2%	n.d.	6.1%	n.d.
Benzene, 1,3-dimethyl-	702273	21421131	0.973	4-100ng	4.7%	2.5%	n.d.	5.7%	n.d.
Styrene	472665	8554263	0.999	4-100ng	n.d.	5.9%	n.d.	7.5%	n.d.
o-Xylene	395014	12307653	0.975	4-100ng	4.6%	2.5%	n.d.	3.9%	n.d.
Benzene, (1-methylethyl)-	635195	8419191	0.986	4-100ng	4.2%	1.7%	n.d.	2.1%	n.d.
Benzene, propyl-	478544	9944618	0.972	4-100ng	3.2%	1.9%	n.d.	4.0%	n.d.
esters									

compound	slope	intercept	R^2	linear_range	RSD(n=5)				
					4ng	20ng	40ng	60ng	200ng
n-Propyl acetate	358155	11228820	0.977	4-200ng	3.3%	n.d.	2.7%	n.d.	16.3%
sec-Butyl acetate	556400	5542265	0.991	4-200ng	5.3%	n.d.	4.9%	n.d.	5.1%
Butanoic acid, ethyl ester	462753	7566755	0.980	4-200ng	5.7%	n.d.	2.5%	n.d.	3.7%
1-Butanol, 3-methyl-, acetate	614255	8680932	0.978	4-200ng	3.4%	n.d.	5.3%	n.d.	2.4%
Acetic acid, hexyl ester	477741	3406899	0.989	4-200ng	15.0%	n.d.	5.8%	n.d.	2.6%
Acetic acid, phenylmethyl ester	610322	6465680	0.995	4-200ng	10.5%	n.d.	4.2%	n.d.	2.9%
Benzeneacetic acid, ethyl ester	265875	15735816	0.986	4-200ng	2.3%	n.d.	5.7%	n.d.	3.5%
Acetic acid, 2-phenylethyl ester	647480	8130532	0.980	4-200ng	5.3%	n.d.	2.9%	n.d.	2.0%
Linalyl acetate	198923	6751661	0.980	4-200ng	12.8%	n.d.	7.7%	n.d.	5.9%
Dimethyl phthalate	350836	3614714	0.989	4-100ng	2.9%	2.8%	n.d.	4.2%	n.d.
Diethyl Phthalate	371204	1488632	0.980	4-100ng	7.8%	3.2%	n.d.	2.4%	n.d.
Benzyl Benzoate	830246	6059710	0.990	4-200ng	3.8%	n.d.	1.8%	n.d.	2.5%
Dibutyl phthalate	328509	15297024	0.975	4-100ng	6.6%	1.3%	n.d.	1.7%	n.d.
Benzyl butyl phthalate	459157	8652860	0.975	4-100ng	7.8%	3.0%	n.d.	5.9%	n.d.
Hexanedioic acid, bis(2-ethylhexyl) ester	649694	4949450	0.986	4-200ng	6.3%	n.d.	3.9%	n.d.	3.7%
Bis(2-ethylhexyl) phthalate	731246	6634275	0.991	4-100ng	16.7%	3.0%	n.d.	5.3%	n.d.
Di-N-octyl phthalate	919796	3612301	0.986	4-100ng	18.1%	3.0%	n.d.	5.0%	n.d.

compound	slope	intercept	R^2	linear_range	RSD(n=5)				
					4ng	20ng	40ng	60ng	200ng
ketones									
Cyclohexanone	707182	5939017	0.997	4-200ng	1.9%	n.d.	5.6%	n.d.	3.2%
3-Heptanone	286135	9024371	0.978	4-200ng	32.1%	n.d.	1.9%	n.d.	3.1%
2-Heptanone	292003	35369085	0.965	4-200ng	22.3%	n.d.	5.0%	n.d.	6.4%
5-Hepten-2-one, 6-methyl-	458266	11114987	0.972	4-200ng	6.5%	n.d.	2.6%	n.d.	2.2%
Acetophenone	591155	15979443	0.987	4-200ng	12.9%	n.d.	2.1%	n.d.	4.8%
Isophorone	487756	6832225	0.975	4-100ng	2.2%	0.9%	n.d.	8.6%	n.d.
Camphor	195385	22259055	0.955	4-200ng	n.d.	n.d.	4.6%	n.d.	4.8%
Quinoline	637795	8612696	0.988	4-200ng	5.1%	n.d.	5.4%	n.d.	2.4%
alkanes and alkenes									
C7	146035	3133309	0.986	4-100ng	20.3%	30.7%	n.d.	96.3%	n.d.
C8	784938	4737945	0.990	4-100ng	7.7%	2.8%	n.d.	5.5%	n.d.
C9	292422	18633044	0.978	4-100ng	7.6%	2.5%	n.d.	1.8%	n.d.
C10	598582	9039032	0.976	4-100ng	6.1%	2.9%	n.d.	2.1%	n.d.
C11	257733	17282643	0.967	4-100ng	2.3%	2.1%	n.d.	4.1%	n.d.
C12	511216	9518454	0.975	4-100ng	2.8%	1.4%	n.d.	2.2%	n.d.
C13	609010	10636341	0.980	4-100ng	0.8%	1.2%	n.d.	1.7%	n.d.

compound	slope	intercept	R^2	linear_range	RSD(n=5)				
					4ng	20ng	40ng	60ng	200ng
C14	483085	11803587	0.986	4-100ng	0.8%	1.2%	n.d.	2.1%	n.d.
C15	577509	24698431	0.987	4-100ng	3.8%	0.4%	n.d.	3.6%	n.d.
C16	539434	27472675	0.991	4-100ng	1.6%	0.9%	n.d.	4.1%	n.d.
C17	863756	17858175	0.978	4-100ng	2.4%	1.7%	n.d.	4.9%	n.d.
C18	409603	25656993	0.974	4-100ng	3.0%	1.7%	n.d.	3.7%	n.d.
C19	424592	19678887	0.974	4-100ng	1.3%	1.5%	n.d.	2.9%	n.d.
C20	587255	8079682	0.989	4-100ng	2.2%	1.6%	n.d.	9.5%	n.d.
C21	738093	10204776	0.979	4-100ng	3.0%	0.9%	n.d.	4.8%	n.d.
C22	703648	11095092	0.976	4-100ng	2.6%	0.8%	n.d.	5.6%	n.d.
C23	530361	19584994	0.971	4-100ng	3.8%	1.1%	n.d.	2.7%	n.d.
C24	852644	15234240	0.992	4-100ng	4.5%	1.5%	n.d.	5.4%	n.d.
C25	907839	15516191	0.983	4-100ng	9.1%	1.2%	n.d.	4.8%	n.d.
C26	1090682	9247177	0.992	4-100ng	15.1%	2.8%	n.d.	4.1%	n.d.
C27	909060	11372911	0.995	4-100ng	10.3%	1.3%	n.d.	3.4%	n.d.
C28	1030031	5203146	0.990	4-100ng	9.4%	0.9%	n.d.	5.4%	n.d.
C29	1253914	-1134576	0.973	4-100ng	10.3%	1.8%	n.d.	3.5%	n.d.
C30	1420611	-8453663	0.994	4-100ng	11.1%	4.1%	n.d.	4.9%	n.d.

compound	slope	intercept	R^2	linear_range	RSD(n=5)				
					4ng	20ng	40ng	60ng	200ng
C31	1304834	-2319492	0.994	4-100ng	7.2%	3.4%	n.d.	5.7%	n.d.
C32	1379389	-12026336	0.993	4-100ng	3.9%	5.3%	n.d.	5.8%	n.d.
Cyclohexane, octyl-	357541	16843976	0.991	4-200ng	3.7%	n.d.	0.6%	n.d.	2.5%
3-Carene	218769	10384090	0.987	4-200ng	1.3%	n.d.	3.7%	n.d.	3.0%
N-compounds									
1-Propanamine, N-nitroso-N-propyl-	326597	10974780	0.996	4-100ng	4.9%	1.1%	n.d.	11.4%	n.d.
Benzene, nitro-	362708	6222925	0.984	4-100ng	n.d.	1.0%	n.d.	5.5%	n.d.
Indole	627410	6842884	0.998	4-200ng	10.0%	n.d.	3.7%	n.d.	2.4%
Carbazole	1063918	7272520	0.991	4-100ng	8.0%	1.1%	n.d.	3.5%	n.d.
Benzonitrile	437203	8219380	0.978	4-200ng	8.2%	n.d.	2.1%	n.d.	3.6%
PAHs									
Naphthalene	343479	19347461	0.987	4-100ng	2.2%	3.1%	n.d.	1.3%	n.d.
Naphthalene, 2-methyl-	862618	16797341	0.975	4-100ng	3.7%	3.0%	n.d.	4.6%	n.d.
Acenaphthylene	452774	7766843	0.991	4-100ng	3.7%	1.6%	n.d.	3.4%	n.d.
Acenaphthene	523720	11138693	0.986	4-100ng	0.5%	1.1%	n.d.	2.5%	n.d.
Fluorene	835221	7374597	0.992	4-100ng	0.9%	0.9%	n.d.	2.4%	n.d.
Azobenzene	376963	6555488	0.988	4-100ng	4.7%	2.3%	n.d.	3.5%	n.d.

compound	slope	intercept	R^2	linear_range	RSD(n=5)				
					4ng	20ng	40ng	60ng	200ng
Phenanthrene	533657	8641899	0.984	4-100ng	2.3%	2.0%	n.d.	5.6%	n.d.
Anthracene	677343	12322203	0.992	4-100ng	2.8%	2.7%	n.d.	1.8%	n.d.
Fluoranthene	702143	14392382	0.985	4-100ng	3.2%	1.3%	n.d.	3.8%	n.d.
Pyrene	759231	18389814	0.978	4-100ng	4.0%	1.4%	n.d.	3.2%	n.d.
Benz[a]anthracene	545969	13969649	0.987	4-100ng	17.2%	2.5%	n.d.	5.1%	n.d.
Chrysene	779638	20110086	0.979	4-100ng	4.9%	1.0%	n.d.	1.9%	n.d.
Benzo[b]fluoranthene	1508220	19731914	0.975	4-100ng	4.5%	3.2%	n.d.	7.3%	n.d.
Benzo[k]fluoranthene	829561	15533128	0.986	4-100ng	n.d.	0.4%	n.d.	5.6%	n.d.
Indeno[1,2,3-cd]pyrene	1928464	-20525563	0.977	4-100ng	n.d.	9.0%	n.d.	24.4%	n.d.
Benzo[ghi]perylene	1197192	4235210	0.996	4-100ng	n.d.	8.0%	n.d.	16.9%	n.d.
phenols									
Phenol	181376	2256806	0.965	4-100ng	n.d.	6.7%	n.d.	6.8%	n.d.
Phenol, 2-methyl-	426215	-8029785	0.987	4-200ng	6.4%	n.d.	2.3%	n.d.	2.1%
Phenol, 3-methyl-	792593	-13245628	0.993	4-200ng	10.5%	n.d.	2.2%	n.d.	1.4%
Phenol, 2,6-dimethyl-	370168	23598090	0.984	4-200ng	5.1%	n.d.	2.4%	n.d.	6.1%
Resorcinol	480783	-4239934	0.972	4-200ng	n.d.	n.d.	1.7%	n.d.	1.9%
1-Naphthalenol	331227	9477848	0.973	4-200ng	12.3%	n.d.	1.2%	n.d.	2.5%

compound	slope	intercept	R^2	linear_range	RSD(n=5)				
					4ng	20ng	40ng	60ng	200ng
2-Naphthalenol	757947	11450570	0.986	4-200ng	n.d.	n.d.	1.8%	n.d.	0.8%
VCPs									
2,2,4-Trimethyl-1,3-pentanediol diisobutyrate	243154	2038616	0.979	4-200ng	3.6%	n.d.	4.6%	n.d.	5.9%

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54 **Table S6.** The amounts of selected standards calculated by standard curves, surrogate standard curves, and the difference of the semi-quantitative
55 method.

Compound	True calibrated amounts (ng)	Amounts using TIC and surrogates of the same class calibration (ng)	Amounts using TIC and *n*-alkanes calibration (ng)	% Difference using surrogates of the same class	% Difference using *n*-alkanes
		Alkanols			
1-Heptanol	19.99	15.72	10.86	-21%	-46%
1-Octanol	14	17.31	1.29	24%	-91%
1-Nonanol	19.42	17.44	10.91	10%	-44%
1-Decanol	19.84	22.16	5.96	12%	-70%
1-Undecanol	9.46	9.96		5%	
Square average				16%	66%

		Phenols			
p-Cresol	21.08	15.31	3.8	-27%	-82%
Phenol, 2,4-dimethyl-	19.22	25.22	8.44	31%	-56%
Square average				29%	70%
		Aldehydes			
Hexanal	17.06	18.11	15.65	6%	-8%
Heptanal	32.01	30.31	16.65	-5%	-48%
Octanal	22.27	20.21	16.66	-9%	-25%
Square average				7%	32%
		Ketones			
Isophorone	19.04	18.08	6.4	-5%	-66%
2-Decanone	21.06	22.53	13.3	7%	-37%
Square average				6%	54%
		Esters			
Hexanoic acid, methyl ester	20.84	19.03	21.94	-9%	5%
Octanoic acid, methyl ester	21.56	22.52	18.64	4%	-14%

Decanoic acid, methyl ester	23.36	21.99	10.57	-6%	-55%
Undecanoic acid, methyl ester	20.99	17.65	3	-16%	-86%
Methyl (Z)-10-pentadecenoate	20.9	20.1	4.18	-4%	-80%
9-Hexadecenoic acid, methyl ester, (Z)-	18.92	22.72	1.65	20%	-91%
Square average				12%	65%
		Amides			
Hexadecanamide	19.77	50.43	7.12	155%	-64%
Octadecanamide	17.66	13.76	2.81	-22%	-84%
Square average				111%	75%
		Nitriles			
Benzonitrile	22.09	21.35	25.81	-3%	17%
Decanenitrile	17.5	19.03	7.12	9%	-59%
Square average				7%	43%
		Aromatics			

Toluene	20.83	15.22	15.99	-27%	-23%
o-Xylene	18.86	20.87	32.11	11%	70%
Benzene, propyl-	20.19	24.74	34.61	23%	71%
Benzene, dodecyl-	20.48	12.54	4.36	-39%	-79%
Square average				27%	65%
Total uncertainty				27%	69%

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Figures caption

Figure S1. A typical chromatogram of system blank.

Figure S2. The chromatograms of standard chemicals after 6h（brown）, 24h（blue）, 48h (red), and 72h (blue) of flowing by pure nitrogen gas. The flow of nitrogen gas is set to be the same as the sampling flow (0.5 L min^{-1}). No significant breakthrough was observed within 24 h (<3%).

Figure S3. Typical chromatograms of fried chicken (a), Kung Pao chicken (b), Pan-fried tofu (c), and stir-fried cabbage (d) emissions.

Figure S4. Chemical composition of ER, ozone formation potential (OFP), and secondary organic aerosol (SOA) of gaseous chemicals of four dishes. The mass unit is μg min^{-1}.

Figure S5. Chemical composition-volatility distributions of four dish emissions. The mass unit is μg min^{-1}.

Figure S6. Typical chromatograms of fried chicken cooked with corn (a), peanut (b), soybean (c), and sunflower (d) oils.

Figure S7. Chemicals identified from fried chicken emissions cooked with corn (a), peanut (b), soybean (c), and sunflower (d) oils. Column and Tenax TA bleeding after 75 min in 1st retention time are excluded from qualification, quantification, and 2D binning processes.

Figure S8. Chemical composition of ER, ozone formation potential (OFP), and secondary organic aerosol (SOA) of gaseous chemicals of fried chicken using four types of oil (corn, peanut, soybean, and peanut). The mass unit is μg min^{-1}.

Figure S9. Volatility-polarity panels of gaseous chemical emissions from fried chicken fumes cooked with corn, peanut, soybean, and sunflower oils. Ozone formation potential (OFP), and secondary organic aerosol (SOA) were estimated from gas-phase precursors. VOCs (blue color in *x*-axis), IVOCs (orange color in *x*-axis), and SVOCs (red color in *x*-axis) are displayed in volatility bins (a decrease of volatility from B9 to B31) along with their polarity (an increase from P1 to P10 in *y*-axis). The emission rate unit is μg min^{-1}.

Figure S10. Top 10 species in four edible oils (corn, peanut, soybean, and sunflower). Organics are normalized to 1 and the y-axis is the percent response (%).

Figure S11. Chemical composition-volatility distributions of fried chicken emission cooked with four

edible oils. The mass unit is μg min^{-1}.

Figure S12. Chemical reactions of cooking emissions elucidated by MPCA key components. Chemicals in red color are detected by TD-GC×GC-MS.

Figure S13. Correlations of ERs (μg min^{-1}) of linoleic acid-related chemicals ((a) and (b)) and oleic acid-related chemicals (c).

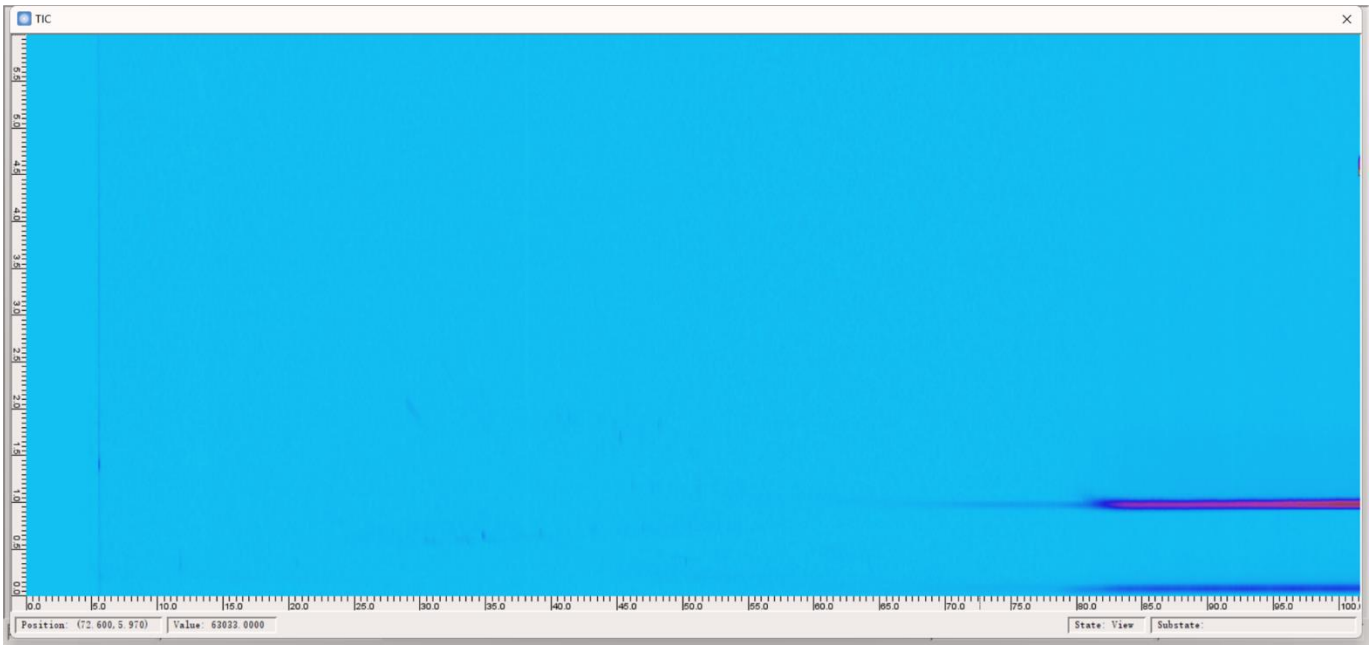


Figure S1. A typical chromatogram of system blank.

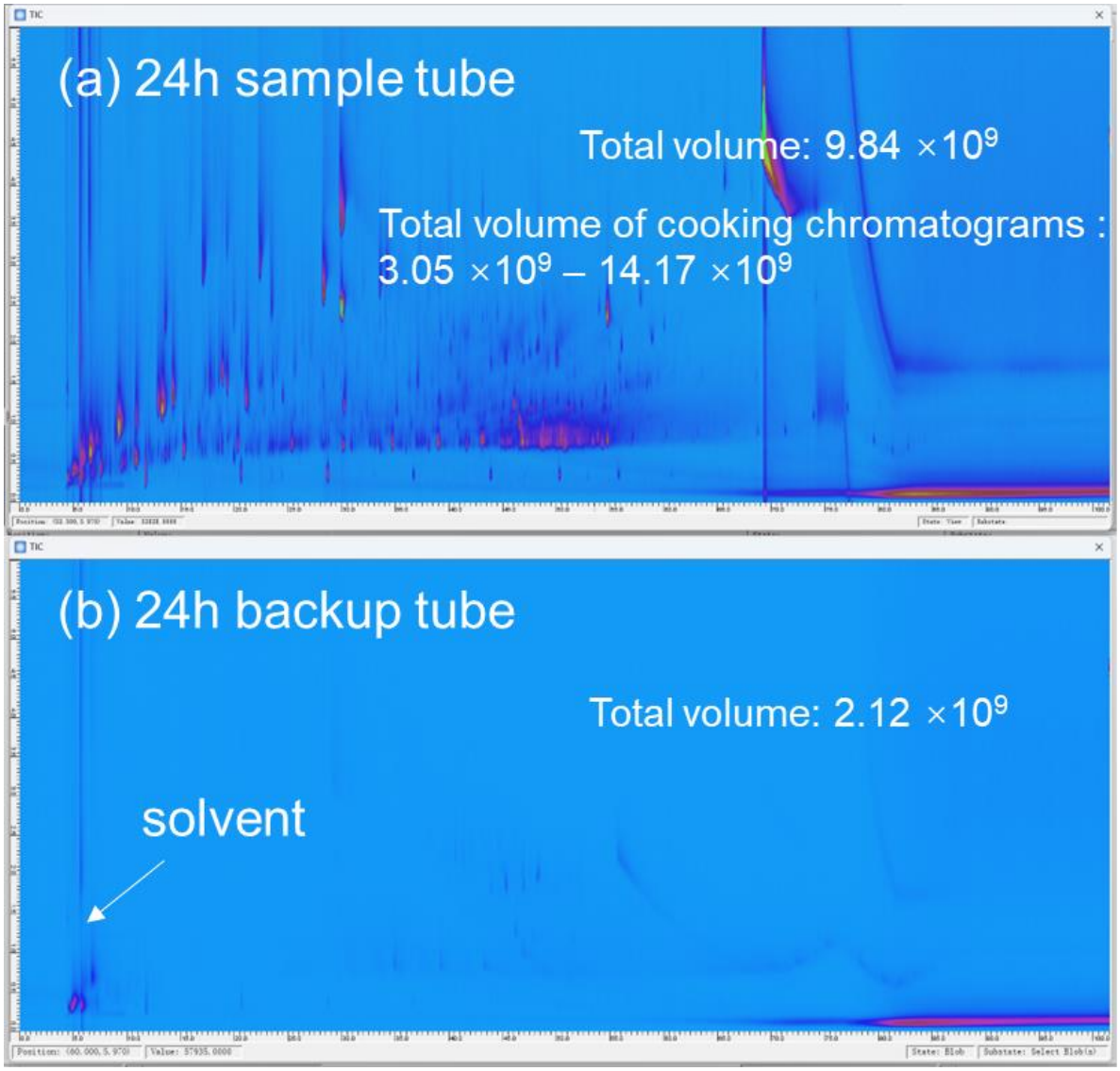
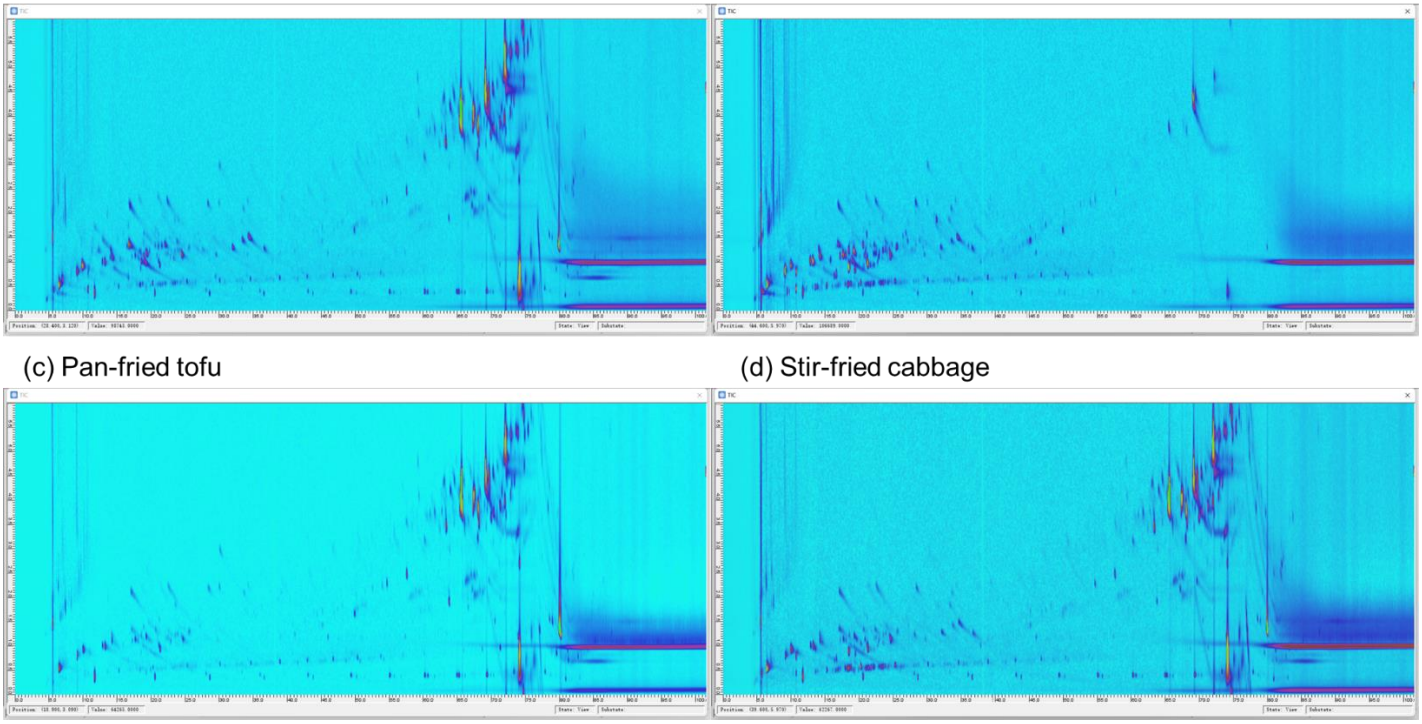


Figure S2. The chromatograms of the breakthrough experiment. (a) is the chromatogram of the sample tube, while (b) is the chromatogram of the backup tube. The sampling flow is set to be 0.5 L min^{-1}. No significant breakthrough was observed within 24 h (<1% for each compound). The total volume of cooking emission chromatograms ($3.05 \times 10^9 – 14.17 \times 10^9$) falls in the range of the sample tube (9.84×10^9) and is much higher than the volume of the backup tube (2.12×10^9). The volume of the backup tube (2.12×10^9) is close to the volume of the blank tube (1.33×10^9, Figure S1). After subtracting the volume of the blank tube, the volume of the backup tube is less than 10% of the sample tube, indicating the breakthrough effect of the Tenax TA tubes could be neglected.

(a) Fried chicken

(b) Kung Pao chicken



(c) Pan-fried tofu

(d) Stir-fried cabbage

Figure S3. Typical chromatograms of fried chicken (a), Kung Pao chicken (b), Pan-fried tofu (c), and stir-fried cabbage (d) emissions.

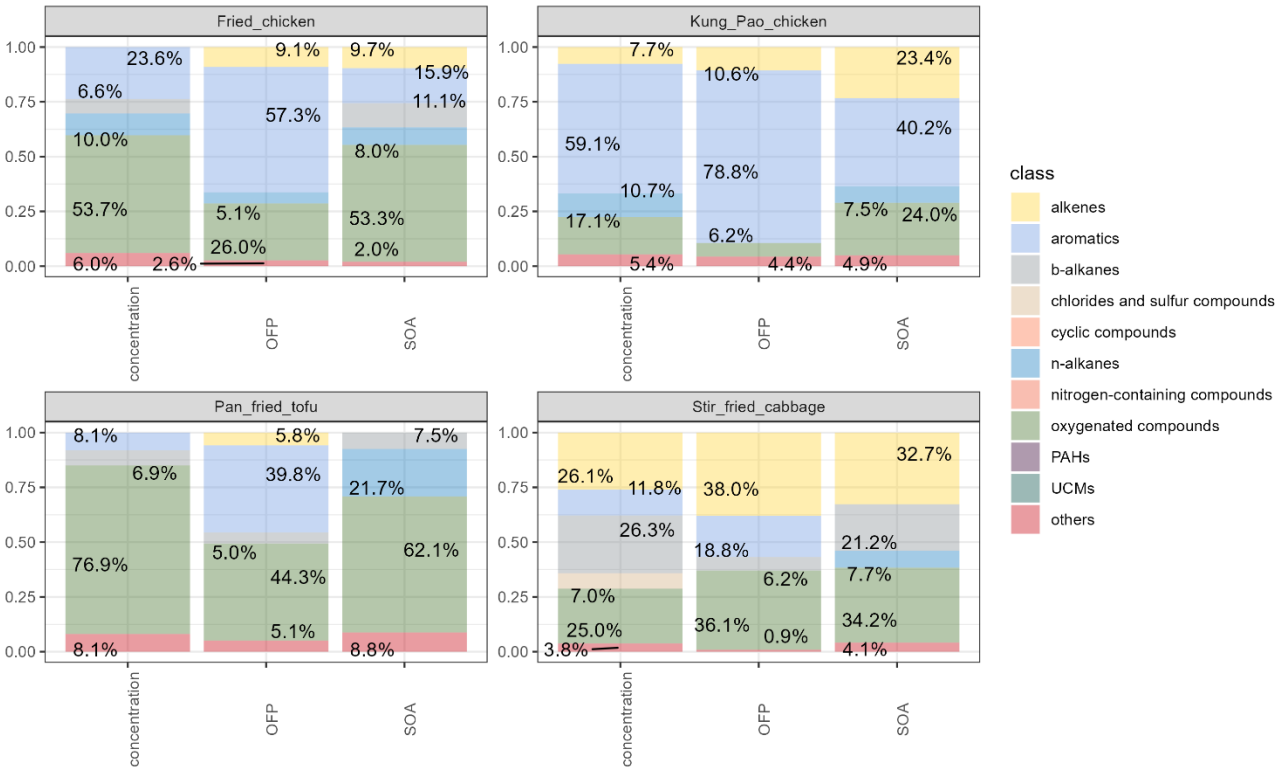


Figure S4. Chemical composition of ER, ozone formation potential (OFP), and secondary organic aerosol (SOA) of gaseous chemicals of four dishes. The mass unit is μg min^{-1}.

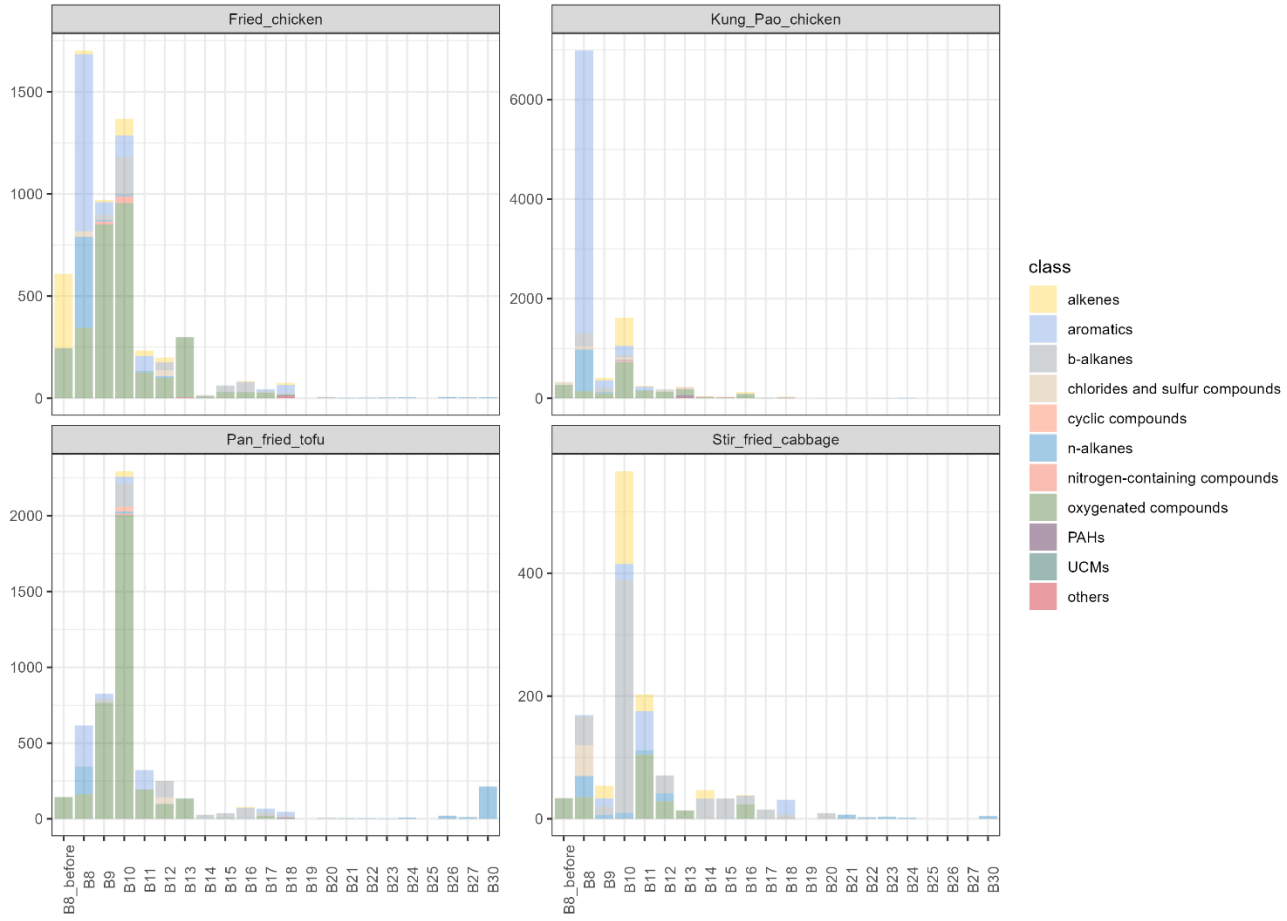


Figure S5. Chemical composition-volatility distributions of four dish emissions. The mass unit is μg min^{-1}.

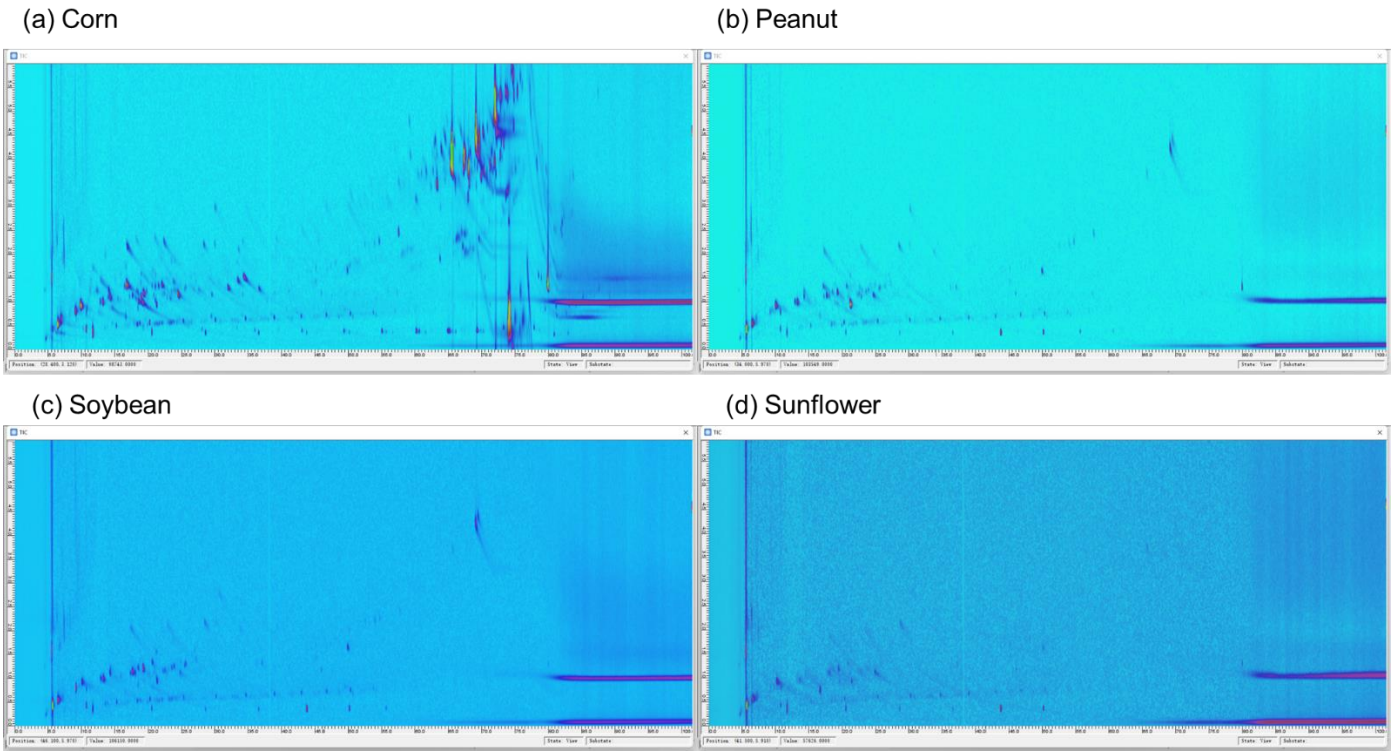


Figure S6. Typical chromatograms of fried chicken cooked with corn (a), peanut (b), soybean (c), and sunflower (d) oils.

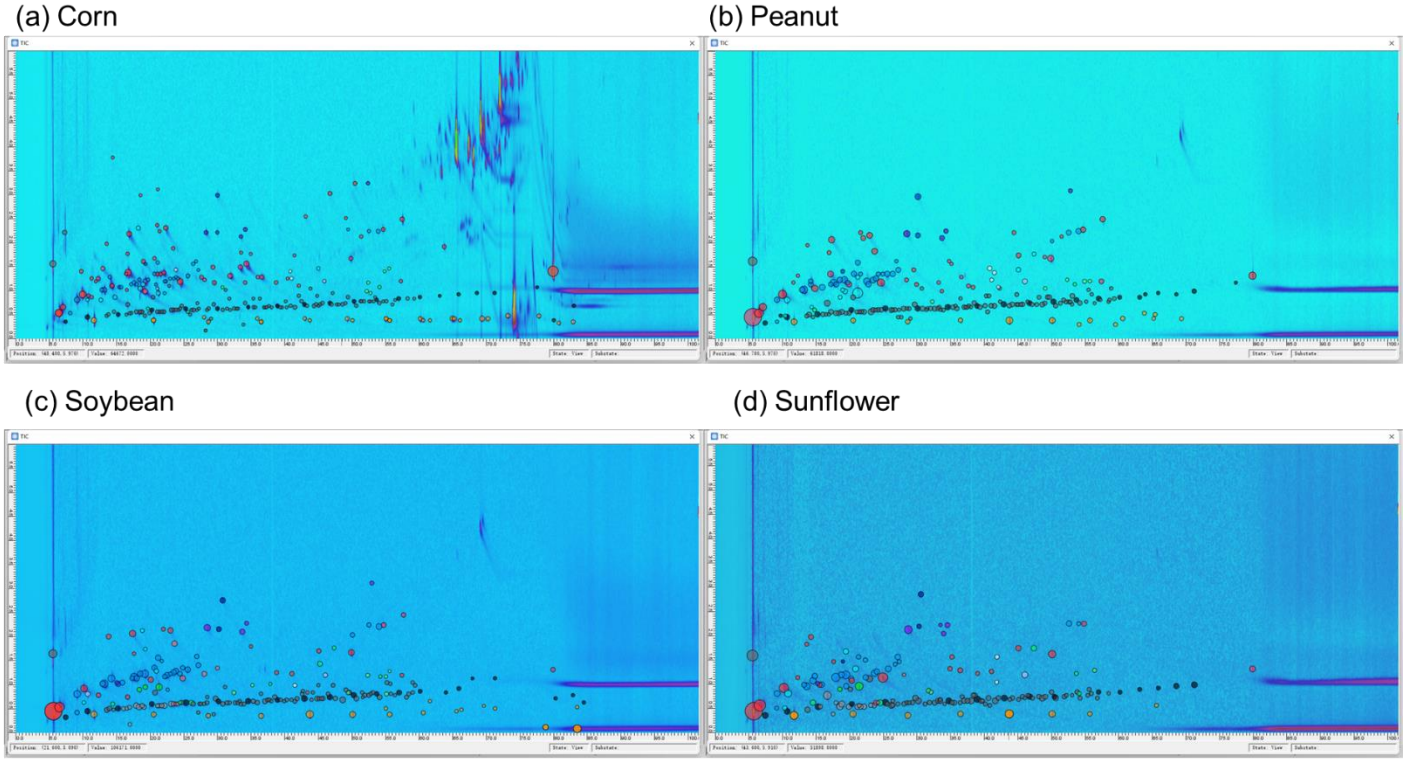


Figure S7. Chemicals identified from fried chicken emissions cooked with corn (a), peanut (b), soybean (c), and sunflower (d) oils. Column and Tenax TA bleeding after 75 min in 1st retention time are excluded from qualification, quantification, and 2D binning processes.

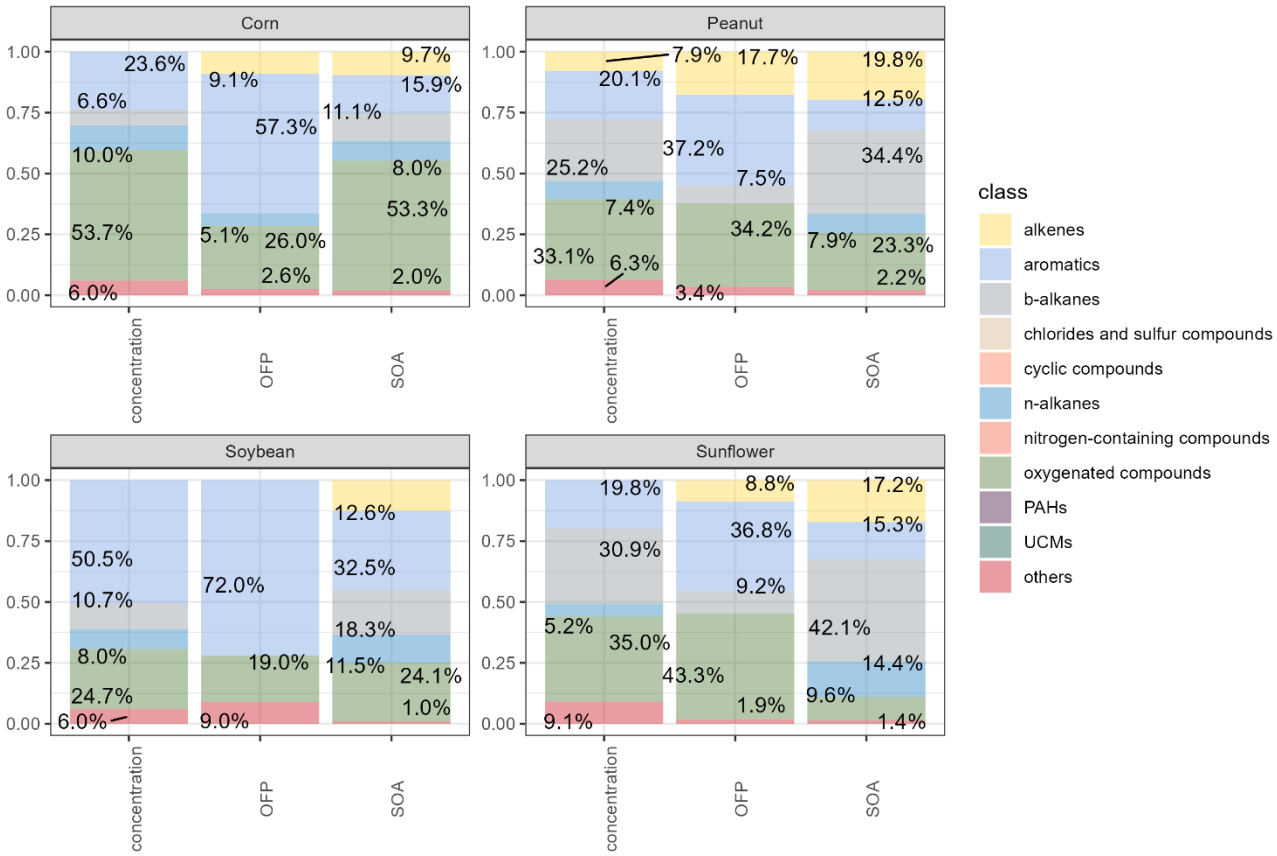


Figure S8. Chemical composition of ER, ozone formation potential (OFP), and secondary organic aerosol (SOA) of gaseous chemicals of fried chicken using four types of oil (corn, peanut, soybean, and peanut). The mass unit is μg min^{-1}.

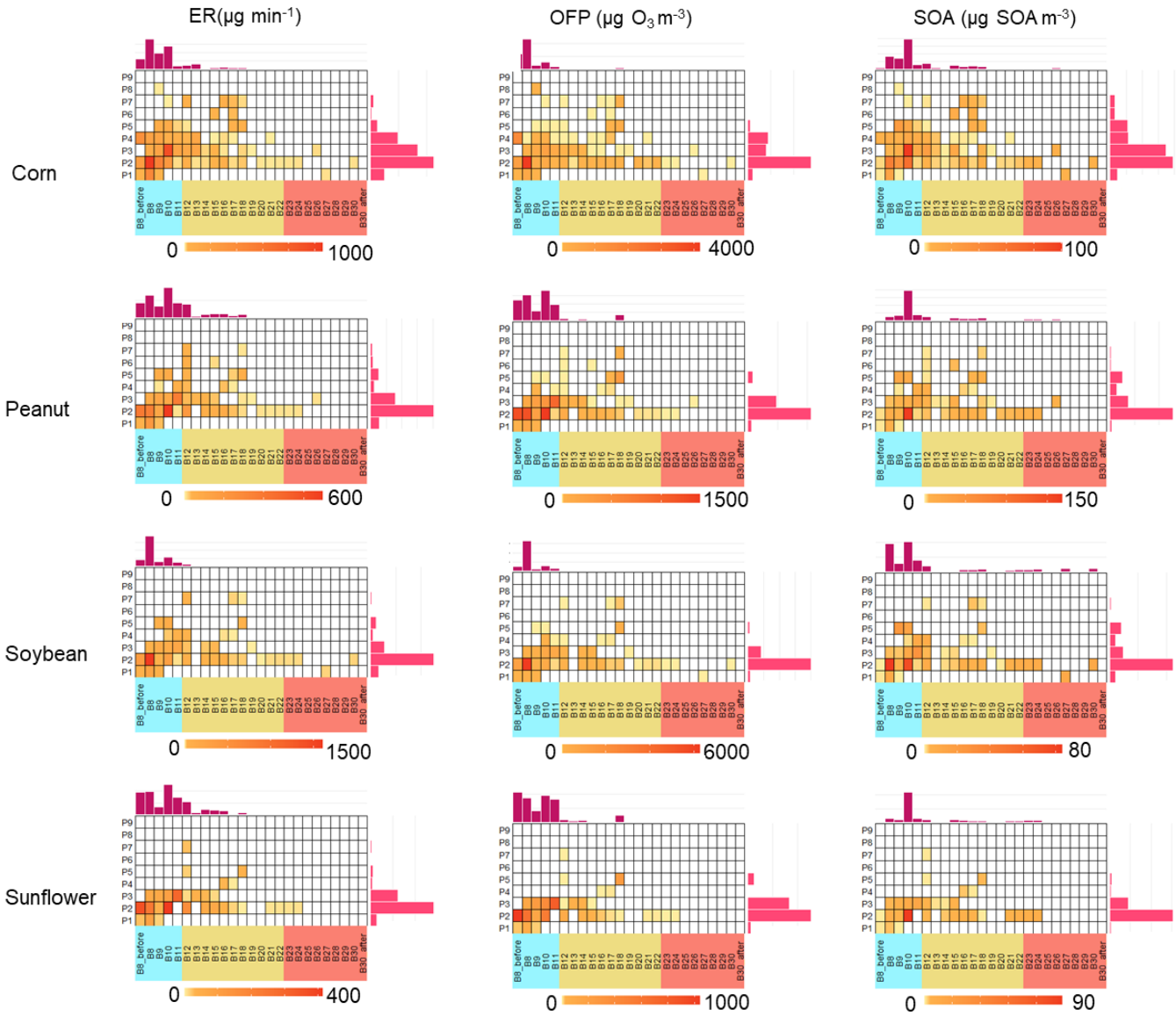


Figure S9. Volatility-polarity panels of gaseous chemical emissions from fried chicken fumes cooked with corn, peanut, soybean, and sunflower oils. Ozone formation potential (OFP), and secondary organic aerosol (SOA) were estimated from gas-phase precursors. VOCs (blue color in *x*-axis), IVOCs (orange color in *x*-axis), and SVOCs (red color in *x*-axis) are displayed in volatility bins (a decrease of volatility from B9 to B31) along with their polarity (an increase from P1 to P10 in *y*-axis). The emission rate unit is μg min^{-1}.

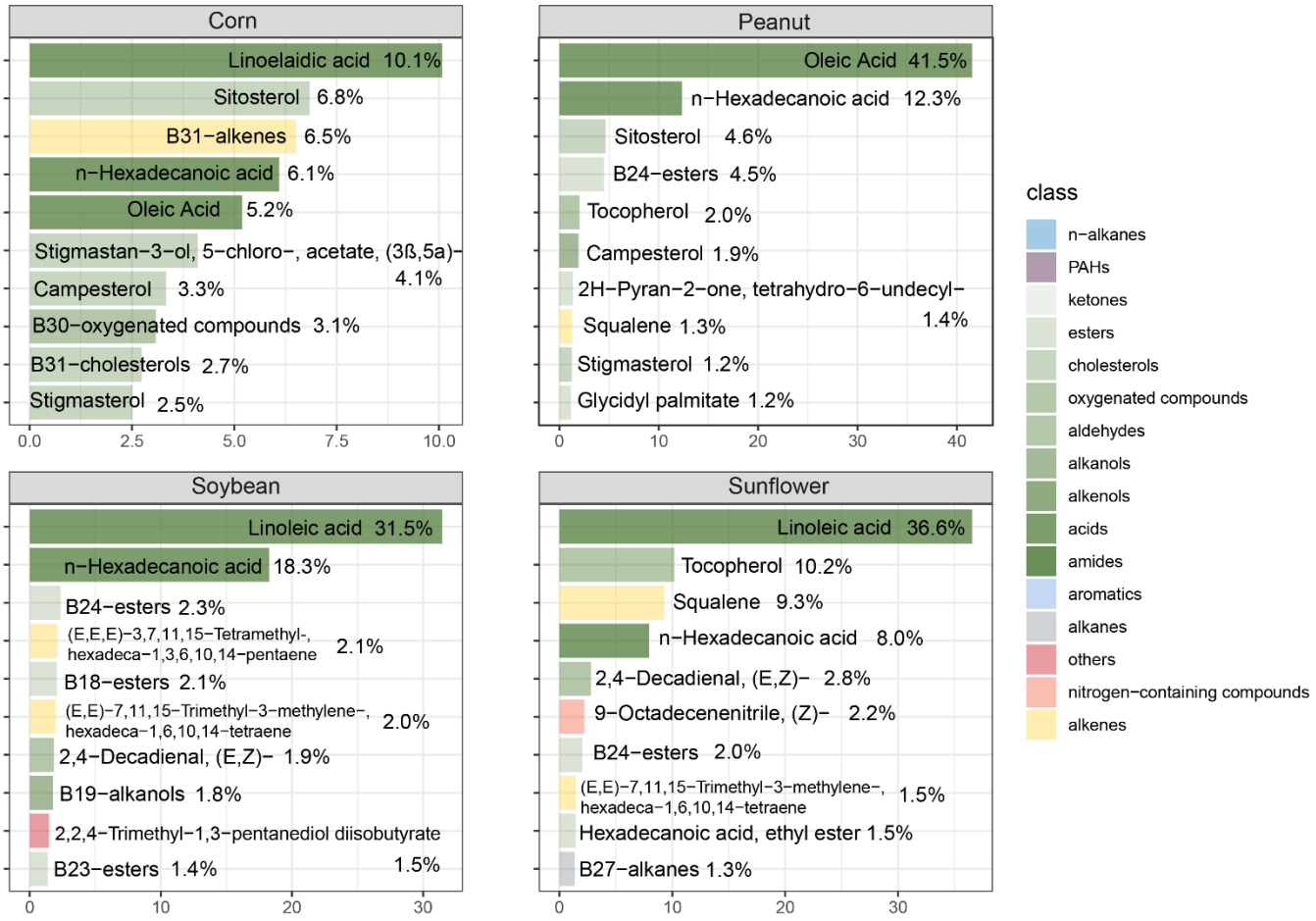
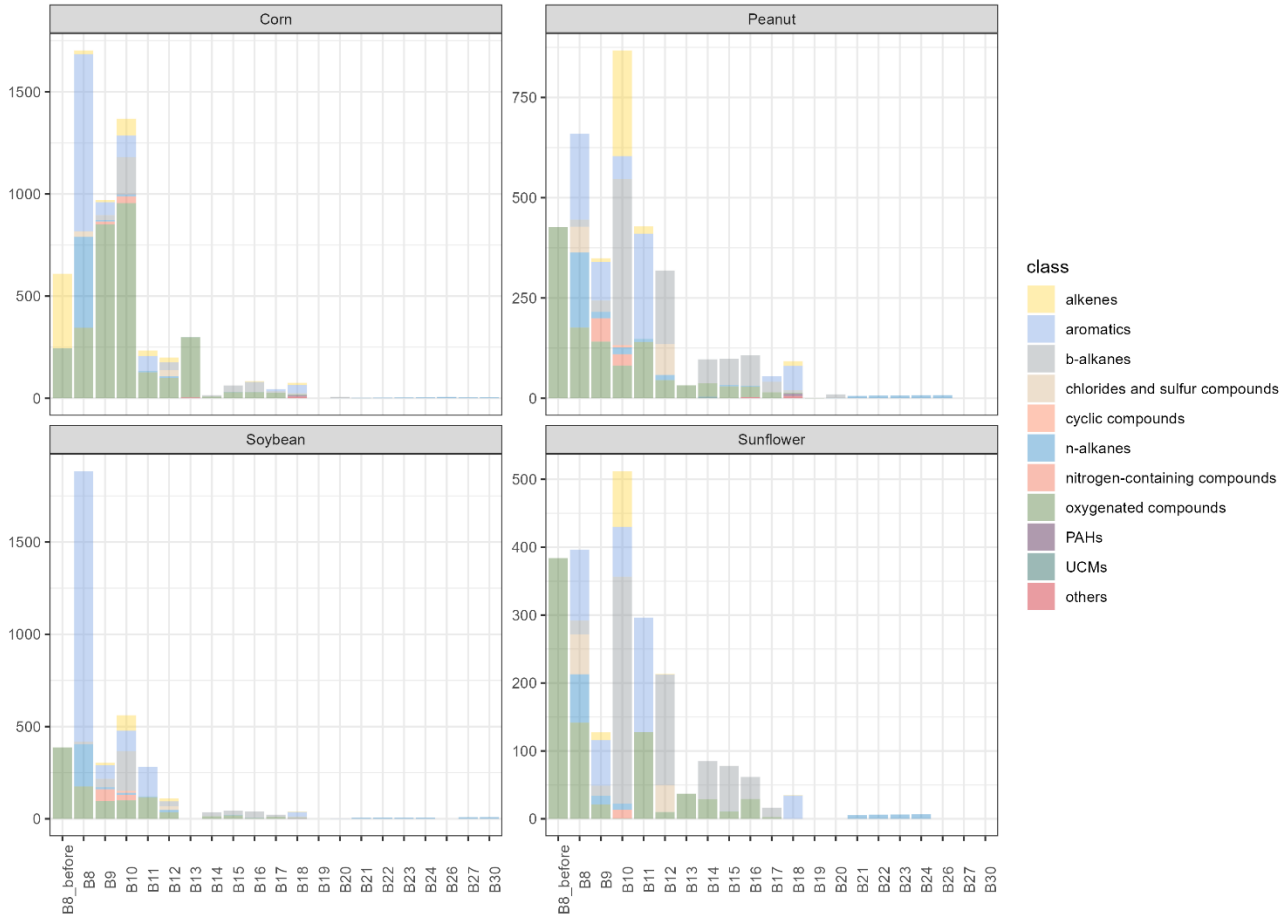


Figure S10. Top 10 species in four edible oils (corn, peanut, soybean, and sunflower). Organics are normalized to 1 and the y-axis is the percent response (%).



144

145 **Figure S11.** Chemical composition-volatility distributions of fried chicken emission cooked with four

146 edible oils. The mass unit is μg min^{-1}.

147

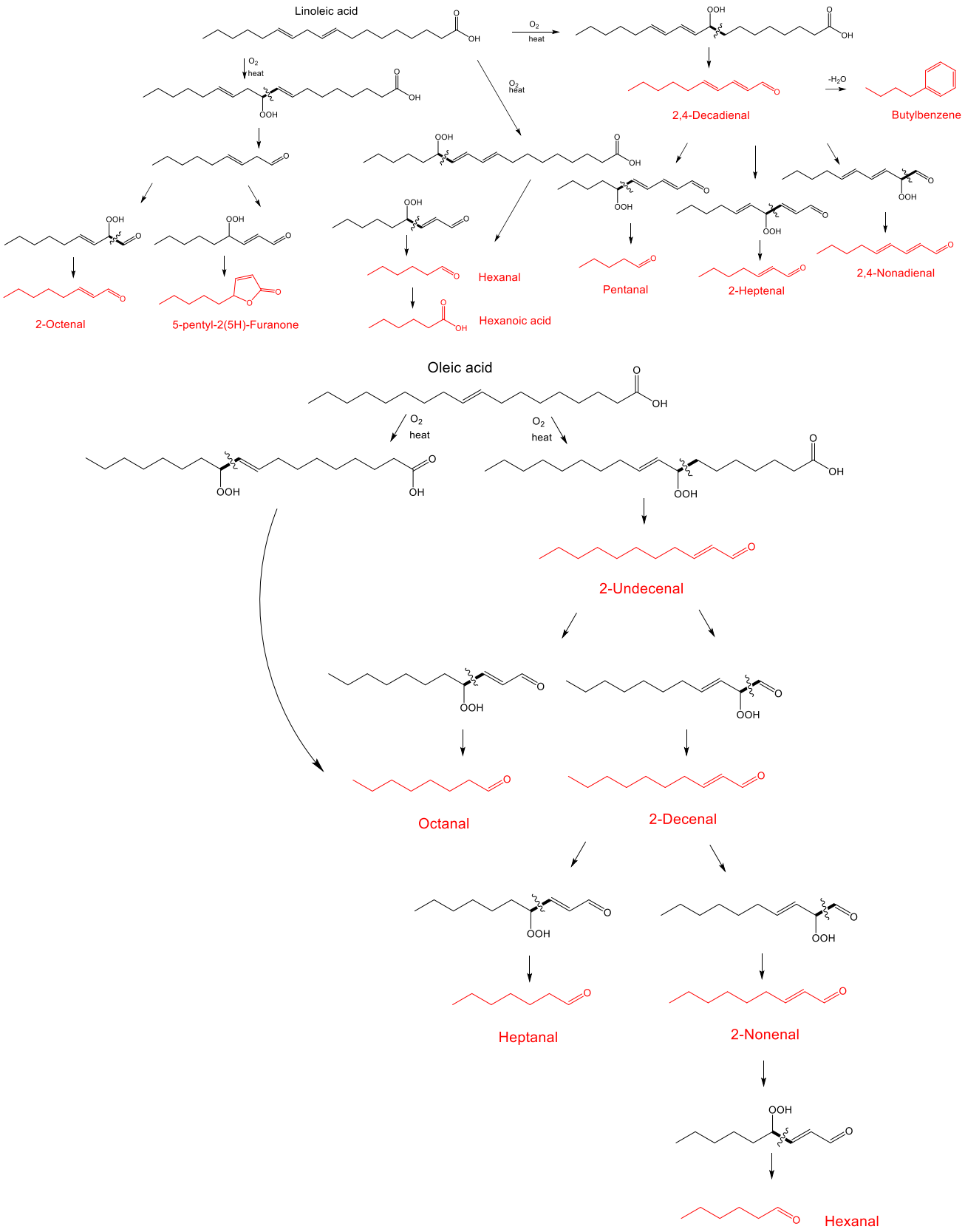
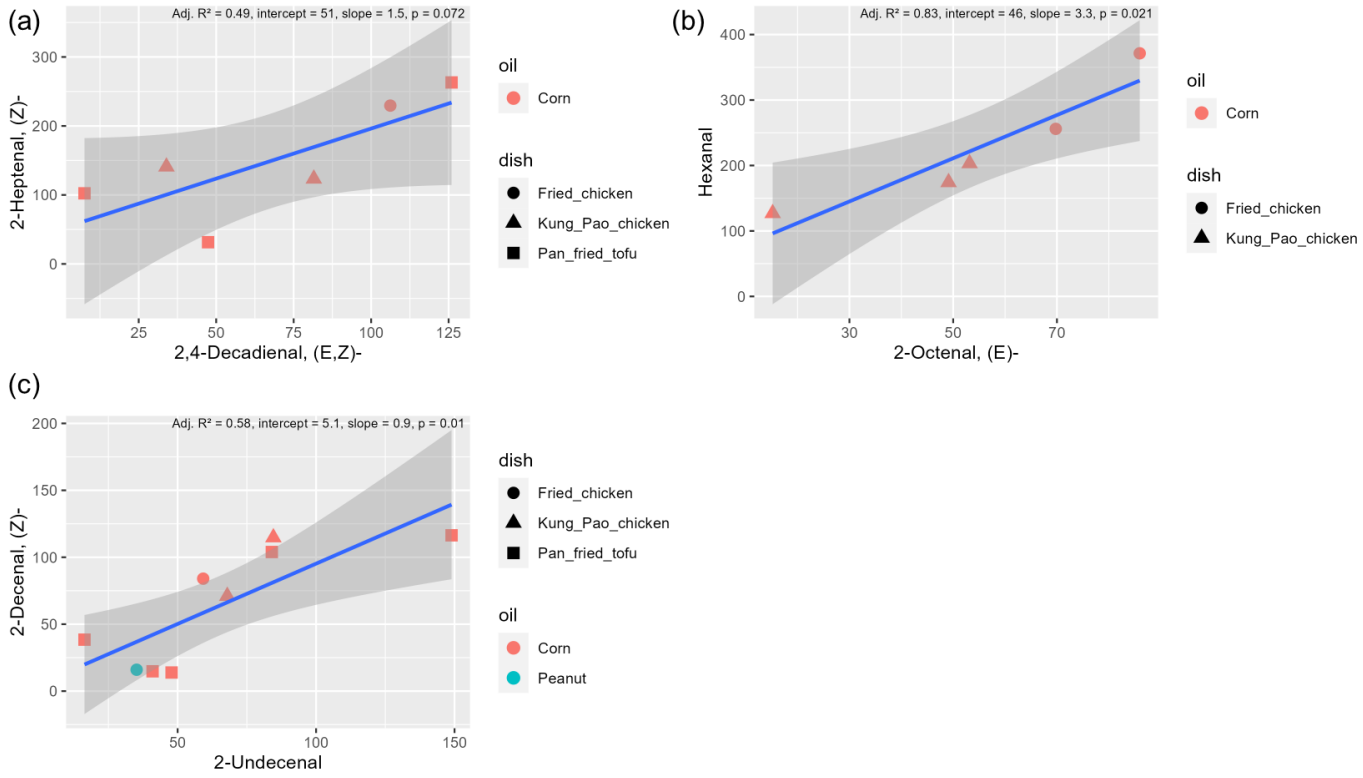


Figure S12. Chemical reactions of cooking emissions elucidated by MPCA key components. Chemicals in red color are detected by TD-GC×GC-MS.



152

153 **Figure S13.** Correlations of ERs (μg min^{-1}) of linoleic acid-related chemicals ((a) and (b)) and oleic

154 acid-related chemicals (c).