Supplementary information

Gasoline aromatic: a critical determinant of urban secondary organic aerosol formation

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Figure S1. Time series of driving speed (a) and size distribution of primary particles (b) in a typical cold start Beijing cycle

Figure S2. Chemical composition of secondary aerosols formed in a typical chamber experiment (experiment No.V2)

Figure S3. Spectra of secondary aerosols formed inside the chamber and the low oxidized secondary organic aerosols (LO-OOA) factor in the ambient air

Figure S4. Wall loss curve for particle number and mass inside the chamber

Figure S5. Comparison of calculated CO concentration based on sampling flowrate (red line) and measured CO concentration (blue dot)

Table S1. Working parameters and emissions for the vehicle chassis dynamometer experiments

#	Fuel	Working parameters			Average concentration of gaseous pollutants in the CVS				
		Temperature in the lab / ° C	Absolute humidity in the lab / g m ⁻³	flowrate in CVS / m ³ min ⁻¹	CO / ppm	CO ₂ / %	THC / ppmC	NO _x / ppm	Ration of THC/NO _x
V1	F3	24.28	9.56	5.53	11.2	0.67	13.0	1.41	9.2
V2	F3	22.73	8.25	5.53	12.1	0.65	13.5	1.32	10.2
V3	F2	23.99	8.78	5.54	7.4	0.65	9.7	1.30	7.5
V4	F2	23.35	7.11	5.56	7.4	0.64	9.0	1.25	7.2
V5	F1	21.97	7.03	5.57	10.2	0.66	10.4	1.40	7.5

Table S2. Working parameters and emissions for the vehicle chassis dynamometer experiments

#	Type	Fuel	Fuel consumption ml min ⁻¹	Oxidation
E1	PFI	F2	90.97	1 ml H ₂ O ₂
E2	PFI	F1	90.97	1 ml H ₂ O ₂
E3	PFI	F1	90.11	1 ml H ₂ O ₂

Table S3. Parameters of the test fuels

Specifications	F1(BASE)	F2	F3
Ron	93.1	93.6	93
Mon	86.3	84.8	84
Density (g/ml)	0.72	0.728	0.744
Rvp (kpa)	58.6	63.2	55.4
Aromatics (%v/v)	29.8	28.5	36.7
Olefin (%v/v)	4.1	18.8	15.4
Ethanol (%v/v)	<0.1	0.12	0.01
Oxygen (%m/m)	0.01	0.06	0.02
Mn (mg/kg)	<0.1	<0.1	<0.1
Sulfur (mg/kg)	9	7	6
T10 (°c)	50.8	50.9	55.4
T50 (°c)	79.4	101.9	109.9
T90 (°c)	162.6	167.5	164.3
Fbp (°c)	187.9	195.7	194.4
Quality level	Phase v	Phase v	Phase v

Table S4. Parameters of instruments used in the chamber experiments

Name of the Instruments	Manufacturer	Species/Parameters	Time resolution
HR-TOF-AMS	Aerodyne Research inc.	NR-PM1 (NO_3^- , SO_4^{2-} , Cl^- , NH_4^+ and OA)	5 min
SMPS (DMA and CPC)	TSI	Particle number size distribution	5 min
CCN counter	DMT	CCN concentration	5 min
CPMA	Cambustion	Density of aerosol	10 min
LOPAP	Custom-built	HONO, HNO_3	10 min
PTR-MS	Ionicon Analytik GmbH	VOCs	1 min
CO_2 analyzer	Thermo Inc.	CO_2	1 min
Trace level gas analyzer	Thermo Inc.	CO , O_3 , NO_x , SO_2	1 min