Supporting Information of

Measurement report: Oxidation potential of water-soluble aerosol components in the southern and northern of Beijing

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Calculation of absorption coefficient of BrC

The light absorption data of BrC measured by the UV-Vis spectrophotometer equipped with a liquid waveguide capillary cell can be converted to the absorption coefficient (Abs) (M m^{-1}) according to the following formula:

$$\text{Abs}_\lambda = (A_\lambda - A_{700}) \times \frac{V_l}{V_a \times L} \times \ln(10) \tag{S1}$$

where Abs_λ is Abs of BrC at λ nm, A_{700} is the absorption at 700 nm, serving as a reference to account for baseline drift, V_l is the volume of water that the filter was extracted into, V_a is the volume of sampled air, and L is the optical path length (0.94 m). A factor of $\ln(10)$ is used to convert the log base 10 (recorded by UV–Vis spectrophotometer) to a natural logarithm to provide a base-e absorption coefficient.

ICP-MS analysis

For ICP-MS analysis, a seven-point calibration curve (i.e., 1, 2, 5, 10, 20, 50, 100 µg L^{-1}) was established for each targeted element, and the regression coefficients for all elements were > 0.999. For the analysis, ^{103}Rh and ^{185}Re were added as internal standards at a concentration of 10 µg L^{-1} in 2% HNO_3. At least one blank sample was analyzed for every 10 ambient samples, following the same procedures as for ambient samples. All data reported in this study were corrected for the blanks. The accuracy was estimated by analyzing the reference material GBW07406 (GSS-6). The differences between the measured and certified values ranged from -20% to 15% for the fourteen elements.

GC-MS analysis

Half of a 47 mm filter sample was ultrasonically extracted with a mixture of dichloromethane and methanol (2:1, v/v) for 15 min and repeated three times. The extracts were purified by quartz wool packed in a Pasteur pipette and then evaporated with a rotary evaporator to ~ 0.5 mL and dried with a gentle stream of nitrogen.Then, 50 µL of N,Obis(trimethylsilyl)trifluoroacetamide (BSTFA-TMCS; Fluka Analytical, 99 %) and 10 µL of pyridine were added and heated for 3 h at 70 °C for silylation. After reaction, 140 µL of n-hexane was added to dilute the derivatives. Finally, a 2 µL aliquot of the derivatized extracts was introduced into the GC–MS (Agilent Technologies, Santa Clara, CA, USA), which was equipped with a DB-5MS column (30 m × 0.25 mm i.d., 0.25 µm film thickness, J&W Scientific), an electron impact (EI) ionization source (70 eV) and a GC inlet of 280 °C. The GC oven temperature was held at 50 °C for 2 min, ramped up to 120 °C at a rate of 15 °C min^{-1} and finally reached 300 °C at a rate of 5 °C min^{-1} (held for 16 min). For the quantification of target organic compounds, an external standard method was used through daily calibration with working standard solutions. Also, for every 10 samples, a procedural blank and a spiked sample (i.e., ambient sample spiked with known amounts of standards) were measured to check the interferences and recoveries. The measured

recoveries were > 80 %, except for phthalic acid (~ 70%), and the relative standard deviations (RSDs) were < 10 % for measured organic compounds.

Table S1. Average values and standard deviation (Std) of measured parameters in the southern and northern of Beijing.

Compounds	South		North	
	Average	Std	Average	Std
PM$_{2.5}$ (μg m^{-3})	122.3	48.9	62.3	27.9
DTTv (nmol min^{-1} m^{-3})	3.9	0.9	3.5	1.2
DTTm (pmol min^{-1} μg^{-1})	36.1	14.5	65.3	27.6
WSOC (μg m^{-3})	8.1	5.0	4.0	2.0
Abs365 (M m^{-1})	19.7	13.0	6.8	5.4
4-nitrophenol (4NP) (ng m^{-3})	61.7	40.2	20.6	13.0
2-methyl-4-nitrophenol (2M4NP) (ng m^{-3})	25.2	17.5	7.7	4.7
3-methyl-4-nitrophenol (3M4NP) (ng m^{-3})	21.6	15.8	7.1	4.0
4-nitrocatechol (4NC) (ng m^{-3})	58.4	44.9	12.9	17.8
3-methyl-5-nitrocatechol (3M5NC) (ng m^{-3})	37.0	28.5	7.0	8.3
4-methyl-5-nitrocatechol (4M5NC) (ng m^{-3})	23.0	19.1	4.2	4.6
4-nitro-1-naphthol (4N1N) (ng m^{-3})	12.4	8.2	3.1	3.0
Ti (ng m^{-3})	199.9	97.5	131.1	64.0
V (ng m^{-3})	4.1	2.0	2.9	1.4
Cr (ng m^{-3})	24.5	4.9	17.4	3.7
Mn (ng m^{-3})	80.3	26.9	55.8	20.2
Fe (ng m^{-3})	1717.2	810.6	1266.7	574.2
Co (ng m^{-3})	0.8	0.3	0.6	0.3
Ni (ng m^{-3})	3.5	0.7	3.4	0.7
Cu (ng m^{-3})	78.6	66.2	25.0	24.3
Zn (ng m^{-3})	224.6	120.3	130.8	78.4
As (ng m^{-3})	10.6	9.6	6.0	5.7
Sr (ng m^{-3})	27.4	11.9	16.2	6.8
Cd (ng m^{-3})	1.6	1.0	0.7	0.5
Ba (ng m^{-3})	71.5	24.0	69.0	12.1
Pb (ng m^{-3})	65.0	42.5	25.3	16.1
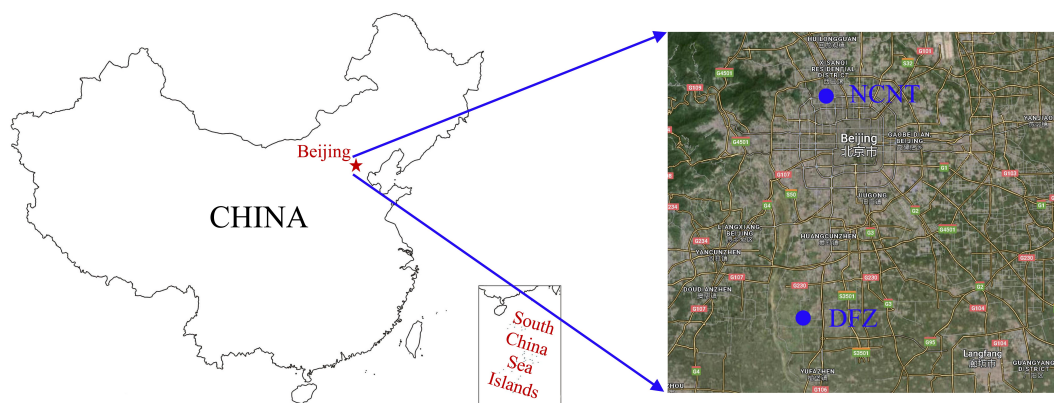
Figure S1. Map of the sampling sites. NCNT and DFZ are abbreviations for the north (the National Center for Nanoscience and Technology) and south (the Dingfuzhuang village, Daxing district) sites of Beijing, China, respectively. The left panel from Ministry of Natural Resources of China, and the right panel from © Google Maps.
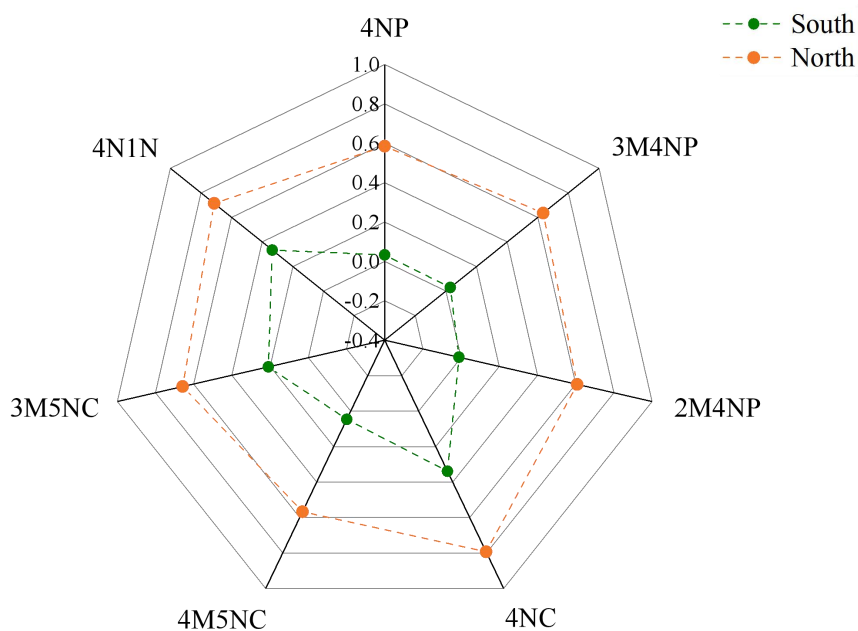
Figure S2. Correlation coefficients between DTTv and NACs in the south and north of Beijing.
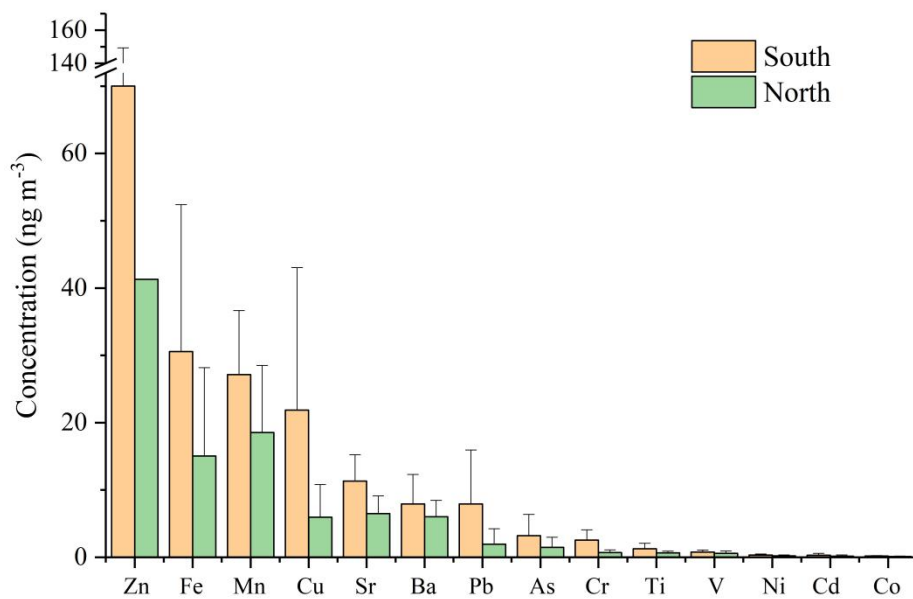
Figure S3. Concentrations of soluble elements in the south and north of Beijing.
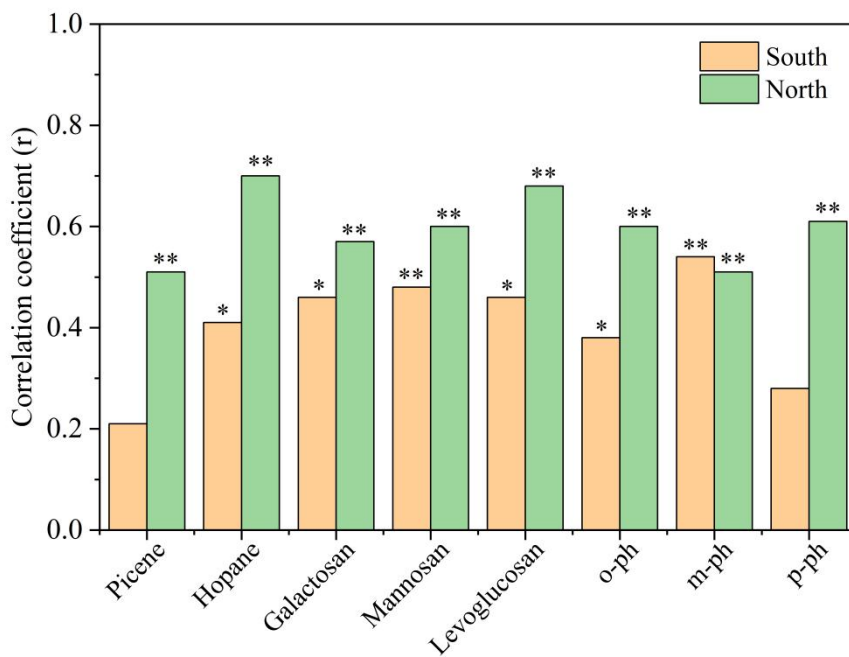
Figure S4. Correlation coefficients between DTTv and organic markers in the south and north of Beijing.
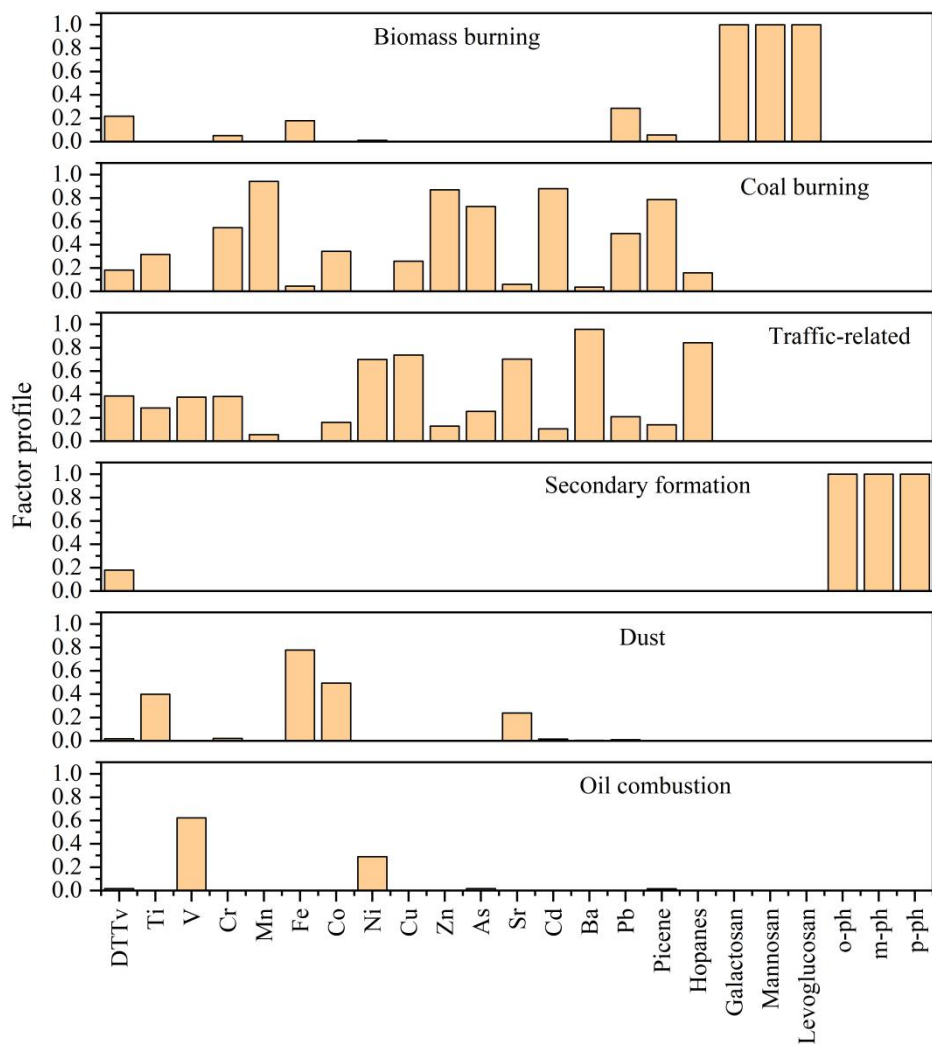
Figure S5. Factor profiles for the resolved six-factor solution.