

General comments:

This work measured two groups of nitro-aromatic compounds (NACs), including nitrophenol (NP) and nitrocatechol (NC) like species at an urban site in summer Beijing. Their diurnal variations and formation pathways were discussed thoroughly with additional data of VOCs, meteorological parameters, etc. The authors found that the secondary formation is a more dominant NAC source than biomass burning, and the two types of NACs have distinct formation mechanisms. A concentration ratio of NACs was applied to indicate the relative importance of aqueous-phase and gas-phase oxidation. The NACs are an important group of light-absorbing compounds in ambient aerosols. Their compositions and sources in the atmosphere are very complex and studied intensively in recent years. The topic of this work is very interesting, and the manuscript is very well organized and written. However, some of the conclusions might need more work with more valid evidence.

1. Page 7, lines 194-198.

As NACs were more correlated with toluene and benzene ($r = 0.64 - 0.70$) than potassium ($r = 0.49$), the authors concluded that the NACs were more likely from photo-oxidation of VOCs than biomass burning in summer Beijing.

First, please provide the significance level of the correlations.

Second, the authors did regression analysis by comparing the particle-phase NACs with VOCs and potassium. In the atmosphere, NACs are mainly subject to two atmospheric processes, photolysis and gas-to-particle partitioning; toluene and benzene are in gas phase and precursors for SOA. The authors might need to consider the uncertainties in correlations due to atmospheric transformations.

2. Page 7, line 211 – 217

4M5NC and 3M5NC had higher nighttime concentrations than daytime, and were more correlated with RH than other NACs, which were ascribed to the aqueous-phase oxidation.

However, the authors might need to consider other possibilities.

1). Nitrocatechols are easier to be oxidized than nitrophenols. The second-order rate constant for nitrocatechol ($5 \times 10^9 \text{ M}^{-1} \text{ s}^{-1}$) with OH in aqueous phase is much higher than nitrophenol ($3.7 \times 10^9 \text{ M}^{-1} \text{ s}^{-1}$) (Hems and Abbatt, 2018). So the higher nighttime concentrations of 4M5NC and 3M5NC might also be associated with their shorter life time during daytime.

2) The nitrocatechol has one more hydroxyl group and is more water soluble than the nitrophenol. Besides gas-to-particle partitioning, the nitrocatechols might also be dissolved into particle water, which could be another explanation for the higher correlations between nitrocatechols and RH%.

3. Page 8, lines 224- 226.

Could it be resulted from their different life times?

4. Page 9, line 250.

Why NO_x oxidation of anthropogenic VOC precursors is the dominant source of NACs? Can we estimate the relative contributions of biomass burning and NO_x oxidation?

5. Page 10, lines 305-306. Page 11, lines 317-319.

As mentioned in comment 2, please consider the shorter life times of nitrocatechols than nitrophenols during the daytime, and the dissolution of nitrocatechols in particulate water as RH% increases.

Moreover (connect to Page 6, lines 181-183), the authors thought that a higher relative humidity (RH%) would increase the relative contribution of aqueous-phase oxidation. Is the aqueous-phase oxidation in ambient aerosols only dominated by RH%?

Specific comments

1. Page 4, line 122. Please provide the recoveries for the target compounds.

References

Hems, R. F., and Abbatt, J. P. D.: Aqueous Phase Photo-oxidation of Brown Carbon Nitrophenols: Reaction Kinetics, Mechanism, and Evolution of Light Absorption, ACS Earth and Space Chemistry, 2, 225-234, 10.1021/acsearthspacechem.7b00123, 2018.