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Reply on RC1

Hao Luo et al.

Author comment on "Formation kinetics and mechanisms of ozone and secondary organic aerosols from photochemical oxidation of different aromatic hydrocarbons: dependence on NO_x and organic substituents" by Hao Luo et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-29-AC1>, 2021

Manuscript ID: acp-2021-29

Title: Formation kinetics and mechanism of ozone and secondary organic aerosols from photochemical oxidation of different aromatic hydrocarbons: dependence of NO_x and organic substituent

The corresponding author: Prof. Taicheng An

Dear Anonymous Referee #1,

We are sincerely grateful to your attention on this paper. We have made careful modifications and revisions on the original manuscript according to your comments. Below you will find our point-by-point responses to your comments and questions:

Question1: The title may be changed to '... dependence on Nx and organic substituent'.

Response: We are very grateful to the reviewer's suggestion. The title is accordingly revised and the new title was 'Formation kinetics and mechanism of ozone and secondary organic aerosols from photochemical oxidation of different aromatic hydrocarbons: dependence on NO_x and organic substituent' in the revised manuscript.

Question2: Line 70: NO can photolyze under UV irradiation with a wavelength of less than 420 nm. Please indicate the centre of the UV lamp wavelength applied in this work in the experimental section.

Response: We are very grateful to the reviewer's comment. The centre of the UV lamp wavelength applied in this work was 360 nm, which was accordingly supplied in the experimental section of the revised manuscript.

Question3: Line 80, 88-90: The detection limit of instruments should be provided. Line 123: Did the authors detect any oligomer products during the photochemical reaction in this work?

Response: We are very grateful to the reviewer's comment. The detection limits of PTR-ToF-MS (< 20 ppt for m/z 79 and < 10 ppt for m/z 181 within averaged over 1 min), NO_x analyzer (< 0.4 ppb within averaged over 1 min) and O₃ analyzer (0.5 ppb) were accordingly provided in the revised manuscript. And a total of ten products were in-situ detected by PTR-ToF-MS in gas phase (shown in Figure S14). However, no oligomer products were detected during the photochemical reaction in this work, probably due to their low concentration or easily being adsorbed by the reactor.

Question4: Line 160-165: As the authors suggested that reaction conditions, such as the VOC/NO_x ratio, could influence the formation rate and mechanism of O₃. What are the conditions of the experiments in previous studies?

Response: We are very grateful to the reviewer's comment. The VOC/NO_x ratio ranging from 1.0 to 13.0 was selected to evaluate its effect to O₃ formation. Thus, the corresponding range of VOC/NO_x ratio in our work and main references were collected and listed in Table S2 of revised supporting information. After comparison, it was found that the range of VOC/NO_x ratio in these references were close to that in our study. Therefore, the sentence in Line 164-165 of original manuscript was revised as 'Meanwhile, the VOC/NO_x ratio ranging from 1.0 to 13.0 was selected to its effect to O₃ formation. And the range of VOC/NO_x ratio in above researches was close to that in our study (Table S2). Then, our results of O₃ concentration were comparable to those in the previous studies under similar range of VOC/NO_x ratio'.

Question5: Line 497: Please clarify the reaction time in Figure 5 (a).

Response: We are very grateful to the reviewer's comment. The number concentrations of SOA in Figure 5(a) were obtained at the endpoint of each reaction. Accordingly, the clarification of 'The number concentration of SOA was obtained at the endpoint of each reaction.' was supplied in the revised version.

Question6: Some spelling mistakes should be avoided in the revised version, such as "NO2" in Line 18.

Response: We are very grateful to the reviewer's comment. The whole manuscript was carefully checked and the mistakes were accordingly revised.