

Atmos. Chem. Phys. Discuss., referee comment RC3
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Comment on acp-2021-560

Anonymous Referee #3

Referee comment on "Synergetic effect of NH₃ and NO_x on the production and optical absorption of secondary organic aerosol formation from toluene photooxidation" by Shijie Liu et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-560-RC3>, 2021

In this study, the authors reported the synergetic effect of NH₃ and NO_x on the production and optical absorption of toluene-derived SOA characterized using the AMS. The presence of NH₃ and NO₂ has different influence on the yield concentration.

Comments:

- Does the lowest concentration in Exp 4 (adding NO₂) suggest the current reduction of NO_x would lead to higher SOA? How to link the discovery of the chamber study to the real environment?
- The authors provided several possible causes for the SOA mass variation with the addition of NH₃ or NO₂ based on literature. It would provide more new information if the authors could quantify the potential mechanism contribution since a detailed AMS analysis was conducted.
- Does the determined organonitrogen-related species in AMS reflect the yield concentration change?
- In addition to the proposed mechanism to the influence of NO₂ in the manuscript, could NO₂ reacting with OH to form HNO₃? Such reaction will provide additional OH consumption and reduces the oxidation level of organic species. Because of the high volatility of HNO₃, the overall mass might decrease. The addition of NH₃ can further cause the formation of NH₄NO₃, which can condense on the particles to increase secondary aerosol formation.
- The y-axes labels of Figure S4 (a) (c) (e) are not in the correct position.