



EGUsphere, referee comment RC1
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Comment on egusphere-2022-1068

Anonymous Referee #1

Referee comment on "SO₂ enhances aerosol formation from anthropogenic volatile organic compound ozonolysis by producing sulfur-containing compounds" by Zhaomin Yang et al., EGU sphere, <https://doi.org/10.5194/egusphere-2022-1068-RC1>, 2022

The manuscript by Yang et al. describes a set of laboratory measurements, in which they investigated SO₂ effects on the formation and chemical composition of particles from anthropogenic volatile organic compound ozonolysis. Various monomeric and dimeric products with C, H, and O atoms were observed under SO₂-free conditions. The authors found that SO₂ presence can induce the formation of sulfur-containing compounds. They suggested that the observed sulfur-containing compounds have stronger ability for particle formation than corresponding precursors, leading to an enhancement of particle formation. Structures and reasonable formation mechanisms of these sulfur-containing compounds were also proposed. Overall, the experimental design, results, and discussion of this manuscript are presented in a logical sequence that is easy to follow and understand. The paper provides new and valuable results for our understanding of the details of SO₂ roles in aerosol formation, and also guidance and inspiration for the community that reads ACP. Therefore, I would recommend the publication of this work if the author consider the minor comments below.

Specific comments:

- The authors did a great job of explaining the reasons why their study would be of importance and interest. However, there is just brief text regarding the influences of SO₂ on aerosol chemistry. Some recent literatures should be considered.
- Deng, P. S. J. Lakey, Y. Wang, P. Li, J. Xu, H. Pang, J. Liu, X. Xu, X. Li, X. Wang, Y. Zhang, M. Shiraiwa and S. Gligorovski, Daytime SO₂ chemistry on ubiquitous urban surfaces as a source of organic sulfur compounds in ambient air, *Sci. Adv.*, 2022, 8, eabq6830.
- Wang, T. Liu, J. Jang, J. P. D. Abbatt and A. W. H. Chan, Heterogeneous interactions between SO₂ and organic peroxides in submicron aerosol, *Atmos. Chem. Phys.*, 2021, 21, 6647-6661.
- P4, L92. The authors mentioned that cyclohexane was injected into the chamber to scavenge OH radical. It is also worth mentioning how did the authors determine that OH had been successfully scavenged.
- P5, L118 and L128. Particle production experiments were carried out as batch mode experiments. Therefore, the chemical reaction systems were evolving during the

ozonolysis of anthropogenic volatile compound. During which reaction period of the experiments did the authors collect aerosol particles? Please indicate this information.

- P6, L130. It should be also stated clear how the extraction was done (i.e., whole filter or punches? device?)
- P7, L162–167. Perhaps it is better for the understanding of readers to include some relevant citations.
- P7, L168. Full equation from Li et al. (2016) should be given.
- P9, L225. From Fig. S2, the volume concentration of aerosol particles reached its maximum within 240 min. So, what is the definition of the initial stage of particle production experiment?
- The authors mentioned that the enhancement of aerosol particles was mainly due to the formation of inorganic and organic sulfates. Although wall losses of organic vapors may be negligible as the author discussed, previous studies suggest that increased particle surface area by SO₂ may cause the increase in particle volume concentration. Would this be a possible clarification?
- P17, L378. Could you provide some more details about the IR absorption of different functional groups? Perhaps in the Supplement?
- P19, L 396. The Reviewer would recommend the author to present briefly the strengths of ESI-MS in characterizing organosulfate. This may be significant in supporting the production of organosulfate.
- P22, Figure 7. The legend "Precursor" is confusing since cyclooctene is also referred to as a precursor in this manuscript. Suggest different legend such as organosulfate precursor or something else.