Comment on acp-2022-294

Anonymous Referee #1

Referee comment on "Effects of OH radical and SO_2 concentrations on photochemical reactions of mixed anthropogenic organic gases" by Junling Li et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2022-294-RC1, 2022

The manuscript entitled "Effects of OH radical and SO_2 concentrations on photochemical reactions of mixed anthropogenic organic gases" presents new findings of the atmospheric processing of the anthropogenic pollutants, represented by n-dodecane, 1,3,5-trimethylbeneze, which are associated with the vehicular traffic pollution. The paper is scientifically sound; for the most part, methods and experimental details are adequately presented. The equipment and methodology used in the simulation chamber experiments are adequate and provide valuable information about the reactions under investigation. The length of sections 1 and 2 is well balanced, providing sufficient details and discussion without adding too much volume to the final manuscript.

At the same time, the article would benefit from major revisions. Generally, the use of the English language should be improved because it is frequently awkward, even from the point of view of a non-native speaker of English.

My technical comments are provided below. Regarding the scientific comments, I believe that the article would benefit greatly from a more in-depth analysis of the results. The is a lack of a broader context in the presented discussion. The discussion in section 3 discusses the data but without providing any broader insights into the processes under investigation. In connection with this comment, there is no quantitative information presented in section 4, which almost reads like a literature review section. I would recommend constructing a kinetic model (perhaps MCM can be utilized in some way) and attempting to reproduce the experimental temporal profiles of the reactants from the chamber experiments and the measured yields of SOAs. All of the elements are here; rate coefficients for the two molecules under investigation are available or can be estimated with SAR parameter if needed. The author should attempt to construct a mechanism explaining the experimental observations and the use of this mechanism to discuss and explain the atmospheric implications of their findings in section 4 (Atmospheric Implications).

See also:

Environ. Sci. Technol. 2001, 35, 1394-1405

https://acp.copernicus.org/articles/22/215/2022/acp-22-215-2022.pdf

Technical comments.

Line 36-37, 41-45 These sentences are not well constructed and read awkwardly, please revise.

etc. is used a little bit too much in the introduction, please avoid such abbreviations in the scientific writing.

Line 61 Consider removing "in combination with the corresponding equipment"

Lines 74-77 Can you please clarify why the temperature inside the chamber during wintertime is within 15-30 °C range?

Line 80 Consider removing "classics"

Line 80 NO was introduced from a 500 ppm standard gas cylinder, I understand that this cylinder contained a 500 ppm mixture of NO in nitrogen? Similar comment to Line 84 (SO_2 cylinder).

Line 82 Consider removing "home-made"

Line 92 Consider removing "solid" and changing adsorbent to sorbent

Line 99 Can you provide some more details about the experimental conditions for the ESI-MS measurements? Perhaps in the SI? What was the difference between the measured and expected elemental formula? What was the mass resolution of the used instrument?

Note also that the elemental composition provides little information about the molecular structure.

Line 111 Referring to OH as the hydroxyl free radical is rather uncommon.

Lines 271-272 more as a higher number or larger concentration?

Figures S2 and S3 – the labels on these plots are completely unreadable, can you please make the fonts larger?

Figures 2 and 4 are difficult to read, perhaps consider presenting some of these results in a form of a bar plot?