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Atmospheric Chemistry and Physics Discussions

Interactive comment on "AMS and LC/MS analyses of SOA from the photooxidation of benzene and 1,3,5-trimethylbenzene in the presence of NO_x: effects of chemical structure on SOA aging" *by* K. Sato et al.

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General comments

The manuscript "AMS and LC/MS analyses of SOA from the photooxidation of benzene and 1,3,5-trimethylbenzene in the presence of NO_x: effects of chemical structure SOA aging" from Sato et al. presents results from smog chamber experiments to illustrate the influence of the chemical strucutre of a precursor compound on the chemical composition of the SOA formed by its oxidation. The authors first used an AMS to study

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the general composition of the aerosol and the functional groups present with Van Krevelen diagrams. They also consider specific classes of compounds (e. g. nitrates and peroxides) and, by LC/TOF-MS, were able to identify several compounds. I would recommend the publication of this manuscript in ACP after addressing the following comments.

Regarding the structure of the manuscript, I would suggest a minor change. Section 5 discusses the atmospheric relevance of the measurements and may be included in the Conclusions or may be moved just before the Conclusions.

Specific comments

Abstract, lines 19-20: The authors mention that the duration of the experiment explains why laboratory SOA is less oxidized, but do not write about the influence of mass loading effects on the SVOCs partitionning as discussed in Section 3.

Abstract, lines 21-22: The authors state that no laboratory experiment can simulate oxidation in the aqueous phase. Why would, for example, a photochemical oxidation experiment with an ammonium sulfate seed at high relative humidity not be suitable for this kind of investigation?

Page 285, lines 20-21: The authors should specify which impact of OOA they are thinking of (e. g. climate, health). For instance, would aging increase or reduce the toxicity of SOA?

Page 286, lines 14-16: Do the newly developed AMS data anylsis methods refer to the ones mentionned on lines 8-10? Instead of repeating the same information, the author may want to describe, if possible, in a couple of short sentences what is new in this method.

Page 287, line 15: Does the different instrument have different time resolution between 6 and 10 minutes or is the time resolution of one specific instrument varying?

Page 288, line 8: Why is this analysis (and its results) not mentionned in the abstract?

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Page 288, line 10: Same comment as previously: "Each filter sample..." would be more suitable. The authors may want to describe how much of the filter they used for this analysis and for LC/TOF-MS analysis, respectively.

Page 289, line 6 (and Table 1): At what time the SOA yields were calculated?

Page 289, lines 17-24: The authors compare here only SOA yields from different studies, but do not mention if the VOC/NO_x ratios are comparable and if the experimental conditions (e. g. temperature, relative humidity) allow a direct comparison.

Page 290, line 24: The authors may want to describe shortly what is new in the fragment table and explain how the data is affect sompared to an analysis with the "old" fragment table.

Page 294, lines 26-27: How would exactly peroxides influence the $f44$ value and the O/C ratio from AMS data?

Page 295, lines 10-12: The authors report organic peroxides to total mass of 12 ± 8 % for 1,3,5-TMB SOA and $<$39 % for benzene SOA and design them as "low mass fraction". The authors should be more specific on the "limited effect of these peroxides on the AMS data". How would they be affected if a third of the benzene SOA is organic peroxides?

Page 314, Figure 2: Why did the authors included data from a previous study in Fig. 1 and not in this one? I would suggest to merge Fig. 2 and Fig. S4.

Technical corrections

Page 286, line 13: The abbreviation "NO_x" is not defined.

Page 287, line 4: I suggest to write simply "Hydrocarbon, methyl nitrate, NO, NO_2, and O_3 were monitored...".

Page 287, lines 21-24: The formulation of those sentences suggest that the authors only analysed one sample. Instead of "A filter sample was...", I recommend to write

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"Each filter sample was...".

Page 287, line 27: Are all the percentages given refering to the volume?

Page 289, line 9: The authors could cite Alfarra et al. (2006) who estimated 1,3,5-TMB SOA density.

Page 290, lines 1-3: The first two sentences should be swapped to start with a general statement and then continue with a more specific one about the measurements of the present study.

Page 291, line 23: Describing the line as "black" and "dotted" instead of only "straight" will help the reader. Moreover this line does not "represent" alcohols or peroxides directly, but it represents the evolution of the H/C and O/C ratios if only alcohols or peroxides would be formed in the SOA.

Page 292, line 9: It is "Fig. S4" and not "Fig. 4S".

Page 293, lines 12 and 22: The numbering of the Tables is missing (2 and 3).

Page 293, line 25: The "Fig. S1" is found as "Photo S1" in the Supplement.

Page 300, line 13: Typing error ("dmethyl" instead of "dimethyl").

Page 310, Table 1: Instead of "Compound" the authors may want to use "Hydrocarbon (HC)", which would be consistent with "$[HC]_0$".

Page 311, Table 2: In the footnotes e and f, specifying which peak (giving its retention time) is the strongest would provide interesting information to the reader.

Page 313, Figure 1: The legend could be improved by grouping the results from this study and mention Sato et al. (2010).

Supplement, Figure S1: In the main text the authors use "H/C" and "O/C", while in the caption of this figure they use "H:C" and "O:C". For more consistency, "H/C" and "O/C" should be use also in the Supplement.

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Supplement, Figure S3: The legend is not clear at all for the reader and should be changed.

Supplement, Figure S5: The authors should avoid to use a screen capture as figure.

References

Alfarra, M. R., Paulsen, D., Gysel, M., Garforth, A. A., Dommen, J., Prévôt, A. S. H., Worsnop, D. R., Baltensperger, U., and Coe, H.: A mass spectrometric study of secondary organic aerosols formed from the photooxidation of anthropogenic and biogenic precursors in a reaction chamber, Atmos. Chem. Phys., 6, 5279–5293, doi:10.5194/acp-6-5279-2006, 2006.

Sato, K., Takami, A., Isozaki, T., Hikida, T., Shimono, A., Imamura, T.: Mass spectrometric study of secondary organic aerosol formed from the photo-oxidation of aromatic hydrocarbons, Atmos. Env., 44, 1080–1087, doi:10.1016/j.atmosenv.2009.12.013, 2009.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 283, 2012.