**Atmospheric
Chemistry
and Physics
Discussions**

Interactive
Comment

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.

K. Sato et al.

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Dear Dr. A. Praplan,

Thank you for your careful reading and useful comments. I reply to your comments as follows:

"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."

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This section is 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."

I include the influence of mass loading effects in the abstract.

"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?"

I revise this sentence as "The laboratory chamber experiments under dry conditions are not be able to simulate..." The corresponding sentences in the text and in the conclusions are also revised.

"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?"

Peroxides inducing oxidative stress might increase through the quinone-catalytic aqueous phase reactions (Wang et al., 2012) during SOA aging, while peroxides might dissociate to form less toxic products. From current understanding of SOA aging chemistry, the authors cannot specify which impact of OOA is expected.

"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."

Yes, they do. I rewrite the second sentence including explanations of the methods.

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Interactive Discussion

Discussion Paper

"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?"

Measurements of FT-IR, SMPS, and H-ToF-AMS were carried out every 10 min in runs 1 and 4 or every 6 min in the other runs. I revise the sentence.

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

I add these results in the abstract.

"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."

I revise this sentence to "Each filter sample..." I describe how much of the filter we used for this analysis and for LC/TOF-MS analysis, respectively, in the section of experimental procedure.

"Page 289, line 6 (and Table 1): At what time the SOA yields were calculated? The SOA yield was calculated using the data when the volume concentration reached its maximum. This is added in the text."

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

Discussion on the relationships between the SOA yield and the NOx level is added. All experimental data plotted in Fig. S2 were measured at room temperatures (297-304 K) and dry conditions (RH < 28%). This is explained in the caption of this figure.

"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."

The intensities of m/z 18 and 28 organic fragments were modified in the new table

(Aiken et al., 2008). Results of f44 decreased <2% by this modification. I describe these in the text.

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

The relationship between the peroxide to SOA fraction and the f44 value is discussed based on present and previous data in the text.

"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?"

It is discussed in the text as follows:

The organic peroxides to SOA ratio measured for the photooxidation of aromatic hydrocarbons in this study were lower than that measured for the ozonolysis of α-pinene. If organic peroxides affect the f44 value obtained by AMS, the f44 value of SOA from α-pinene would be higher than that of SOA from aromatic hydrocarbons. However, the f44 values measured for SOA from the α-pinene ozonolysis (0.042 (Bahreini et al., 2005)) were close to or lower than those measured in this study (0.038-0.17). Although organic peroxides from aromatic hydrocarbon are present in SOA, the effect of these peroxides on the AMS data will be limited.

"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."

Following your comment, I merge Fig. 2 and Fig. S4.

"Technical corrections"

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

I add the definition of NOx here.

"Page 287, line 4: I suggest to write simply "Hydrocarbon, methyl nitrate, NO, NO2, and O3 were monitored...".".

I revise following the comment.

"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 "Each filter sample was...".".

I revise it.

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

Yes, they are. I revise all the units of mobile phase concentration to "% v/v".

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

Thank you for providing information. I cite this article.

"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."

I swap the first two sentences.

"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."

I substitute "straight line" with "black dotted straight line" and revise the sentence following your comment.

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

I fix it.

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

I fix it.

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

I fix it.

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

I fix it.

"Page 310, Table 1: Instead of "Compound" the authors may want to use "Hydrocarbon (HC)", which would be consistent with "[HC]0"."

I fix it.

"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."

I specify which peak is the strongest by giving its retention time.

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

I fix it.

"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."

I revise both figure and caption.

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

I fix it.

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

I fix it.

References:

Aiken, A. C., DeCarlo, P. F. Kroll, J. H., Worsnop, D. R., Huffman, J. A., Docherty, K. S., Ulbrich, I. M., Mohr, C., Kimmel, J. R., Sueper, D., Sun, Y., Zhang, Q., Trimborn, A., Northway, M., Ziemann, P. J., Ganagaratna, M. R., Onasch, T. B., Alfarra, M. R., Prevot, A. S. H., Dommen, J., Duplissy, J., Metzger, A., Baltensperger, U., and Jiemenez, J. L.: O/C and OM/OC ratios of primary, secondary, and ambient organic aerosols with high-resolution time-of-flight aerosol mass spectrometry, Environ. Sci. Tehcnol., 42, 4478-4485, 2008.

Wang, Y., Arellanes, C., and Paulson, S. E.: Hydrogen peroxide associated with ambient fine-mode, diesel, and biodiesel aerosol particles in Southern California, Aerosol Sci. Tech., 46, 394-402, 2012.

Sincerely,

Kei Sato

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