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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Investigating the use of secondary organic aerosol as seed particles in simulation chamber experiments" *by* J. F. Hamilton et al.

Anonymous Referee #2

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General Comments

This paper describes results from a series of simulation chamber experiments to investigate the use of SOA, generated from photo-oxidation of beta-caryophyllene, as seed particles in SOA formation from the photo-oxidation of another precursor (limonene). A range of on-line and off-line techniques have been used to probe the characteristics of the SOA and the results indicate that this may be a useful approach for future studies.

I think the paper could have been improved by performing experiments with inorganic seed particles and also in the absence of seeds, as this would have enabled a more

comprehensive evaluation of the approach. Nevertheless, the article is well written and the results are presented in a clear and logical manner. The experimental data are of high quality and the interpretation and discussion of the results is generally appropriate.

I recommend publication following revision of the manuscript in line with the following comments.

Specific Comments

1. There appear to be some slightly unusual aspects regarding the use of NOx in these experiments and clarification is required on a number of issues.

(i) The source of NOx should be stated in section 2.2, where only details for NO2 addition are provided. In classical photo-oxidation experiments, NOx is typically added as NO, which becomes partially oxidized to NO2, with the result that the NO mixing ratio is several factors larger than that of NO2. However, as shown in figure 1, the initial NO2 levels are higher than those of NO. Was this deliberate or was it due to the method for introducing NOx? Some comment is required here.

(ii) For the photo-oxidation of limonene, only NO2 was added. This resulted in an even larger ratio for NO2 to NO. Why was NO2 added instead of NOx?

(iii) Figure 1 indicates that the NO mixing ratio appears to increase as the chamber is being flushed, while both NO2 and O3 decrease considerably at this time. Is there an explanation for this?

(iv) Why did the authors want to achieve a VOC:NOx value of 2?

2. Page 25133, line 19: The composition of beta-caryophyllene SOA is only briefly discussed as it will be reported in more detail in another publication. Nevertheless, the authors should at least refer to the work of Jaoui et al. (2007), which first identified beta-caryophyllinic acid as a photo-oxidation product of beta-caryophyllene. It should also be noted that Li et al. (2010) generated SOA form the ozonolysis of beta-caryophyllene, rather than photo-oxidation.

3. Page 25135, line 20 and Table 2: The species in limonene SOA are identified from LC-MS data. The results should be compared to those of Jaoui et al. (2006), who determined many compounds in limonene SOA.

Minor Comments

1. Page 25119, line 7: Sulfate is the spelling recommended by IUPAC.

2. Page 25120, line 7: Chamber instead of chambers

3. Page 25123, line 14: ...was generated from the photo-oxidation of beta-caryophyllene...

4. Page 25124, line 11: Maybe change title to Gas Phase Measurements?

5. Page 25127, line 8: How did the authors know that 10-20 mg of a filter was being cut?

6. Page 25129, line 16: ...the mass concentration...

7. Page 25131, line 14: ...a series of experiments was carried out...

8. Page 25131, line 22: increases instead of increase

9. Page 25132, line 22: ppbV instead of ppb

References

Jaoui, M, Corse, E., Kleindienst, T. E., Offenberg, J. H., Lewandowski, M., Edney, E. O.: Analysis of secondary organic aerosol compounds from the photooxidation of d-limonene in the presence of NOx and their detection in ambient PM2.5, Environ. Sci. Technol., 40, 3819-3828, 2006.

Jaoui, M, Lewandowski, M., Kleindienst, T. E., Offenberg, J. H., Edney, E. O.: Beta-caryophyllenic acid: An atmospheric tracer for beta-caryophyllene secondary organic aerosol, Geophys. Res. Lett., 34, L05816, doi:10.1029/2006GL028827.

Li, Y. J., Chen, Q., Guzman, M. I., Chan, C. K., and Martin, S. T.: Second-generation products of beta-caryophyllene ozonolysis are the dominant contributors to particle mass concentration, Atmos. Chem. Phys. Discuss., 10, 17699–17726, doi:10.5194/acpd-10-17699-2010, 2010.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 25117, 2010.