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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Influence of Relative Humidity on the Heterogeneous Oxidation of Secondary Organic Aerosol" *by* Ziyue Li et al.

Anonymous Referee #1

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Review of "influence of relative humidity on heterogeneous oxidation of secondary organic aerosol" by Li et al.

The authors explored the heterogeneous oxidation of secondary organic aerosols (SOA) by OH radicals as a function of relative humidity. A difference was observed between heterogeneous oxidation at 25% compared to 80%, and a model was developed to explain the results. This manuscript is easy to follow and clear. The science is also of high quality and provides significant insight. I recommend the manuscript for publication after the authors have had a chance to address the following comments.

Comments:

In this study it was assumed that the oxidation of SOA by OH occurred only in the

condensed phase. How did the authors rule out the possibility of gas-phase oxidation of semivolatile organics that partition between the condensed-phase and gas-phase after the generation of SOA. This is likely a question that has been addressed in previous studies, but for the uninformed reader, it would be beneficial to discuss in the current manuscript as well.

Page 13, lines 7-9. At this point in the manuscript (without the modelling) the implications to the atmosphere is not completely clear since the reaction time in the laboratory was seconds, while the reaction time in the atmosphere can be days. Because of this difference in reaction times, diffusion limitations can be more important in the laboratory compared to the atmosphere. Hence, at this point in the manuscript, the authors may want to change the wording to "These observations may have implications for the lifetime of SOA with respect to heterogeneous oxidation in the atmosphere".

As pointed out by the authors, mass concentrations of SOA was 1000 microgram/mˆ3, which is higher than ambient concentrations. Can the authors speculate on how their results may change with mass concentration? Two recent studies have explored the effect of mass concentration on the viscosity of SOA. 1,2

References:

(1) Grayson, J. W.; Zhang, Y.; Mutzel, A.; Renbaum-Wolff, L.; Boege, O.; Kamal, S.; Herrmann, H.; Martin, S. T.; Bertram, A. K. Effect of varying experimental conditions on the viscosity of alpha-pinene derived secondary organic material. Atmospheric Chemistry and Physics 2016, 16, 6027-6040. (2) Jain, S.; Fischer, K. B.; Petrucci, G. A. The Influence of Absolute Mass Loading of Secondary Organic Aerosols on Their Phase State. Atmosphere 2018, 9, 14.

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