

Interactive comment on “Physical Properties of Secondary Photochemical Aerosol from OH Oxidation of a Cyclic Siloxane” by Nathan J. Janechek et al.

Anonymous Referee #1

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Janechek et al. describe yields and physical properties of SOA formed from the photooxidation of the D5 volatile siloxane and D5-containing consumer product. Such studies are definitely important because we know very little about the atmospheric fates of these cyclic volatile methylsiloxanes (cVMS) and the study could be useful for an initial step in more accurate modelling which currently is also challenging. A rather shocking discovery from this study is that these volatile silicon-containing organic compounds appear to have much higher yields for secondary organic aerosol (SOA) formation than previously thought which might inspire new questions about how SOA from the large anthropogenic emissions of siloxanes affect human health and climate.

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Overall, the paper is well written, and the atmospheric relevance of siloxanes is a timely subject, so it looks like a useful contribution to the literature. However, I have some relatively minor suggestions/comments which hopefully can be successfully addressed during the revision.

General

- Why did the authors focus only on D5 experiments? While this is indeed the most common cVMS in consumer care products, other siloxanes are also common in the atmosphere (as the nice community comment emphasizes). I think the authors should consider extending the analysis to other cyclic siloxanes (D3-D7) but if it is not possible then at least the other compounds should be discussed in terms of how similar or different they might be. I am particularly concerned that your models extrapolate from this study to D4 and D6 so might be completely inaccurate for the mixed siloxane atmospheres (D3-D7).

Specific

- The methodology is very nicely described. However, given the high SOA yields, are you sure that the house air was not introducing any additional precursors or cVMS? Why was the house air used to flow over D5 standard instead of zero air from a catalyst or a zero-air generator? The indoor air may contain very high concentrations of siloxanes and other VOCs (e.g. Tang et al., 2016). It is quite reassuring what is written in P6 L12 “During D5 gas phase measurement and analysis, personal care products that contained cyclic siloxanes were avoided by laboratory personnel.” but was the personnel instructed to use no shampoo, soap, creams, or just to avoid antiperspirants? There could potentially be grease or products which could be a strong siloxane source in a lab. I therefore wonder how the authors have convinced themselves there was no significant level of VOCs (e.g. 100 ppb of D4, for instance)? Your assumption of the clean air might be due to the presence of a charcoal filter but

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was it new and how efficient was it for cVMS? Have you done any measurements of the air before and after the charcoal filter before each yield experiment? I think a zero-air generator would be a much better solution for these type of experiments.

- Brass fittings are avoided in VOC sampling. Is there any reason why these were used?

- Fig. 3, is one of the points an outlier? Fig S8 informs that these yield extremes occur at the RH of 45%, and are more consistent at RH of 25%. It would be nice to shed more light on understanding the effect of humidity.

- Table 1, water bath temperature only affected the evaporation rate of D5 to the dilution flow. It would be useful to add temperature of the reactor.

Technical

- P7,L32 Should be "Data were".

References

Tang X, Misztal PK, Nazaroff WW, Goldstein AH. Volatile Organic Compound Emissions from Humans Indoors. *Environmental Science Technology*, 50(23):12686-94, 2016.

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