Verneuil en Halatte, 12th October 2023

Dear Arthur Chan,

Please find below a point-by-point response to your comments (in blue) concerning the manuscript EGUSPHERE-2023-1355 entitled “Insights into secondary organic aerosol formation from the day- and nighttime oxidation of PAHs and furans in an oxidation flow reactor”. We have addressed your comments and revised the manuscript accordingly. We think that this new version can now fully meet the standards of the Atmospheric Chemistry and Physics journal.

With very best wishes,

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Editor:

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Specifically, the abstract is too long, and the conclusions should include a more thorough discussion of context, limitations and implications.

The abstract has been shortened to fit with ACP's guidelines. The conclusions have been modified and now include a better introduction of the context as well as a discussion on the limitations and implications of the work.

Also, obtaining results for other studies (biological assessments) is not necessarily a justification for the high loadings in this study. This manuscript is a standalone work and the conditions should be relevant for the research questions in this particular study. The loadings are high even for a laboratory SOA study. The other justification about being relevant to near-field conditions is not that strong either. If so, more evidence should be presented about how relevant that would be (e.g. how long would it take for the plume to dilute to lower PM levels). In general, I do not believe the authors have quite addressed a major concern raised by almost all the reviewers, and a better justification is needed.

We totally agree that the high SOA loadings used in this study are not relevant to ambient air conditions. However, they are relevant to the OFR ageing studies performed on biomass burning emissions as well as solid fuel combustion emissions and to the study of the subsequent formation of secondary particles (comparable either in terms of VOC concentrations or resulting PM/OA concentrations in the OFR) (e.g. Bruns et al., 2015; Budisulistiorini et al., 2021; Iaukea-Lum et al., 2022; Ortega et al., 2013; Reece et al., 2017; Zhang et al., 2021). The list here is not exhaustive and most of the studies performed on such combustion sources have been probably done using high loadings (the dilution factors applied are not high enough to reach ambient air conditions). Such studies are performed to be further extrapolated to ambient air and are relevant to address the research questions related to atmospheric chemistry or atmospheric processes. In addition, such high concentration conditions used in this type of studies are also related to potential certification purposes of the particulate emissions of residential heating appliances or combustion engines (Cao et al., 2020).

Moreover, several previous OFR studies focusing on the SOA from pure anthropogenic precursors, and addressing similar research questions, have been also performed in similar high loading conditions (e.g. Lau et al., 2021; Liu et al., 2015).

Finally, as specified before, toxicological studies on SOA based on the use of OFR also used usually high precursor concentrations to get sufficient amount of PM material (e.g., Wang et al., 2018; Khan et al., 2021; Offer et al., 2022).

This is now specified in the text and the text has been modified as follows:

"These concentrations were relatively high compared to ambient air conditions. However, they are comparable to OFR aging studies performed on biomass burning as well as solid fuel combustion emissions (Bruns et al., 2015; Budisulistiorini et al., 2021; Iaukea-Lum et al., 2022; Ortega et al., 2013; Reece et al., 2017; Zhang et al., 2021). Several previous OFR studies focusing on the SOA from pure anthropogenic precursors, and addressing similar research questions, have been also performed with comparable high loading conditions (Lau et al., 2021; Liu et al., 2015). Besides the study of the SOA formation, our objective to further perform in vitro biological assessment (El Mais, 2023) requiring large quantity of PM materials (collected on filters, sampling flow of 6.5 L min^{-1}, Figure 1) similarly to different previous works (Khan et al., 2021; Offer et al., 2022; Wang et al., 2018)."

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