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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Heterogeneous oxidation of amorphous organic aerosol surrogates by O_3, NO_3, and OH at typical tropospheric temperatures" *by* Jienan Li et al.

Anonymous Referee #1

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In this work, Li et al. investigated the reactive uptake coefficients of O3, NO3 and OH onto thin film of surrogate organic aerosols (OA) species over a troposphere-relevant temperature range. The underlying hypothesis is that the temperature induced change in phase state of the studied chemicals will impact the uptake kinetics of atmospheric oxidants onto OA and consequentially the degradation rate of OA. This was clearly shown from the measurement of uptake coefficient that took place in a temperature-controlled flow reactor with inner wall coated with the studied OA surrogate species. The phase state changes were supported by poke-flow experiments. The measured uptake coefficients onto the thin film were extended to estimate the temperature dependent particle degradation fraction (DF) for studied species/binary mixture as 200 nm

particles. Atmospheric implications were drawn that the lifetimes of OA are expected to be longer against heterogeneous oxidation due to a liquid-to-solid or semi-solid to solid phase transition that slows down the reactions. The overall experimentations were well thought and designed to minimize effects that can impact the accurate determination of reaction kinetics. The results were presented in high quality and discussed in detail with appropriate reference to the literature for data interpretation and comparison. Some specific comments provided below:

1. Could authors give more background to justify the choice of canola oil, levoglucosan and glucose as OA surrogates and the choice of paired oxidant as well?

2. There are no clear indications on the morphologies of films before being poked. Please consider adding these images to help interpret the images including those in the SI. Are the films for all individual species and mixtures supposed to be transparent before poking?

3. Line 224, would the Tg pred agree better with Tg exp if 10%-16% residual water was accounted for in the calculation? This will help to support the argument here.

4. In Section "Atmospheric implications" and "Conclusions", author should probably note that when coupled with higher ambient relative humidity the estimated temperature dependent DF using uptake coefficient derived from dry experiments may be underestimated for hygroscopic species like levoglucosan and glucose. Some discussions in this regard and directions for future studies could be added.

Technical Notes: 1. Font types of header and numbers in Table S4-Table S6 are not consistent.

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