

## ***Interactive comment on “Role of aldehyde chemistry and NO<sub>x</sub> concentrations in secondary organic aerosol formation” by A. W. H. Chan et al.***

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We thank the reviewer for the helpful comments. Please see responses below:

- *Page 10240, lines 20–25: Do you mean specifically alpha-beta unsaturated aldehydes may be important in SOA formation or all aldehydes?*

Since only  $\alpha$ ,  $\beta$ -unsaturated aldehydes are studied in detail here, we expect these aldehydes are important SOA precursors through PAN chemistry. As shown in this work, other aldehydes (e.g. 4-pentenal) can be a source of SOA, but the formation pathways are different than those shown for  $\alpha$ ,  $\beta$ -unsaturated aldehydes. At this point, we cannot establish that the chemistry elucidated in this work can be applied to other aldehydes.

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- *Page 10237, lines 11–15 and Page 10263, Figure 10: It looks like the stoichiometry of the reactions for forming the dihydroxyacid and hydroxynitrooxyacid by reaction of the dioxketone intermediate with H<sub>2</sub>O and HNO<sub>3</sub> is incorrect. To form these products the dioxketone would need to react with H<sub>2</sub> and HNO<sub>2</sub>, or if the reactions occurred with H<sub>2</sub>O and HNO<sub>3</sub> then O atoms would have to be formed as products. This probably makes the proposed reactions less likely.*

We agree with the reviewer that reaction with H<sub>2</sub> and HONO is unlikely. Reaction with H<sub>2</sub>O or HNO<sub>3</sub> is far more likely, but the stoichiometry would result in an additional O atom. This pathway cannot be ruled out from our experimental results. Another possible pathway is an analogous cyclization of the alkoxy radical (following reaction with NO), leading to a C<sub>4</sub>-hydroxy-epoxyketone (with one fewer O atom than the dioxketone proposed here). Reaction of this intermediate with H<sub>2</sub>O or HNO<sub>3</sub> will yield the observed oligoesters. However, decomposition of the alkoxy radical is likely favored over cyclization, and, in addition, such an intermediate is highly strained, making this pathway less likely. At this stage, we propose the dioxketone pathway as the most viable pathway, and more work needs to be done to elucidate the exact chemistry.

- *Page 10252, Table 1: I think the MBO232 and MBO231 structures in the table are reversed.*

Table 1 has been corrected.