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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Effect of NO_x level on secondary organic aerosol (SOA) formation from the photooxidation of terpenes" *by* N. L. Ng et al.

Anonymous Referee #2

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General Comments:

This manuscript presents a series of experiments to investigate secondary organic aerosol (SOA) formation from photoxoidation of three selected terpenes (a-pinene, longifolene and aromadendrene) under different NOx levels. Recently, results from several research groups show that increasing NOx levels can cause the decrease of SOA production from different compounds, such as isoprene, a-pinene (ozonolysis), benzene and m-xlyene. This paper shows that, similar to previous studies, SOA formation from the photooxidation of a-pinene decreases with increasing NOx levels. However, the two sesquiterpenes follow an opposing trend: their SOA formation increases with increasing NOx levels. The latter observation could be explained by the formation of low volatile organic nitrate species or the formation of large hydroxycarbonyls and

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multifunctional products through an isomerization pathway in the presence of high NOx level. This subject will be of significant interest to readers of Atmospheric Chemistry and Physics. The experimental techniques appear to be state-of-the-art, the methodology is adequately described and the results significant and are presented in a clear and logical fashion. This paper should be accepted by Atmospheric Chemistry and Physics. I have only a few significant suggestions.

Specific Comments:

1.Experimental Section. Wall-loss coefficient is very crucial for smog chamber experiments, and it could vary from experiment to experiment. In this study, the author apparently utilizes a set of size-dependent wall-loss coefficients obtained from different experiments using inorganic particles. Are these coefficients appropriate for this study in which particles are organics or covered by organics? Although I understand that this study is to compare the trend of aerosol formation under varying conditions instead of obtain accurate aerosol yield, the accuracy of the wall-loss coefficient may not be important. 2.How is the concentration of H2O2 calculated? If the H2O2 is calculated based on the chamber volume and the liquid volume injected, the result may not be accurate. Because H2O2 could be lost to the wall during the injection, it is likely that the actual concentration of H2O2 will be much lower. 3.In section 5.2.2, the author states that in the intermediate NOx experiments, NO will be consumed quickly and then the aerosol will be a mixture of the products formed under both high and low-NOx conditions. However, at the time the NO concentration approaches zero, only a very small amount of a-pinene should be left for the low-NOx reaction. In addition, O3 level is negligible under both high and low-NOx conditions, while there is considerable amount of O3 formed during the intermediate NOx experiments. NO3 radical levels should also be much higher during the intermediate NOx experiment. The gas-phase reactive oxidation products may further react with O3 and NO3 radical to form compounds with low volatility that can condense on aerosols. In Figure 1, only the growth curve of intermediate NOx experiment shows a clear “hook”, which could be a good

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evidence to support the further reactions between reactive oxidation products and O3 and NO3 radical. Thus, the compounds of SOA from intermediate NOx experiments may be quite different from those formed from low and high-NOx experiments.

Technical comments:

1.Page 10140, line 11, a-pinene should be longifolene. 2.Figure 1, 2 and 3, captions, why are these curves called time-dependent growth curve? I don't see any time presented in these figures.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 10131, 2007.