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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Secondary organic aerosol formation from toluene photooxidation under various NO_x conditions and particle acidity" *by* G. Cao and M. Jang

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We would like to thank the reviewer for the valuable comments.

Response to reviewer 2:

Comment 1. The reviewer questions the assumption that SOA density remains 1.4 g/ml under all experimental conditions in this study, because the compositions of SOA in different conditions are different.

Response: In this study, we didn't measure the SOA density experimentally. We agree that SOA densities depend on SOA compositions and may vary under different experimental conditions. However, the current limited knowledge of SOA compositions

hinders the accurate estimation of SOA densities. The findings of toluene SOA densities at different NOx concentrations are not very consistent. For example, Sato et al. (2007) reported that the density of SOA remained 1.4 g/ml at different initial NOx concentrations (0.2 ppm and 1 ppm). But Ng et al. (2007) found that the toluene SOA density was 1.45 g/ml at low NOx level and 1.24 g/ml at high NOx level. If 1.24 g/ml is used as the SOA density for the high NOx conditions, our assumption in this study (SOA density =1.4 g/ml) probably overestimates the SOA yields at high NOx levels by 0.01%-0.02%, which can not significantly change our interpretation and conclusions. Therefore, we would like to remain our assumption for the toluene SOA density.

Comment 2. The reviewer comments on the Figure 5C that besides mechanisms addressed in this manuscript, another possibility proposed by Hurley et al. (2001) may explain the curve shape of aerosol growth profile.

Response: We thank the reviewer for providing the valuable information regarding the Fig. 5C. The additional sentences have been included at the end of section 3.2 (line 3 on Page 14481) of the revised manuscript.

"Hurley et al. (2001) who simulated the toluene SOA formation at high NO_x levels using a chemical kinetic model have seen the similar SOA growth curves as observed in this study, which indicates another possible mechanism for toluene SOA formation: not only first-generation but also second-generation oxygenated products can contribute the toluene SOA formation. However, this mechanism may not very significant in our system with high initial toluene concentrations where first-generation products are dominant."

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 14467, 2008.