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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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General Comments:

While particle acidity effect on secondary organic aerosol (SOA) formation is acknowledged for biogenic SOA, it is not the case for aromatic SOA. Ng et al. (2007) and Bahreini et al. (2005) reported that acidic seed has no effect on SOA generated from toluene and m-xylene photooxidation. However, a recent study (Cao et al., 2007) by the author of this manuscript showed that acidic seed can significantly increase SOA yield for toluene photooxidation in the absence of NOx. This manuscript further investigates the acidic seed effect on aromatic SOA under varied NOx and relative humidity (RH) levels. The results indicate that the extents of the acidic seed and RH effect vary in

different experimental conditions. The content of this manuscript is certainly of interest to ACP. The experiment seems to be logically designed, the methodology is adequately described, the reasoning and development of the article are clear and sound, and the results appear to be reliable. I suggest this manuscript should be accepted by ACP.

Here below are two minor points:

1. The density of the organic aerosol is assumed as 1.4 g/mL. However, in the experiments under different NOx conditions, the dominant reaction channels that form SOA are different (Figure 3). In addition, particle-phase water and acidic seed could enhance heterogeneous reactions in the aerosol. Thus, the compositions of SOA in different conditions are different. In this sense, I doubt it reasonable to assume the density of SOA would not change.

2. In figure 5, panel C, the curve shape of aerosol growth profile (OM vs. ∆ROG) is explained that it was caused by two different reaction mechanisms. However, there is another possibility that this could be a result of chemical kinetic effect. Hurley et al. (2001) assumed that toluene SOA was formed via the reaction of first generation gas-phase products from parent hydrocarbon and OH radical, and then a chemical kinetic model (equation C) was used to simulate the SOA formation. The result of the simulation (Figure 5) showed a curve shape similar to that of this study.

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Interactive Comment