comments on acp-2020-457-manuscript-version3

In this study, Hao et al. studied the photochemical reaction of a-pinene in a smog chamber by using HR-ToF-PTRMS and HR-ToF-AMS. They mainly focused on the formation of ammonium. It was found the concentration of ammonium was in good correlation with gas phase organic acids. Thus, they pointed the important role of organic acids in the formation of ammonium. Considering the ubiquitous presence and its alkalinity in the atmosphere, this work provided useful information to realize the environmental impacts of NH_3 and has important enlightenment for the future research on SOA formation. I think it is suitable for publication on ACP. However, there are still several concerns needed to be addressed before acceptance.

Major concerns.

1. the title. The "CCN-size" in the title is not necessary. The title of a paper should contain informative key words to represent the main content. However, no measurement about the CCN activity of particles was conducted. In fact, the size of particles reported in this study were based on the measurement limit of size-range of AMS, which has no direct link with CCN-size.

2. Since the work focused on the conversion of gas phase NH_3 to particulate NH_4^+, the concentration of NH_3 in the reaction system should be measured. In all experiments, ammonia was introduced to the chamber as an impurity. This condition makes the research loose and unscientific. The source of NH_3 may include the evaporation from the wall of reactors due the previous deposition of ammonium. However, its sources may be not stable and fluctuate the concentration of NH_3. Then there are errors in the analysis of ammonium as a function of time due to the uncertainty of NH_3. At least the author needs to prove that the concentration of ammonia is constant or varies regularly during the experiment.

3. the interpretation about the difference between experimental results with and without seeds is lack. The authors designed two sets of experiments and found distinctly different results. However, the reasons were not provided. Why the VOC concentrations are so different between these two sets of experiments? What's the role and effects of seeds on the formation of ammonium? Moreover, it is difficult to understand the difference in the consumption of NOx (ΔNOx-E314>ΔNOx-E327 in Fig. S2) and the corresponding formation of nitrate (ΔNO_3^--E314<ΔNO_3^--E327 in Fig. 1).

4. removal Fig. 3 to SI. The data in fig. 3 were directly derived from the subtraction of data in Fig. 2, then no new meaning was provided in Fig. 3 and it could be removed to SI.

5. line 200: the statement "The delay is caused by the effect of nitric acid arising from the background NOx photooxidation." is not correct. According to Fig. 1-B2, it seems the main reason may be the formation of sulfate. However, no obvious consumption in

SO_2 in Fig. S2 make the yield of sulfate hard to understand. Why the formation of ammonium in the seed experiments is earlier than sulfate, nitrate, and light on? Again, the effect of seeds needed to be explained.

After checking the authors' response to the former version, I find some critical concerns still present. A more convincing reply is needed to addressed these concerns.

Minor concerns:
1. line 9: ubiquitously
2. The Sequence of Fig. 3 appears in the main text is earlier than Fig. 4
3. line 168: Fig. 2?
4. line 247: AMSSurprisingly?