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Interactive comment on “CCN activity of aliphatic amine secondary aerosol” by X. Tang et al.

Anonymous Referee #2

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General comments

Tang et al. have measured CCN activity (κ) and volatility of aliphatic amine secondary aerosol. Their results show that aerosol hygroscopicity and volatility depend on the amine precursor, oxidation method and humidity. One of the studied amine aerosols is so volatile that particles evaporate in a thermal gradient CCN counter, which has an effect on the observed CCN activity.

Although there are several studies about the formation and composition of amine secondary aerosol, there are only a few studies about their CCN activity and volatility. The findings of Tang et al. are interesting and the topic of the paper is within the scope of ACP. The paper is compact, well-written and clear. Therefore, I recommend this paper for publication after a few corrections and clarifications.

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Specific comments

1) Page 37, lines 19-20: Typically T_1 is higher than the sample temperature, and the temperature set points change automatically with the sample temperature while keeping a constant ΔT ; was this the case in these experiments? If yes, please clarify this part of the text. How constant was T_1 and what was the difference between T_1 and the temperature of the reactor chamber? Could the observed changes in T_1 or in the temperature difference between the CCN counter and the reactor chamber have an effect on the conclusions about volatility?

Related to the previous comment, could the conclusions on CCN activity depend on the location of the maximum supersaturation, which also gives the temperature where the particles activate? Theoretically (e.g. Lance et al., Mapping the Operation of the DMT Continuous Flow CCN Counter, *Aerosol Sci. Tech.*, 40, 242-254, 2006), increasing flow rate means that the maximum center line supersaturation is reached earlier in the CCN column. It is mentioned in the paper (page 42, lines 17-18) that the total residence time increases with decreasing flow rate, but at the same time particles activate earlier and in the cooler part of the column, which could actually decrease the evaporation.

2) The VTDMA measurements showed that especially the humid butylamine- N_2O_5 secondary aerosol is highly volatile, but this doesn't seem to cause problems in the CCN measurements when the column temperature difference is smaller than 21 °C, why? Volatile material could be evaporated already before the aerosol reaches the CCN counter and also in the CCN counter, and either one these would change the observed CCN activity. If there are indications that particles are evaporating, this should be mentioned as an uncertainty for calculated κ values especially for the particles composed of volatile amines.

The observed step-like change in the CCN activity (Fig. 4 and page 42, line 19) when the column temperature difference changes just 7 °C is interesting; does it mean that the evaporation starts only after a certain minimum temperature and/or residence time?

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Was the CCN/CN ratio approaching unity when the chamber temperature difference was smaller than 21 °C or for other compounds at 21 °C? If not, could this cause problems for the SMCA data analysis (e.g. multiply charged particles could become important)?

3) Especially approximate VFR (Volume Fraction Remaining) values from Fig. 1 and possibly also salt mass fractions could be added to Table 1. This would make it easier to see the similarities and differences between the experiments.

Technical corrections

Page 32, line 3: Delete word "composition"

Page 32, line 4: Maybe "The ratio of organic to inorganic..." or "The fraction of organic materials..."

Page 34, lines 4-6: Maybe "...as well as in the..."? Could use insoluble instead of non-soluble and variability (or similar term) instead of variance, which refers to statistics.

Page 34, line 20: Maybe "ambient aerosol"?

Page 37, line 5: Does this inversion procedure account for multiply charged particles or maybe something else? Is this the SMCA or SMPS inversion method? Please clarify.

Page 38, line 14: I guess S_c is the critical saturation ratio?

Page 40, line 17: The 30 % should refer to percentage points; a change from 30 % to 60 % means doubling of the evaporated volume.

Page 42, line 4: Could use variability (or similar term) instead of standard deviation, which refers to statistics.

Page 43, line 21: Could replace variance by e.g. variability.

Page 45, reference Finlayson-Pitts and Pitts: Check the information.

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