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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Constraining uncertainties in particle wall-deposition correction during SOA formation in chamber experiments" *by* T. Nah et al.

Anonymous Referee #1

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General Comments

In this paper the authors report results of a comparative study of four methods used to correct smog chamber measurements of SOA yield for losses of particles to the walls. A series of experiments were conducted for a range of seed particle surface area and with SOA generated from the reaction of a-pinene with ozone. The four wall-loss correction methods include use of size-dependent wall-loss coefficients measured prior to the experiment, and decays in particle number, volume, or inert seed particles measured during the experiment. The corrected SOA yields are compared and reasonable explanations provided for the observed differences, which were substantial in many cases. The importance of accounting for particle coagulation in data interpreta-

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Discussion paper

tion was especially emphasized. Recommendations were then given for using these methods. Although many of the observations are what most people probably would have predicted, it is valuable to see intuition agree with experimental results, and to get a sense of the magnitudes of the differences. Overall, I think this is a very useful paper and significant contribution to aerosol chemistry. I recommend it be published after the following comments are addressed.

Specific Comments

1. Line 278–282: What does the theory for charging effects assume about charge on the chamber walls? This can vary due to contact when conducting experiments and so may not be reproducible.

2. Lines 514–518: How is it known that SOA growth should stop after the a-pinene reacted? Why can't there be continued growth due to condensation driven by oligomer formation?

3. Lines 514–518: How can all three methods be effective for correcting for wall loss when they give such different results?

4. Lines 584–593: Similar to Comment 3. The recommendations are a bit unclear, considering that the methods can give significantly different corrections.

5. Conclusions. It would be worth noting that it is also possible to use an slightly different inert tracer method that does not assume that the particles on the wall remain in equilibrium with suspended particles. One can use the decay of the AMS seed signal after peak SOA to estimate a wall-loss rate coefficient and then apply this to the rest of the experiment. It is similar then to the volume average method, except that the measured wall-loss rate coefficient is not affected by changes in particle volume due to evaporation after peak SOA is reached. Measuring time-profiles of different AMS masses relative to the seed also gives information on whether the particle composition is changing due to condensation or evaporation.

6. In this analysis it is assumed that the results are unaffected by vapor loss to the walls. Are there situations where particle and vapor wall loss are closely coupled, and so cannot be interpreted as separate processes as was done here?

7. It would also be useful to provide some comments on at least one approach that could be used to avoid complications from wall loss of particles and vapor, which is to conduct short experiments.

Technical Comments

Throughout the paper the authors jump between the term "volume averaged" and "volume dependent" method. I suggest sticking with one or the other.

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