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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Introducing the concept of Potential Aerosol Mass (PAM)" *by* E. Kang et al.

E. Kang et al.

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Additional Section 3.6 Comparison of mass spectra from m-xylene

We will include a new Section 3.6 and an additional figure in the revised manuscript.

"Section 3.6 Comparison of mass spectra from m-xylene.

A critical test of the PAM concept is the comparison of the chemical composition of SOA particles formed in the PAM chamber to the chemical composition of SOA particles formed in large environmental chambers. The percent contribution to the total organic aerosol signal for m/z between 15 and 100 is a good indicator of the chemical composition (Jimenez et al., 2003; Bahreini et al., 2005; Alfarra et al., 2006; Canagaratna et al., 2007).

Aerosol mass spectra were measured in the PAM chamber with a Quadruple Aerosol Mass Spectrometer (Q-AMS) from Aerodyne Research Inc. (Jayne et al., 2000). The AMS inlet was inserted into the PAM chamber near the inlet for the TEOM so that total mass and mass spectra were measured simultaneously. Experiments were preformed for three SOA precursor gases- α-pinene, m-xylene, and p-xylene- at different amounts of precursor gases and oxidants.

To compare the mass spectra taken in the PAM chamber to those taken in large environmental chambers, the amounts of precursor gas should be similar in the two experiments. The PAM chamber experiment with 163 ppbv of m-xylene is quite similar to the amount used for a published mass spectrum of 143 ppbv of m-xylene (Bahreini et al., 2005). The percentage contribution to the total organic mass signal for the two studies is shown in the Figure (*Please find this Figure in the mentioned webpage at the bottom*). At each m/z, the smaller percentage is plotted in front of the larger. The similarity of the mass spectra indicates that the chemical composition of the particles produced in the PAM chamber is similar to the chemical composition of particles produced in the large environmental chamber.

Differences exist, however, particularly in the ratio of m/z 43, which represents less oxidized organics, to m/z 44, which represents more oxidized organics (Zhang et al., 2005; Alfarra et al.,2006). The ratio from the PAM chamber is about 1.0, while the ratio from Bahreini et al. (2005) is 0.8. This difference should not be surprising. The degree of oxidation depends on the total exposure to oxidants and on the initial precursor gas amount, which affects to total SOA mass. The smaller the precursor gas amount, the more oxidized the SOA particle will be for a given exposure to oxidants. The lower m-xylene amount in the Bahreini et al. (2005) experiment means that the SOA particles should be more aged and have a lower m/z 34 to m/z 44 ratio than the SOA particles in the PAM chamber, as is observed. Taking the differences in precursor gas amount into account explains most of the differences in the m/z 43 to m/z 44 ratio that were observed."

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Additional References

Alfarra, et al. (Atmos. Chem. Phys., 6, 5279–5293, 2006)
Bahreini, et al. (Environ. Sci. Technol., 39, 5674–5688, 2005)
Canagaratna, et al. (Mass Spectrometry Review, 26, 185–222, 2007)
Jayne, et al. (Aerosol. Sci. Tech., 33, 49–70, 2000)
Jimenez, et al. (J. Geophys. Res.„ 108(D7), doi:10.1029/2001JD001213, 2003)
Zhang, et al. (Environ. Sci. Technol., 39, 4938–4952, 2005)

The additional Figure can be found in the following webpage.

http://www.personal.psu.edu/euk111/

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 9925, 2007.