Atmos. Chem. Phys. Discuss., 10, C292–C294, 2010
www.atmos-chem-phys-discuss.net/10/C292/2010/


Atmospheric Chemistry and Physics Discussions

# *Interactive comment on* "Temperature effect on physical and chemical properties of secondary organic aerosol from $m$-xylene photooxidation" *by* L. Qi et al.

**Anonymous Referee #2**

Received and published: 1 March 2010

This paper reports on experimental data on SOA formation at different temperatures and on the behaviour of the formed aerosol when temperature is changed after SOA was formed.

The authors show that the behaviour of the aerosol is not only described by gas-particle-partitioning, but that there is a significant chemical difference in composition dependent on temperature. The properties of SOA formed at high temperatures can in most cases be reproduced by heating SOA formed at cold temperatures, but for the opposite case this does not work: Cooling of the formed SOA does not change the density or the growth factor. This shows that the chemical composition of the formed SOA



is different and that the parameters like density and growth factor are not determined by gas-particle partitioning of semi-volatile compounds.

The paper is an important contribution to aerosol science and fits well into the scope of ACP. I therefore recommend publication in ACP with minor revisions.

The only flaw of this work is that the results are not presented in a clear manner. This could be very much improved by harmonizing the appearance of the experiments in all Figures. I suggest plotting always the same number of experiments in all Figures, including the temperature evolution. This will facilitate the reader's understanding of the results.

Specific comments:

2 Experimental section

page 867, line 26: Jayne et al, 2000 is not the appropriate reference for the HR-ToF-AMS. Either deCarlo et al., 2006, or Canagaratna et al., 2007

I suggest including a table with the experiments. Not all figures show the results of all experiments, it is therefore somewhat confusing to the reader to keep the overview on all experiments.

3 Results:

3.1 Light intensity I suggest shifting this section into the experimental section, since it reports on a prerequisite for the experiment

Figures:

As mentioned above, I strongly suggest using the same format for all pictures, the best would be the format chosen in Figure 2 (and 3): separate time series for each experiment, but including the temperature

Figure 5: Indicate m/z for distinct peaks.

Figure 6 Is it necessary to show the O:C on the 0.0 – 0.8 scale at all? The insert figure is the more important plot. My suggestion: Average the AMS data over time to reduce scattering. Don't use a running mean. Or: Average the raw mass spectra over time, then perform PIKA O:C analysis again

Figure 6 should also include a graph with the second experiment of Fig 5, showing the different O:C ratio of the SOA formed in this experiment.

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Interactive comment on Atmos. Chem. Phys. Discuss., 10, 863, 2010.