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Atmospheric Chemistry and Physics Discussions

# *Interactive comment on* "Chemical aging of *m*-xylene secondary organic aerosol: laboratory chamber study" *by* C. L. Loza et al.

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We thank the reviewer for helpful comments. Please see responses below.

*Comment 1*

*page 24977, line 13f I wonder if wall deposition can really compete with condensational growth of the suspended particles at least for low volatile species.*

Response 1

For the issue of wall deposition, see the response to the major comment of Referee 2.



*Comment 2*

*page 24979, line 18f Why does $\Delta M_o$ in Fig. 1 decrease at long times? I expect $\Delta M_o$ to be a monotonic increasing function in time.*

Response 2

Explanations of the decrease of $\Delta M_o$ at long times appear in Sect. 3.3 and a new section, Sect. 3.4 (see main comment, Referee 2). The duration of these experiments was sufficiently long such that all the *m*-xylene reacted before the end of the experiments. The main source of organic aerosol ceased before the end of the experiments, and, therefore, semivolatile aerosol components may repartition to the gas phase.

*Comment 3*

*page 24980, line 10 and Fig. 2 To me it looks as if the single experiments have a slight offset in O:C with respect to each other. I suggest to determine the rate of O:C change for each experiment separately and average the slopes. I am convinced the average ageing rate is larger than 0.0012 $h^{-1}$. The dashed line in Fig. 2 seems to be to flat.*

Response 3

We evaluated the rate of O:C change for each of the experiments separately. The rates ranged from 0.0016 $h^{-1}$ to 0.0021 $h^{-1}$ resulting in an average value of 0.0019 $h^{-1}$. The manuscript has been changed to read, "After 5 h, O:C gradually increases at an average rate of 0.0019 $h^{-1}$ for the remainder of the irradiation period." In Fig. 2, the dashed line has been regenerated using the average slope and average intercept of lines fit to the O:C change for each experiment separately, and the figure caption has been changed similarly to the text.

*Comment 4*

*page 24981, line 17f The data is ratioed to $SO_4$ and normalized, also relative. The term "the total amount of each of the ions" seems to be misleading in this context.*

Response 4

The sentence describing the top panel of Fig. 5 has been changed to, "In the top panel of Fig. 5, the time trends of the normalized, wall-loss corrected ion signals are shown."

*Comment 5*

*page 24985, equ. 9 The OH lifetime depends on $A^p$. What did you assume for the surface concentration?*

Response 5

The following sentence has been inserted on page 24985 at line 7: "The particle surface area concentration was calculated from measured particle number distributions." The sentence on lines 7-8 has been changed to read, "Based on the upper and lower bound wall loss corrections, $\tau_{OH+P}$ ranges from 6-13.5 s, corresponding to particle surface areas of $(0.47 - 1.1) \times 10^{-5}$ cm$^2$cm$^{-3}$."

*Comment 6*

*page 24987, line 19 But there is also evidence that high generation products are only slowly attacked by OH in the gas-phase. This raises the question if in such cases condensed phase OH becomes important or if low vapor pressure compounds are quasi-inert and persistent for typical atmospheric lifetimes of particles.*



Response 6

The lifetime of OH against reaction with high generation products is estimated based on similar reactions in the MCM. For example, for second-generation products, the estimated OH lifetime is 0.2 s. The comparable estimate of OH lifetime against OH-particle reactions (assuming unit efficiency) is $\sim 6 - 13.5$ s based on the measured size distribution in the experiments.

*Comment 7*

*Fig.9 The captions are a little too scarce. Please, explain in the captions the difference between the two experiments.*

Response 7

The following sentences have been added to the figure caption of Fig. 9, "The signals labeled 36 h were recorded during the set of experiments in which the chamber contents were irradiated for 36 h. The signals labeled 12 h were recorded during the experiment in which the lights were turned off after 12.4 h of irradiation and remained off for the remainder of the experiment."

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Interactive comment on Atmos. Chem. Phys. Discuss., 11, 24969, 2011.