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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Aging of secondary organic aerosol generated from the ozonolysis of α-pinene: effects of ozone, light and temperature" *by* C. Denjean et al.

Anonymous Referee #1

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Review of manuscript ACP-2014-568 titled "Aging of secondary organic aerosol generated from the ozonolysis of α-pinene: effects of ozone, light and temperature", by C. Denjean et al.

General comments

The paper by Denjean et al. titled "Aging of secondary organic aerosol generated from the ozonolysis of α-pinene: effects of ozone, light and temperature" presents results of chamber simulations of alpha-pinene SOA formation and aging. To the present date, alpha-pinene is almost certainly the most studied biogenic volatile compound (VOC),

and many laboratory studies have used chamber experiments to understand the mechanisms of its formation and chemical evolution under different conditions. Typically, chamber experiments are conducted either under photo-oxidation conditions (i.e., using the hydroxyl radical OH which is usually produced by UV lights) or under dark conditions, using ozone (O3) as reactive agent (ozonolysis). In this paper, the authors chose to focus on the properties of alpha-pinene SOA initially generated via ozonolysis and subsequently exposed to either elevated O3 concentrations and visible light and / or heat. The idea underlying these experiments is that few studies so far have investigated the effects of light and temperature separately on alpha-pinene SOA generated by ozonolysis. The results of the study seem to be indicating that, surprisingly, the observed changes in the alpha-pinene properties are driven by direct changes in temperature rather that photochemistry. Although this conclusion can not be compared to other similar studies (as it seems), the paper is somewhat original in addressing a well-known system from a slightly different perspective. Therefore, I consider this work appropriate for ACP. The manuscript is extremely well written and clear in all the various sections. The introduction puts the work into context of previous literature and the references are adequate and up to date. The experimental part is accurately described and the authors provide extensive detail on the instruments used to characterized the SOA properties, and provide information regarding the measurement accuracy, detection limit and precision whenever possible. The amount of material (text and figures) provided for the discussion is sufficient and clear. The authors also acknowledge that these results are somewhat different from previous studies and critically discuss the possible reasons for the observed disagreement. I have a few comments and questions (see specific comments), but I believe that the paper can be published after minor comments are addressed.

Specific comments

Paragraph 2.3.2 In this paper, the author report oxygen-to-carbon (O/C) and hydrogen-to-carbon (H/C) ratios for the SOA, using an Aerodyne HR-ToF-AMS. Perhaps the au-

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thors are aware that a new parameterization for the O/C and H/C derived from the Aerodyne AMS was recently published on ACPD by Canagaratna et al. (ACPD, 2014). The link is:

http://www.atmos-chem-phys-discuss.net/14/19791/2014/acpd-14-19791-2014.html.

The paper offers an easy way to "correct" O/C and H/C numbers by applying a simple parameterization. I recommend using this new formulation since it will become the new standard. This would allow to put these measurements in context of the new corrections. However, since the paper is still under discussion, the authors can chose to report both old and new numbers and discuss whether it matters to report the new ones (and why).

Paragraph 3.2, page 22450, line 3 The authors state that particle aging did not change the light absorption properties of the studied SOA systems and that likely chromophores were not formed. The authors cite previous literature work that has looked at similar aspects of SOA particles. Can the authors add a statement where they compare these results with previous work cited in page 22441 - lines 14-20 - and also add a statement on why these results might be different. Is it the specific type of SOA (alpha-pinene in this case) that is not prone to chromophore formation ? Is it sensitivity issues of the instruments used to detect changes in the imaginary part of the refractive index ?

Paragraph 4, page 22453, lines 25-27 Are there any other studies that measure SOA volatility after many hours of ageing ? After reading the paper, I am under the impression that the methodology used in these experiments (ozonolysis and long time scale t allow evolution of the SOA before processing) is not common. If true, the authors should state this clearly. If other laboratories have used a similar approach, those results should be compared, at least qualitatively.

Conclusions It would be worthwhile noting that different VOC systems (other biogenic etc) could behave differently than alpha-pinene, such as other SOA systems that have

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shown different "glassy" properties in other studies.

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