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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Physico-chemical characterization of secondary organic aerosol derived from catechol and guaiacol as a model substance for atmospheric humic-like substances" *by* J. Ofner et al.

Anonymous Referee #3

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The authors report on the ozone oxidation of two phenols - catechol and guaiacol – under several conditions of light/dark and dry/"wet". They then analyze the characteristics of the resulting SOA using a large suite of complementary analytical tools. Overall this is an interesting paper that should be published after addressing the points made below.

Major Comments

A. The authors make a major point of saying that the SOA produced in their experiments is very similar to atmospheric HULIS. But there are several important differences between their product and the very broadly defined HULIS: e.g., their SOA has too low an H/C ratio and contains no N; furthermore, the hygroscopic properties have not been explored. It is interesting that the phenol-derived SOA is very similar in some ways to HULIS, but I don't see this as a requirement of the paper. It's interesting to see the phenol-derived SOA in its own right, without being tethered to HULIS. I suggest the authors point out these similarities, but don't make it a major point of the work.

B. The authors have coined a new term (HULI-SOA) to refer to the humic-like SOA produced in their experiments. Do we really need this term? Does this term (presumably meaning Humic-Like SOA) accurately describe the products? My suggestion is to drop the term and replace it with a clearer, more accurate phrase such as "phenol-derived SOA".

C. There are a number of parts of the manuscript that could be shortened. For example: p. 17374, main paragraph (it's a bit rambling); p. 17375, paragraph under "2 Methods" repeats points made in the Introduction and could be deleted.

D. The IR data (both LP and ATR) is very interesting but the description in the text is very long and difficult to read because it requires flipping back and forth between the text and figures. (1) Is there a way to graphically highlight the main points? What about including the functional group assignments on the figures? (Some of this information is on the figures, but not nearly to the level of detail as found in the text.) It would be worthwhile as a reader to see a figure with the suggested assignments in the text. (2) It would be useful if the results could be put in some order of importance, whether abundance or some other criterion. (3) Have the authors tried to make their assignments quantitative? (As in the Coury and Dillner paper cited.) This would be very interesting.

E. The authors have very little to say about Figure 11 (section 4.6). Are there other important points to make from this figure? If not, why not put it in Supplemental material?

F. Fig. 8. UV-Vis spectra were obtained from samples deposited on quartz filters. But presumably each sample had a different mass. Thus presenting the spectra as in Fig. 8 is misleading because the results are not normalized to sample mass (or sample OC or some other parameter).

Minor and Technical Comments

a. The proper names of catechol and guaiacol should be included.

b. p.17372, lines 22-23, "...from other precursors...": What other precursors.

c. p. 17373, last sentence. It's not clear what this means.

d. p.17377, lines 14-16. How were the standards used? Were they applied to the UV-Vis data in any way?

e. p. 17379, line 6. What was the RH under the "dry" conditions? Was this variable between experiments? If so, in what range?

f. p. 17380, line 5: "...yields are observed to increase significantly." Compared to what? The low RH case?

g. p. 17381, line 22. In discussing the IR C=O groups, the list mistakenly contains peroxides (which does not contain a carbonyl).

h. p. 17382. Is there any evidence from either the LP or ATR FTIR analyses for dimers, as recently reported for the aqueous oxidation of phenols by Sun et al. (ACP, 2010). Could dimers or higher oligomers be determined by their IR methods?

i. p. 17386, line 10. What is an ortho-benzene? Simply any benzene ring with ortho substituents? If so, this would be more accurately described as "ortho-substituted benzene".

j. p. 17387, lines 1-2. How does spherical morphology indicate atmospheric origin? (e.g., primary soot spherules are also spherical but not from atmospheric origins.) For

the current study, what other origin would be possible for the particles?

k. Table 2. The line "where guaiacol SOA dark does not exist..." appears in the table heading and as a footnote.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 17369, 2010.