

Interactive comment on “Isoprene, sulphony radical-anions and acidity” by K. J. Rudziński et al.

Anonymous Referee #1

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Detailed Review:

For purposes of this review, the summary description in the abstract is adequate.

Does the paper address relevant scientific questions within the scope of ACP?

The paper is relevant based on the authors consideration of scientific issues in the introduction.

Does the paper present novel concepts, ideas, tools, or data?

The ideas and methods have already been presented in prior publications from the authors. The paper expands on the conditions for the observed phenomena. The data are both new and relevant.

Are substantial conclusions reached?

The conclusions are valuable for understanding the possible formation of organic sulfates in the atmosphere. The major issue with respect to applying the work to the atmospheric chemistry of isoprene is whether the mass transfer of isoprene is sufficiently high to permit the reactions and products described in the text to be realized in atmospheric aerosol. This consideration should be included in the Conclusion Section.

Are the scientific methods and assumptions valid and clearly outlined?

Yes, but improvements can be made. The description of the mass spectroscopic analysis (p.20873, L.09) is inadequate and needs to be expanded. Moreover, the authors need to provide better justification for the identifications reported in Fig. 6. Clearly, these are tentatively identified compounds and not discovered as described in the text (p.20876, L.02).

Are the results sufficient to support the interpretations and conclusions?

Yes, but this could have been done more effectively. Section 3 entitled Results and discussion is essentially a section on results only. The Discussion itself starts with Section 4, currently titled Chemical mechanism and simulation of experiments. Certain aspects of the Section 3 and 4 are unclear and should be rewritten. For example, Section 3.2 is highly abbreviated and should be expanded considerable, especially with the interpretation of the UV spectra in Figure 5 and the MS in Figure 6. The discussion of Section 4.1 (and Figure 7) could easily be eliminated given its minor importance to the subject matter. At worst, combine Sections 4.1 and 4.2 with the major focus on the material in 4.2. Section 4.4 is presently terse and should be expanded particularly the last two paragraphs. I would suggest a single mechanism be presented with consecutively numbered rate constants. Right now it is almost impossible to correlate the numerical values for the rate constants in Table 2 with where they are found in the three mechanisms presented. Section 5 (Conclusions) should have a better focus on the atmospheric implications of the work especially the reported formation of

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reported organic sulfates in the atmosphere. How is the present work able to clarify these observations, if at all?

Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)?

The experimental methods section could be strengthened with respect to the mass spec measurements and the oxygen measurement.

Do the authors give proper credit to related work and clearly indicate their own new/original contribution?

Yes. However, the authors should have included the following reference: Limbeck et al., Secondary organic aerosol formation in the atmosphere via heterogeneous reaction of gaseous isoprene on acidic particles, *Geophys. Res. Lett.*, 30, doi:10.1029/2003GL017738, 2003.

Does the title clearly reflect the contents of the paper?

The title is a bit too terse and should include the type of phenomena being examined.

Does the abstract provide a concise and complete summary?

The abstract should include more detail on the differences for the auto-oxidation reaction in neutral and base solutions. This is one case where the model apparently did a poor job in compound predictions as noted in the text.

Is the overall presentation well structured and clear?

The structural changes and the issue of clarity are considered above.

Is the language fluent and precise?

The language needs work. Here are some suggested changes.

- (p.20870, L.02 and throughout the text) replace autoxidation with auto-oxidation

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- (p.20871, L.09) replace tetraols with tetrols
- (p.20871, L.13) replace in a nutshell with in summary; In a nutshell is jargon.
- (p.20874, L.07) replace exemplary with sample; inappropriate usage
- (p.20875, L.09) replace got with were
- (p.20876, L.02) replace discovered with tentatively identified; one would need a calibration standard.
- (p.20876, L.09) delete protection
- (p.20886, footnote) replace are inaccurate with have increased uncertainty

Are mathematical formulae, symbols, abbreviations, and units correctly defined and used?

The rate constants should be number consecutively to make them easier to follow.

Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated?

For the size of the document, 12 figures seems excessive. The mechanism in Figs. 7-8 should be combined into a single figure, if not all three mechanisms into a single figure. A better discussion in the text should be given for Figures 10-12.

Are the number and quality of references appropriate?

The reference list looks complete except for Limbeck et al. (2003) noted above.

Is the amount and quality of supplementary material appropriate?

n/a

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 20869, 2008.