

Interactive comment on “SOA formation from the atmospheric oxidation of 2-methyl-3-buten-2-ol and its implications for PM_{2.5}” by M. Jaoui et al.

M. Jaoui et al.

jaoui.mohammed@epa.gov

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We wish to extend our sincere appreciation to the reviewer for the time and effort spent in evaluating this manuscript. The comments have been very helpful in improving the manuscript. We have carefully considered the comments from the reviewer, and our revisions have been made to reflect these comments. We have addressed each point separately below. The comments are delineated as Comments and this is followed by a Response which note changes made to the manuscript.

We thank him for his suggestions and comments. Below, are our response to issues and comments raised by this reviewer?

Specific Comments:

Comment # 1. "It would be useful to note the approximate atmospheric lifetimes of MBO with respect to reactions with OH and O₃?

Response. To reflect the reviewer concern, we changed the following sentence on page 3, line 3 from bottom (original manuscript) from: "Moreover, its OH rate constant is similar to that of monoterpenes at 5.8×10^{-11} cm³ molec⁻¹ s⁻¹ (Carrasco et al., 2007)."

To

"Moreover, the MBO + OH reaction rate constant is similar to that of monoterpenes at 5.6×10^{-11} cm³ molec⁻¹ s⁻¹ (Carrasco et al., 2007), and leads to a MBO lifetime of about 2.5 hours using a tropospheric OH concentration of 2×10^6 molec cm⁻³. The reaction of MBO with O₃ is relatively slow 10.0×10^{-18} cm³ molecule⁻¹ s⁻¹ which gives a lifetime of 30 hours at 40 ppb ozone concentration."

Comment # 2. Is there any evidence or expectation for photolysis of carbonyls in these experiments?

Response. As noted in the experimental section, the chamber incorporates a combination of fluorescent bulbs to provide radiation distributed over the actinic portion of the spectrum similar to solar radiation, from 300-400 nm. For some irradiations without NO_x present, UV-313 sunlamps were also used. For these radiations, photolysis of carbonyls (aldehydes) is expected to occur. Also on page 11, the last sentence in the original manuscript indicates that photolysis does occur for carbonyls. This sentence reads:

"Under the conditions of these experiments, except for acetone, these compounds all have very rapid OH rate constants ($> 1 \times 10^{-11}$ cm³ molec⁻¹ s⁻¹) and thus yields for the carbonyls are very difficult to determine in the absence of secondary OH reaction and photolysis."

Comment # 3. At the high HO₂/RO₂ ratios expected for these experiments one would

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expect hydroperoxide formation. Would these be detected? Is it known what happens to these when processed with the derivatizing agents?

Response. The reviewer is correct and at elevated HO₂/RO₂ ratios, hydroperoxide are expected to be formed. In this study, our goal was to analyze organic compounds using BSTFA derivatization in order to link chamber MBO SOA and ambient PM_{2.5}. This derivatization technique is not suitable for hydroperoxide compounds, and no attempt was made in this study to analyze them.

Comment # 4. Page 24056, lines 2-4: Why isn't the XAD-4 coated with derivatizing agent to help avoid the chromatographic behavior in the denuder that causes losses?

Response. Since DNPH method followed by HPLC analysis was used for light organic carbonyls, it was not necessary to use XAD-4 coated with derivatizing agent PFBHA.

Comment # 5. Was anything done to try to evaluate wall losses of the reaction products like DHIP? For instance, Loza et al. (EST 2010) have observed significant losses of small molecules like glyoxal at high RH.

Response. SOA wall loss was measured previously in our chamber experiment. This will be helpful when the chamber is run as a batch reactor (static mode). However, DHIP in this study was measured in dynamic experiments and wall losses are not expected to affect the DHIP values.

Comment # 6. DHIP and some of the other products seem rather volatile to be in SOA at such low mass loadings. Some discussion of expected compound vapor pressures and gas-particle partitioning, as well as the possibility that these compounds are bound reversibly to other compounds in the particles would be helpful.

Response. See response to comment # 1, reviewer #1.

Technical Comments:

Comment # 7. Abstract, lines 3-4: I think either "dynamic" or "steady-state" needs to

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be replaced by “batch” or “static”. It would also be useful to use just two of these terms throughout the paper.

Response. This was done. We replaced “steady state” by “static” throughout the manuscript.

Comment # 8. The authors tend to use the word “found” a lot, such as in “the yield of X was found to be Y”, when it would be better to just write “the yield of X was Y”

Response. Corrected as suggested by the reviewer.

Comment # 9. Page 24046, line 2: Should be “relatively low”.

Response. Corrected as suggested by the reviewer.

Comment # 10. Page 24047, line 11: The phrase “limited number of” is not very informative. I suggested replacing with “few”.

Response. This was corrected.

Comment # 11. Page 25054, line 20: “substituent” should be “substituted”.

Response. Corrected as suggested by the reviewer.

Comment # 12. Page 25054, line 25: “hydrocarbons” should be “hydroxycarbonyls”.

Response. The reviewer is correct and this was corrected in the revised manuscript.

Comment # 13. There are quite a few other typos and grammatical errors in the text that I did not attempt to correct. The paper needs another careful reading by the authors.

Response. This was done as suggested by the reviewer.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 24043, 2011.

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