

Interactive comment on “Design and characterization of a smog chamber for studying gas-phase chemical mechanisms and aerosol chemistry” by X. Wang et al.

Anonymous Referee #1

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General comments

This article describes the characterization of a newly installed indoor aerosol chamber in China to study aerosol formation and the involved chemical gas-phase mechanisms. Technical specifications of the installed instrumentation, as well as the chamber suitability for proposed applications are provided by reporting first experimental results from propene NO_x irradiation and α -pinene ozonolysis studies. The propene NO_x experiments were compared with results from MCM modeling to evaluate if chemical mechanisms can be studied in this facility, whereas the α -pinene ozonolysis experiments were compared with reported SOA yields to investigate the suitability of the

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chamber for aerosol formation studies. Relevant parameters for the chamber were evaluated, and the comparison to modeling and literature values make the publication a solid measurement method paper with valuable data. I recommend this article for publication in Atmospheric Measurement Techniques after some minor revisions, mainly clarifications and after improving some language issues, as listed below.

Specific comments

Page 7740, Line 12: Was the Teflon reactor self-made? Or was the assembling made by a company?

Page 7740, Line 18-19: Does the movement of the chamber affect the aerosol (e.g. leading to increasing wall losses)?

Page 7740, Line 28 - Page 7741, Line 2: Here several sampling ports are described but in Figure 1 (a) it seems that only one line is used for the different on- and off-line instruments and analytical techniques. Can the authors give comments on the homogeneity of the sampling process for each of the used instruments that are operated with different flow rates?

Page 7741, Line 7-8: Does the rotation of the fan affect the aerosol (e.g. destruction of them)?

Page 7741, Line 16: Just a comment regarding the emitted wavelength range of the black lamps. Some species can photolyse in this range as well (e.g. peroxy radicals).

Page 7741, Line 20: Were also tests conducted with the usage of different groups of the black lights? Were differences observed among the different groups? Or can a recommendation be given how a reduction in light intensities can be realized for this chamber?

Page 7742, Line 18: To which temperature the injection system was heated up for the introduction of reactants? Was a possible permeation loss through the FEP-Teflon line observed/evaluated?

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Page 7743, Line 15: Are for this GC three detectors simultaneously connected for each analysis?

Page 7745, Line 6: Were all the installed black lights switched on for this temperature homogeneity test?

Page 7745, Line 13: Was also a test for other compounds performed regarding their mixing behavior in the chamber (e.g. α -pinene)? And were carry-over problems observed from day-to-day experiments from e.g. impacted particles on the fan?

Page 7746, Line 16: How was the correction for the reaction of O₃ and NO in the sampling line done/calculated?

Page 7747, Line 22: Just a small question about the duration of atomizing the ammonium sulfate solution - I feel 20 min is quite a long time. . . Can the authors comment on this?

Page 7749, Line 4-5: Also the absolute values for NO₂ concentrations in the chamber are overpredicted by the model. Can the authors give possible reason for this difference in observed and modeled concentration profiles?

Technical corrections

Page 7737, Line 4: word usage is not fitting; change for example to "... reactor housed in " (instead of suspended)

Page 7737, Line 5: the term is also inappropriate ("two banks of black lamps"); maybe change to just "black lamps "

Page 7737, Line 23-24: Can the authors give an example for studies examining meteorological effects in smog chamber studies? It sounds not so common to me (wind channel studies?).

Page 7738, Line 16: Can the authors check if Cocker et al., 2001 really was the first to study aerosol formation? e.g. the following example was published earlier: Tobias, H.

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J. and Ziemann, P. J.: Compound identification in organic aerosols using temperature-programmed thermal desorption particle beam mass spectrometry, *Anal. Chem.*, 71, 3428– 3435, 1999.

Page 7738, Line 28 (+ Page 7743, Line 20): Can the authors unify the reference style according to the journal's style? Here Q. Zhang et al., 2012 is given, whereas nowhere else the initials of the first name were used.

Page 7739, Line 7: I would recommend not to restrict the application of planned chamber experiments for low NO_x conditions.

Page 7739, Line 15: Here are "ions/anions samplers and analyzers" described but no description about them can be found in Table 1. Can the authors add the missing information?

Page 7741, Line 11: Change to "The Netherlands"

Page 7742, Line 20: Check the sentence. Is it mean to be "...to prevent the generation of NO_x."

Page 7742, Line 2-6: Please check the sentences. Formulation is not good.

Page 7744, Line 19: Change to "ammonium nitrate"

Page 7746, Line 12 (equation 1) and Line 13: Please change the k into a non-capitalized letter.

Page 7746, Line 21: Change to "off-gassing"

Page 7746, Line 22: Change to "gas losses"

Page 7747, Line 6: Change to "...within the range of reported values of. . ."

Page 7750, Line 19: Change to "...probably owing to their assumed aerosol density of. . ."

Figure 3: Change to "injection of ozone"

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Figure 7: Change to “This study”; add space between temperature and the unit

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