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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Characterization of primary and aged wood burning and coal combustion organic aerosols in environmental chamber and its implications for atmospheric aerosols" *by* Amir Yazdani et al.

Anonymous Referee #1

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Comment on ACPD script titled as "Characterization of primary and aged wood-burning and coal combustion organic aerosols in an environmental chamber and its implication for atmospheric aerosols" The script states chemical transformations for laboratory-generated wood-burning and coal combustion emissions with respect to OH radical photooxidation and NO3 radical reaction in an environmental chamber. Techniques in combination of in situ AMS measurement and filter-based MIR characterization were applied to extrapolate bulk chemical features of unprocessed and aged samples, the results were also compared with biomass burning related ambient samples to investi-

gate the atmospheric significance and relevance of this study. The dimension reduction/component analysis of the AMS and MIR spectra is very helpful to elucidate bulk functional/structure changes of the aerosol, but the chemical results for the different reaction pathways are of limited novelty and present limited analysis. In addition, the uncertainty caused by the use of a Teflon filter for MIR measurements needs to be discussed. There is no uncertainty analysis or discussion for the AMS and MIR results in the entire manuscript. Nevertheless, this study is an addition to the literature, helping to understand the environmental influence caused by biomass and fossil fuel combustion. Please carefully address the comments before consideration of publication in the journal of Atmospheric Chemistry and Physics. Specific comments: 1. Line 16: the term "chamber WB OA" is confusing, is it unprocessed or aged WB OA? 2. More information concerning the burning conditions is needed, such as combustion efficiency and influence of added kindling. This should be provided in the methods section. Besides, a description of the preparation procedure of the chamber should be added, including particle/gas background, zero-air supply, etc. 3. Line 102: the spectra of the UV lamps should be provided, and the photolysis rate of jNO2 is suggested to compare the chamber environment with ambient conditions. 4. Line 104: Do you mean injecting the H2SO4-NaNO2 solution to the chamber or flushing the evaporated HONO into the chamber? what kind of particle filter? Teflon membrane, quartz fiber, or HEPA filter? 5. In tracing OHexp using butanol-D9, did you consider its wall losses? 6. Line 111: Provide more details on the concentration of the NO3 radical. Is it based on CRDS measurement or box-model simulation? What were the initial concentrations of O3 and NO2 used to achieve the NO3 radical exposure under relatively high humidity (55-60% RH)? Is the NO2:O3 ratio optimized? Was the contribution of NOx emitted by the burning itself considered? What are the estimated wall losses of gaseous species and what are the influences of these wall loss on the results and conclusions? 7. Line 122: AMS collection efficiency should be calibrated using NH4NO3 particles. 8. How the influence of water in the filters on the IR spectra was estimated? Did you condition the filters? 9. Line 219: is there CO2 influence on IR peak in 2400-3400 cm-1? 10. Line

219: change to “carbonyl peak” 11. Line 225: Please explain the reason that a limited number of precursor reactions with NO3 radical lead to the observed less prominent decrease of aCH. There is a place for a more detailed and quantitative analysis of the chemical aging. The normalized results or relative abundances of FG are misleading. For example, aCOH relative abundance in WB aerosol decreases with aging, while the absolute abundances of COOH increase, considering the three-fold increase in OA mass, the absolute concentration of aCOH may also increase. 12. It was stated that phenol, methoxyphenols, and naphthalene are among the most important SOA precursors in WB, can you explain why there were no nitroaromatic products in the MIR for NO3 processed WB. 13. The figures should be improved. Some figures contain too much information and difficult to read. Please pay more attention to color selection in MIR spectra, increase the caption font size, and differentiate overlayers of MIR spectra more clearly. 14. Line 256: is it an absolute or relative abundance of m/z$\sim$60 signal that decreased with aging? 15. Line 261: check citation format 16. Explain why the mass spectra include masses only up to m/z$\sim$80. Please provide a wider range spectra analysis to show some fragments that are discussed in the manuscript but are not displayed in the figures.

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