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Interactive comment on “Photosensitised heterogeneous oxidation kinetics of biomass burning aerosol surrogates by ozone using an irradiated rectangular channel flow reactor” by S. M. Forrester and D. A. Knopf

Anonymous Referee #1

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This is a nice piece of work focusing on the uptake kinetics of ozone on a series of surfaces of levoglucosan and 5-nitroguaiacol acting as surrogates for biomass burning aerosol particles. A special focus of this work dealt with the photo-induced processes, with and without the presence of Pahokee peat acting as a photosensitizer. The uptake rate was indeed observed to be significantly photo-enhancement on some surfaces, following a Langmuir-type isotherm. The impact on the oxidative power in the condensed phase appears to be significant and its atmospheric implication is clearly discussed. In my opinion, this paper is well written and illustrated. I really enjoyed reviewing this

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Discussion Paper



manuscript.

Great care was given to the experimental conditions and especially to avoid chemical impurities.

The experiments have been performed using a newly developed irradiated rectangular channel flow reactor, operated at low pressure (2-4hPa). Under such conditions, I'm wondering how stable the organic films were? In fact, some of the compounds studied are still quite volatile and I would suspect some re-evaporation from the glass block in the reactor, was this observed? Could this lead to a redistribution of the organic film on other surfaces within the reactor – affecting the calculation of the uptake coefficient (leading to some underestimations)? Were the organic monitored using the CIMS? If re-evaporation occurred, then the film composition may not necessarily reflect the composition of the solution which was deposited on the glass block. Any comment on that?

Low pressure should avoid important gas phase diffusion limitations. Nevertheless, it is mentioned that some corrections were applied to the data. How important were they?

It is mentioned that the surface somehow passivates upon reaction (leading to the determination of steady-state uptake coefficient, which is the correct parameter to report on). However, it is unclear to me how often the organic films were changed i.e., for each data point?

The pH of the solution is shown to affect the absorption spectrum of nitroguaiacol. Was therefore the pH effect on the photoenhanced uptake of ozone also studied? In this case, if I compared the output of the visible lamp to the NG absorption spectrum at pH=12, I could expect some photoenhancement, or am I wrong stating this? Please clarify in section 3.4.2 if those experiments were performed or not.

The absence of photoenhancement under visible light for the PP/LEV mix is surprising to me. As pure PP exhibit photosensitizing properties, in the mix this compound

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should undergo competitive reactions with either O₃ or LEV, and therefore show some enhancement. Or was finally PP buried in LEV with no direct contact with incoming ozone?

The uptake coefficients in the figures are given with arbitrary units (u.a.), this is not correct as the uptake coefficient is a dimensionless parameter. Please correct your figures.

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 13, 7553, 2013.

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