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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Aqueous Reactions of Organic Triplet Excited States with Atmospheric Alkenes" *by* Richie Kaur et al.

Anonymous Referee #1

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Major comment: The authors present a nice study on the reactions of a model triplet species with various alkenes and reveal which features (e.g. one electron reduction potential, double bond location) have a higher reactivity towards triplets. When reading the manuscript, I was curious whether or not the authors could confirm that the rate constants for triplet benzophenone are similar to those generated from brown carbon/natural organic matter (NOM). Although beyond the scope of this study, a discussion of how the rate constants for the 17 model compounds might be different for triplet NOM, or how they might vary if NOM is also present, might be useful.

Minor comments: Abstract/Intro Is brown carbon something that needs to be defined here (like in line 46)? Or is it a fairly common term in atmospheric chemistry literature? Is "a.k.a" commonly used?

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Discussion paper

Line 76: what are the steady-state concentrations of OH radicals and triplets? Are the concentrations of benzophenone and alkenes used in this study environmentally relevant?

Methods Why was a pH of 5.5 selected?

Does irradiating the benzophenone solution generate other oxidants? Can you confirm all reactions due to 3BP*? Similarly, do any of the test alkenes or reference compounds degrade due to direct photoreactions when BP is not present?

How does 100 uM BP and 50 uM alkene compare to brown carbon concentrations and alkene concentrations, respectively, in fog droplets/aqueous particles?

What irradiation time or times were used? Did they vary? Is oxygen consumed in sealed quartz cell during this time, impacting rates? I imagine benzophenone and NOM have different absorbance (A) spectra? It would be interesting to compare A spectra multiplied by irradiance for benzophenone and for brown carbon (or something similar to figure S1). Fig. S1 is a bit confusing showing %transmittance for the light source and not its irradiance through the filters? I think showing the irradiance the sample sees would be more useful for a comparison to solar irradiation. I imagine the photon dose the sample sees impacts the formation of triplets, can the authors confirm that this does this not matter for the competition kinetic experiments performed here?

Line 115-117: Where was the aluminum wrapped dark in relation to the irradiated sample? If the two samples are side by side there will certainly be issues since aluminum foil is a hard reflector and could increase photon dose in irradiated sample.

Results/Discussion Lines 311-333: As the authors note, adjusting 3BP* constants is uncertain, but I also now wonder if 3MAP and DMB triplets are more representative of triplets from NOM? Or is that unknown?

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