I thank the authors for considering and implementing my suggestions, especially with respect with structure of the materials and methods, and interpretation of UV-vis and MS data.

Before accepting the manuscript for publication, I advise the authors to clarify a few minor points that I highlighted in orange in the comments list below. The remaining items mostly are typos and suggested rephrasing (for clarity).

Abstract and intro

Line 23: Faster photobleaching with respect to ..? Please, add the comparison term.
Line 48-49: Rephrase as following: "For example, photodegradation of pyruvic acid in high ionic strength and low pH values (< 4) results in the red shift of its major absorption band." (it is unclear what "peak intensity" is: is it increase in the molar extinction coefficient of its absorption band? Clarify or remove)
Line 53: Can you specify the wavelengths?
Line 60: Rephrase as following: "However, no photodegradation studies have been conducted in the presence …"
Line 62-63: Change "broken down" to "degraded"
Line 72: On which substrate was the photolysis conducted? Please, change "OH radicals" to "hydroxyl (OH) radicals." (OH has not yet been defined)
Line 72: Change "with strongly" to "concluding that strongly"
Line 79: Change "dry" to "dry (i.e., organic)"
Line 88: Change "slowed under these conditions" to "slowed as compared to the experiment in pure water."

Materials and methods

Line 96: Remove the comma after "chamber" (or change as following: "… chamber described in Malecha and Nazadorovick, 2017")
Line 130: Add "Further experimental details on the two setups are provided in the following sections."
Line 139: Move "water" right after "MilliQ"; How much water did you add/how much total volume did you obtain?
Line 149: Change "solvent" to "water"
Lines 156-160: From my experience, (pure) water and acetonitrile are quite soluble with each other's: how did you manage to separate the two solvents after adding the 2.5 mL of ACN? Was the presence of salt in water helping phase separation? If so, how could you reproduce the same procedure with the pure water isolate? I recommend clarifying these points in lines 156-157.
Line 168: Why was this filter extracted in ACN (while for the others you used water)? Do you think this may introduce a bias in your UV-vis spectra? Do you have data showing that UV-vis spectra in ACN and water are similar for these filter extracts?
Line 174: Change "with photolysis" to "during photolysis"
Line 177: Change "the whole setup" to "the cuvette"
Line 180-182: I think you can delete the part in parenthesis: it is sufficient to say that you used the same 0.5 cm cuvette. I would rather add that these samples were measured in ACN.

Results and discussion

Figure 1b: Can you specify in the caption if this graph was obtained using the dark-corrected or the uncorrected spectra?

Line 271: Change "absorbance" to "normalized absorbance"; change "rate constants" to "first-order rate constants"

Line 272: Change "absorbance" to "normalized absorbance

Paragraph starting at line 275 (until "… from the data."): Rephrase as following: "Based on this analysis, we observed a considerably slower photolysis on filter than in the aqueous phase. However, for the filter sample we could only collect 4 datapoints, which may introduce a bias in our analysis. In particular, the filter data did not include the 0.5 h timepoint, which characterizes the fast-reacting chromophores pool in the aqueous sample."

Table 2: I suggest reporting the results with 2 significant digits if the first significant digit of the error is < 4. In other words, I suggest adding an additional significant digit to all tau1 values and of tau2 of AS. Furthermore, I suggest moving the lifetime of the filter under tau_2, as, based on the text above, you are only obtaining the "slow reacting" pool. (you can consider changing "A_2" to "A_1" in line 277.

Line 301: Change "A large" to "Under all conditions, a large"

Line 306: Why for some peaks you give a formula but not a name? Is it correct that there are two C7H7NO3 compounds in Figure 2 (but only the one at 10.36 is identified as nitrocresol)? Can you indicate with an asterisk the formulas for which you could identify the associated chemical name in Figure 2?

Figure 2: I now understand the rationale for showing twice the unaged and water photolysis results. However, I am surprised to see such a large discrepancy from the two filters for the same treatment (e.g., unaged). (In panel (a), all peaks also appear less resolved, maybe due to some chromatographic issues, which makes them appear more different than they probably are). Can you add a sentence to the main text (maybe at the end of section 3.2.1) explaining why the unaged chromatograms of the two filters are different? Will this affect your conclusions?

Line 336: Change "on filter" to "on filter (from filter 3)"

Line 337: Change "sulfate" To "sulfate (from filer 4)"

Line 344: I suggest pointing out that these are also the compounds identified in Figure 2 as being the most abundant (provide the names as well, if possible)

Line 345 and entire section 3.2.2: How did you evaluate the difference between the various conditions? Is a visual/qualitative comparison of the highest peak intensities? The same comment applies also for the discussion of VK diagram results.

Figure 3 and 4, caption: Clarify that it is from Filter 3 and 4, respectively

Figure 5: I appreciate that the authors took up my suggestion of using KV diagrams. I have a follow up suggestion: for the figure in the main text, do you think it be useful to show only datapoints above a certain intensity threshold? This will allow cleaning up the diagrams and better highlight differences among treatments.

Line 406: Change "with on-filter" to "during on-filter"

Line 407: Change "The purpose of this analysis was to directly contrast the difference in composition changes with photolysis" to "Differently from HRMS, this analysis allowed characterizing bulk changes in composition during photolysis"

Line 408: Change "observe dramatic differences" to "dramatic changes in chemical composition"

Line 431: Then you think that during on-filter photolysis nitro groups are converted to gas-phase N species? It would be good to add some sort of conclusion to the discussion.
Line 458-459: Please revise as following: "In spite of the *slower* nitrophenols photodegradation (assessed via HRMS, offline-AMS, and FTIR analyses), the overall photobleaching (assessed via UV-vis analyses) was actually *faster* in the aqueous phase as compared to on-filter photodegradation."
Line 463: This fact may also agree with the larger decrease in the unresolved baseline absorption that you observed for the aqueous samples (- 35% and – 45% for pure water and AS) as compared to the filter isolates (- 21%). It would be good to point this out.
Line 483: Change "and a large fraction of photorecalcitrant fraction is likely." To "and likely results in the formation of a photorecalcitrant faction."
Line 484: Change "by SOA." To "of this type of SOA."
Line 488: Change "faster photobleaching" to "faster overall photobleaching (assessed by UV-vis analysis)."
Line 490: Change as following: "Based on previous studies, we propose that the difference … sample matrices."
Line 500: remove "photochemical"
Line 505-504: "(Hems et al., 2021)" should be placed after "days".
Line 502: Change "photobleaching" to "overall photobleaching"
Line 504: delete "with respect to photobleaching and lifetimes"