

I. 169: Which "Energy" is meant here? The unit $\mu\text{W cm}^{-2}$ seems to indicate that this is a power density (not energy), likely referring to radiant flux density / irradiance. Please specify.

Response

Thank you for your suggestion. You are absolutely right — we have revised the manuscript by replacing “energy” with “irradiance”, which is more accurate and appropriate in this context. The modification can be found at lines 169-170.

I. 271: If you use the expression "significantly higher", please indicate the level of statistical significance. Otherwise, consider using "much higher".

Response

Thank you for the reminder. We have revised the expression “significantly higher” to “much higher” in the manuscript. (Shown at line 271)

I. 273: What is referred to with "This results is very close to our recently published data as well"? It is not clear whether "this result" refers to the determined rate of Fe-Glu, or published rate coefficients of the Fenton reaction. Neither of them seems "very close".

Response

Thank you for the helpful suggestion. We have clarified this part to avoid ambiguity. The revised text now reads:

Moreover, the value is about five times higher than our recently reported value for the reaction between Fe(II)-oxalate and H_2O_2 ($3.2 \pm 0.3 \times 10^3 \text{ M}^{-1} \text{ s}^{-1}$) (Scheres Firak et al., 2025). Despite the quantitative difference, both two obtained values are of the same order, highlighting the significant reactivity enhancement conferred by organic ligand coordination. (lines 273-277)

I. 274: "reactivity constant" should probably read "rate constant" to align with the rest of the manuscript, unless a different concept is used here.a

Response

Thank you for pointing this out. We have corrected the term “reactivity constant” to “rate constant” throughout the manuscript (lines 150 and 220, 274,), to maintain consistency and clarity.

I. 276: "hence" should probably read "enhance"

Response

Thank you for your suggestions. We have revised this paragraph. The modification can be found at lines 275-277.

I. 350: Since solar radiation was not used in this experiment, I would suggest to phrase this as "no significant light absorption in the solar spectrum".

Response

Thank you for your suggestions. We have corrected this part by using no significant light absorption in the solar spectrum in the manuscript. (lines 349-353)

I. 350: How was an "efficiency" determined? Efficiency typically refers to some form of ratio of input and output.

Response

Thank you for your valuable comment. We have removed the word "efficiency" from the sentence, as no quantitative measure of efficiency was provided, making the expression more accurate. (line 350)

I. 363: "Continuous lines" - Does this expression also include the dashed lines? What is the difference between dashed and solid lines?

Response

Thank you for pointing this out. To avoid confusion, we have modified the figure to use only solid lines and clarified in the caption that the continuous lines are for visual guidance. (line 359).

I. 409: What is the unit of the reaction rate coefficient provided here? It is not clear why this is given here as the previous sentence refers to production of OH, not consumption of OH by formic acid. A full sentence of explanation might be needed.

Response

Thank you for your suggestion. We have clarified the sentence and added units ($\text{M}^{-1} \text{s}^{-1}$) for the rate constant. The revised sentence now reads: (lines 407-411)

The concentration of formate initially increased, reaching a maximum value of $8.7 \mu\text{M}$ at 20 min, followed by a decline to about $6.4 \mu\text{M}$ at 60 min. The reason for the decline is probably due to the reaction of formate with photo-generated $\bullet\text{OH}$ ($k_{\text{Formate}}^{\bullet\text{OH}} = 1.3\text{-}1.4 \times 10^8 \text{ M}^{-1} \text{ s}^{-1}$) (Buxton et al., 1988). Acetate concentration steadily increased throughout the reaction, reaching $10.9 \mu\text{M}$ at 60 min.

I. 479: "Further oxidation of succinic acid produces smaller carboxylic acids." - Please provide a reference.

Response

Thank you for the suggestion. We have added a relevant reference to support the statement regarding further oxidation of succinic acid. (line 480)

I. 518: It is not clear what is meant here with "proportion". If you increase the concentration of dissolved material through evaporation of water, would not all organic ligands increase in concentration, and thus the "proportion" of Fe-Glu remain constant?

Response

Thank you for your insightful comment. We have revised the sentence to clarify that while the total concentration of ligands increases due to evaporation, their relative proportions remain constant. (line 518)

I. 524: Please explain what is meant with "the efficiency and pathways of the observed processes are highly dynamic".

Response

Thank you for the constructive comment. We have clarified this point in the revised manuscript. Specifically, we now explain that the photochemical processes involving Fe–Glu complexes are highly dependent on environmental conditions (e.g., pH, light intensity, ligand concentrations), which in turn affect the degradation and transformation pathways of amino acids. The revised sentence can be found at lines 524–527.

I. 535: "Overall, the generation of NH_4^+ is regarded as a link between organic nitrogen species and inorganic nitrogen in cloud water." - It is not clear if this is a conclusion of this work or a literature reference. Please explain how this is derived from this work or provide a reference.

Response

Thank you for pointing this out. In our work, NH_4^+ was detected as one of the degradation products of Glu under irradiation, which suggests a transformation of organic nitrogen into inorganic nitrogen. We have revised the sentence accordingly to clarify that this is an experimental observation from our study and to highlight its atmospheric implication. A reference has also been added to support this link (see lines 536–543).

L. 538: "can be complex with iron and participate in the consequent photoreactions" should probably read, e.g., "can complex iron and influence photochemistry"

Response

Thank you for the suggestion. We agree and have revised the sentence to: "*can complex iron and influence consequent photochemistry*" which improves clarity and aligns with the intended meaning (see lines 541-543).