

# ***Interactive comment on “Photochemical degradation of iron(III)-citrate/citric acid aerosol quantified with the combination of three complementary experimental techniques and a kinetic process model” by Jing Dou et al.***

**Anonymous Referee #4**

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The manuscript at hand describes a model and several sets of laboratory experiments that examine Fe driven photocatalytic organic chemistry in model particles. I am impressed with both the laboratory and modeling techniques used here. My main critique involves how applicable this system is issues of a global scale, as the paper attempts to address in the conclusions. How important are organic-Fe particles globally? Are they so abundant that they are expected to measurably affect the organic aerosol burden? How representative is the Fe citrate system of globally distributed aerosol iron? I comment below regarding the phase of Fe and how that might affect the conclusions

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at the end of the paper. I think the paper is a good one because it does stimulate one to ask many questions. Moreover, I think there is potential to extend these methods beyond this particular system. My specific comments are as follows: Line 20: I suggest adding a brief description of the type of parameters used to "tune" the model. Line 119: It is stated that refractive index is assumed not to change. Shouldn't the refractive index change with the amount of water on the particle? If the RH changes, so will the refractive index. Was this accounted for? Refractive indices for both dry and aqueous phases should be available and used to show this is a good assumption. If its not a good assumption, how might it affect results and conclusions? Line 125: Molar absorptivities are stated, and will affect reaction rates. How likely is it for side products to be formed that have different optical properties? Line 126: I find the term "O<sub>2</sub> gas phase" and "oxygen atmosphere" ambiguous and confusing. Are these atmospheres of pure O<sub>2</sub>? I think it would be best to spell this out. Line 190: Change "devides" to "divides" Line 329: Change "dryer" to "drier" Figure 13: How representative are these sizes of Fe containing particles? Also, if it is dust, how applicable are the results obtained on the iron citrate system which is homogeneously mixed and all soluble? Also, panel B is for a 200 nm diameter particle. Why not increase the particle size for a more reasonable Fe containing particle size? Line 425: How applicable are the EDM experiments to smaller particles? Is it possible to have a size dependent photolysis rate for reasons beyond that described in the PRAD model? What about small particle optical effects?

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