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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The influence of physical state on shikimic acid ozonolysis: a case for in situ microspectroscopy" *by* S. S. Steimer et al.

Anonymous Referee #2

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General: The authors present a paper that utilizes STXM/NEXAFS measurements together with an in situ chemical reactor to observe the oxidation kinetics of shikimic acid and ozone. Overall the paper is well written and the experiment pushes the state of the art a bit further. The authors conclude that the diffusivity of ozone within the particles at low humidity controls the rate/extent of reaction. The authors were unable to observe any gradient in the extent of reaction, which they attribute to the thinness of the reacted layer and the spatial resolution of the instrument. It would be nice to see the authors discuss whether a set of experiments can be conducted to try and directly observe a reaction gradient; this would help demonstrate the diffusion limitation. Also, the authors qualitatively discuss the morphology/thickness of the particles. They hypothesize that as the RH increases, the particles flatten out and the diffusion

constants increase, leading to a rapid reaction. It would be good if the authors added some quantitative measure of thickness by assuming a density and absorption cross section. I have detailed these and other comments below. Overall, I think this is a great paper and should be published in ACP after minor revisions. Detailed: P. 7358, Line 15: The spatial resolution should be quoted and referenced. P. 7359, Line 20: The formula for silicon nitride should be Si3N4. p. 7363, Lines 15-17: When the authors refer to the peak height, how is this calculated? Is it the average over the particle, or is it the sum of the per-pixel absorbance? p. 7368, Lines 1-3: The authors include a discussion of shape and include speculation that the particles are either spheres or non-spheres. How did they determine this? I would think it is possible to more quantitatively determine/estimate the thickness of the particles (pure or reacted) by assuming a density and absorption cross section. p. 7369, Lines 24-27: The authors are not able to resolve any radial dependence to the C=C peak around 284.4 and attribute this to an extremely short reacto-diffusive length. It would be nice to see the authors suggest ways that this can be further probed to try and resolve this. Are there another set of experimental conditions or perhaps another system that could be tried to resolve a gradient in functionality? I think some discussion of this would be useful. Figure 6d, h: what line corresponds to what particle? Its stated in the caption, but perhaps include a legend.

Figure 6g: It almost appears that there is a slight ring of red around the particle in c, f, g, etc...perhaps this is an artifact due to normalizing by total carbon?

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 7355, 2014.