

Interactive comment on “Multiphase Reaction of SO₂ with NO₂ on CaCO₃ Particles. 2. NO₂-initialized Oxidation of SO₂ by O₂” by Ting Yu et al.

Anonymous Referee #2

Received and published: 14 November 2017

I support the other referee's assessment, including the recommendation that Part 1 and Part 2 be combined into a single article. The articles don't stand on their own, and studying the reaction of SO₂ with NO₂ in the absence of O₂, as in Part 1 - since O₂ apparently plays a role in the reaction - is not relevant for atmospheric chemistry. I also agree that there are numerous English language errors in this manuscript.

The study and the results presented are interesting. However, I have doubts about the technical soundness of the approach. For one thing, it's impossible to understand the experimental approach based on what is written in section 2 of this manuscript. Yes, the reactor was a flow reactor, but where were the particles? Were they part of the flow? Or were gases flowing past the particles which are stationary on a surface? What were the particles like (size, shape, porosity, etc.)? How were they prepared and

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dispersed? The manuscript is meaningless without these basic pieces of information. It is possible that they were mentioned in Part I of the manuscript, but I am being asked to review only this manuscript - and it must stand on its own at least to this extent.

I suspect that the particles were not part of the flow. In which case, did the authors consider the issue of gas phase diffusion limitations in their data analysis?

Was relative humidity actually measured or only inferred from mixing ratios of humid and dry air? RH is well known to be unpredictable in experiments, it should be measured directly.

Line 36: This may be a language issue but it is not appropriate to refer to a point of disagreement in the literature which has prompted detailed analysis and publications as "different opinions." Replace with "uncertainties in the pH value..." or something similar.

Line 56: Delete "O₂ is abundant in the atmosphere," this is an atmospheric chemistry journal.

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2017-900>, 2017.

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