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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The effect of fatty acid surfactants on the uptake of ozone to aqueous halogenide particles" *by* A. Rouvière and M. Ammann

Anonymous Referee #2

Received and published: 15 August 2010

This paper discusses the effects of fatty acid coatings on ozone uptake by KI and KI/NaCl aerosol particles. This effect has been studied previously for other gases but this is the first such study involving ozone. A systematic study of fatty acids of different lengths/phase behavior was made. Coatings consisting of mixtures of short and long chain fatty acids were found to inhibit ozone uptake similarly to longer chain fatty acids.

The results presented in this paper are very interesting and relevant to the atmospheric community. I recommend it for publication in ACP after some key issues are addressed.

General Comments:

For this reviewer, the weakest point of this manuscript is the discussion and presen-

tation of the results. While the authors present a large set of interesting data with potentially important atmospheric implications, this does not come out clearly in the manuscript. I mention specific opportunities for improving clarity below, but one major improvement would be the addition of a section on atmospheric implications. For example, the mixed fatty acid data is atmospherically relevant and interesting, and should be emphasized/discussed in further detail.

The abstract is very brief and should be expanded to include at least a summary of the key findings of this study.

Within the paper, beginning in the abstract, you state that you use fatty acids as surfactants. This language is peculiar because fatty acids are, in fact, surfactants, so they are not behaving as surfactants. Fixing this language choice will help clarify your experimental procedure. Specific locations include page 15024, line 2; page 15028, line 4.

How are you sure that the particles are deliquesced? The kinetics of water uptake are also inhibited by the surfactant coating. Can you distinguish whether decreased ozone uptake is due to the barrier action of the film vs. decreased liquid water content of the coated particles?

What was the pH of the particles? This is important for understanding fatty acid solubility and phase behavior.

Why is micelle formation not expected from the fatty acids used (page 15030, line 5)? I presume this due to the solubility of the fatty acids, but this should be made clear in the text. Additionally, on page 15028, line 28, you assume "...fatty acids spontaneously form a monolayer with the excess accumulating a lens at the aqueous surface...". What is the basis for this assumption? Please include this in the text along with a discussion of alternative morphologies that could exist.

Detailed comments:

The manuscript should be edited by a native English speaker in order to fix the overly colloquial/casual language and grammatical errors.

Page 15024, line 25: Please remove the '. . .', they are unnecessary.

page 15025, line 14: ". . .shown a decrease of the reactive uptake of N2O5 in presence of monolayers surfactants. . ." please fix grammar.

Page 15025, line 19: The McNeill paper referenced here should be the 2006 paper.

Page 15026, line 6: The last word is misspelled "und" rather than "and".

page 15029, line 11: ". . .where the monolayer can not be compressed more without that a separate solid (or liquid) phase would precipitate." Please fix grammar.

Page 15029, line 23-25: Please spell out the methodology (i.e. calculation) used to plot Figure 3b more explicitly. It is not quite clear how the area/molecule was determined from the mass fraction of Figure 2b.

Page 15030, eqn 1&2: The rate constant is not the same in both equations. Also, because you are talking about the rate of ozone loss from the gas phase, there should be a negative sign within your equation.

Page 15031, line 13-15: You talk about a previous study, but do not cite it. Please cite studies whenever mentioning them throughout the paper.

Page 15032, line 13: "For" should not be capitalized.

Page 15033, line 18: The definition for γcoated/γuncoated is the same as you have previously defined (page 15032, line 8), there is no need to define this ratio again.

Page 15034, line 23: Please mention how you indicate the position of the phase transition in Fig. 5b (by a circle) within the text for clarity.

Page 15038, line 21: I believe you mean "pentoxide" instead of "peroxide".

Page 15047, Figure 1: Currently the diagram is confusing to read because not every

box is labeled. For instance, what is the part of the diagram to the right of the KI solution? It is not described within the text. Also, adding valves to the area of the Kr source, the DMA and the electrostatic precipitator would be useful; currently it appears that flow is following both of these pathways at all times. Is the box after the humidifier, before the reactor, intended to be the condenser?

Page 15048, Figure 2: In Figure 2a, if monodisperse particles enter the coating apparatus, why do you see a bimodal size distribution up to 85C? How does this affect the results of the uptake experiments? Also, in Figure 2b, I would have expected a trend following increasing chain length. Do the authors have an explanation for why there isn't one? In the caption for (a), Lauric does not need to be capitalized.

Page 15051, Figure 5: These are small for how much important information is contained within, I would make them slightly larger.

Page 15054, Figure 8: An extraneous parenthesis should be removed after C12/C18, or one should be added before (a).

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