

## ***Interactive comment on “New cloud chamber experiments on the heterogeneous ice nucleation ability of oxalic acid in the immersion mode” by R. Wagner et al.***

### **Anonymous Referee #2**

Received and published: 24 January 2011

#### General Comment:

Although this is a good paper I have one major concern. To my view this paper would much better fit into a journal of physical chemistry than into ACP. If I had been asked to do the initial technical review I had recommended to transfer the paper to another journal. However, I only got the paper when it was already in ACPD, so I will not insist on transferring the paper to another journal.

#### Major comment:

Anyway, it would be beneficial for the paper when the authors include some statements on the atmospheric relevance of their research, in particular for cirrus clouds. The

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authors write that dicarboxylic acids make up 1-10% of the particulate organic carbon in various areas, but how does this compare to other substances that affect ice formation? Is oxalic acid (OA) an important player in cirrus formation or is it just a "footnote"? On Page 29457 (1st par) there is a long discussion why only a small number concentration of ice is produced in the AIDA chamber from the OA aerosol. As the AIDA is believed to mimic atmospheric processes, doesn't this imply that OA is an unimportant species for cirrus formation? Also on Page 29481/2 I find a discussion that suggests to me that OA is not really relevant for the atmosphere: "no early heterogeneous ice formation took place", "difficulty to detect a small heterogeneous mode..." give such indications. Given this, it was a bit surprising to find in the Summary (page 29488, l. 6-7) a statement "oxalic acid might play a considerable role in the Earth's climate system". At least the word "might" indicates that it is doubtful how considerable this role actually is.

The paper is hard to read because the sections and subsections (and even single paragraphs) are very long. Please split them as appropriate.

Minor and technical comments:

Otherwise I have only a number of minor and technical comments:

P. 29452, l. 24-26: "This finding corroborates" - I cannot see this, please explain.

P. 29453, l. 15: I think, an emulsion is not the same thing as a solution. What is then an "emulsified binary solution"?

P. 29453, l. 17: is "eutectic melting point of ice" a correct expression? Shouldn't it rather read "eutectic melting point of the mixture"? To my knowledge "eutectic" is a property of a mixture rather than of the single components.

P. 29455, l. 5: According to the Köhler theory it should rather read "When exceeding 100% RH".

P. 29455, l.13-17: The sentence is difficult to understand as it is rather long. Splitting it into two sentences would help.

P. 29455, l. 23: Isn't it possible that in case A freezing happens before water saturation is reached?

P. 29456, first par: I believe this par is about Zobrist's experiments, but it is not so clear. Please make clear which statements refer to Zobrist's experiments and which to AIDA.

P. 29456, l. 24-26: Why is the number concentration of ice crystals limited?

P. 29457, l. 27: please include "of the inorganic component" after "efflorescence".

P. 29457, l. 28-29: I am puzzled by the word "pure" because it seems that you mean the solution (pure OA should not depend on RH; correct me if I'm wrong).

P. 29458, l. 12: again the word "pure" disturbs me. I think this is NaCl crystals immersed in water.

P. 29459, l. 17: what is Milli-Q quality water?

P. 29460, l. 16: wrong hyphenation of dia-gnostics.

P. 29461, l. 1: probably you mean that the particle water is evaporated before the measurement is done. The sentence is not clear.

P. 29462, l. 27: I am surprised that you need only an injection period of 5 s. This is certainly not the time it needs to reach a homogeneous concentration of  $10^4 \text{ cm}^{-3}$  in the AIDA.

P. 29466, l. 4-7: I cannot understand this sentence. In fig 5 (left) the traces for  $S_{ice}$  do not coincide. So what is the sense of this statement?

P. 29467, l. 8: "only records the tail..." - not clear.

P. 29467, l. 16: Again "reaching" should perhaps be replaced by "exceeding"

P. 29467, l. 17: more precisely it should read "the largest seed aerosol particles".

P. 29468, l. 3: Delete the reference to figure 6 here.

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P. 29468, l. 15: "explained in the caption of fig. 7" is clearer, and delete the word "explicitly".

P. 29469, l.12-21: Very difficult to understand. Isn't the assumption that OA dihydrate does not form the easiest (i.e. most parsimonious) explanation?

P. 29470, l. 4: What is "the best part", how is that defined?

P. 29471, l. 23: Is there really a Bergeron-Findeisen process? What is the actual  $p_w$  in the chamber and what is the saturation  $p_w$  of the solution droplets? A strong Raoult effect could prevent the Bergeron-Findeisen process.

P. 29475, l. 8: "bears" instead of "bares".

P. 29482, l. 7: delete "explicitly".

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Interactive comment on Atmos. Chem. Phys. Discuss., 10, 29449, 2010.

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