Atmos. Chem. Phys. Discuss., 9, C7742–C7744, 2009
www.atmos-chem-phys-discuss.net/9/C7742/2009/
© Author(s) 2009. This work is distributed under
the Creative Commons Attribute 3.0 License.

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Depositional ice nucleation on solid ammonium sulfate and glutaric acid particles" *by* K. J. Baustian et al.

K. J. Baustian et al.

baustian@colorado.edu

Received and published: 1 December 2009

The authors would like to thank Referee #1 for their helpful comments and suggestions regarding this manuscript. We address each suggestion below:

1. Introduction. A reference to Knopf and Koop (2006) would be appropriate given that the study also observed ice nucleating ability of individual ice particles.

The authors agree that this reference would be appropriate and it has been added.

2. Page 20952: "In the atmosphere as a component of secondary organic aerosol" 3. Page 29956: " change "respectfully" to "respectively"

Both changes have been made as suggested

4. Page 20956: "Thus, it is not possible to quantify the exact experimental surface area or nucleation rates in this study." It is not clear what this sentence is referring to.

The authors hope to improve the clarity of this sentence by changing it to: "Because the motorized stage is used to move around the sample during experimentation, the field of view is constantly changing and it is not possible to quantify the exact experimental surface area or nucleation rates in this study".

5. Page 20958: "These frost point measurements were found to be accurate when checked using calculations from Marti and Mauersberger (1993)." How accurate?

19 experiments were performed at temperatures between 233 K and 221 K in which the vapor pressure over pure ice in a flow tube apparatus was measured by the hygrometer and compared to model predictions calculated using formulations by Marti and Mauersberger (1993). On average, vapor pressure measurements from these experiments were within 0.93% of the model predictions with a standard deviation of 4.50%. It is important to note that any error in our vapor pressure measurements should be accounted for within our temperature calibration curve.

6. Could the roughness in texture of the solid ammonium sulfate particles be a clue to their being moderately good IN?

Yes, the authors believe that the roughness in texture of the ammonium sulfate particles could influence IN ability by providing active sites for nucleation. Using this experimental technique we were are not able to precisely determine how the roughness might affect our results. However, a sentence has been added to the final manuscript highlighting surface morphology differences as a possible reason that ammonium sulfate is a more potent ice nucleus than glutaric acid.

7. Page 20963. "In all three types of experiments we observed ice nucleation occurring preferentially on just a few particles per sample." When the ice starts to nucleate presumably the ice supersaturation no longer exists, or at least is lower than it was

previously, as the water vapor condenses as ice. Is this the reason that only 1 in 1000 particles form ice crystals? This point should be made in the paper, i.e. that only the onset of nucleation can be measured because of this effect.

The authors believe that the ice supersaturation levels experienced by all particles are not significantly lowered after only one ice crystal forms. Therefore we do not believe this is the reason only 1 in 1000 particles nucleate ice. We are constantly flowing water vapor into the cell so ice formation should not be water vapor limited in the cell.

Nonetheless, we do emphasize that this paper is reporting only ice onset conditions. To reemphasize this point, we have added an additional sentence in the final manuscript that highlights this point.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 20949, 2009.