

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 #1

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General comments

This study presents results on the ice nucleation ability of oxalic acid (OA) in the immersion and the condensation mode. The experiments were carried out in the AIDA aerosol and cloud chamber of the Karlsruhe Institute of Technology. In a companion paper the authors studied the ice nucleation ability of pure oxalic acid dihydrate depending on its formation mechanism (Wagner et al., 2010). This paper here focuses on the way oxalic acid crystallizes in mixed aerosol particles and how it induces ice formation. The main findings are that oxalic acid crystallizes in ternary NaCl/OA/H₂O droplets when they are exposed to relative humidity below the efflorescence point of

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NaCl. In subsequent expansion cooling cycles starting at 244 K and 235K, the crystalline OA is active as ice nucleus. Heterogeneous nucleation of oxalic acid on the ice crystal surface could be observed for the ternary H₂SO₄/OA/H₂O system, however, only with a very low efficiency. In more concentrated supercooled solution droplets OA crystallized homogeneously before ice formed. The authors therefore hypothesize that the crystallization of oxalic acid dihydrate in the emulsion freezing experiments by Zobrist et al. (2006) might just be related to the strong increase of the solution concentration upon ice formation rather than heterogeneous freezing on the ice surface. This finding might also have implications for the way oxalic acid dihydrate forms in atmospheric particles.

This paper is well-written. The experiments are well conceived and thoroughly and convincingly discussed. I just have some minor suggestions that the authors might consider before publication in ACP:

The authors might explain why they chose different preparation procedures for the H₂SO₄/OA/H₂O and the NaCl/OA/H₂O aerosols.

The sections of the paper are quite long. The authors might consider splitting them up into subsections.

An additional column might be added to Table 1 summarizing the main results of the experiments (critical ice saturation ratio, frozen fraction).

Specific/technical comments:

Page 29465, line 16: add references to this statement.

Figure 9 might be improved by stretching the x-axis and only showing the range up to ca. 4000 cm⁻¹. The position and meaning of the dashed line should be indicated.

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

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