**Atmospheric
Chemistry
and Physics
Discussions**

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 #4

The present work demonstrates the ability of crystallized oxalic acid in ternary $NaCl/OA/H_2O$ and $H_2SO_4/OA/H_2O$ droplets to act as immersion freezing nuclei. The experimental work was performed at the AIDA facility of the Karlsruhe Institute of Technology. Experiments are repeated for different mass ratio of solutions at two initial temperatures of 244 and 235 K.

Dicarboxylic acids are ubiquitous components of the water-soluble organic fraction of the tropospheric aerosol. The Authors reported a reduction of the critical supersaturation for homogenous freezing of ternary $NaCl/OA/H_2O$ aqueous solution droplets S_{crit} from 1.38 down to 1.32 if particulate oxalic acid is present. That might (as a thesis) be important to cloud processes.

The presented work is done on a high scientific standard and all findings are discussed in detail.

I recommend to publish the work in ACP after carefully editing.

The discussion of all details on all associated measurements is one of the causes that the overall length of the paper exceeds the standards of this journal. Beside this, as a reader I tent to "get lost" in the explanations of the many aspects. Which means - the main message is hard to follow.

Furthermore the authors tent to mix sections. For example there is a large subsection in the "Introduction" (P 29454, l.18pp) where AIDA experimental details are discussed which are partly repeated in the following sections (where they are supposed to be). Also in the following introduction section (P 19456 l.1pp) the differences between AIDA and Zorbrist et al.2006 measurement are discussed in detail and in section 3 again (P29485 L27 pp).

The challenge is now to edit this paper by structuring and distilling the main messages. Here it would help to devide the quite long sections in subsections with individual captions which will guide the reader more gentle.

Minor details:

- The thesis of the potential importance of particulate oxalic acid has to be checked by discussing the relative role of the ice nucleation ability in comparison to e.g. mineral dust.

- In "AIDA-Plots" Fig. $\{5; 7; 10; \ldots; 17\}$ I would like to see in the scatter plots (particle size vs. time) the median, 25, 75 percentile of the particle size in addition to the scattered single data- even if the complex diagram becomes more complex.

But this data will make the "dot cloud" more quantitative readable.

- (P29461 l. 15) The definition of the depolarization ratio should be:

$$\delta = (I_\perp - I_\parallel)/(I_\perp + I_\parallel) \tag{1}$$

  . . . to avoid a potential singularity if the scattered light is completely perpendicular polarized.

- What is the effect of multiple scattering on the depolarization ratio if the cloud becomes thick (up to 80 cm^{-3})?

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

C12891