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Laboratory studies on carboxylic acids and their interaction with ice nucleation

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For the formation of clouds aerosol particles play an important role. But not all particles influence the cloud nucleation in the same way. This arises from the fact that the atmosphere holds many different types of aerosol particles. In the upper troposphere the main part of the aerosol is composed of inorganic materials as mineral dust, but also biologic materials, soot and other carbonaceous substances are present.[1] But these compounds might have the potential to exert strong influence on the ice building mechanisms. Recent studies showed that pure soot aerosol is unable to nucleate ice and citric acid suppresses the nucleation to a certain extent in laboratory models.[2], [3]
As many mechanisms of the nucleation process are not fully enlightened and understood yet the aim of this work is to gain some information of the ice freezing process with carboxylic acids. For the experiments emulsions of citric and oxalic acid were observed at low temperatures with environmental scanning electron microscopy (ESEM), X-Ray diffraction and Raman Spectroscopy.

[1] Pratt et al. “In situ detection of biological particles in cloud ice-crystals” Nature Geoscience, 2, 398-401, 2009

[2] O.Möhler et al., Meteorol.Z.14, 477, 2005

[3] B.J. Murray “Inhibition of ice crystallization in highly viscous aqueous organic acid droplets.” Atmos.Chem.Phys., 8, 5423-5433, 2008