Geophysical Research Abstracts, Vol. 8, 10228, 2006
SRef-ID: 1607-7962/gra/EGU06-A-10228

CCN activation of mixed salt-secondary organic aerosol particles

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The role of organic aerosol in cloud formation has been attributed more and more importance in the past decade, but so far most laboratory studies have been done with pure organics (one compound) or mixtures of a few inorganic and organic compounds. Ambient aerosols, however, contain a mixture of hundreds of organic compunds of which a significant are secondary (formed from gaseous precursors). Studies of the CCN activation of particles produced by the oxidation of relevant precursor gases in a controlled laboratory setting can give important insights into the CCN ability of ambient aerosol.

In this study we have measured CCN activation of secondary organic aerosol (SOA) particles from ozonolysis of β-pinene (an important biogenic SOA precursor gas), inorganic particles ((NH4)2SO4) and of inorganic particles coated with the ozonolysis products. The coating measurements were done using an organic tandem DMA consisting of three parts. The first part is a nebulizer coupled to a DMA where inorganic particles are produced and one size (e.g. 35 nm) is selected. They are then lead to the second part; a flow reactor where the ozonolysis takes place. A part of the reaction products then condense on the inorganic particles, which are then lead to a second DMA (third part) selecting a second (and larger) size. A cloud condensation nuclei counter (CCNC) at the exit of the organic tandem DMA measures the CCN activation of the particles by scanning in supersaturation. From this measurement the critical supersaturation can be measured. The sizes measured lie in the range of 25-60 nm.

First results show that the organic particles have a much higher critical supersaturation than the inorganic particles (1.3 % vs 0.65 % for 40 nm particles). Thin organic

coatings (organic:inorganic volume ratio less than 1:1) act as inert material, so that the coated particles have the same critical supersaturation as their inorganic seed particles within the sensitivity of our CCN instrument. For thicker coatings the organic material contributes slightly to the activation.

References:

Frank, G. P., Dusek, U. and Andreae, M.O. 2005. Technical note: Characterization of a static thermal-gradient CCN counter, Submitted to Atmospheric Chemistry and Physics Discussions.

Bonn, B.; Schuster, G. and Moortgat, G. K. 2002. Influence of water vapor on the process of new particle formation during monoterpene ozonolysis, Journal of Phyical Chemistry A (106)12: 2869-2881.