Geophysical Research Abstracts,
Vol. 10, EGU2008-A-03795, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-03795
EGU General Assembly 2008

Hygroscopic Growth of Oxalic Acid and its Ammonium, Sodium and Potassium Salts

A. Buchholz, Th. F. Mentel
Research Centre Juelich, ICG-2: Troposphere, 52425 Juelich

Aerosols influence the radiation budget of the atmosphere directly by scattering and absorbing sun light. They also act as condensation nuclei for water or ice clouds and affect the radiation properties of the formed cloud. Both the direct and indirect effect depends strongly on the hygroscopicity of the aerosols. To determine the ability of water uptake of aerosols below 100% RH (relative humidity) a HTDMA (hygroscopicity tandem differential mobility analyzer) was set up and a new humidification system was developed to reach RH higher than 95% by cooling the second DMA to a few degrees below ambient temperature. RH and temperature of the in and outgoing air was measured by Vaisala sensors. From these and precise temperature measurements inside the cooled DMA the RH at which the particle grew was calculated. With this novel setup several laboratory aerosol systems were investigated. Secondary aerosols produced by the ozonolysis of myrcene, a- and b-pinene (important biogenic emissions) were examined for changes in the hygroscopic growth due to aging of the aerosol. Aged particles appeared to be more compact and less hygroscopic than freshly formed particles. Oxalic acid is an oxidation product of many organic compounds with a relatively low vapor pressure and therefore quite common in the organic fraction of aerosols. Oxalates may form in aerosol particles e.g. if oxalic acid is neutralized by ammonia. Oxalic acid and ammonium oxalate are thermodynamically most stable as crystal hydrates while sodium and potassium oxalate form preferably the water-free crystal. With these four substrates the influence of crystal hydrate formation on hygroscopic growth was studied. Potassium oxalate behaved like a slightly soluble inorganic salt. Sodium oxalate showed some irregularities at recrystallization. Oxalic acid and ammonium oxalate exhibited a complex recrystallization behavior that may be connected

to the formation of crystal hydrates instead of the water-free form.