Determination of water-soluble organic Ions of size-segregated Aerosol Particles by Capillary Zone Electrophoresis

A guest contribution to subproject AEROSOL

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Aerosol particles play an important role in the atmosphere since they scatter and absorb light (radiative forcing – direct climatic effect), act as cloud condensation nuclei (indirect climatic effect) and influence the atmospheric chemistry processes (reactive medium, reservoir or sink of chemical species). Even the chemical composition of trace compounds can have a strong influence on these properties.

Due to small amounts of mass (µg range) and the lack of an appropriate technique little is known about organics and especially watersoluble organic ions in atmospheric aerosol particles.

Capillary zone electrophoresis – a new and powerful technique in this field – is used to determine the watersoluble ions of particulate organic matter in the atmosphere. The main advantage is the high separation efficiency (up to >100,000 theoretical plates), thus it is possible to separate some tens of different species in about 20 min combined with no sample preparation (only filtrating of the dissolved sample) and a large range of signal-to-concentration-linearity (up to 4 orders of magnitude). Indirect UV-absorption is used as detection method and detection limits of lower than nmol per sample are achieved.

As sampling unit a 5-stage low pressure impactor (Berner-type) is used to seperate different types of aerosol particles with respect to their size (0.05-10µm diameter). Typically a 12h sampling time is performed.

The main inorganic ions and some organic acids such as MSA, oxalate and higher diacids are determined and quantified. In addition, mass and the total amount of volatile and nonvolatile carbon are available. Results of different field measurements are presented.