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Effect of ammonium salts on the photochemical degradation of iron containing organic aerosol

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Formation of organic aerosol by oxidation of gas phase compounds has been intensely studied, and is much better understood than the aerosol ageing transformations during the lifetime of organic aerosol. Aerosol ageing influences how those aerosol particles affect climate and human health and is still not well constrained in current models.

Photochemistry in the condensed phase is an important mechanism responsible for ageing of organic aerosol. In the lower troposphere, where UV light intensity with sufficiently low wavelength to directly photolyze aerosol components is low, indirect photochemistry (catalyzing redox processes of non-absorbing molecules) is especially relevant. Recently we studied transition metal complex photochemistry in single particles levitated in an electrodynamic balance. In particular, we investigated the aqueous iron(III)-citrate/citric acid system and found that irradiation at 473 nm led to rapid and significant degradation of the citric acid. Up to 80% of the initial particle mass was partitioned to the gas phase with the degradation rate depending on kinetic transport limitations of oxygen. These kinetic limitations arise are influenced strongly by the relative humidity dependence of particle viscosity where water acts as a plasticizer.

Here we will report on photochemical degradation experiments adding various salts in different (ammonium sulfate, ammonium bisulfate, etc.) to the reference system iron(III)-citrate/citric acid. Preliminary experiments suggest that pH of the aerosol particle influences the degradation rate in this system significantly.