

Secondary organic aerosol formation through reactions in atmospheric waters

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Introduction

There is a growing understanding that secondary organic aerosol (SOA) can form through reactions in atmospheric waters (i.e., clouds, fogs, and aerosol water). In clouds and wet aerosols, water-soluble organic products of photooxidation dissolve into the aqueous phase where they can react further with OH radicals to form low volatility products that are largely retained in the particle phase. Oligomer formation can also occur via non-radical reactions, including hemiacetal formation during droplet evaporation, acid/base catalyzed, and reaction of organics with other constituents (e.g. forming C-N containing oligomers). Most of this knowledge has been obtained through controlled laboratory experiments and chemical modeling. Atmospheric evidence for SOA formation through cloud processing is provided by measurements of organic acids below and above clouds. Measurements of water soluble organic carbon, liquid water content, and aerosol organic matter in Atlanta, USA are consistent with the hypothesis that SOA formation in aerosol water is important. Three publications now predict that regional (northeastern USA) and global SOA formed through aqueous pathways is comparable in magnitude to that formed through partitioning of semivolatile products, generally considered to be the 'traditional' pathway.

Discussion

This paper uses kinetic modeling, experiments conducted with aqueous carbonyl solutions in the presence and absence of OH radicals, electrospray ionization Fourier transform ion cyclotron resonance mass spectrometry, and the literature to discuss similarities and differences in aqueous chemistry at aerosol-relevant and cloud-relevant concentrations. Partial dehydration of carbonyl compounds appears to impact the chemistry at aerosol-relevant concentrations and during droplet evaporation. At least for glyoxal + OH, chemical modeling can reproduce experiments conducted at cloud-relevant concentrations without including radical-radical reactions, whereas such reactions become dramatically more important at higher concentrations.

Organic contamination of bentonite: Electrokinetic remediation

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Expansive sodium bentonites have been studied for its potential on retaining heavy metals and radioactive elements e.g. [1]. On the other hand, the retention of organic contaminants such as PAH on clay particles does not depend on their natural negative charge and are more prone to leach. Electrokinetic remediation is a technique that has been widely applied for the decontamination of contaminated soil [2, 3]. It consists on applying an electric field to a moist porous material. Several phenomena take place: electromigration, electroosmosis and electrophoresis. Electromigration consists on the migration of electrically charged species and is the main phenomena which enable the removal of heavy metals from a contaminated media, when combined with a pH where the species are in an ionic form. Electroosmosis is the movement of the pore water itself under the effect of an electric field. Nevertheless, as water is dragged to the electrode, uncharged contaminants species may be dragged with it. Electrophoresis consists on the movement of electrically charged particles, usually colloids.

Electrokinetics has then been applied in a laboratorial scale e.g. [2] and in the field itself e.g. [3]. In the present work a description of the electroosmosis and its advantages on the removal of organic contaminants from bentonite calys, both based on literature survey and laboratorial experiments based on Heister *et al.* [4].

- [1] Alonso *et al.* (2008) *Geotech. Geol. Eng.* **26**, 817–826.
[2] Lageman *et al.* (2005) *Eng. Geol.* **77**, 191–201. [3] Acar & Alshawabkeh (1993) *Environ. Sci. Technol.* **27**, 13. [4] Heister *et al.* (2005) *J. Colloid. Interf. Sci.* **286**, 294–302.