



Heterogeneous chemistry of organic particles and aqueous particles coated with organic films

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Field measurements have shown that organic material is abundant in the atmosphere, comprising 10-70% of the total fine particulate mass. Organic particles can be oxidized in the atmosphere by radicals such as OH and NO₃. This could change the hygroscopicity of the particles and possibly lead to volatilization.[Molina et al., GRL, 2004] To better understand this chemistry, we have investigated the oxidation of organic substrates by NO₃ radicals. The experiments were conducted using a flow tube reactor for kinetic studies and X-ray photoelectron spectroscopy for surface analysis. The results show that NO₃ radicals can rapidly process organic surfaces in the atmosphere: the time for oxidation of an alkane surface by NO₃ is on the order of one day for troposphere conditions. These results are consistent with measurements by Moise et al.[JGR, 2002]. The results also show that NO₃-initiated oxidation does not lead to rapid volatilization. This is in contrast to OH radicals, which initiate volatilization of organic surfaces based on previous measurements.[Molina et al., GRL, 2004]

Surface-active organic molecules (organic molecules that have both a hydrophobic group and a hydrophilic group) are common constituents of tropospheric aerosol particles. Several researchers have suggested that these organic molecules form organic coatings or films on the surface of aqueous particles in the troposphere.

Using a newly constructed flow cell, we have investigated the effect of organic films on the hydrolysis of N₂O₅ on aqueous surfaces. The results show that single component organic monolayers, such as octadecanol monolayers, can decrease the reactive uptake coefficient of N₂O₅ on aqueous surfaces by approximately a factor of 50.