Geophysical Research Abstracts, Vol. 9, 07454, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-07454

Aerosol chemistry of phenols

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Phenols are widely present in the atmosphere and nitration probably in the aerosol phase leads to nitrophenols. Nitration by nitric acid in sulfuric acid can be rapid, but little is known of the process under atmospheric conditions. The Henry's law constants $K_H{}^{\dagger}$ of phenol and 2- , 3- and 4-nitrophenol were all measured by a bubble stripping method as: 2820 mol kg^{-1} atm^{-1} (at 298K), 147 mol kg^{-1} atm^{-1} (at 298 K), 1.6x10^4 mol kg^{-1} atm^{-1} (at 308 K) and 2.1x10^4 mol kg^{-1} atm^{-1} (at 308 K) respectively. The Henry's law constant of phenol in sulfuric acid systems is lower by more than a factor of two at 1020 mol kg^{-1} atm^{-1} (at 298 K) in 40 weight percent sulfuric acid, which is in line with salting-out of oxygen-containing aromatic compounds in water-sulfuric acid systems. The Henry's law constants of 2-and 4-nitrophenol behave differently and are almost independent of sulfuric acid concentration. The variation of $K_H{}^{\dagger}$with temperature (T) described in terms of -d ln ($K_H{}^{\dagger}$)/d(1/T) does not to vary with sulfuric acid concentration, suggesting enthalpy of dissolution for phenol is independent of sulfuric acid. The series of Henry's law constants measured here can describe the equilibrium situation for phenols in careful determinations of phase partitioning in the atmosphere.