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Division of Environmental Chemistry

Symposium: Role of Nitrogen-Containing Compounds in Formation & Transformation of Ambient Aerosols: Past, Present, & Future

https://www.morressier.com/o/event/611a5aa65faad60014d170a3/article/612e2cd9cb003360fe3a984a

The effects of particle phase acidity and gaseous ammonia on the heterogenous interactions between amines and ambient aerosol

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Recent research in atmospheric chemistry suggested that gaseous amines may rapidly react with the acidic components in the aerosol to be incorporated in the particle phase. However, laboratory experiments suggested that these heterogeneous processes may be sensitive to the reaction conditions, such as relative humidity (RH), the initial aerosol acidity and the initial concentration of gaseous ammonia which is ubiquitous in the atmosphere. We studied the heterogenous reactions between several amines and ammonium sulfate using a series of thermodynamic simulations under varying initial conditions, including RH, particle-phase acidity and gaseous amine and ammonia concentrations. Several distinctively different trends in the particle-phase ammonium, amines and water content were observed, depending significantly on the particle-phase acidity and the initial amine to ammonia mole ratio. One notable observation was that alkylamines may facilitate the water uptake of ammonium sulfate even in the presence of 1000 times more ammonia gas. Such change in aerosol water content may alter the surface tension, uptake coefficient and could formation properties of aerosol and influence the radiative forcing of the particles.