**Study of the Kinetics and Thermodynamics of New Particle Formation**

The measured concentration of particles in the atmosphere is often higher than predicted by atmospheric models. In order to reconcile the difference between measured and modeled particle concentrations new mechanisms for particle formation need to be determined. Formation of particles has frequently been modeled using classical nucleation theory (CNT). The first step in CNT is the nucleation step where molecular clusters form. In a second step, these clusters grow into particles through coagulation or condensation. Previous research has shown that for prototypical clusters such as the sulfuric acid-water (H2SO4-H2O) and methane sulfonic acid-water (MSA-H2O) systems that the rate of particle formation is enhanced by the inclusion of ppt concentrations of amines to the reaction mixture. We have investigated computationally and experimentally the ability of the formic acid-water (HCOOH-H2O), acetic acid (CH3COOH-H2O) and hydroperoxy radical-water (HO2-H2O) complexes to serve as nucleating clusters for new particle formation in the absence and presence of trace amounts of amines. Computational and experimental results show that the inclusion of amines into a reaction mixture containing formic acid or acetic acid and water vapor serves to stabilize the HCOOH-H2O and CH3COOH-H2O complexes which leads to an increase in the absolute number and rate of new particle formation. Computational results indicate that inclusion of trace amounts of amines into an air mass stabilizes the HO2-H2O nucleating seed complex. These results suggest that the addition of amines to air masses containing formic acid, HO2 and water vapor will serve as a viable mechanism for new particle formation in the atmosphere.