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A STUDY OF SINGLE SUSPENDED AMMONIUM NITRATE AEROSOLS

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Atmospheric aerosols have a direct impact on the earth's radiation balance, an effect opposite in sign to that of the greenhouse gases. By scattering incoming solar radiation, either directly or indirectly as cloud particles, aerosols exert a cooling effect on the earth's climate. In addition, they may provide catalytic sites for heterogeneous reactions to occur. The extent to which they will scatter light and be chemically reactive is directly related to particle size, composition, and physical state. Tropospheric aerosols, both natural and anthropogenic in origin, are mostly composed of hygroscopic inorganic salts such as ammonium nitrate and may contain organic compounds. These mixed particles may behave quite differently from the pure particles under changing relative humidity (RH) conditions. Therefore, in order to gain an understanding of these atmospheric processes and provide accurate input for regional climate models, it is imperative to understand the thermodynamics and kinetics of internally mixed particles under variable atmospheric conditions.

Our group has begun laboratory investigations of single internally mixed ammonium nitrate/organic particles at 298K. Conflicting results on the efflorescence point of ammonium nitrate, indicate that ammonium nitrate is highly susceptible to heterogeneous nucleation from certain kinds of impurities. As a result, a purification method has successfully been developed to reliably produce non-efflorescing ammonium nitrate particles 5-10 um in size. This method has been employed to study the evaporation kinetics of single crystalline, liquid-anhydrous, and supersaturated particles of ammonium nitrate. Measurements on the evaporation rates and phase transitions of organic/ammonium nitrate mixed aerosols are currently underway with some preliminary data presented here.

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