



A Laboratory Study on Immersion Freezing Behavior of Aerosols in Beijing

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This study investigates the immersion freezing behavior of aerosols in Beijing. Three types of local aerosols are considered in the experiments: dry deposition aerosols, pollen, and soil particles. We also investigate the immersion freezing behavior of montmorillonite, to compare with the local aerosols. The experimental data show that there exist different onset temperatures for different types of aerosols, above which freezing does not occur. The average onset temperatures for dry deposition aerosols, pollen, soil particles, and montmorillonite are respectively -13.8° , -13.1° , -14.3° , and -14.5° . We then use a θ -pdf scheme to parameterize the freezing process. This scheme assumes that the cosine of contact angle follows a lognormal distribution. The calculated curves fit well with the data points. The fitting parameters show that the nucleation efficiencies of different aerosols are quite different. There is a 5000-10000 times difference in nucleation rate between dry deposition aerosols and soil particles. Results of this study indicate that pollen and dry deposition aerosols are more efficient than soil particles in immersion freezing mode.