2.128 Effect of Liquid-Liquid Phase Separation on the Heterogeneous OH Oxidation of Inorganic-Organic Aerosols.

Early Career Scientist

Presenting Author:
Hoi Ki Lam, Earth System Science Programme, Faculty of Science, The Chinese University of Hong Kong, Hong Kong, China, kitty4496@hotmail.com

Co-Authors:
Man Nin Chan, Earth System Science Programme, Faculty of Science, The Chinese University of Hong Kong, Hong Kong, China; The Institute of Environment, Energy and Sustainability, The Chinese University of Hong Kong, Hong Kong, China

Abstract:

Organic compounds and inorganic salts are found to coexist in a large fraction of tropospheric aerosols. Recent studies revealed that these aerosols may undergo liquid-liquid phase separation (LLPS), a result of non-ideal interaction between the dissolved salt ions, water molecules and organic molecules, which affects the morphology of aerosols. Despite the importance of aerosol morphology in governing many physical and chemical processes of the aerosols, whether the heterogeneous OH oxidation will be affected by LLPS physically or chemically still remains unknown. Therefore, the role of LLPS on the chemistry and kinetics of heterogeneous OH oxidation of 2-methylglutaric acid (2-MGA)/ammonium sulfate (AS) was examined in this study. Experimental data and molecular information of reaction products were obtained using an aerosol flow tube reactor and a soft atmospheric pressure ionization source, (Direct Analysis in Real Time, DART) coupled with a high-resolution mass spectrometer. Aerosol mass spectra reveal that same reaction products are formed independent of LLPS. The aerosol composition at a certain oxidation lifetime is also unrelated to LLPS, suggesting that LLPS may not significantly change the reaction mechanism of 2-MGA upon OH oxidation. In addition, a new reaction product with small relative abundance is found in the 2-MGA/AS system which does not exist in pure 2-MGA system. Therefore, it is likely that LLPS does not affect the chemistry of heterogeneous OH oxidation. For the kinetics, the rate constant are found to decrease as LLPS occurs, which may be explained by the increase in viscosity due to the higher concentration of organic at the surface.