Mechanical Engineering Department Seminar

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1130 Mechanical Engineering

Atmospheric PM$_{2.5}$ Pollution and Haze Formation in China

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Due to its rapidly expanding economic and industrial developments, air pollution has become one of the top environmental concerns in China. PM2.5 in 14 of China’s large cities achieves high concentrations in both winter and summer with averages >100 µg m$^{-3}$ being common occurrences. Inorganic, organic, and isotopic compositions of PM2.5 were investigated to understand its sources, transformation, and deposition. Both primary and secondary PM2.5 are important contributors at all of the cities and during both winter and summer. Based on the continuous 10 years observation, this study presents the current state of the air pollution problems and identifies the immediate challenges to understanding and controlling air pollution at Xi’an megacity in northern China. In situ measurement of chemical composition of non-refractory submicron aerosol, during a heavy haze-fog event in Xi’an is reported. During the event, the formation of secondary sulfate and organic aerosol was very active with very low photochemical activities, indicating that other chemical processes, such as aqueous-phase reactions, may play important roles. The scattering coefficient of sunlight was significantly affected by secondary sulfate, in the form of (NH$_4$)$_2$SO$_4$, with contribution of $\sim$50% in wet particulate phase. Because the sulfur emission is very large in north China, this study suggests that the aqueous phase reaction is a major cause for the heavy haze-fog event in north China.

Distribution of ground-based mass concentrations for atmospheric PM$_{2.5}$ in the world

Bio: Dr. Junji Cao, President of the Institute of Earth Environment, Chinese Academy of Sciences (IEECAS) and Research Professor in the Division of Aerosol and Environment (DAE), has over 17 years of experience establishing emission inventories, conducting air quality studies, and performing statistical data analysis. He was the founder of the Key Laboratory of Aerosol Science & Technology at the Chinese Academy of Sciences, where he leads a group of 40 professional staff, technicians, and graduate students in conducting ambient and source characterization studies, laboratory filter processing, chemical speciation, and data validation. Dr. Cao has conducted over 10 aerosol studies in China, and has made major contributions with advice to local and central government agencies for air pollution control. He is the principal author or co-author of $\sim$160 papers on ISI with total citations of $\sim$2700. Dr. Cao is President of Asian Aerosol Research Assembly (AARA).