On the Acidity of Ambient Particles and its Implications

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Particle acidity is a vital property of ambient aerosols because it directly influences many of the particle impacts on the environment, human health and coupled particle-gas processes. Particle pH is yet not well characterized – or even understood. It is also often misjudged due to inferences made on intuition, frequently based on extrapolation of dilute systems to much more concentrated fine particles, and the historical and wide spread use of pH surrogates, such as ion balances and molar ratios. One approach to quantitatively assess pH is through the use of a thermodynamic model with measurements of (preferably) species, that partition between the gas and particle phases and are sensitive to aerosol pH. Particle mixing state and particle size-dependent composition may also be important factors. Since not all factors that may contribute to pH are necessarily known, or represented in models, predictions must be assessed by comparisons with observations. In this talk, fine particle pH predicted from a range of studies will be presented and assesses based on measurements of partitioning of semivolatile species that depend on pH. Examples of the impact of pH will also be discussed, including the effectiveness of ammonia control on PM2.5 mass in various locations and the partitioning of organic acids such as oxalate. The role of pH on the mobilization of metals affecting the bioavailability of trace nutrients and the toxicity and adverse health impacts of PM2.5 will also be presented.