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Effect of Organic Coatings on the Reactivity of Gas-Phase Ozone with Particle-Borne PAHs

Shouming Zhou, Alex Lee, Robert McWhinney, and Jonathan Abbatt
University of Toronto, Department of Chemistry, Toronto, Canada (szhou@chem.utoronto.ca)

Atmospheric aerosols affect climate by scattering and absorbing solar and terrestrial radiation and modifying physical and radiative properties of clouds. In addition airborne particles have adverse effects on human health. A dominant fraction of atmospheric aerosol is now known to be composed of organic substances. Organic aerosols can undergo various physical and chemical transformations and hence change their properties e.g. hygroscopicity, density, toxicity and composition via atmospheric oxidative 'aging'. Both field and laboratory studies show evidence that heterogeneous surface reactions contribute to aerosol aging, however, the aerosol oxidation rate and mechanism remain poorly understood. One question that remains unclear is whether or not the bulk reactions in the particle following heterogeneous uptake of reactive species (such as OH, NO3 and O3) contribute to the aerosol aging process.

It is now well recognized that surface-bound PAHs react rapidly under typical atmospheric oxidant conditions. However, it is not known the degree to which this reactivity is suppressed by organic coatings that (initially) bury the PAH. In the present study, we are expanding upon recent studies of the reactions between O3 and particle-borne PAHs conducted by both our group and others. In particular, studies focused on particle with a range of different organic coatings (e.g. liquid vs solid) that are then exposed to ozone within both a flow-tube and a newly built atmospheric simulation chamber will be presented. A detailed particle coating procedure, images of the aerosol particles after coating, effects of the coating material and light intensity on the kinetics will be presented.