



Polycyclic Aromatic Hydrocarbons Transformations in an Urban Fog

K. Valsaraj, M.J. Wornat, J. Chen, and F. Ehrenhauser

Louisiana State University, Chemical engineering, Baton Rouge, United States (valsaraj@lsu.edu, 225-578-1476)

Polycyclic aromatic hydrocarbons (PAHs) are generated from incomplete combustion of fuels, coal-fired power plants and other anthropogenic activities. These are ubiquitous in all environments, especially the atmosphere. PAHs generally are found in the gaseous form and associated with the particles in the atmosphere. They are also found in the atmospheric water present in the form of fog, mist, rain, snow and ice. Particles (aerosols) in the atmosphere invariably contain a thin film of water which tends to have a high affinity for the adsorption of gaseous PAHs. Molecular dynamic simulations clearly show that the air-water interface is a preferable surface for adsorption of large molecular weight PAHs and atmospheric oxidants (e.g., O₃, OH, HO₂, NO₃). Thus, photochemical transformation of adsorbed PAHs in fog droplets is a possibility in the atmosphere. This could lead to the formation of water-soluble oxy-PAHs which are potential precursors for secondary organic aerosols (SOAs). Field work in Baton Rouge and Houston combined with laboratory work in thin film reactors have shown that this hypothesis is substantially correct. Field data on fog and aerosols (pre- and post-fog) will be enumerated. Laboratory work and their implications will be summarized. The thin film surface environment resulted in enhanced reaction kinetics compared to bulk phase kinetics. The influence of surface reactions on the product compositions is evaluated by performing experiments with different film thicknesses.