19c Heterogeneous Chemistry of Organic Compounds on Atmospheric Droplets

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The mass transfer of aromatic hydrocarbon vapors to water droplets in air was studied in the presence of ozone in the gas phase. A falling droplet reactor with water droplets of diameters 55 to 182 mm was used for the study. Ozone reacted with the organic compound at the air-water interface, thereby decreasing the mass transfer resistance and increasing the rate of uptake into the droplet. A Langmuir-Hinshelwood reaction mechanism at the air-water interface satisfactorily described the surface reaction. The first order surface reaction rate constant, showed a distinct dependence on the droplet size. Several organic intermediates were identified in the aqueous phase as a result of ozonation of naphthalene and phenanthrene vapors at the surface of the droplet indicating both peroxidic and non-peroxidic routes for ozonation. The presence of an organic carbon surrogate (Fulvic acid) increased both the partition constant of the organic and the surface reaction rate of ozone.