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Interactions between water droplets and atmospheric pressure plasmas[1] JULIUSZ KRUSZELNICKI, AMANDA M. LIETZ, MARK J. KUSHNER, University of Michigan — Atmospheric pressure plasmas are being studied for their potential application in water purification and agriculture. Transfer of plasma produced reactivity to the micro-droplets is potentially efficient due to the high surface area to volume ratio. We present results from a modeling study of the interactions between water micro-droplets and dielectric barrier discharges. The modeling is the plasma hydrodynamics simulator, *nonPDPSIM*. Spherical water droplets (5-20 μm) were placed into a 2 mm gap between dielectric-covered electrodes. For spherical water droplets ($\varepsilon_r \approx 80$), dielectric polarization results in local electric field enhancement at the poles of the droplet. During the discharge, this enhancement increases the electron temperature near the poles, which can launch ionization waves (IW) from the droplet. Since the IW interaction time is short compared to the dielectric relaxation time of the droplet, charge deposition occurs at the boundary, leading to an initial anisotropy in the species produced in the droplet. Large droplets depleted the local gas-phase densities of reactive species, which leads to a radius-dependent saturation of densities and pH. Liquid-phase saturation densities of reactive species strongly depends on their Henry's Law constants, h. Low-h species, such as O_3, saturate rapidly invariant of the droplet size, whereas high-h species (e.g., H_2O_2, NO_2, N_2O_5) do not saturate and become transport limited in getting reactants to the droplet.

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