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Modeling the direct injection of binary liquid droplets into low-pressure environments and plasmas IQBAL SARAF, DAISUKE OGAWA, MATTHEW GOECKNER, LAWRENCE OVERZET, UT Dallas — We will present simulation results obtained from a model describing binary droplet evaporation in low pressure plasmas. The time required for a droplet to evaporate is a function of background pressure, initial T, droplet-vapor interactions, solute mole fraction and initial droplet size. A 25μm radius droplet of hexane evaporates in less than 3 seconds at 100mTorr without plasma. The addition of plasma can decrease the evaporation time by more than an order of magnitude. We find that the evaporation time depends weakly on background pressure, gas temperature and electron temperature in presence of plasma; however, it strongly depends upon the plasma density. In addition, the model predicts that the temperature of the injected droplet first decreases by evaporative cooling (to $\sim$200K for hexane); however, once the solvent has fully evaporated, the plasma heats any remaining solute. As a result, the temperature can first fall to 200K then rise to nearly 700K in less than a second at a plasma density of 10^{11}cm^{-3}.

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