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Droplet evaporation and combustion in a liquid-gas multiphase system METIN MURADOGLU, MUHAMMAD IRFAN, Koc University — Droplet evaporation and combustion in a liquid-gas multiphase system are studied computationally using a front-tracking method. One field formulation is used to solve the flow, energy and species equations with suitable jump conditions. Both phases are assumed to be incompressible; however, the divergence-free velocity field condition is modified to account for the phase change at the interface. Both temperature and species gradient driven phase change processes are simulated. Extensive validation studies are performed using the benchmark cases: The Stefan and the sucking interface problems, d^2 law and wet bulb temperature comparison with the psychrometric chart values. The phase change solver is then extended to incorporate the burning process following the evaporation as a first step towards the development of a computational framework for spray combustion. We used detailed chemistry, variable transport properties and ideal gas behaviour for a n-heptane droplet combustion; the chemical kinetics being handled by the CHEMKIN. An operator-splitting approach is used to advance temperature and species mass fraction in time. The numerical results of the droplet burning rate, flame temperature and flame standoff ratio show good agreement with the experimental and previous numeric

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