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Sharp Interface Level Set Method based Study for Evaporation of a Sessile Droplet on Hydrophilic and Hydrophobic Substrates. JAVED SHAIKH[1], ATUL SHARMA[2], RAJNEESH BHARDWAJ[3], Department of Mechanical Engineering, Indian Institute of Technology Bombay — The evaporation of a sessile droplet is important in many applications like hot-spot cooling, surface patterning etc. An understanding of the droplet dynamics in terms of evaporation rate, evaporative cooling and substrate wettability is important for designing the droplet based devices. Extensive theoretical and experimental research has been conducted on evaporating droplets in recent years; however, the effect of surrounding vapors on the evaporation dynamics of a sessile droplet is not found in the literature. In this work, an in-house sharp-interface level set code based on the Ghost Fluid Method (GFM) is used. Energy, species, and momentum equations are coupled for studying the sessile droplet evaporation phenomenon on hydrophilic and hydrophobic substrates. Different modes of droplet evaporation i.e. constant contact radius (CCR), constant contact angle (CCA) are observed for the two types of substrates. The coupling of energy and species equations is used for capturing the evaporating cooling induced dip in the droplet surface temperature. The effect of surrounding vapors like fluorocarbon vapors, on the evaporative cooling, is presented for water droplet on the hydrophilic and hydrophobic substrates.

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