



Thin-film Evaporation in an Evaporating Droplet

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Thin-film evaporation – the evaporation taking place near a solid-liquid-vapor junction – has long been believed to be the dominant mode of heat transfer in two-phase heat transfer systems. Evaporation of droplets is important in many applications such as coating, printing, spraying and dropwise condensation. Small ($0.5 \mu\text{l}$) water droplets evaporating on glass slides are studied. Three distinct modes of evaporation are observed: (1) the contact line remains pinned and the contact angle decreases progressively (4.5 to 0.7 deg), (2) the contact line recedes suddenly, and (3) complete dryout occurs. A high-resolution optical interferometer (0.1 nm in z-direction) is used to resolve the transient droplet profiles in the thin-film region. Micro-particle image velocimetry measurements of the flow field generated near the thin-film region are obtained. The liquid flows from the center of the droplet to the thin-film region to replenish the evaporating liquid.