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Experimental investigation of interfacial phenomena in evaporating sessile droplets for evaporative cooling applications BRENDAN MACDONALD, MD. ALMOSTASIM MAHMUD, University of Ontario Institute of Technology (UOIT) — Evaporation of sessile droplets has applications in many fields, including evaporative cooling technology. An example from nature is human perspiration. Evaporative cooling applications typically operate at atmospheric pressure and 20 to 80°C, and systems that mimic perspiration require droplets that are continuously fed fluid. A number of studies have investigated phenomena associated with evaporating sessile droplets including (1) interfacial energy transport, (2) distribution of the evaporation flux along the interface, and (3) temperature discontinuities at the liquid-vapor interface; however, many of these studies were not undertaken in the regime relevant to evaporative cooling and used low pressures and temperatures or droplets that were not continuously fed fluid and changed shape as they were depleted. We will present the results from our experimental study, which examined these phenomena in the regime relevant to evaporative cooling to determine if they are present and if they have an impact on the evaporation behavior. In this regime we found that conduction provided a majority of the energy required for evaporation, the local evaporation flux changed depending on thermocapillary convection, and interfacial temperature discontinuities were present.

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