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Visualization of Buoyant Convection in Droplets on Superhydrophobic Surfaces SUSMITA DASH, ADITYA CHANDRAMOHAN, JUSTIN WEIBEL, SURESH GARIMELLA, Purdue University — We investigate hitherto unreported flow characteristics that are manifested inside a sessile droplet when evaporating on a superhydrophobic surface. Evaporative cooling at the droplet interface establishes a temperature gradient that induces buoyant convection inside the droplet. A single rotating vortex, with a solid body rotation flow pattern, is observed using Particle Image Velocimetry. This flow pattern develops due to the large height-to-diameter aspect ratio of the droplet, which dictates a stable buoyancy-induced convection mode with one rolling vortex. The flow velocity is an order of magnitude higher compared to droplets evaporating on hydrophobic substrates. The high recirculation velocity, combined with the sliding contact line of the droplet, mitigates deposition of particles on the substrate during the evaporation process and enables a single concentrated deposition after complete drying on superhydrophobic substrates.

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