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Radiative heating of acoustically levitated nano-silica droplets: Internal flow pattern leading to ring or bowl shaped structure ABHISHEK SAHA, ERICK TIJERINO, RANGANATHAN KUMAR, University of Central Florida, SAPTARSHI BASU, Indian Institute of Science — An experimental setup using radiative heating has been used to understand the thermophysical phenomena inside acoustically levitated droplets. In this transformation process, through IR thermography and high speed imaging, events such as vaporization, precipitation have been recorded at high temporal resolution; leading to bowl or ring shaped structures. High solute loading is seen to form high concentration precipitate near the surface with a weak center linkage which results in a horizontal ring formation initially. Droplet recirculation is more effective at lower concentrations, inducing a bridge formation near the center leading to a bowl formation. With non-uniform particle distribution, these structures can experience rupture which modifies the droplet rotational speed with preferential orientation. PIV on sub millimeter sized droplets shows presence of strong single core vortex around droplet center. Study with droplet diameter and viscosity of the liquid leads to the conclusion that the strength of the vortex is dependent on these parameters. Further investigation with LIF confirms preferential accumulation of particles at the bottom of the droplet.

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