

Abstract Submitted
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Coffee Stain Effect with Liquid Droplets¹ SUSHANTA MITRA, SIDHARTHA DAS, University of Alberta — We discuss the dynamics of immiscible bidispersed oil droplets that are suspended in an evaporating water sessile drop. Therefore, in contrast to classical coffee stain problem, the depositing “particles” are replaced by microscopic oil droplets – hence, we discuss a liquid-droplet coffee stain phenomenon. We show experimentally that unlike colloidal particles in a classical coffee stain problem, liquid oil droplets cannot reach the three phase contact line (TPCL) due to the aversion of the oil droplets to form finite oil-air interface in water medium. Therefore, the oil droplets get positioned at a finite distance from the TPCL. We call this distance the “enclosure” distance, which being a function of the droplet size, triggers a spontaneous size-based oil droplet separation. In addition, the “enclosure” effect is a function of the surface energies of the oil droplet and the rate of evaporation. We develop a theory to describe this effect, and the results show excellent agreement with the experimental findings.

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