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Oil drop spreading on a liquid substrate VARUN KULKARNI, SUHAS TAMVADA, SUSHANT ANAND, University of Illinois at Chicago — Several systems in nature such as oil spills, food dressings, and pharmaceutical drugs demonstrate an interaction of oil and water. The process of merger of a single drop and the underlying bulk liquid represents one such scenario which has so far not received much attention in literature. In this study we use high speed imaging to experimentally investigate the dynamics of drop deformation and spreading during a gentle deposition of an oil drop onto an air-water interface. After contact with the bulk the merger of the oil drop and its spreading is found to either proceed in stages or instantly depending on the viscosity of the oil drop as characterized by its Ohnesorge number ($Oh = \mu_p/\sqrt{\rho_p \sigma D_p}$). The topological features during transition scale as a function of the drop viscosity and are theoretically validated using appropriate force balances. It is found that the spreading behavior of the drop depends dominantly on the viscosity of the oil, ultimately determining the extent of film coverage over the liquid substrate. To validate the spreading behavior of the oils, a theoretical model based on the damped harmonic motion is also presented.

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