

Singular Droplets

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We study droplets of complex fluids, having either surfactants or polymers dissolved in the fluid. We study the spreading at low Reynolds number. It turns out that both polymers and surfactants slow down the spreading. A special type of surfactants (trisiloxanes), however, leads to superspreading, in which the droplet spreads out orders of magnitude quicker than with usual surfactants. We provide quantitative explanations for the slowing down of the spreading; however, the mechanism of the speeding up remains a puzzle. At high Reynolds number, we study the impact and subsequent retraction of aqueous droplets on hydrophobic surfaces. Here, the polymer and surfactant additives slow down the retraction, leading to improved deposition. The mechanisms are however very different: the surfactants act on the surface tension, whereas the polymers change the bulk rheology.

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