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Spreading and atomization dynamics of ultrasonically excited droplets RANGANATHAN KUMAR, University of Central Florida, DEEPU P, SAPTARSHI BASU, Indian Institute of Science — The dynamics of a sessile droplet under the combined influence of standing pressure wave and a constant substrate acceleration is investigated experimentally. The asymmetric acoustic force field results in radial spreading of the droplet. The spreading rate varies inversely with viscosity which is explained using an analytical model. In low viscosity droplets, towards the end of droplet spreading capillary waves grow to form ligaments of varying length and time scales, ultimately leading to droplet disintegration. Proper Orthogonal Decomposition of high speed images from the droplet spreading phase predicts the likelihood of atomization. The different regimes in the life of surface ligaments are identified. Viscous dissipation plays a crucial role in determining the initial ligament momentum and thus the frequency of ligament breakup. However in the current experimental conditions the growth of a typical ligament is governed by inertial and capillary forces and the influence of viscosity in the ligament growth phase is rather negligible. By including the effect of acoustic pressure, a characteristic timescale is deduced which collapses the ligament growth profiles for different fluids on a straight line.

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