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On the dynamics of shock-droplet interaction. AWANISH SINGH, SHUBHAM SHARMA, SAPTARSHI BASU, Indian Institute of Science — The interaction between shock and droplets is a two-phase flow problem that occurs in many high-speed flow scenarios and has a variety of practical applications. This work aims to provide understanding of the interaction of a planar shock wave with a single droplet. We used high-speed shadowgraph and schlieren imaging techniques (up to 100,000 fps) for visualization of the interaction phenomenon. The different strengths of planer shock wave are created using exploding wire technique, which resulted in the shock Mach numbers between 1.5 and 2.5. In the early stage of interaction, the reflected, transmitted, and refracted shock wave is observed together with the Mach steam at all the Mach numbers. However, the mode of droplet-breakup is governed by the Weber number, as indicated in the other studies. The standing shock wave forms when the Mach stem reaches and collides downstream of the droplet, leading to an increase in pressure. This increased pressure leads to deformation and at the same time surface waves due to Kelvin-Helmholtz instability appears on the windward side of the droplet. The crest of these surface waves is stripped away from the equator of the droplet by the fluid flow behind the incident shock. Subsequently, complete catastrophic breakup of the droplet occurs.

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