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Drop impact on liquid film: dynamics of interfacial gas layer XIAOYU TANG, ABHISHEK SAHA, Princeton University, CHUNG K. LAW, Princeton University, Tsinghua University, CHAO SUN, Tsinghua University — Drop impacting liquid film is commonly observed in many processes including inkjet printing and thermal sprays. Owing to the resistance from the interfacial gas layer trapped between the drop and film surface, impact may not always result in coalescence; and as such investigating the behavior of the interfacial gas layer is important to understand the transition between bouncing and merging outcomes. The gas layer is, however, not easily optically accessible due to its microscopic scale and curved interfaces. We report the measurement of this critical gas layer thickness between two liquid surfaces using high-speed color interferometry capable of measuring micron and submicron thicknesses. The complete gas layer dynamics for the bouncing cases can be divided into two stages: the approaching stage when the drop squeezes the gas layer at the beginning of the impact, and the rebounding stage when the drop retracts and rebounds from the liquid film. The approaching stage is found to be similar across wide range of conditions studied. However, for the rebounding stage, with increase of liquid film thickness, the evolution of gas layer changes dramatically, displaying a non-monotonic behavior. Such dynamics is analyzed in lights of various competing timescales.

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