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Shape deformation dynamics of acoustically pulsed functional pendant droplet undergoing burning SAPTARSHI BASU, ANKUR MIGLANI, Indian Institute of Science, RANGANATHAN KUMAR, University of Central Florida — Understanding surface dynamics at the droplet scale is a problem of fundamental significance and general utility. We show that the preferential entrapment driven homogenous boiling in burning functional droplet can induce severe bulk shape oscillations in the droplet. Internal pressure upsurge resulting from ebullition activity force ejects bubble from the droplet domain causing surface undulations and oscillations in bulk, thus driving the droplet into a nonperiodic swell-shrink cycle. The extent of droplet deformation depends on the frequency and intensity of these bubble expulsion events. Besides, the bubble ejections result in localized droplet fragmentation with the subsequent formation of pinched-off satellite droplets that aids secondary atomization. In a unique regime of single major bubble residing within the droplet the pre-ejection transient time is characterized by an interfacial DL instability, where volumetric bubble-shape oscillations drive the droplet oscillations. However, in the presence of longitudinal acoustic forcing at 100 Hz this instability appears to be suppressed since external pulsing modulates the droplet flame into an oscillatory heat source, resulting in delayed bubble incipience and reduced bubble growth rates.

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