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Secondary atomization pathways in burning functional droplets subjected to travelling pressure wave ANKUR MIGLANI, SAPTARSHI BASU, Department of Mechanical Engineering, Indian Institute of Science — Self-induced internal boiling in burning multicomponent droplets and the resulting pressure upsurge is observed to initiate characteristic bubble ejection/droplet disruption events. These bubble ejections (also termed as secondary atomization events) corrugate the droplet surface and induce bulk shape deformation in the droplet. In this study, first, we identify the entire spectrum of secondary break-up modes that occur at distinct stages of droplet lifetime and at different temporal scales. Based on the increasing magnitude of their droplet-shape deformation inducing potential they range from high aspect ratio, high momentum needle type ligament break-up to low momentum, thick ligament break-up. Needle-type ejections are dominant at initial stages of droplet lifecycle and are primarily responsible for triggering only small-scale, localized surface wrinkling. In contrast, latter modes of atomization occur at later stages and initiate large-length scale droplet deformation. Second, we show that by exciting the droplet flame in its critical responsive frequency range (80 Hz $\leq \boldsymbol{f_P} \leq$ 120 Hz) the latter high intensity modes can be suppressed.

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