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Effect of viscosity on the dynamics of a spark-generated non-equilibrium bubble in free-field and near a free-surface Y S KANNAN, SARAVANAN BALUSAMY, BADARINATH KARRI, KIRTI CHANDRA SAHU, Indian Institute of Tech Hyderabad, BADARINATH KARRI TEAM — The effect of viscosity on the behaviour of a spark-generated non-equilibrium bubble is investigated experimentally. In specific, the dynamics of the bubble in two scenarios, namely, when the bubble is generated in the bulk of the fluid (“free-field” bubble) and when the bubble is generated near a free-surface (“free-surface” bubble) are investigated. The bubble is created using a low-voltage spark circuit and its dynamics is captured using a high speed camera with back-lit illumination. The viscosity of the surrounding medium is varied by using different grades of silicone oil. It is observed that for a “free-field” bubble, the bubble oscillates radially and with an increase in the viscosity of the liquid, both the number of oscillations as well as time period of each oscillation are increased. For “free-surface” bubbles, our experiments reveal a variety of distinctive bubble and re-entrant jet behaviours as the initial distance of the bubble from the free-surface and the viscosity of the surrounding fluid are varied. It is observed that beyond a certain initial distance of the bubble from the free surface, the bubble behaves as a “free-field” bubble. This limiting initial distance is observed to decrease as the viscosity increases.

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