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Effect of viscosity and density ratios on two bubbles rising side-by-side SIVANANDAN KAVURI, MOUNIKA BALLA, Indian Institute of Technology Hyderabad, India, MANOJ KUMAR TRIPATHI, Indian Institute of Science Education and Research Bhopal, KIRTI SAHU, Indian Institute of Technology Hyderabad, India, RAMA GOVINDARAJAN, International Centre for Theoretical Sciences, Bangalore — We study the dynamics of a pair of initially spherical 'bubbles' of fluid rising side-by-side in a surrounding, denser, fluid. Interesting dynamics are reported, which cannot be extrapolated from previously known dynamics of gas-liquid systems. Similar to two air bubbles though, we find that two liquid bubbles move away from each other as they rise, in cases where a single bubble would rise vertically. A pair of light bubbles always remains in two-dimensional motion, and higher bubble viscosity increases the tendency of wobbling. This is in contrast with the dynamics of a single bubble that follows a highly three-dimensional trajectory at very low bubble viscosity, but is restricted to two dimensional motion at higher bubble viscosity. On the other hand, a pair of heavier bubbles displays three-dimensional behaviour at low bubble viscosity and two dimensional behaviour at high viscosity. We find that a pair of bubbles is far less sensitive to viscosity contrast than a single bubble is, in our parameter range. In contrast to gas-liquid systems, where shape change of the bubble was tied to nonlinear dynamics of the trajectory, we find in liquid-liquid systems that interesting bubble trajectories can occur without corresponding large shape changes.

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