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Experimental study of oil-coated bubble rising dynamics LIU HONG, BINGQIANG JI, University of Illinois at Urbana-Champaign, JIN-TAE KIM, university of northwestern, JIE FENG, LEONARDO CHAMORRO, University of Illinois at Urbana-Champaign — Bubbles encapsulated by a bulk organic phase are widely present in ocean as well as many industrial processes, such as froth flotation. Despite its central role, their dynamics and the modulation imposed by the oil layer are fundamental multi-phase flow problems far from being well understood. Here, we focus on the coupled dynamics of a water medium and oil-coated bubbles with different oil fractions and viscosity. A combination of particle image velocimetry (PIV) and particle tracking velocimetry (PTV) techniques was used to characterize the flow around the rising bubbles and the 3D trajectories of the bubbles simultaneously. A high-speed stereo camera system with continuous LED light illumination was employed to reconstruct the 3D bubble trajectories; a wavelength filter was used in one of the cameras to isolate the LED illuminated bubbles from the laser-scattered seeding particles. Experiments reveal distinct dynamics of the bubbles dependent on the oil fraction and viscosity. In particular, the bubble trajectories exhibited characteristic features including the onset of path instability, transverse oscillation amplitude and frequency, and unsteady wakes—the results may serve to understand the rising dynamics of bubbles with various coatings.

Liu Hong
University of Illinois at Urbana-Champaign

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