

Buoyancy-driven motion of a liquid droplet in another immiscible liquid

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Abstract

The buoyancy-driven motion of a liquid droplet in another immiscible liquid was simulated by a front-tracking / finite difference method. The shapes of the droplet examined were spherical, ellipsoidal, and dimpled by controlling the Etövis number. As increasing the Etövis number, the droplet was more likely to deform and it eventually exhibits spiral and wobbling motions. The dynamic changes of a rising velocity, drag forces, and a projected area to the flow direction, were obtained from numerical results in order to determine the drag coefficient. Comparing the drag coefficient with the models previously proposed by several researchers, we discussed the relation between the motion of the droplet and the drag coefficient.

Keywords: Liquid droplet, Buoyancy-driven motion, Front-tracking / finite difference method, Drag coefficients