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Numerical Study of Taylor Bubble Dynamics[1] JING LOU, SHAOPING QUAN, CHANGWEI KANG, Inst. of High performace Computing — Taylor bubble rising is numerically investigated using a front tracking/finite difference method, with systematic studies of bubble shape, the effects of the Reynolds number (Re_T), the Weber number (We_T), and the Froude number (Fr), the thin liquid film thickness (w) and the wake length (l_w). The effects of density ratio (η), viscosity ratio (λ), Eötv ös number (Eo) and Archimedes number (Ar) are examined in detail. The results show that the density ratio and the viscosity ratio have minimal effect on the dynamics of the Taylor bubble. Eötvös number and Archimedes number influence the elongation of the tail and the wake structures, where higher Eo and Ar result in longer l_w. A critical value of unity of locally defined Weber number (We_l) is found to represent the sudden extension of the bubble tail. The Archimedes number drastically affects the final shape of Taylor bubble, the terminal velocity, the thickness of thin liquid film as well as the wall shear stress. A correlation between thin film thickness (w/D) and Archimedes number (Ar) is obtained as: $w/D = 0.32Ar^{-0.1}$.

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