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Density Effects on Immiscible Interface Breakup and Drop Formation Process CHIYOON SONG — The interface dynamics of a single immiscible interface at varying density ratios with the viscosity ratio order of one in the presence of vortical flow is examined through Front-Tracking/Finite difference method to solve unsteady Navier-Stokes equations for both the disperse and continuous phase flow. It is observed that as the density ratio of both phases decreases the larger density difference prohibits the formation and growth of surface waves and results in the formation of a longer column, which persists for a longer time until first breakup occurs. In contrast, the numerical simulations show that the change of density ratio is accompanied by the relative small variation in the detached volume of column. In this work, we also show that there exist the upper and lower limits of density ratio. Moreover, the small density ratio effects on the viscosity ratio are investigated. Although the density ratio is responsible for the interface deformation and breakup process when the viscosity of dispersed phase is greater than that of the continuous phase, the small density ratio effects on the dynamics is not observed for the case that the dispersed phase is less viscous than the continuous phase.

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