

Table captions

Table 1. Fluid heights of three group with different total heights

Total height of fluid (H, mm)	Height of lower fluid (H ₂ , mm)	Height of upper fluid (H ₁ , mm)
45	25	15
70	45	20
100	50	45

Table 2. Physical properties of materials.

Fluid	Viscosity (Pa·s)	Density (kg·m ⁻³)	Surface tension coefficient (N·m ⁻¹)
Lower liquid	1.003×10^{-3}	997.2	0.0727
air	2.593×10^{-5}	1.205	
Upper liquid	4.6×10^{-3}	882.4	0.0321

Table 3. Grid schemes investigation.

	Maximum cell size (mm)	Number of nodes
Grid A	0.13	1272192
Grid B	0.15	954487
Grid C	0.18	665991
Grid D	0.20	534772

Table 4. Experimental conditions of reference[38]

	Reference [38]	Simulation
The total height of the bubble movement (mm)	160	160
Initial bubble equivalent diameter(mm)	5.251	5.2
The height of the lower liquid(mm)	44	44

Table 5. The variation ranges of Ga , Re , Eo and E

Radius (mm)	$\frac{Re_{\max} - Re_{\min}}{Re_{\min}}$		$\frac{Ga_{\max} - Ga_{\min}}{Ga_{\min}}$		$\frac{Eo_{\max} - Eo_{\min}}{Eo_{\min}}$		$\frac{E_{\max} - E_{\min}}{E_{\min}}$	
	lower liquid	upper liquid	lower liquid	upper liquid	lower liquid	upper liquid	lower liquid	upper liquid
2	0.4501	0.3916	0.1508	0.2916	0.2060	0.4066	0.4451	0.0677
2.5	0.3333	0.3112	0.0884	0.1841	0.1195	0.2527	0.6511	0.1783
3	0.4863	0.1851	0.1301	0.1447	0.1771	0.1975	0.8367	0.2039
3.5	0.4084	0.2196	0.1097	0.0599	0.1489	0.0807	1.3739	0.2358