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Inertia effects on bubble generation in thin T-junction microchannel KAZUYASU SUGIYAMA, HIDEHIKO OKUBO, SEIGO NABESHIMA, TOMOAKI WATAMURA, Graduate School of Engineering Science, Osaka University — A numerical study on gas-liquid interface dynamics of bubble generation in a thin microchannel with a squeezed T-junction is performed. In consideration of liquid inertia, the basic equations consist of the Laplace law and the two-dimensional Euler-Darcy equation under the assumption of Hele-Shaw's flow owing to a large width-to-thickness aspect ratio of the channel cross-section. The velocity potential and the interface motion are numerically predicted by means of a boundary element method. The simulated results reasonably capture the experimentally observed behaviors that the interface pinches off at the channel junction and then a bubble forms. For a fixed liquid velocity, the generated bubble is likely to be smaller with decreasing the gas pressure, but the bubble is no longer generated at the gas pressure below a threshold. The bubble size minimized at the generation limit is arranged using the capillary, Reynolds and Weber numbers, and the results imply the significance of the liquid inertia in the bubble generation process in spite of the micrometer-scale phenomena.

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