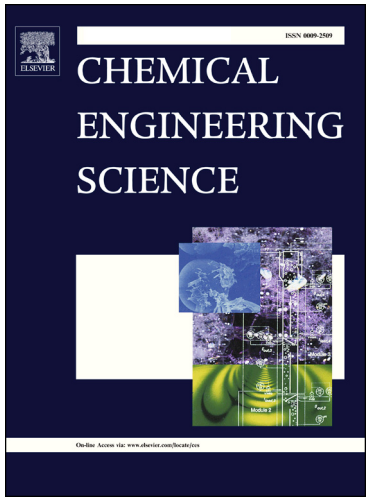


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# Critical condition for bubble breakup in a microfluidic flow-focusing junction

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**Abstract:**

The critical condition for bubble breakup in a microfluidic flow-focusing junction was studied in this work. The experiments were conducted in a square microchannel of 400 μm wide. The critical condition for bubble breakup was investigated by varying the bubble length $l_0$, liquid viscosity $\mu$, velocity of the liquid from the main channel of the flow-focusing junction $u_1$, and velocity of the liquid from the side channels of the junction $u_2$. By analyzing the effects of these factors on the dynamical evolution of gas-liquid interface for bubble deformation and breakup, expressions for describing the bubble deformation and breakup time were established, respectively. On the basis of these two expressions, the critical condition for the bubble breakup in a microfluidic flow-focusing junction was deduced: $\frac{l_0}{w_c} = 1.5\left(\frac{u_1}{u_2}\right)^{0.75} Ca_2^{-0.13}$, where $w_c$ is the width of microchannel, $Ca_2=u_2\mu/\gamma$, and $\gamma$ is the surface tension.