

Longitudinal Vortices Mixing in Three-Stream Micromixers with Two Inlets

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Abstract : In this work, we examine fluid mixing in a full three-stream mixing channel with longitudinal vortex generators (LVGs) built on the channel bottom by numerical simulation and experiment. The effects of the asymmetrical arrangement and the attack angle of the LVGs on fluid mixing are investigated. The results show that the micromixer with LVGs at a small asymmetry index (defined by the ratio of the distance from the center plane of the gap between the winglets to the center plane of the main channel to the width of the main channel) is superior to the micromixer with symmetric LVGs and that with LVGs at a large asymmetry index. The micromixer using five mixing modules of the LVGs with an attack angle between 16.5 degrees and 22.5 degrees can achieve excellent mixing over a wide range of Reynolds numbers. Here, we call a section of channel with two pairs of staggered asymmetrical LVGs a mixing module. Besides, the micromixer with LVGs at a small attack angle is more efficient than that with a larger attack angle when pressure losses are taken into account.

Keywords : microfluidics, mixing, longitudinal vortex generators, two stream interfaces

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