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Three-Dimensional Passive Micromixer Fabricated by Two-Photon Polymerization for Microfluidic Mixing

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Flow mixing is an important process for many microfluidic applications. Efficient mixing is difficult in microscale channels owing to laminar flow. Disturbing the flow stream by modifying channel geometries or embedding barriers improves the mixing rate. In this study, a three-dimensional (3-D) passive micromixer with propeller blades fabricated by two-photon polymerization (TPP) technology is embedded in the channel for fluid mixing. The propeller blades are designed to disturb the laminar flow in three dimensions to improve the mixing rate. Screw-shaped and flat blades are compared. The experimental results indicate that the screw-shaped propeller provides additional streamlines in the Z direction, which enhances the mixing efficiency. Finally, this phenomenon was verified through simulation.

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