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Experimental and numerical analysis of Y-shaped Split and recombination micro-mixer with different mixing units

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Abstract

Three representative types of Y-shaped split and recombination three-dimensional passive micromixers are analyzed for mixing efficiency both experimentally and by numerical simulation. These designs are important because of simple fabrication and better mixing ability. The flow and mixing capability of these mixers are numerically investigated for Reynolds number, in the range of 0.5-100. Mixing index and pressure drop of each micro-mixer design are evaluated in COMSOL 5.2a. All Proposed designs mixing index line graph and images are clearly showing that mixing is much improved as compared to straight mixer YSSAR. It is due to chaotic advection and Dean Flow effect in YCSAR, YRCSAR, and YRSAR that transverse flow mechanism enhance the mixing index. The mixing index of YRCSAR, having both circular and rhombus mixing units is 99% at Reynolds number 100 superior in mixing performance as compared other proposed micro-mixers. Mixers chips are fabricated from borosilicate glass and liquid silicone elastomer material. Red and yellow dye was used for evaluating the mixing performance experimentally. Simulation and experimental images of analyzed micro-mixers as