

Numerical Analysis of Micro-Mixers with Grooves or Blocks

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Abstract

The performance of a micro-mixer is corresponding to the mixing efficiency of it. Due to the tiny scale of the geometry of interest, instead of doing the experiment. In this study the computational fluid dynamics approach is employed to simulate and analyze the passive micro-mixers under consideration include: straight ridges micromixer (SRM)、Double SRM, staggered herringbone micromixer (SRM), staggered herringbone micromixer with oblique block(OBSHM), and only blocks structure, whose flow patterns and mixing efficiencies were studied. On the other hand, the restudy of Hsieh's work [42] has been done with different handling on modeling of the flow field. The wider and the deeper grooves of SRM bring the better mixing efficiency while the too sharp and the too dull angles of inclination of grooves degenerate the mixing performance which are on the contrarily bettered by the Double SRM with grooves placed on the top and bottom of the channel, quite consistent with results reported by Hsieh's [42]. SHM, OBSHM, and Block are further investigated in the present study. OBSHM performs more poorly than SHM does as Peclet number is about 2×10^5 . whereas the contrary happens as Peclet number is about 2×10^3 . Block performs better only when the angle of

inclination is 45 degree. The Blocks micro-mixer has great mixing efficiency then SRM, SHM, OBSHM, when the Peclet number is about 2×10^3 .

