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Optimization of chaotic mixing in staggered herringbone micromixer[1] MRITYUNJAY KUMAR SINGH, PATRICK ANDERSON, HAN MEIJER, Eindhoven University of Technology — Mixing is vital in many microfluidic devices. In this paper, a mapping method has been applied to analyze and optimize periodic mixing protocols in different types of staggered herringbone micromixers. The mixer can be subdivided in a number of characteristic modules and for each a distribution matrix is computed by mapping concentration at the inlet to the outlet. By combining these different mapping matrices different designs of the mixer are easily evaluated, and a design has been predicted to achieve optimum mixing in the micromixer. The advantage of the mapping method is that it needs only one time computation of these mapping matrices which can be combined in various ways, which is computationally very inexpensive. To quantify mixing, the intenity of segregation has been used as a mixing measure. Further as a comparison, we calculated the maximum Lyapunov exponent for three types of mixers with three different groove depths. Our results show that the mapping method and the maximum Lyapunov exponent confirm each other regarding the effect of groove depth on mixing.

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