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Stability and sensitivity analyses of the engulfment regime in a three dimensional T-shaped micromixer ANDREA FANI, SIMONE CAMARRI, Dep. of Aerospace Engineering, University of Pisa, Italy, CHIARA GALLETTI, Dep. of Chemical Engineering, University of Pisa, Italy, MARIA VITTORIA SALVETTI, Dep. of Aerospace Engineering, University of Pisa, Italy — The recent research in micro-fluidics has focused on the development of efficient passive micromixers, in which mixing is promoted without the help of any external power. One among the simplest designs of a passive micromixer is a T shape, in which the inlets join the main channel with T-shaped branches. The range of Reynolds numbers, Re, of interest for practical applications is such that the flow inside such a mixer is laminar but it is characterized by peculiar fluid-dynamics instabilities, which significantly enhance mixing but are poorly investigated in the literature. As Re is increased, the flow goes through a bifurcation which drives the system from a perfectly symmetric flow to a steady but asymmetric state, so enhancing mixing (engulfment regime). The onset of the engulfment has been found to be influenced by geometrical parameters and by inflow conditions. In the present work we characterize the engulfment instability by a global stability analysis on the 3D base flow in a T-mixer. Sensitivity analyses with respect to a structural perturbation of the linearized flow equations and to a base flow modification were carried out. Finally, we characterize the sensitivity of the considered instability with respect to a perturbation of the inlet velocity profile.

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