NASA/ADS

Modeling the Mixing Efficiency of a low-Re Passive Microfluidic Mixer

Show affiliations

Partington, Katherine ; **Morton, Henry** ; **McCaslin, Jeremy** ; **Santana, Steven**

Microfluidic mixing is a well-established problem. Multiple microfluidic solutions have been designed to enhance mixing by increasing the interfacial area between initially distinct streams by generating cross-stream mixing. Previous work has modeled the mixing within these devices for flows with characteristic Reynolds numbers (Re) of approximately two orders of magnitude below unity. However, some applications, such as bioprinting, operate in regimes beyond this range. In this work we evaluate a passive microfluidic mixer in this extended Re range. Flows within these micromixers were modeled using the finite volume method to solve the Navier-Stokes equations. The results characterize the mixing efficiency and associated mixing costs for these low-Re flows. Flows with a range of Reynolds numbers were achieved by varying the viscosity and mass flow rates to better describe their differential impacts on mixing. In addition to modeling the mixing of fluids with identical properties, flows involving fluids of unique viscosities and flow rates were also characterized. Modeling the mixing of these different flows enhances understanding of mixing within low-Re flows.

Harvey Mudd College, The Fletcher Jones Foundation, and The Norman F. Sprague III Fund.

Publication:	APS Division of Fluid Dynamics (Fall) 2020, abstract id.U10.004
Pub Date:	2020
Bibcode:	2020APS..DFDU10004P