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Numerical study of the influence of geometry and flow on the mixing process of non-Newtonian fluids in micromixers

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Abstract-This article is designed for the study of the mixing of non-Newtonian fluids using a kenics micromixer. The governing equations are solved numerically using a CFD code. The species transport model was chosen to characterize the mixing. The flow regime is laminar. The generalized Reynolds number ranges from 0.1 to 120. The CMC solutions supplied to the power law model are used in the simulations as a non-Newtonian fluid. The mixing efficiency was assessed by calculating the mixing index MI. Two geometric configurations of T-type and Y-type micromixers are investigated, and their hydrodynamic mixing performance is compared. The results of the numerical simulations show that the proposed micro kenics have the best mixing index which exceeds 0.98 for all values of (n) and Re_g less than or equal to 25 considered in this study. This micromixer had real potential to improve mixing performance because the kinematic properties are totally chaotic. Finally, this micromixer is suitable for use in microfluidic systems that demand rapid mixing while maintaining low Reynolds numbers.

Keywords: Kenics, Chaotic Mixing, Mixing Index, Non-Newtonian Fluid, Micromixer, Reynolds Number.