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Mixing evaluation using an entropic measure in Dean flow micromixers PETRU FODOR, BRIAN VYHNALEK, MIRON KAUFMAN, Cleveland State University — Promoting mixing in fluid systems at low Reynolds number, remains one of the problems of interest in the development of microreactors. In the laminar flow regime characteristic to these type of systems the mixing between different species needed for chemical reactions relies on diffusion, which is relatively slow. In order to circumvent this problem various methodologies exploiting appropriately chosen geometries or relying on external forces such as magnetic, electrokinetic, ultrasonic ones are used to either increase the interface between the chemical components and/or induce chaotic advection within the fluid stream. In this work we investigate computationally the use of curved channels at Reynolds numbers from 25 to 900, in which the centrifugal forces, experienced by the fluid as it travels along a curved trajectory, induce counter-rotating flows (Dean Vortices). The presence of these transversal flows promotes the mixing of chemical species which are introduced in the system at different position across the cross section of the channel. The mixing efficiency is evaluated using the Shannon entropy. We have found this measure to be useful in understanding mixing in the staggered herringbone mixer [Petru S. Fodor and Miron Kaufman, Modern Physics Letters B 25, 1111 (2011)].

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