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Mixing Potential of an Oscillating Circular Cylinder in a Micro-Channel BAYRAM CELIK, Old Dominion University, UNAL AKDAG, Aksaray University, ALI BESKOK, Old Dominion University — Using h/p type finite element algorithms based on the Arbitrary-Lagrangian-Eulerian formulation, we investigated mixing potential of forced transverse oscillations of a circular cylinder in a microchannel at Reynolds number 100 and oscillation amplitude to cylinder diameter ratio of 0.8. Simulations are performed for two fluids entering the channel that are stirred by the oscillating cylinder in the Strouhal frequency range of 0.4-1.6. These frequencies are selected to be both in the lock-in and non-lock-in regimes using the natural vortex shedding frequency of the stationary cylinder placed in the channel. The relationship between the Strouhal frequency and resulting flow characteristics such as vortex dynamics and the force exerted on the cylinder is investigated. Mixing simulations are performed at Peclet numbers of 100 and 1000. Computational results show that mixing characteristic is highly related to the resulting vortex pattern and the wake behind the cylinder. The lock-in cases have shown better mixing potential than the non-lock-in cases, which is a result of their relatively shorter formation lengths and vortex patterns.

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