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 el-
ement algorithms based on the Arbitrary-Lagrangian-Eulerian formulation, we in-
vestigated 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 in-
vestigated. Mixing simulations are performed at Peclet numbers of 100 and 1000.
Computational results show that mixing characteristic is highly related to the re-
sulting 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.