Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Effects of herringbone groove geometry on flow kinematics in a high aspect-ratio microchannel VISHWANATH SOMASHEKAR, MICHAEL OLSEN, Iowa State University, MARK STREMLER, Virginia Tech — Passive mixing is often achieved in laminar microscale flows by driving fluid through microchannels with geometries that produce secondary flows and/or by splitting and recombining the fluid multiple times. One very successful microscale mixer design is the staggered herringbone mixer introduced by Stroock et al. (Science 2002) In the presented work, we consider very high aspect ratio (62:1) microchannels with a repeated staggered herringbone pattern spanning the entire width of the microchannel. Herringbone geometries with three different interior angles of the herringbone pattern (45, 90, and 135 degrees) were investigated. The flowfields within the herringbone mixers were determined using microscopic particle image velocimetry (microPIV). Velocity fields were measured at the midplane of the microchannel and at the groove-channel interface for Reynolds numbers based on microchannel hydraulic diameter of 0.08, 0.8, and 8. These wide microchannels produce secondary flow patterns that effectively split the fluid into parallel streams without having to fabricate physically separate channels.

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Date submitted: 11 Aug 2009 Electronic form version 1.4