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**Passive mixing in a wide microchannel using surface patterns** VISHWANATH SOMASHEKAR, MICHAEL OLSEN, Iowa State University, MARK STREMLER, Vanderbilt University — Passive mixing is typically achieved on the microscale by driving fluid through microchannels with geometries that either (1) produce strong secondary flows or (2) split and recombined the fluid multiple times. We present a microchannel design that incorporates both of these approaches into a single channel. Our design uses oblique surface grooves on one channel wall to generate strong secondary flows at low Reynolds numbers. The surface groove pattern is inspired by the herringbone pattern of Stroock et al. (2002), who demonstrate good mixing results in a channel with aspect ratio near one. We extend this approach by tiling the wall of a high-aspect- ratio channel with several parallel herringbone patterns, which generate a number of parallel counter-rotating regions in the flow. Alternating the surface patterns in the axial direction causes interaction of these parallel streams in a way that is similar to splitting and recombining multiple channels. We demonstrate this approach to passive mixing in a PDMS microchannel that is 50 $\mu$m deep and 2500 $\mu$m wide. Mixing is characterized experimentally over a range of Reynolds numbers using a phenolphthalein reaction. At $Re = 0.8$, fluid is mixed across the entire channel width after 40 mm.

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