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Flow-enhanced Mixing in Nanofluidic Channels. MYOUNG-WOON MOON, Harvard University, KYU HWAN OH, Seoul National University, Korea, JOHN W. HUTCHINSON, HOWARD A. STONE, Harvard University — We study mixing in nanoscale channels created by patterned buckling in compressed films on silicone substrates. The buckled film displays the telephone cord morphology with a characteristic configuration of zig-zag shape along the length direction. Also, the cross-sectional shape, which is almost semi-circular, has a periodic asymmetry. The channel heights are in the range of 20 – 2000 nm. In this study, buckling channels are used as molds for PDMS stamping, which produced flow channels with height of 400 – 800 nm and widths of 5 -10μm, and these channels are then integrated into a microfluidic experimental system. The flow behavior in the buckling channels shows laminar streams with Reynolds numbers $Re \approx 10^{-2}$. A series of mixing experiments was performed with various flow velocities. Observations with confocal microscopy reveal that the interface is strongly perturbed due to the periodic asymmetric profile of the buckling geometries. The axial mixing distance is proportional to ln (Pe), indicative of a flow enhanced dispersion.

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