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Multifractal Analysis of Mixing in Microchannels MARCO CAMESASCA, Case Western Reserve University, MIRON KAUFMAN, Cleveland State University, ICA MANAS-ZLOCZOWER, Case Western Reserve University — Mixing in microfluidic systems is important for many technological applications, as for example in biotechnolology when sensing trace amounts of chemicals or detecting the bases in a small DNA segment. In such systems, the flow is laminar and driven by pressure gradients with no moving parts to drag the fluid. We develop rigorous measures for assessing the quality of mixing in microchannels by employing Renyi entropies and multifractal dimensions. We apply these measures to asses mixing in microchannels of different surface geometries. We find enhanced mixing efficiency for the geometry similar to the staggered herringbone mixer by comparison with a mixer with straight diagonal ridges. We also analyze the multifractal dimensions for a sequence of pictures obtained at various cross-sections of a staggered herringbone mixer in an experiment where a fluorescent fluid is mixed into a non-fluorescent one*. This multifractal analysis of the generated structures during mixing is used as another measure of quality of mixing. * Stroock A D, Dertinger S K W, Ajdari A, Mezic I, Stone H A, Whitesides G M 2002 Science 295 647–651

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