Hydrodynamic Dispersion in Narrow Microchannels: Shape Matters!

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We highlight the fact that hydrodynamic dispersion in narrow microchannels is essentially controlled by the width of the cross-section rather than by the much thinner height of the channel. Using the lubrication approximation, we provide simple formulas that allow quantitative evaluation of dispersion for any narrow cross-sectional shape, both in the short-time ``ballistic regime'' and in the long-time regime, which is effectively diffusive. The special cases of parabolic and quasi-rectangular shapes are considered due to their frequent use in microsystems.