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On the Design of 3D Micromixers Having the Bernoulli Property

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In dynamical systems theory a hierarchy of characterisations of mixing exist Bernoulli -> mixing ->ergodic, ordered according to the quality of mixing (the strongest first). We consider micromixers whose flows take one of two forms: 2D blinking flows, or 3D duct flows. We show that these types of flows can be reduced to so-called linked twist maps (LTMs). LTMs can be shown to possess the Bernoulli property of mixing under certain conditions. Hence, conditions can be specified for a large class of micromixers guaranteeing the best quality mixing. Extensions of these concepts lead to first principle-based designs without resorting to lengthy computations.

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