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**Breaking Regular Islands for Improved Mixing in an Electro-osmotic Device** RODOLPHE CHABREYRIE, Carnegie Mellon University, CRISTEL CHANDRE, Centre de Physique Theorique - CNRS, PUSHPENDRA SINGH, New Jersey Institute of Technology, NADINE AUBRY, Carnegie Mellon University, CARNEGIE MELLON UNIVERSITY TEAM, CENTRE DE PHYSIQUE THEORIQUE - CNRS TEAM, NEW JERSEY INSTITUTE OF TECHNOLOGY TEAM — Two-dimensional electro-osmotic flow with strong spatial and weak temporal variations of the zeta potential is investigated theoretically for the purpose of enhancing mixing in a microchannel. The flow is a superposition of a primary component and a perturbation. The primary flow, generated by the spatially periodic zeta potential, consists of recirculating rolls, while the perturbation arises due to a small time periodic variation of the zeta potential distribution. In this work, we propose a method that allows us to identify the values of the parameters which produce complete mixing. The method is based on tracking the linear stability of the main periodic orbits corresponding to the recirculating rolls of the primary flow. Poincaré maps, Lyapunov exponents and a box counting measure are computed to corroborate our results.

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