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Electrothermal blinking vortices for chaotic mixing SOPHIE LOIRE, PAUL KAUFFMANN, PAUL GIMENEZ, CARL MEINHART, IGOR MEZIC, UCSB — We present an experimental and theoretical study of electrothermal chaotic mixing using blinking of asymmetric 2D electrothermal vortices. Electrothermal flows are modelled with 2D finite element method using COMSOL software based on an enhanced electrothermal model. Velocities in top-view and side-view devices are measured by micro particle image velocimetry (μPIV). The experimentally reconstructed velocity profile shows a dramatic asymmetry between the two vortices, in good agreement with the FEM model. The separation line between the two vortices is shifted and tilted making the blinking vortices overlap. We use the mix-variance coefficient (MVC) on experimental particle detection data and numerical trajectory simulations to evaluate mixing at different scales including the layering of fluid interfaces by the flow, a keypoint for efficient mixing. The blinking vortices method greatly improve mixing efficiency. Theoretical, experimental and simulation results of the mixing process will be presented.

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