Supplementary Materials.

How a "pinch of salt" can tune chaotic mixing of colloidal suspensions.

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MATERIALS AND METHODS

The Y-shaped microfluidic Staggered Herringbone Micromixer (SHM) was made in polydimethylsiloxane (PDMS) using classical soft lithography methods. The main channel has a width w=200 μm, and height h=115 μm. Staggered Herringone arrangement is made of alternate ensembles of 6 herringbones (50 μm large and spaced by 100 μm), with the total length of one SHM cycle being λ=2 mm. Depth of herringbones is $\alpha_1 h$, with $\alpha_1 = 0.35$ (see Fig.1). Only in Fig.4 (inset) are presented results for slightly varying geometry, with different values of α_1 (0.35; 0.36 and 0.40) as specified in the figure caption. Mixing solution were flowed in SHM using neMESYS syringe pumps at mean downstream velocity $U = 8.6$ mm/s, except in figure 4 where different velocities were explored ($U = 1.7; 4.6; 8.6; 17$ mm/s).

All solutions are prepared in a Tris buffer (1 mM, pH 9). Colloidal suspensions are composed of 200 nm diameter Yellow-Green fluorescent polystyren-carboxylate beads (F8888, Invitrogen) diluted in buffer at a concentration of 0.02% w/v. Other fluorescent suspensions were made from Rhodamine B dye (Sigma-Aldrich) at 10 μM in buffer, and from Methoxyl Rhodamine PEG (MW = 5000, Nanocs) at 10 μM in buffer. Salt effects are explored using LiCl salt (Sigma-Aldrich), which is added to colloidal suspension (salt-in configuration) or to the co-flowing raw buffer (salt-out configuration) at a concentration of 20 mM. Diffusion coefficient and initial concentrations of all solutes are gathered in table I.

TABLE I. Different solute particles used in mixing experiments: diffusion coefficients D as measured by Fluorescence Correlation Spectroscopy setup [2] (except Rhodamine B and LiCl, values from literature [1, 3]) and initial concentrations c_0.

Solute particles	D (μm^2.s^{-1})	c_0
Colloids ⌀200 nm	1.9	0.02% w/v
Rhodamine PEG5000	110	10 μM
Rhodamine B	360	10 μM
LiCl	1360	20 mM

Cross-section images of the SHM were taken at different locations y/λ along the channel, and captured using fluorescence confocal microscopy (Leica TCS SP5) with a water immersion objective (Leica, x20 NA=0.7), and averaged over 400 image scans.

[1] S. A. Rani, B. Pitts and P. S. Stewart, Antimicrob. Agents Chemother., **49**, 728 (2005).
[2] L. Joly, C. Ybert and L. Bocquet, Phys. Rev. Lett. **96**, 046101 (2006).
[3] CRC, Handbook of Chemistry and Physics, 89th edition, (2008).

SUPPLEMENTARY FIGURES

The additional figures SPFig.1 to SPFig.6 correspond to high resolution cross section images of the central portion of the mixing channel at different positions along the channel, as shown in figure 1.

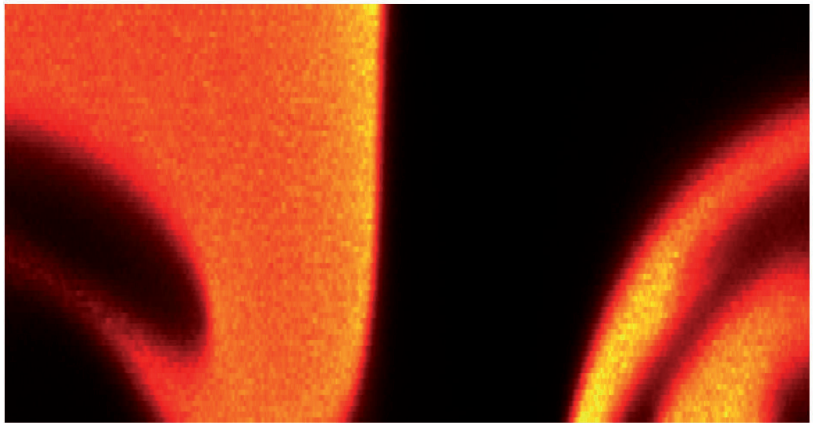

FIG. 1. $y = 2\lambda$; Saltin configuration.

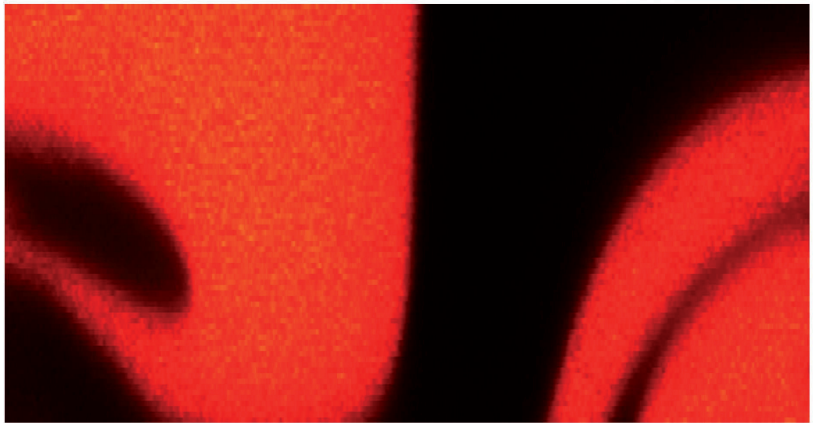

FIG. 2. $y = 2\lambda$; Saltless configuration.

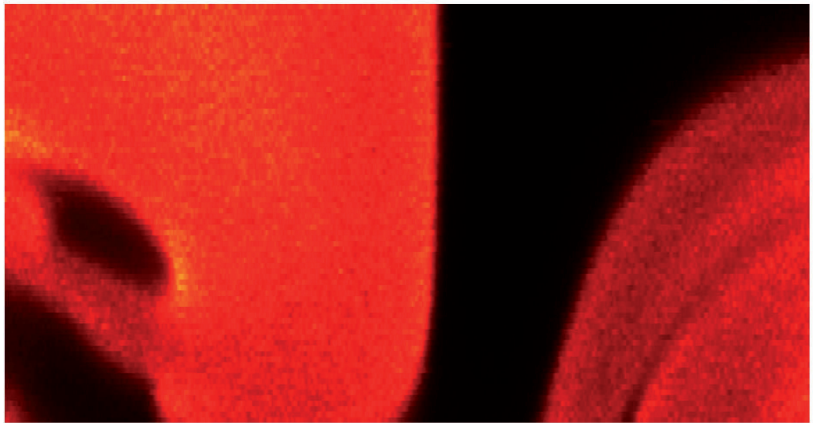

FIG. 3. $y = 2\lambda$; Saltout configuration.

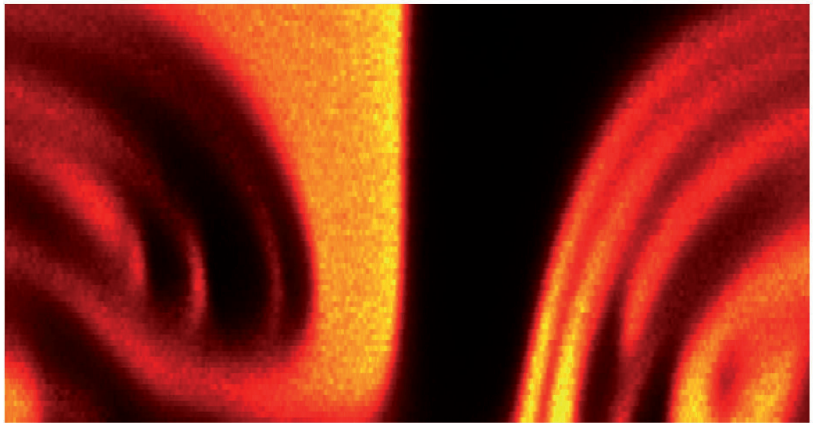

FIG. 4. $y = 4\lambda$; Saltin configuration.

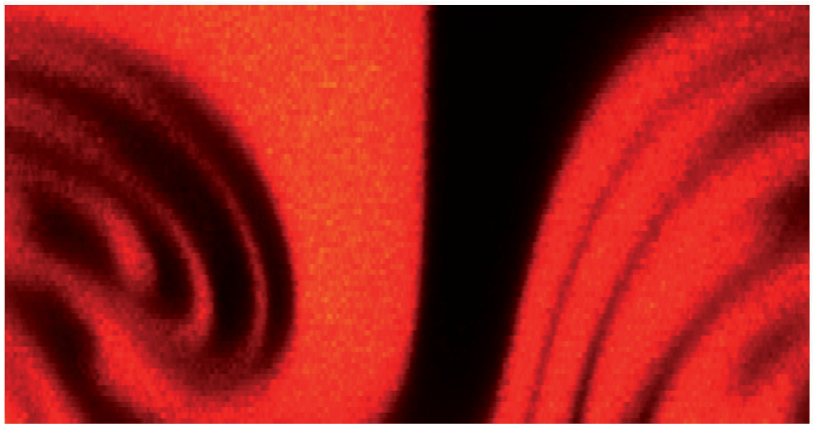

FIG. 5. $y = 4\lambda$; Saltless configuration.

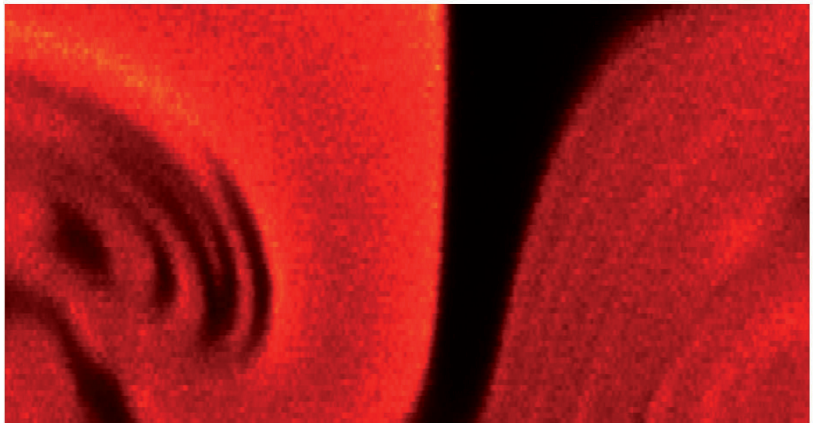

FIG. 6. $y = 4\lambda$; Saltout configuration.