Electronic Supplementary Material (ESI) for Lab on a Chip.

Inertial manipulation of bubbles in rectangular microfluidic channels

S1. Microfabrication:

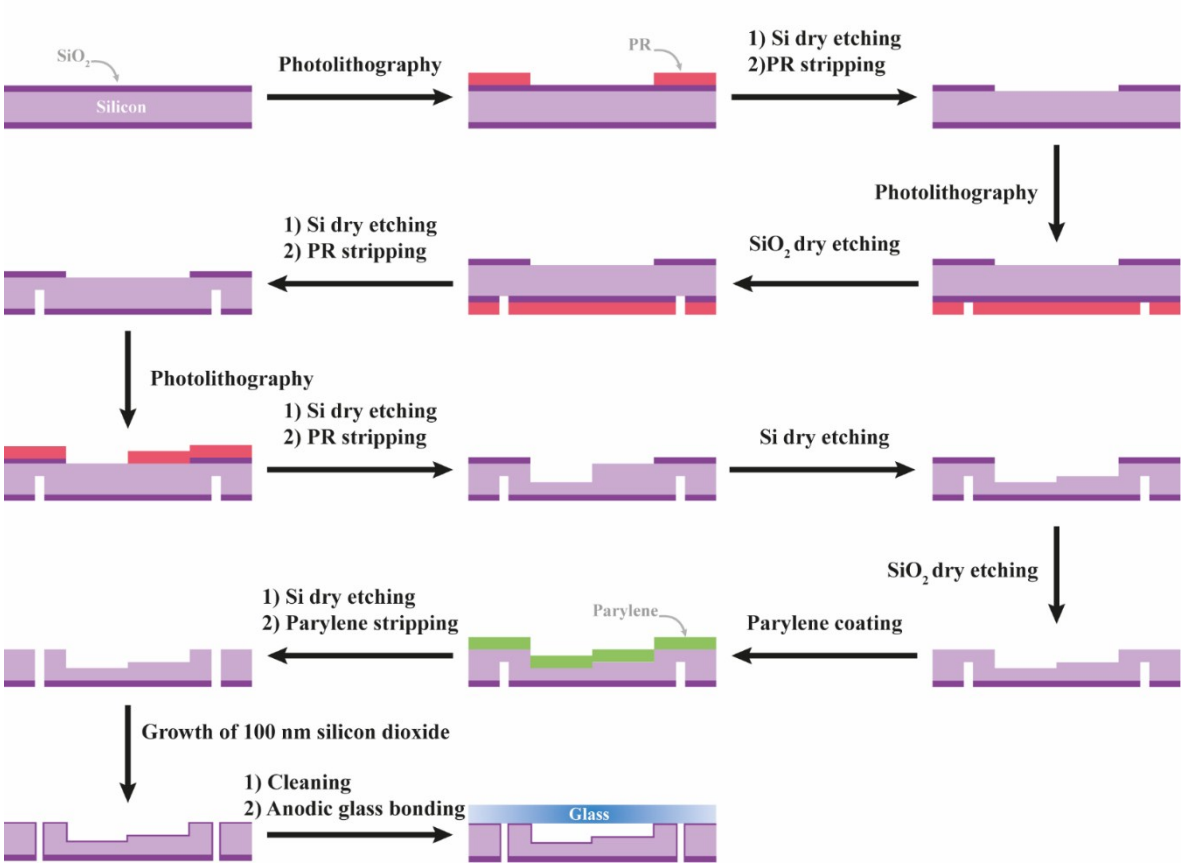

Figure S1. Microfabrication process flow

S2. Numerical simulations for different grid sizes

$Re = 9.48$ $Ca = 0.162$ $\bar{D} = 0.61$		
Grid points	Equilibrium position	U_{bubble}/U_{cl}
105407	$\bar{Y} = 0.52$ $\bar{Z} = 0.52$	0.860
220639	$\bar{Y} = 0.50$ $\bar{Z} = 0.51$	0.855
425697	$\bar{Y} = 0.50$ $\bar{Z} = 0.50$	0.853
650855	$\bar{Y} = 0.50$ $\bar{Z} = 0.49$	0.852

Table S1. Numerical simulation results for different grid sizes

S3. Equilibrium position of the bubble in the rectangular channel

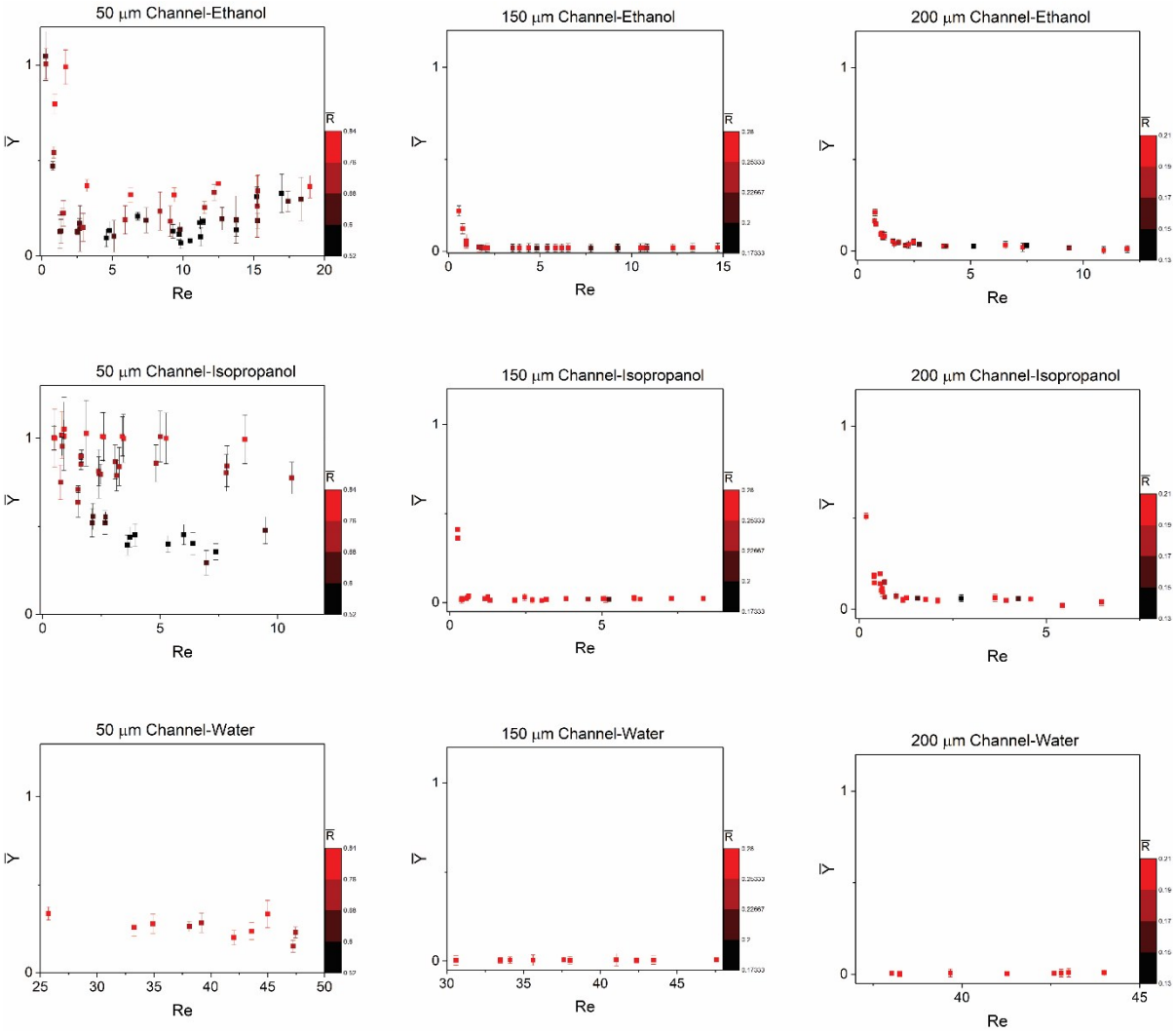

Figure S2. Diagrams of the bubble position with the error bars representing the standard deviation from the average value

S4. Equilibrium position of the bubble in the rectangular channel

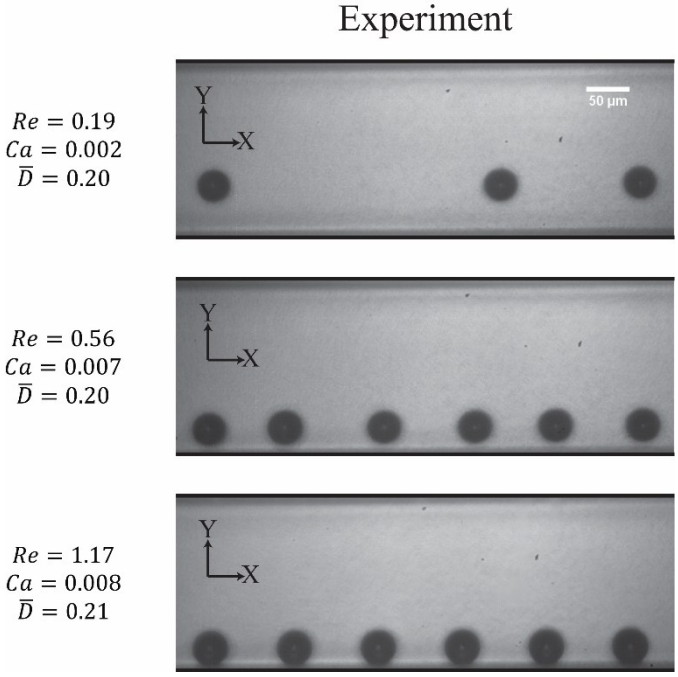

Figure S3. Diagrams of the bubble position with the error bars representing the standard deviation from the average value

S5. Experimental results for the effect of Reynolds number on the bubble position

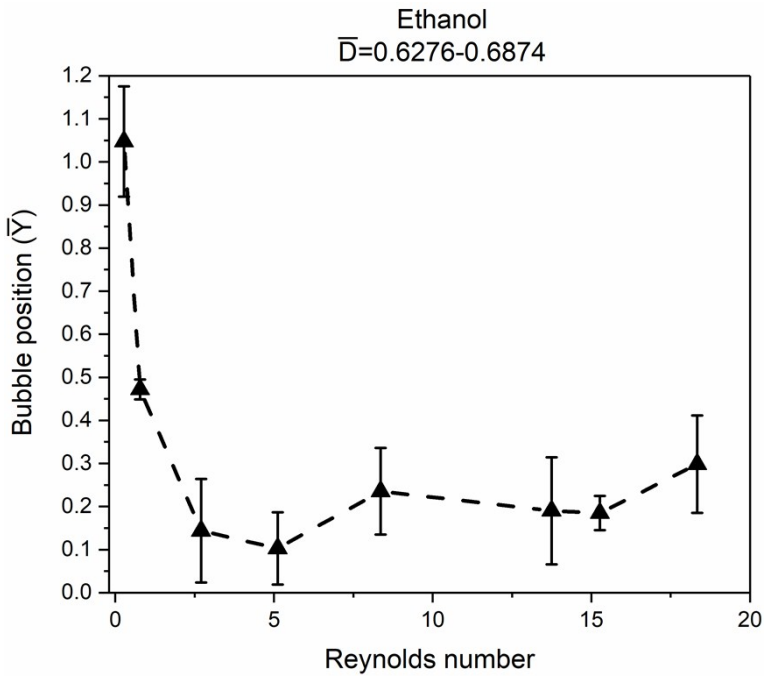

Figure S4. Effect of the Reynolds number on the bubble positoin in the square channel ($50\ \mu m$ width and depth). The continuous phase is ethanol and the error bars represents the standarad deviation from the average value. $\overline{Y} = 1$ corresponds to the bubble position at the centerline and $\overline{Y} = 0$ corresponds to the bubble position at the wall. The diameter of the bubbles $\overline{D}$ are between 0.6276 and 0.6874.

S6. Shear rate at the channel cross section

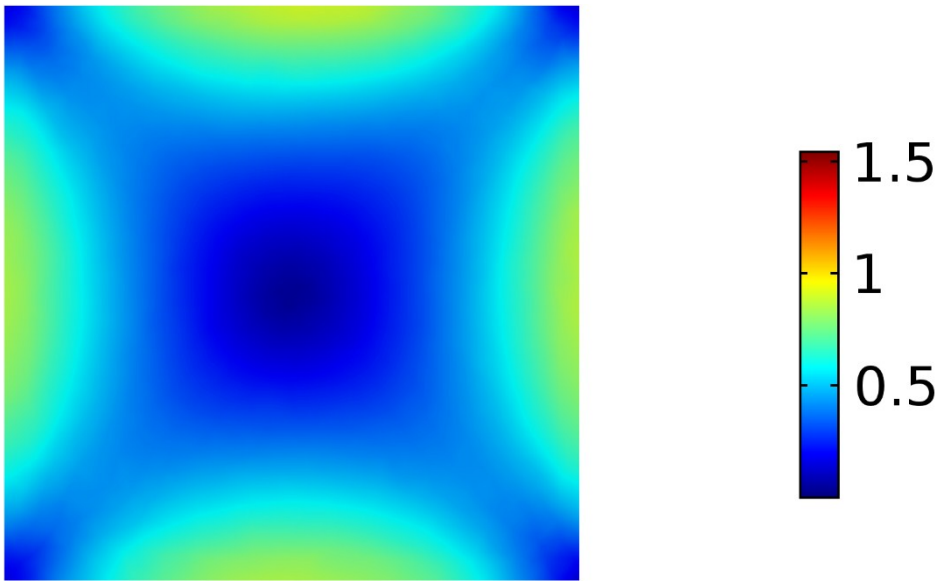

Figure S5. Shear rate at the channel cross section: Center of the channel has the smallest value of the shear rate. Also, diagonals have a smaller shear rate in comparison with the center of sidewalls. The simulation is done for $Re = 10$ in a square channel. The boundary conditions at the inlet and outlet are inlet velocity and outlet pressure, respectivley.

S7. Effect of the surfactant

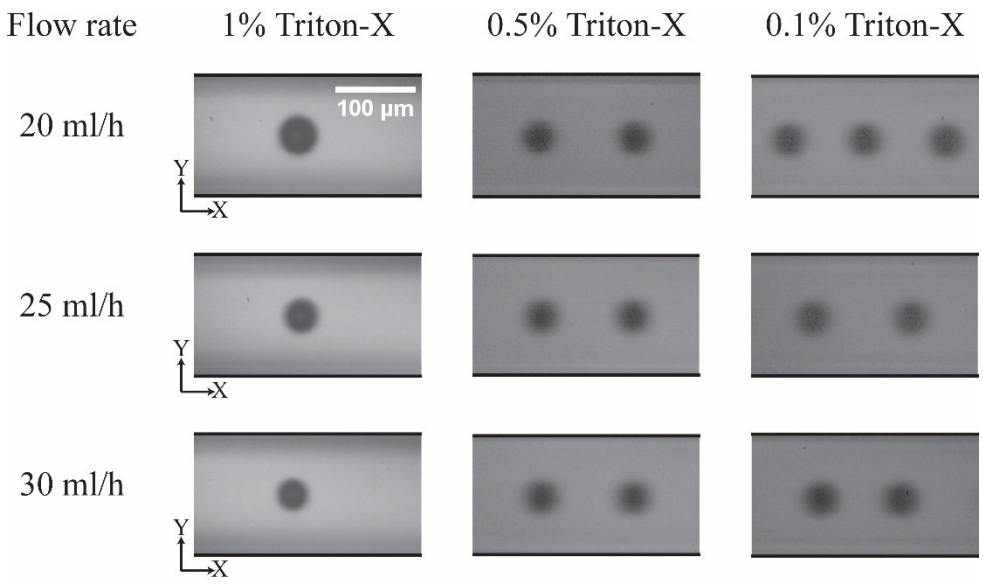

Figure S6. Effect of different Triton-X concentration on the bubble position in a channel with $150\ \mu m$ width and $50\ \mu m$ depth. Since the concentration of the surfactant is enough to cover the interface of the bubble and the liquid, there is no difference between the different concentrations.

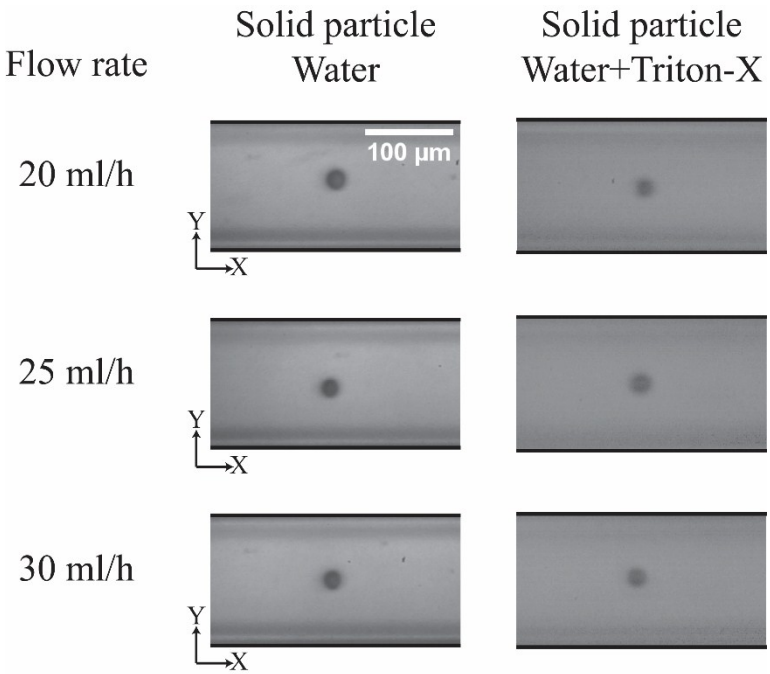

Figure S7. Effect of surfactant on the equilibrium position of a solid particle in a rectangular channel ($150\ um$ width and $50\ \mu m$ depth). The equilibrium position of the solid particle does not change by adding the surfactant to the carrier phase. Water+Triton=X liquid is 1% volumetric aqueous solution of Triton-X.