

Figure S1 Photograph of the fabricated molds on the silicon substrate.

Table S1 Parameters of functional components

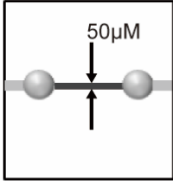
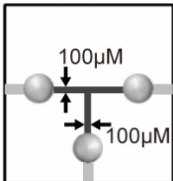
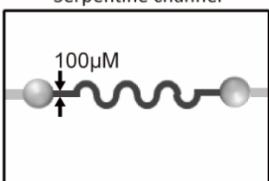
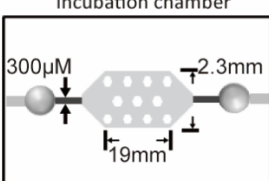
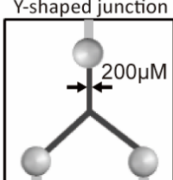
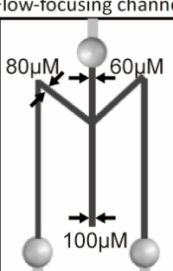
Design parameters
<p>Straight channel</p>  <p>50µM</p> <p>The diagram shows a horizontal channel with two grey spheres at its ends. A vertical double-headed arrow in the center indicates a width of 50µm.</p>
<p>T-shaped junction</p>  <p>100µM</p> <p>100µM</p> <p>The diagram shows a horizontal channel with two grey spheres at its ends. A vertical channel of 100µm width intersects it from the bottom. The width of the horizontal channel is also 100µm.</p>
<p>Serpentine channel</p>  <p>100µM</p> <p>The diagram shows a horizontal channel with two grey spheres at its ends. The channel has a wavy, serpentine path. A vertical double-headed arrow on the left indicates a width of 100µm.</p>
<p>Incubation chamber</p>  <p>300µM</p> <p>2.3mm</p> <p>19mm</p> <p>The diagram shows a horizontal channel with two grey spheres at its ends. A central chamber contains a porous medium. The chamber's width is 300µm, its length is 19mm, and its height is 2.3mm.</p>
<p>Y-shaped junction</p>  <p>200µM</p> <p>The diagram shows a Y-shaped junction with three grey spheres at its ends. The width of the horizontal stem is 200µm.</p>
<p>Flow-focusing channel</p>  <p>80µM</p> <p>60µM</p> <p>100µM</p> <p>The diagram shows a flow-focusing channel with three grey spheres at its ends. The top channel has a width of 80µm, the bottom channel has a width of 60µm, and the central channel has a width of 100µm.</p>



Figure S2 Set-up used for the leakage test of the modular microfluidic circuits. The solenoid valve is normally open and here just used as an adapter.

Fabrication of the glass reaction vessel

The glass reaction vessels (length: ~15mm) with a tip end were made from borosilicate glass capillary tubes (outer diameter: 1.0mm, inner diameter: 0.5mm). Sharp tips were produced by the glass micropipette puller (Narishige PN-30, Japan), which allows for the rapid seal.

Pre-storage of reagents

As shown in Figure S3, a measured volume of reagent solutions was dropped on a clean substrate such as the lid of the PCR tube by the pipettes. The plain end of the glass reaction vessel was inserted into the solution drop to draw the reagents by the capillary action. Then the sharp tip of the glass reaction vessel was heated for 2-3s by the alcohol burner to create a seal. Finally, the liquid was transferred from the plain end side to the tip end side of the vessel by centrifugation.

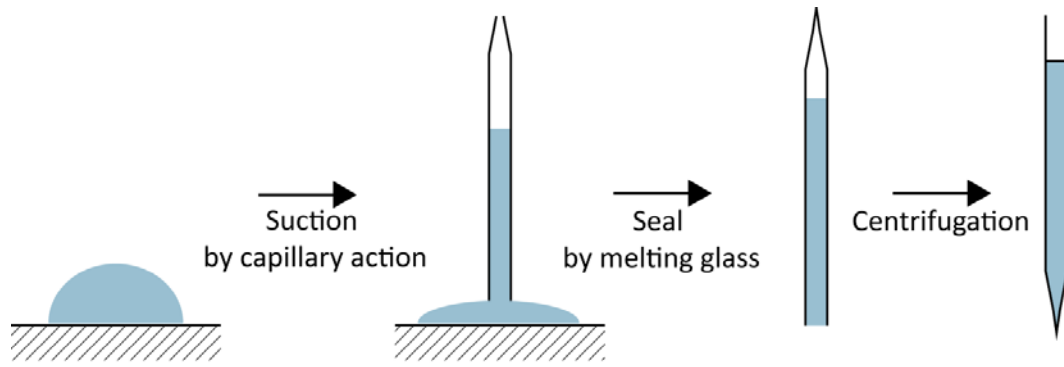


Figure S3 Process of preloading reagents