

Programmable V-type Valve for Cell and Particle Manipulation in Microfluidic Devices

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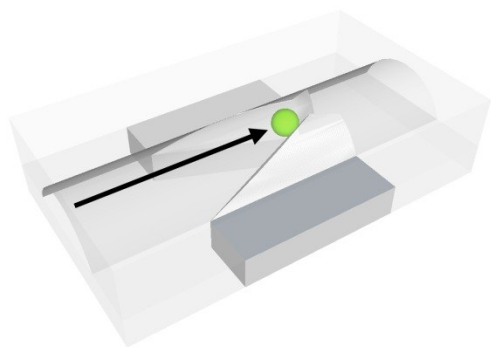
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Fig. S1 Three-dimensional schematic illustration of the operation of a v-type valve. A. Actuation of the v-type valve for particle capture and B. Deactuation of the v-type valve for particle release.

A

V-type valve on for particle capture



B

V-type valve off for particle release

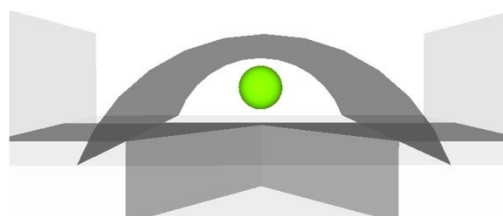
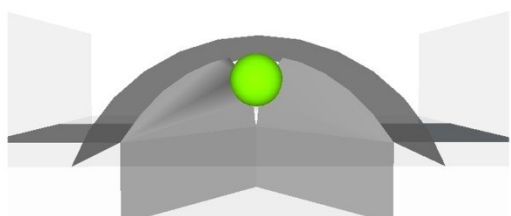
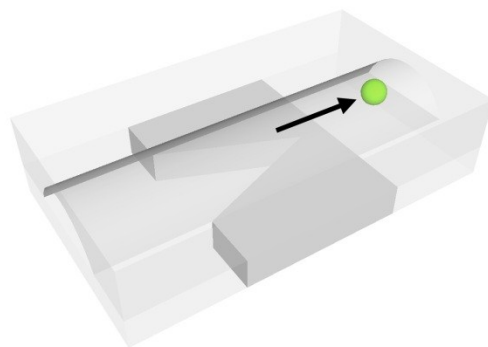


Fig. S2 Photolithographic mask designs (Clewin software) of a microfluidic device to evaluate design parameters of v-type valves and to test actuation of various v-type valves at various applied pressures.

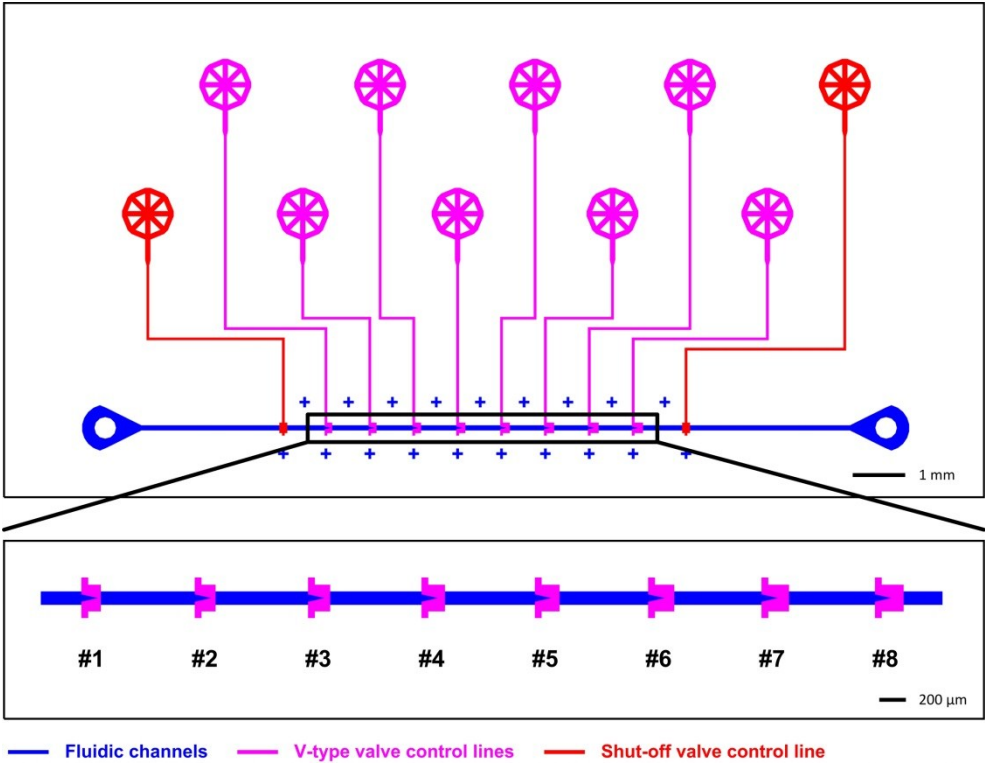
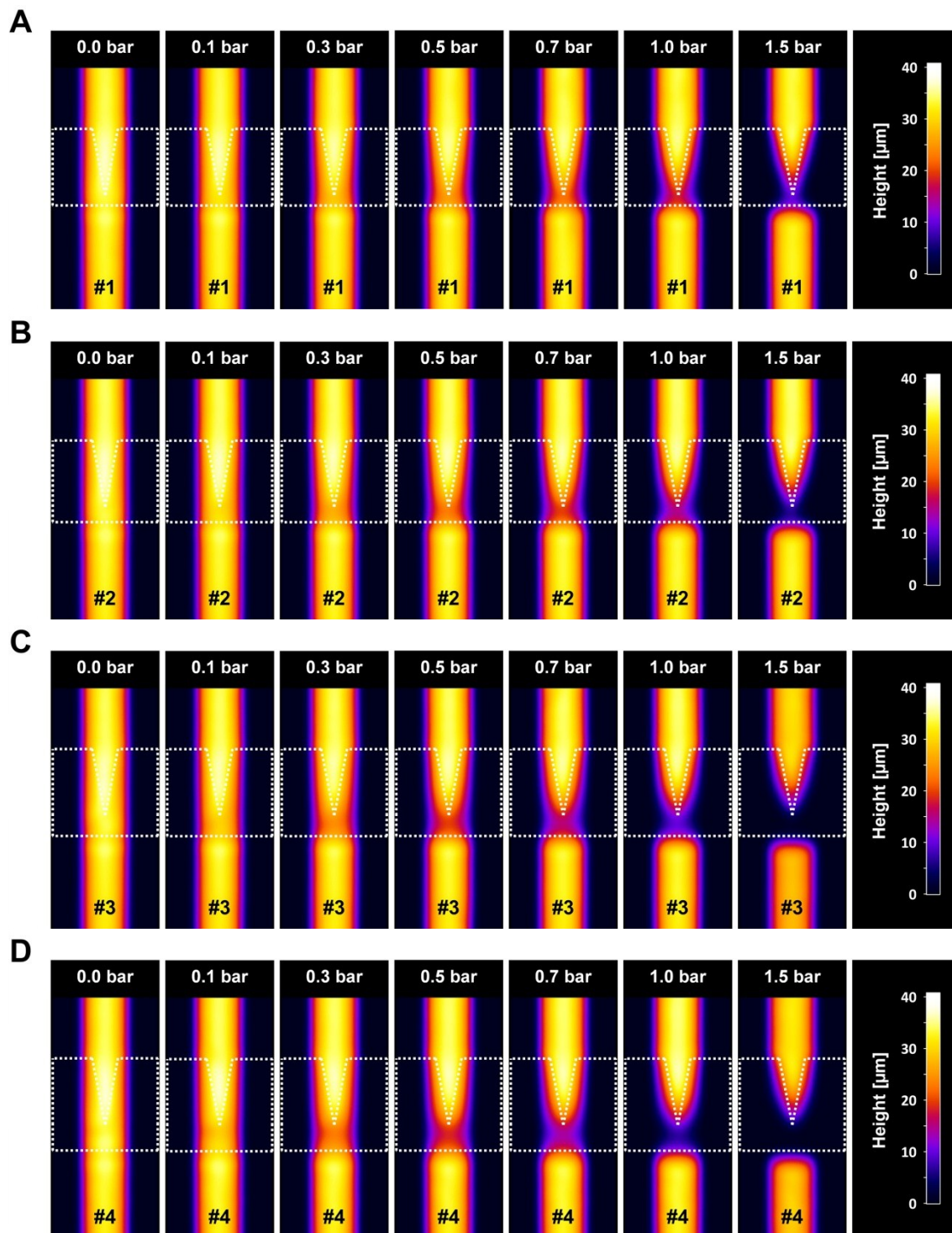


Fig. S3 Actuation of v-type valves at various applied pressures (top view). A. Design #1, B. Design #2, C. Design #3, D. Design #4, E. Design #5, F. Design #6, G. Design #7, and H. Design #8.



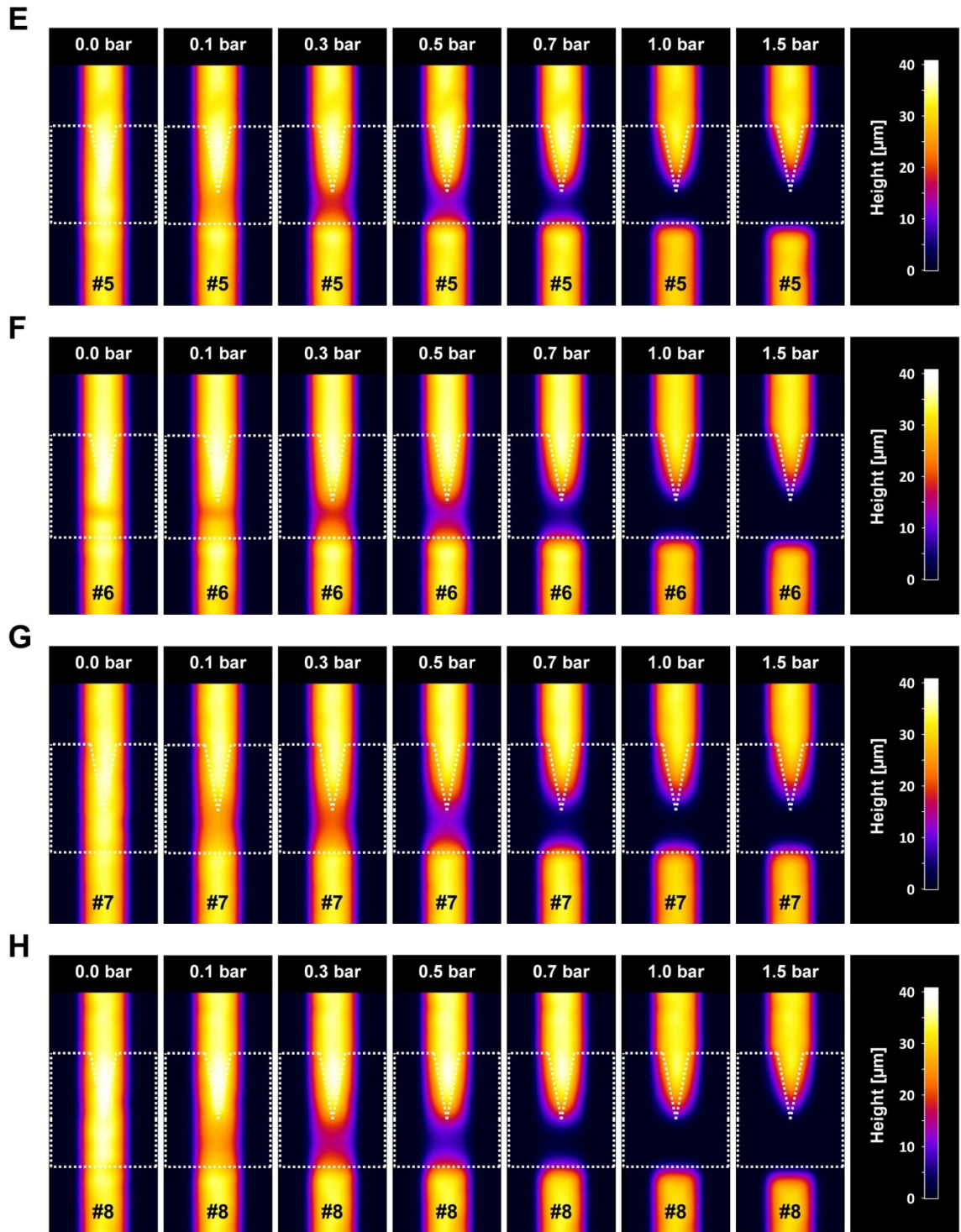
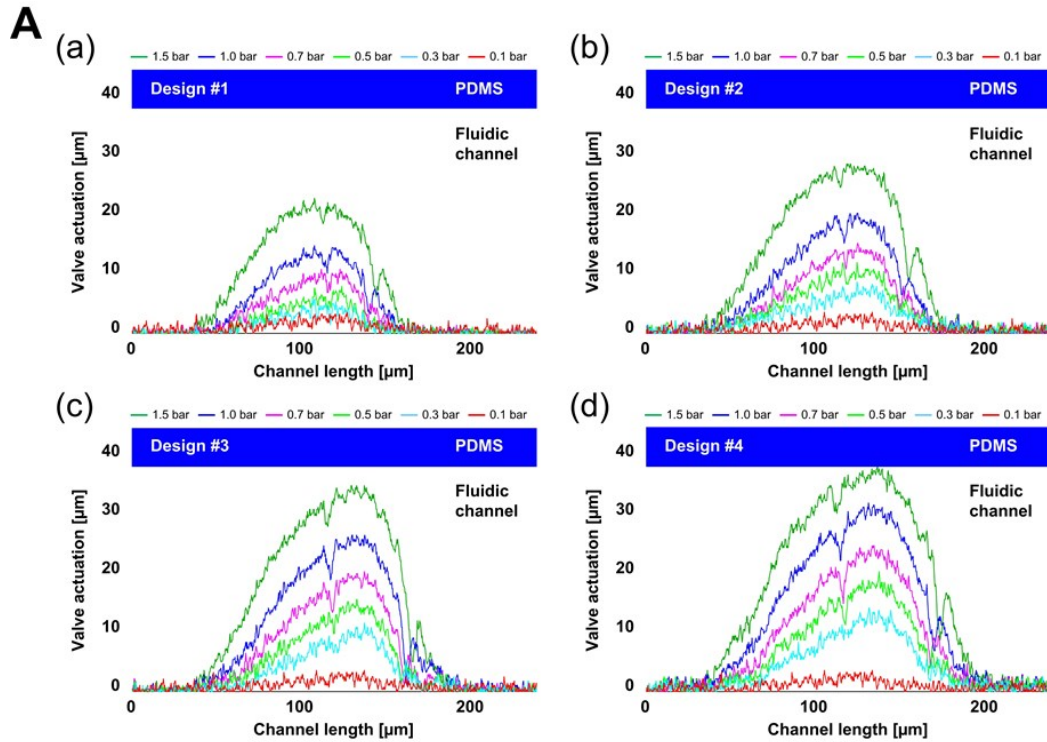


Fig. S4 A. Measurement of actuated heights of v-type valves at various applied pressures. (a) Design #1, (b) Design #2, (c) Design #3, and (d) Design #4. B. Applied pressures for capturing of \varnothing 15 μm and \varnothing 7 μm with valve design #1, #2, #3, and #4.



B

Valve design	Particle size	Applied pressure [bar]																				
		0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
#1	\varnothing 7 μm	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
	\varnothing 15 μm	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
#2	\varnothing 7 μm	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
	\varnothing 15 μm	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
#3	\varnothing 7 μm	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
	\varnothing 15 μm	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
#4	\varnothing 7 μm	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
	\varnothing 15 μm	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green

■ Pass through the valve area
 ■ Captured by the valve
 ■ No flow in the channel

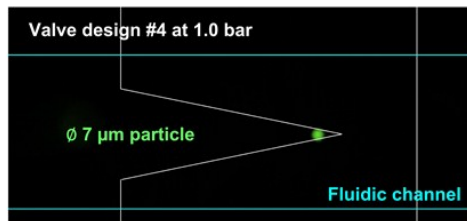
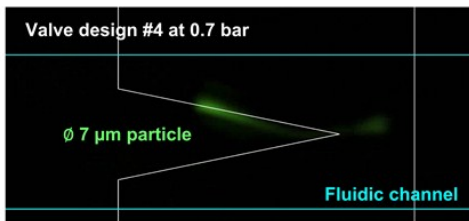


Fig. S5 Design and operation of a microfluidic device for isolation of micro-particles. A. Photolithographic mask design (Clewin software) of the device, and B. Series of operation through step-by-step images.

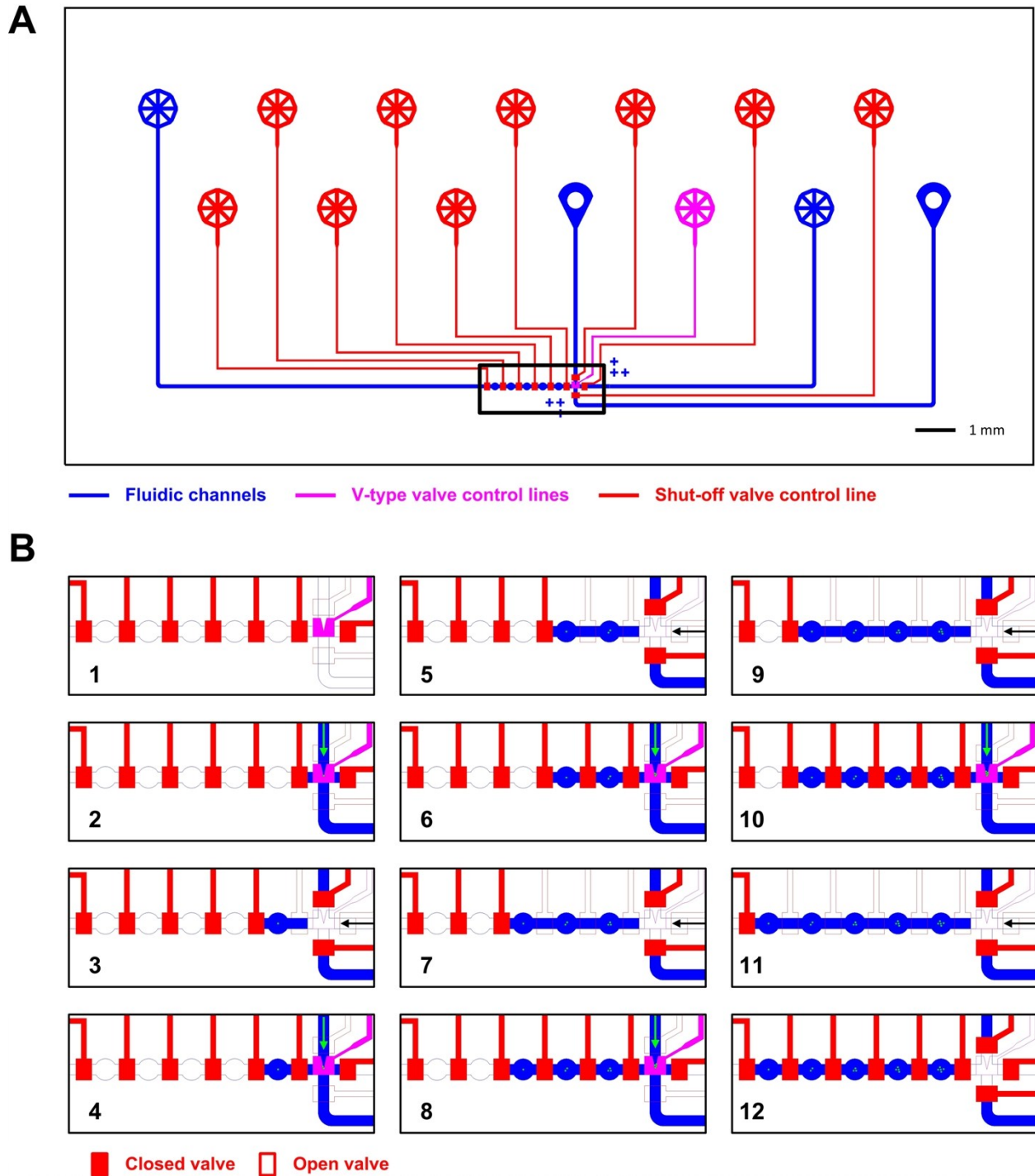


Fig. S6 Photolithographic mask designs (Clewin software) of a microfluidic device for sieving particles out of a water-phase droplet in the flow of oil phase.

