Electronic Supplementary Information

Latchable microfluidic valve arrays based on shape memory polymer actuators

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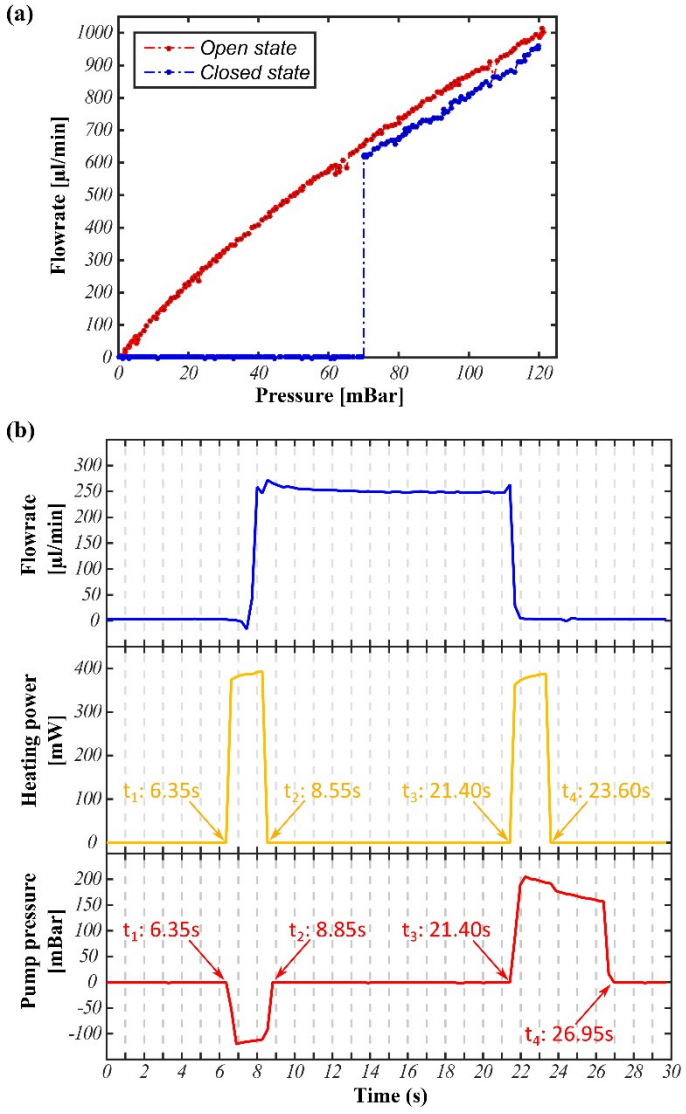

Fig S1 Single valve performance. (a) Flowrates at open and closed states vs. liquid pressure. (b) Flowrate, heating power, and pump pressure versus time. Time at which heating power and pump pressure are applied are labeled.

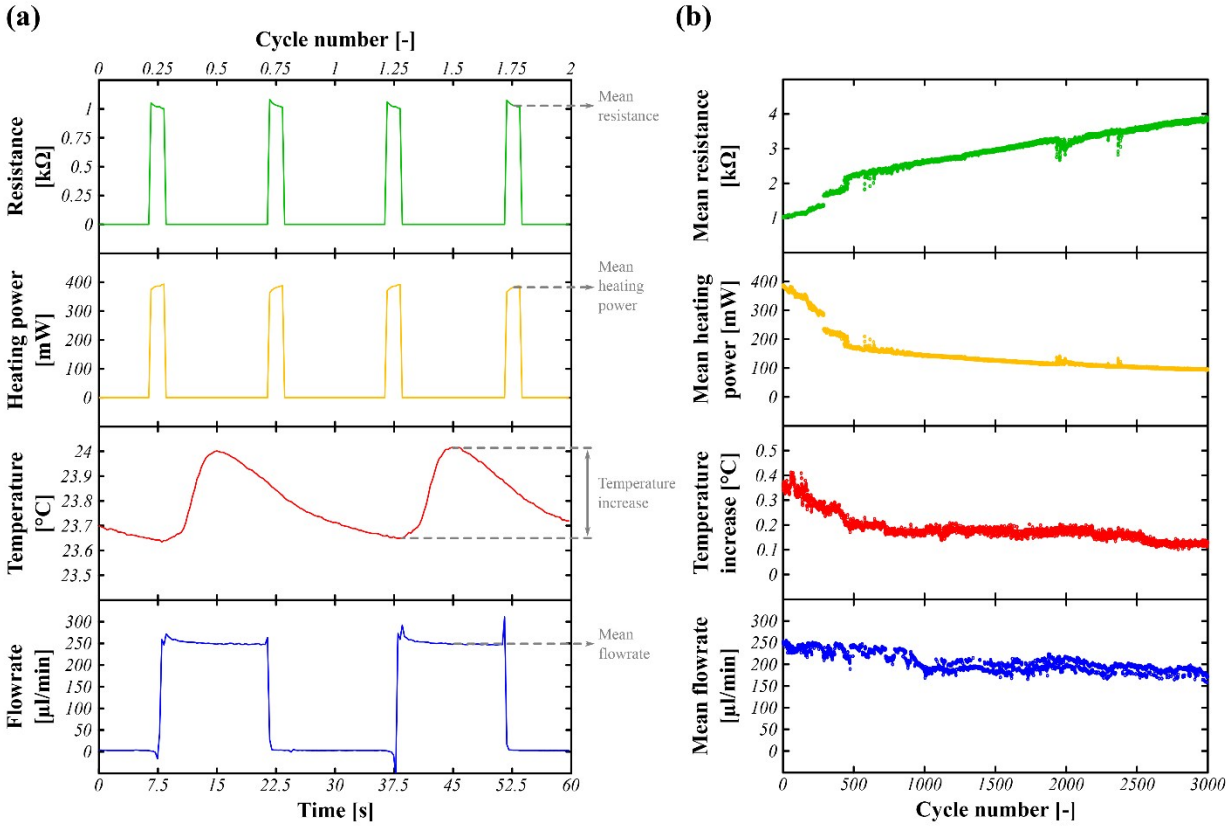

Fig S2 Cyclic aging measurement. (a) Heater electrical resistance, Joule heating power, liquid temperature, and flowrate vs. time (heater resistance and power are only measured when the heater is on). (b) Evolution over 3000 open/close cycles of the average heater electrical resistance, Joule heating power, temperature increase in liquid, and flowrate for the valve in open state, showing slow degradation of the stretchable heater.

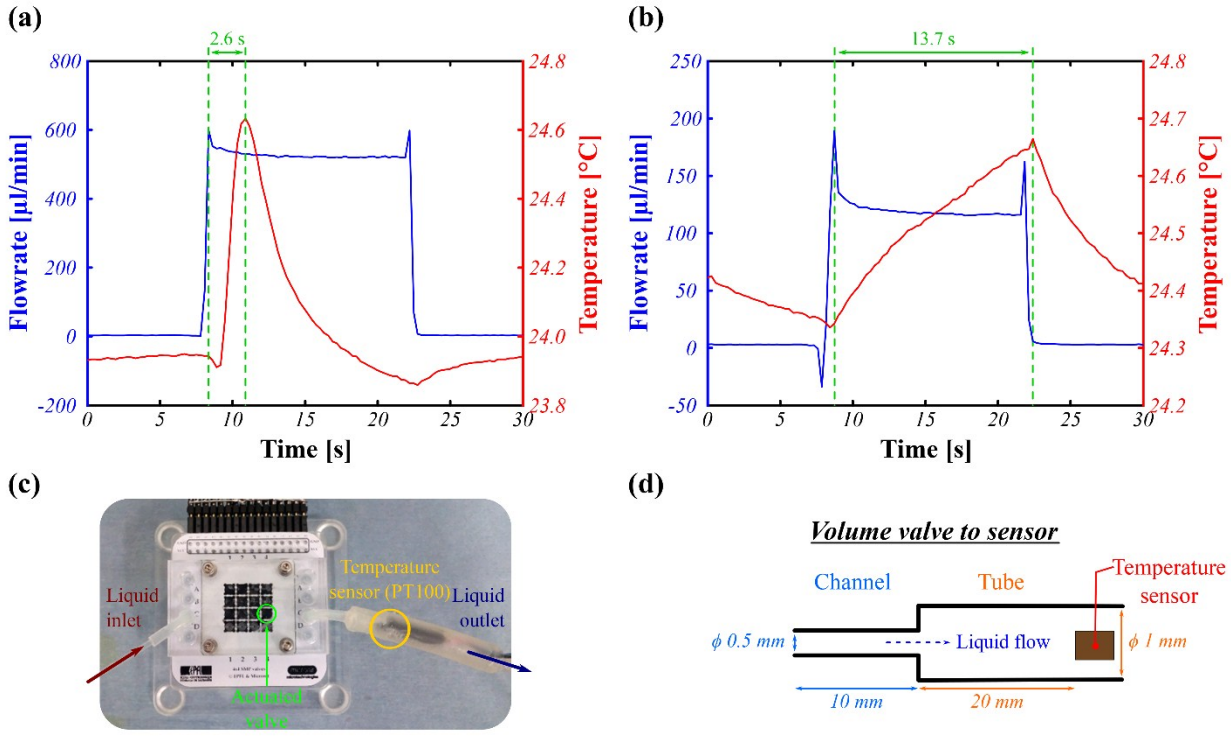

Fig S3 (a)(b)Temperature of the liquid measured 30 mm from valve outlet vs. time as the valve is actuated. For a higher flowrate we obtain a higher and shorter temperature peak than for lower flowrates. (c) Picture of the experimental setup. (d) Schematic illustration of the valve-to-sensor setup and its dimensions.

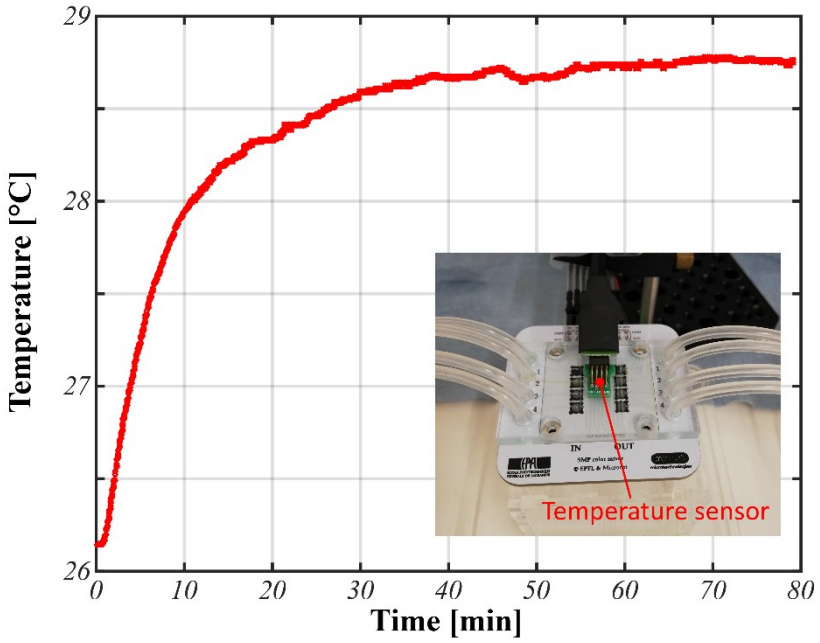

Fig S4 Temperature of valve body versus time showing less than 3 °C temperature incerase when repeatedly actuating all 8 valves for 80 minutes with an average power of 350mW.

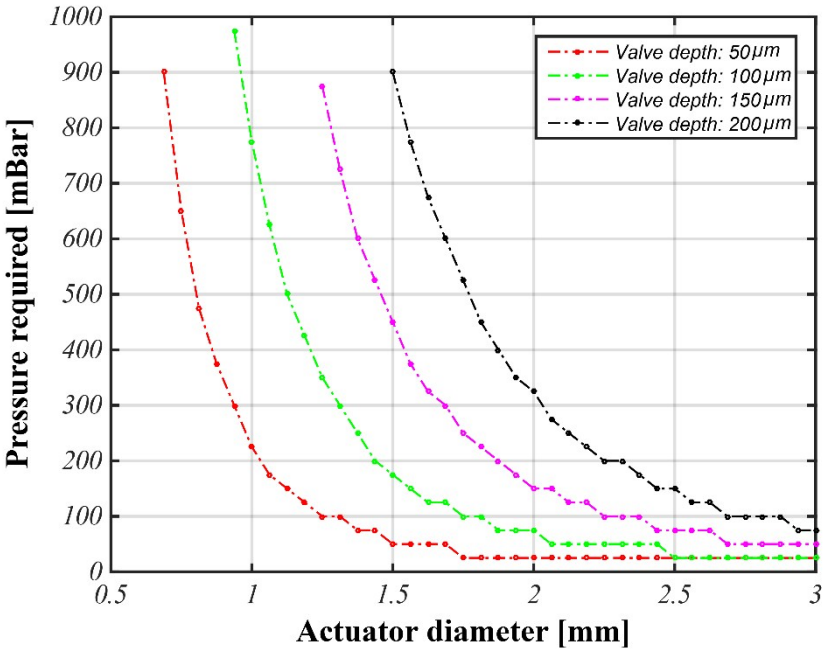

Fig S5 Computed pneuamatic pressure required to close a valve ploted as a function of actuator diameter for different valve depths.

Video S1 Movie of the color reordering using SMP valves. By switching simultaneously one inlet valve and one outlet valve, a single color is transfered at a time. When color transfer is finished, both open inlet and outlet valves are closed, both valves located at the extremities of the device are opened, and the mixing channel is rinsed to the waste container. The inlet channels reagents blue, yellow and red are reordered as red, yellow, and blue at the outlet.

Video S2 Movie of the color mixing using SMP valves. By switching simultaneously two inlet valves and one outlet valve, two colors are mixed together at a time. When mixing transfer is finished, both open inlet and outlet valves are closed, both valves located at the extremities of the device are opened, and the mixing channel is rinsed to the waste container. The inlet channels reagents blue, yellow and red are mixed to obtain green (blue+yellow), violet (blue+red), and orange (yellow+red) at the outlet.