Supporting Information

Optical-switch-enabled microfluidics for sensitive multichannel colorimetric analysis

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The molds of the control layer and the central supply layer were fabricated via UV lithography, while the switch and detection layer were fabricated using two-photon stereolithography. These molds allow the PDMS device to be replicated and assembled.

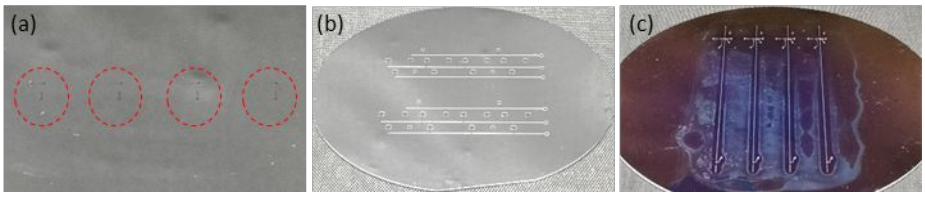


Fig. S1 Microfluidic chip molds on silicon wafers. (a) The control layer, (b) The central supply layer, (c) The switch and detection layer. It should be noted the variable color of the wafer surface in (c) is likely due to residual photoresist on the mold surface.

Optical and microvalve structures were printed using two-photon stereolithography using high-resolution printing parameters.

Fig. S2 Key structures printed in the photoresist prior to development. (a) fiber groove, (b) switch channel, (c) detection channel, (d) microlens and (e) valve structure. Scale bars: 100 μm.

The working mechanism of the pneumatic microvalves is shown in **Fig. S3**. Via programmable control of the driving pressure and control pressure, the microvalve can be closed or opened in a programmable manner.

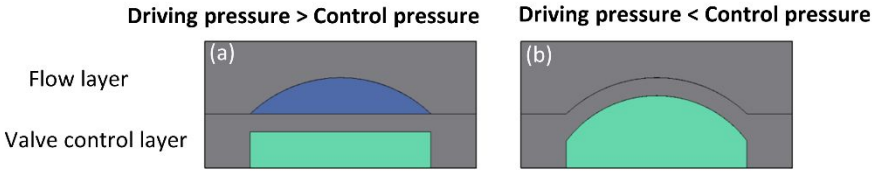


Fig. S3 Schematic representation of the working states of the pneumatic valve, (a) valve open; (b) valve closed.

Fig. S4 reports optical switching performance at frequencies of 1.0 Hz, 0.625 Hz and 0.25 Hz over 120 cycles of operation.

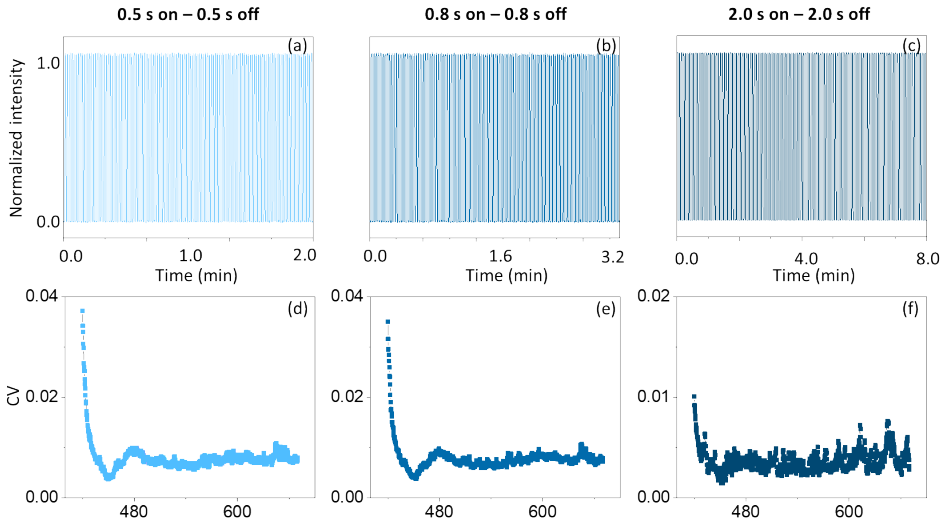
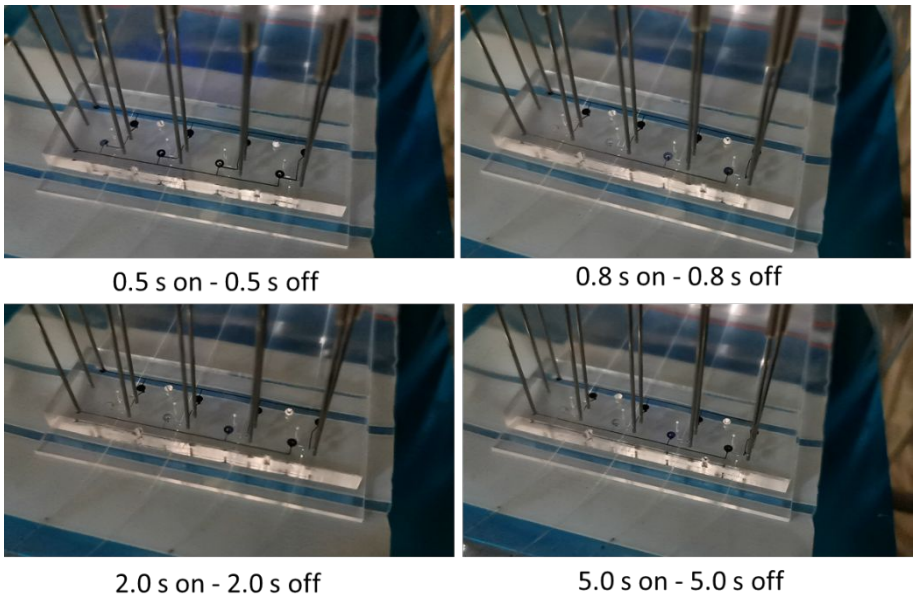


Fig. S4 Switching stability over 120 cycles for three switching frequencies: (a) 0.5 s on - 0.5 s off (1.0 Hz); (b) 0.8 s on - 0.8 s off (0.625 Hz); (c) 2.0 s on - 2.0 s off (0.25 Hz). Data shown correspond to the light intensity at 550 nm normalized to the average light intensity in the on-state in each case. (c), (d) and (f) present corresponding light intensity CVs during the optical switching process (420 - 670 nm).

Video S1 shows the real-time printing of key structures via two-photon stereolithography.

Video S1 Printing the valve and optical structures.

Video S2 shows the movement of light-transmitting and light-blocking fluids at various optical switching frequencies.



Video S2 Sequenced “on-state” and “off-state” for each detection channel

Video S3 shows the induced changes of light emitted from the output fiber.

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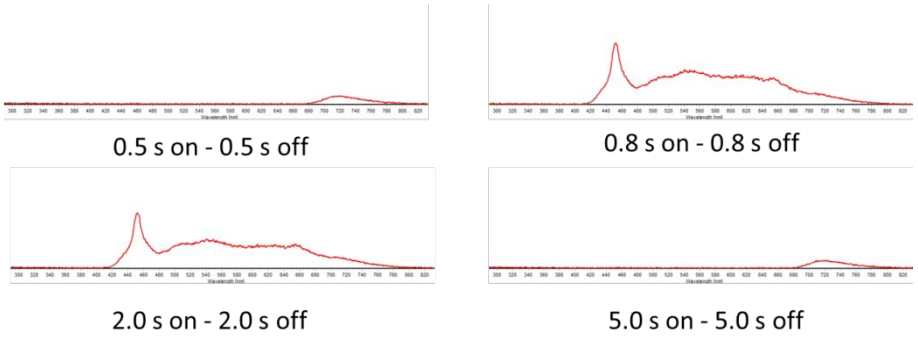
44 **Video S3** Induced changes of output fiber states

45 **Video S4** shows real-time spectral changes of as a result of the optical switching at various

46 frequencies.



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48 **Video S4** Periodic spectral changes of spectrum during operation.