

Supporting Information

Microfluidic static droplet generated quantum dot array as color conversion layer for full-color Micro-LED display

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Fabrication of SDA Microfluidic Chip

The SDA microfluidic chip preparation process is shown in Fig.S1. Firstly, SU8 photoresist templates with SDA patterns were prepared on polished silicon wafers by standard lithography, and then PDMS and curing agent were mixed and stirred according to the mass ratio of 10:1. The mixture's bubbles were vacuumed out before being put over the lithography template and heated at 80 °C for 60 minutes. After cooling, punch holes in the liquid injection port and outlet with a needle, then cut the PDMS into the required size with a blade, then slowly remove the glass substrate and put it into an oxygen plasma cleaning instrument for surface modification (O₂, 200sccm, 120W, 60s). After taking out, the two sides are closely combined and given a certain pressure, and then put into the oven again and heated at 80 °C for 60 minutes. After cooling, the microfluidic chip with SDA pattern can be obtained. However, the porous PDMS structure caused solvent absorption and left a layer of QD solute, resulting in dry cracking of QD pixels, which typically occurs two days after fabrication. Increased microchannel depth or the formulation of higher-concentration QD solutions can add more solute to the QD solution and lessen or completely eliminate pixel cracks.

Selection of transparent sealing liquid

It should be noted that the selection of transparent sealing liquid must have several conditions. Firstly, it is immiscible with the QD solution, so that the QDs will not remain on the inner wall of the microchannel. Secondly, the sealing liquid should be nearly consistent with the refractive index of PDMS material, so as to ensure that when

the QDs is excited, the internal reflection caused by the difference in refractive index will not occur in the chip, and the optical crosstalk can be reduced. Finally, it is necessary to ensure that the sealing liquid has a suitable viscosity, so that after the QD solvent evaporates, the sealing liquid is not easy to flow into bridges and cause damage to the QDs in wells. Dow Corning medical silicone oil is selected as the transparent sealing liquid, with the refractive index of 1.4~1.41, which is basically the same as that of PDMS($n=1.406$), and the viscosity of 350cs, which can meet the experimental requirements.

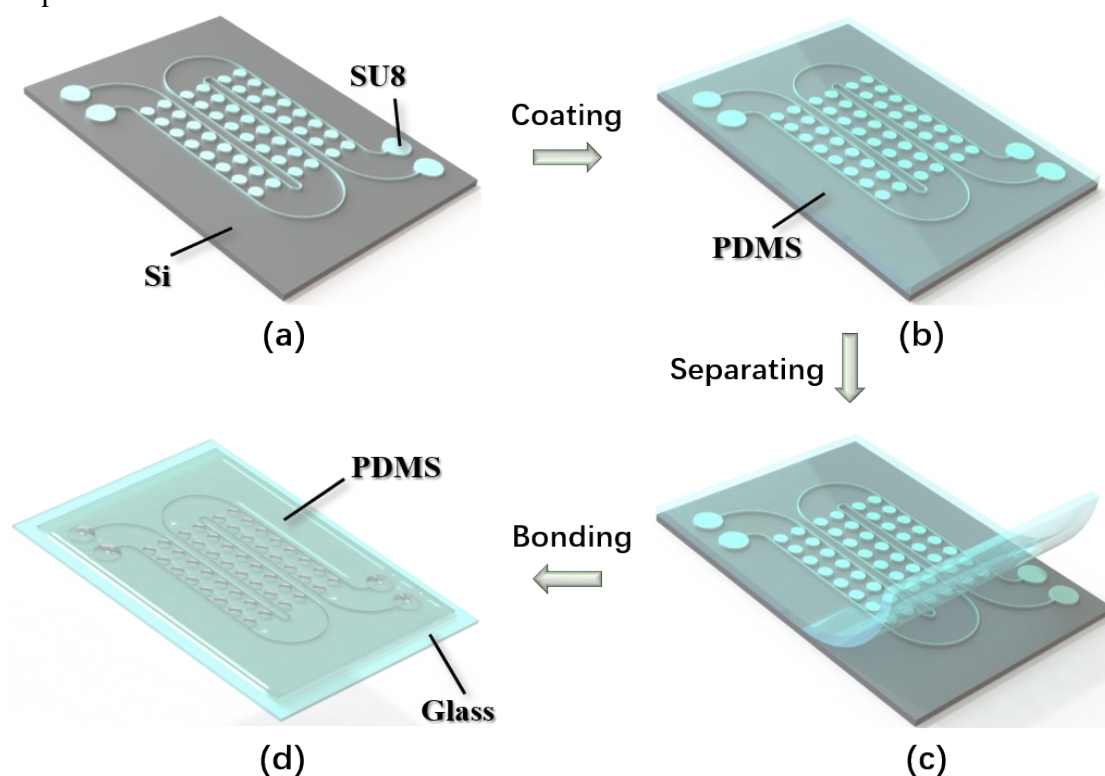


Fig.S1 (a-d) Preparation of SDA Microfluidic Chip.

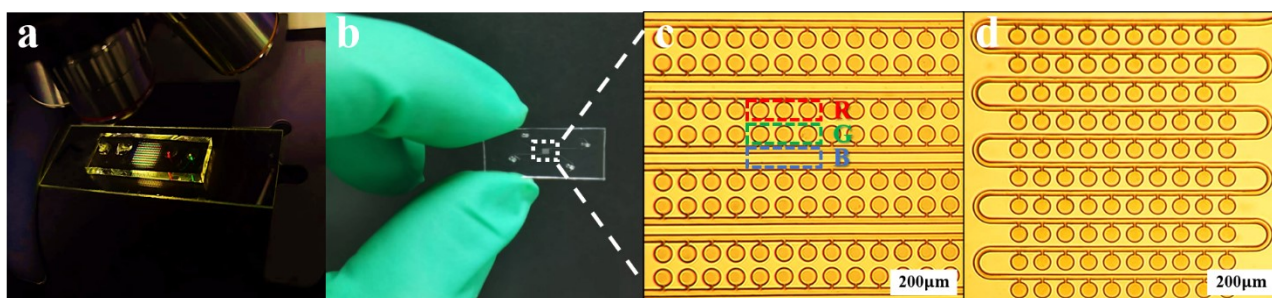


Fig.S2 Macroscopic view of (a) the pixel size 90 μm dual-color QDCCL excited by UV light and (b) SDA microfluidic chip. Optical micrograph of 50 μm (c) dual-color and (d) monochromatic SDA pattern.