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Nano structuring of silicone elastomers for optical applications

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Color pixels composed of plasmonic nanostructures provide a highly promising approach for new display technologies, capable of vivid, robust coloration and incorporating the use of low-cost plasmonic materials.[1] Silicone elastomers, usually in the shape of polydimethylsiloxane (PDMS) elastomers, are commonly used to replicate structures mainly on the micro scale but recently also on the nano scale. PDMS dielectric elastomers are promising materials and have the potential to be used in novel applications, especially due to the ability to be formed into complex shapes and still provide actuation.[2] This project deals with the development of PDMS based silicone elastomers with the ability to easily replicate structures on the nano scale of the silicon stamps (**Fig.1 a-e**). After obtaining the PDMS reproduction, the surface with plasmonic colouring due to siliver depostion on a nanopillar array can change color if the pillars height is altered through the elastomer actuation (**Fig.2**). The color change response depends on the mechanical and dielectric properties of the PDMS dielectric elastomers. This design strategy has the potential to open the door for next-generation flexible photonic devices for a wide variety of visible-light applications.

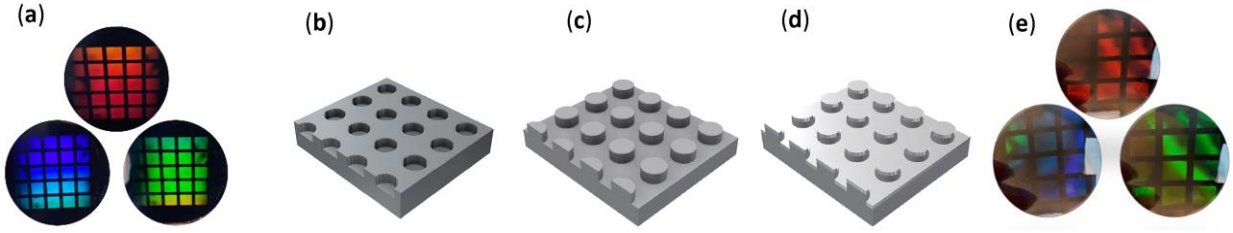

Figure 1. The silicon stamps (a) with nanopillar array (b), PDMS reproduction (c), PDMS after silver deposition (d), PDMS elastomers imprinted nanopillar array and deposited with silver electrodes (e).

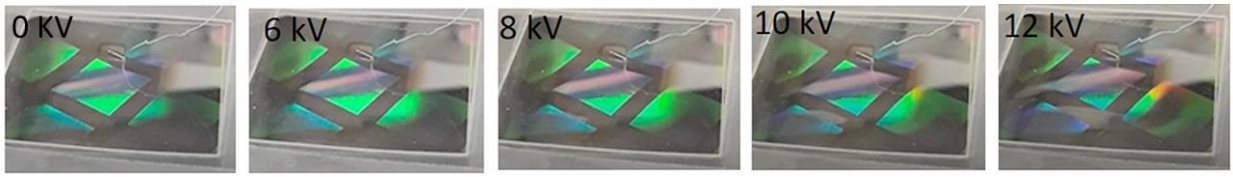

Figure 2. Actuation test of the silicone elastomer film with different applied voltages.

References

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