Downloaded from orbit.dtu.dk on: Apr 26, 2024

DTU Library

Nano structuring of silicone elastomers for optical applications

Yu, Liyun; Eriksen, Sofie Helvig; Kristensen, Anders; Skov, Anne Ladegaard

Publication date:
2019

Document Version
Publisher's PDF, also known as Version of record

Link back to DTU Orbit

Citation (APA):
Yu, L., Eriksen, S. H., Kristensen, A., & Skov, A. L. (2019). *Nano structuring of silicone elastomers for optical applications*. Abstract from 12th International Workshop on Silicon-Based Polymers (ISPO19), Kiryu, Japan.

General rights
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Nano structuring of silicone elastomers for optical applications

Liyun Yu[a], Sofie Helvig Eriksen[a], Anders Kristensen[b] and Anne Ladegaard Skov*[a]

[a]Danish Polymer Centre, Department of Chemical and Biochemical Engineering, Technical University of Denmark, Søltofts Plads 227, 2800 Kgs. Lyngby, Denmark; [b]Department of Health Technology, DTU, Ørsteds Plads 344, 2800 Kgs. Lyngby, Denmark

**al@kt.dtu.dk; phone +45 45252825; fax +45 45882258*

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.

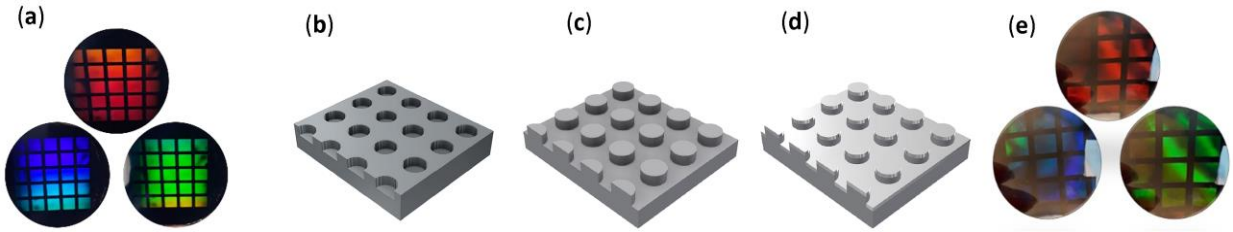

Figure 1. The silicon stamps (a) with nanopillar array (b), PDMS reproduction (c), PDMS after silver deposition (d), PDMS elastomers imprinted nanopillar array and deposited with silver electrodes (e).

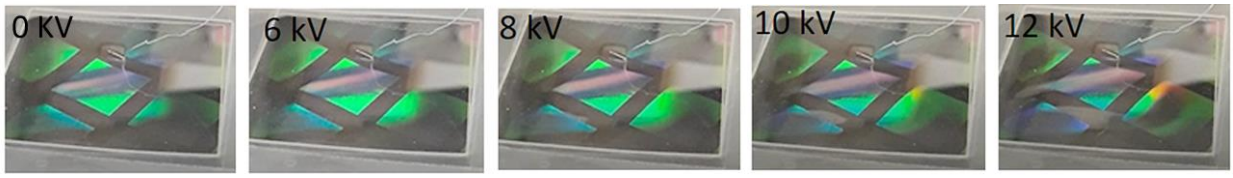

Figure 2. Actuation test of the silicone elastomer film with different applied voltages.

References

[1] M.L. Tseng, J. Yang, M. Semmlinger, C. Zhang, P. Nordlander, N.J. Halas. *Nano Lett.* **2017**, *17*, 6034-6039.

[2] F.B. Madsen, A.E. Daugaard, S. Hvilsted, A.L. Skov. *Macromol. Rapid Commun*. **2016**, *37*, 378-413.