

## Electronic Supplementary Information

### Light-Deformable Dynamic Surface Fabricated by Ink-jet Printing

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### Characterization of glass transition Temperature ( $T_g$ ) of LCN :

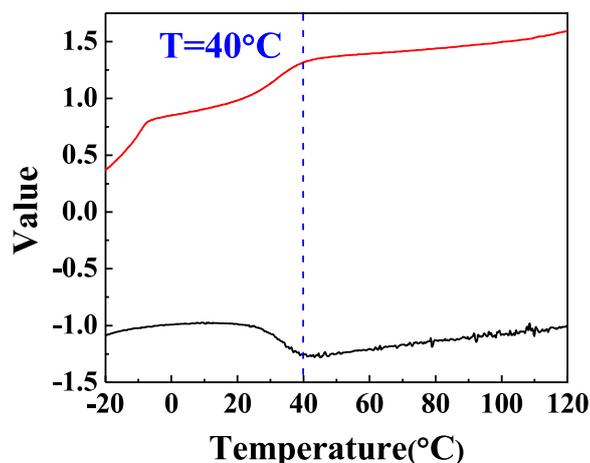


Figure S1. The DSC curve of the LCN film.

### Measurement of the time from cis- to trans-azobenzene :

We used time-mode of UV-Vis (Lambda 950 PerkinElmer) to measure the recovery time of cis-azobenzene to trans state at room temperature. Y-axis indicates absorbance of cis-azobenzene at 450 nm. To compare the recovery time of free azobenzene monomer and azobenzene molecular fixed in liquid crystal network (LCN), we prepared two different samples but controlled the same quantity of cis-azobenzene at the beginning. The two samples were cis-azobenzene monomers dissolved in Tetrahydrofuran (THF) and activated liquid crystal network hemispheres array, respectively. As shown in Figure S2, the two samples had the same initial value of absorbance, and spend several hours more than eight hours to recover to trans-state. Moreover, it took longer time for cis-azobenzene molecular fixed in LCN to than the free monomers.

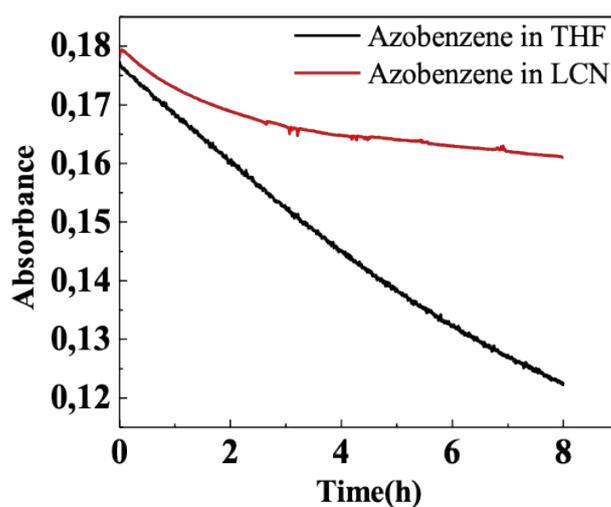
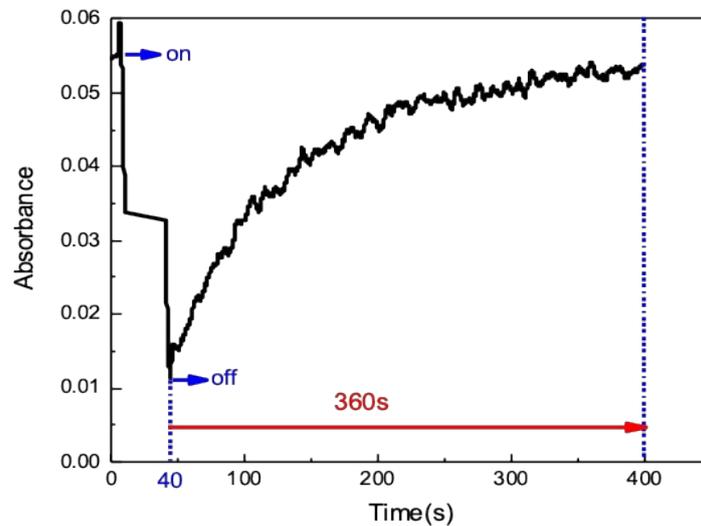


Figure S2. Comparison of the time from cis- to trans-Azobenzene in THF and in LCN at Room Temperature. (Y-axis indicates absorbance of cis-azobenzene at 450 nm)

We used time-mode of UV-Vis (Shimadzu, UV-3102 PC) to measure the recovery time of cis-azobenzene to trans state at 100 °C. Y-axis indicates absorbance of trans-azobenzene at 365 nm. As shown in Figure S3, it spends just 360s to recover to trans-state.



**Figure S3.** The time from cis- to trans-Azobenzene in LCN at 100 °C.

(Y-axis indicates absorbance of trans-azobenzene at 365 nm)

### **Process of copying the surface topography of deforming hemispheres :**

We followed the Liu's replication method <sup>1</sup> and designed a process of copying the surface topography of deforming hemispheres. As shown in Figure S4, prior to activation, the liquid PDMS was poured on the substrate to cover the LCN hemispheres surface. Then we used UV light source to activate the LCN hemispheres, while PDMS was cured complies with the process of hemispheres deformation process. In order to cure the PDMS in shorter time, the deformation process was performed at a high temperature around 100 °C for 15 min that liquid PDMS can be fully cured and copy the surface topography of deforming hemispheres. After switching off the UV light, we easily separated solid PDMS from the surface of hemispheres. Lastly, the PDMS mold and deformed hemispheres were characterized by confocal 3D profiler (DCM8 3D Profilometer).

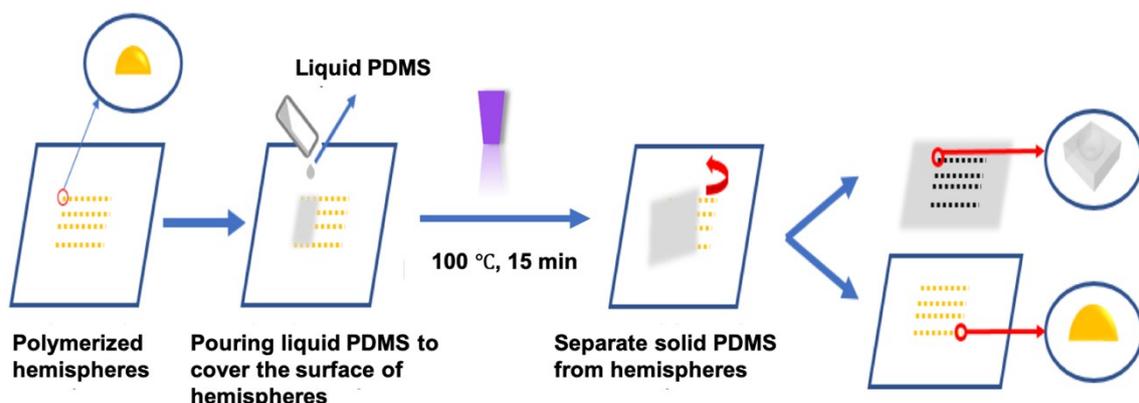


Figure S4. Process illustration of using PDMS to copy the surface topography of deforming hemispheres.

### Process of density change measurements of hemispheres :

We followed the Liu's density measurement method <sup>1</sup> and designed a process for LCN hemispheres. The polymerized hemispheres were removed from the substrates by immersing in a salt solution and then separate by ultrasonic vibration. In order to let the LCN hemispheres suspended in the salt water, the density of the salt water was carefully adjusted to 1.27 g cm<sup>-3</sup>. This salt water with LCN hemispheres was filled into a cell with 480 μm gap. Particularly, the cell was placed between crossed polarizer to make the hemispheres easier to be observed according to their birefringence property. The movement of hemispheres under UV irradiation was checked from one side of cell with a cell phone camera equipped with a 90-magnification lens.

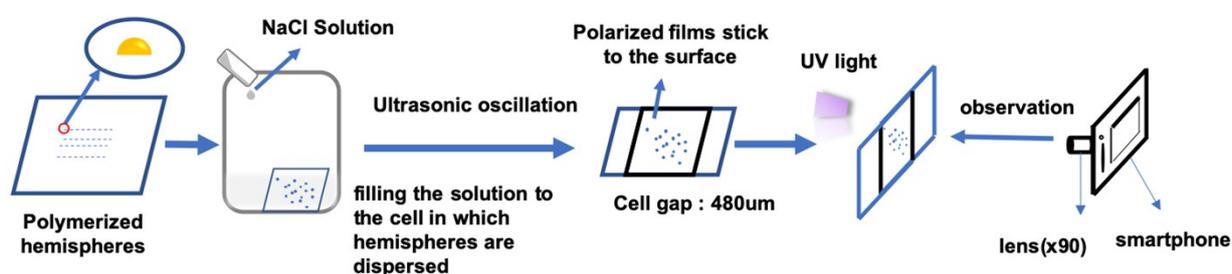


Figure S5. Process illustration of making free-standing hemispheres in NaCl solution and observing the movement of them with a magnification lens

### Influence of deformation time on the deformation ratio :

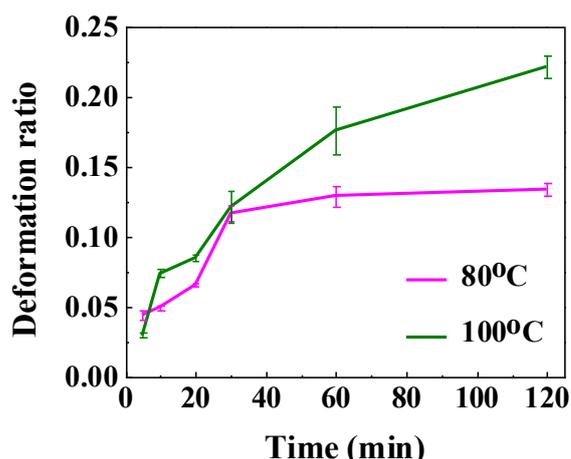


Figure S6. Influence of deformation time on the deformation ratio at 80 °C and 100 °C with 400 mW cm<sup>-2</sup> UV light irradiation.

### Reference

1. D. Liu, C. W. M. Bastiaansen, J. M. J. den Toonder and D. J. Broer, *Macromolecules*, 2012, **45**, 8005-8012.

