Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supporting Information

Biaxial stretchable liquid crystal light scattering display based on uniform energy dissipating non-oriented assemble gel networks

Qinqing Du, Tianyu Shan, Junnan Du, Huiwen He, Meng Ma, Yanqin Shi, Si Chen, Xu Wang**

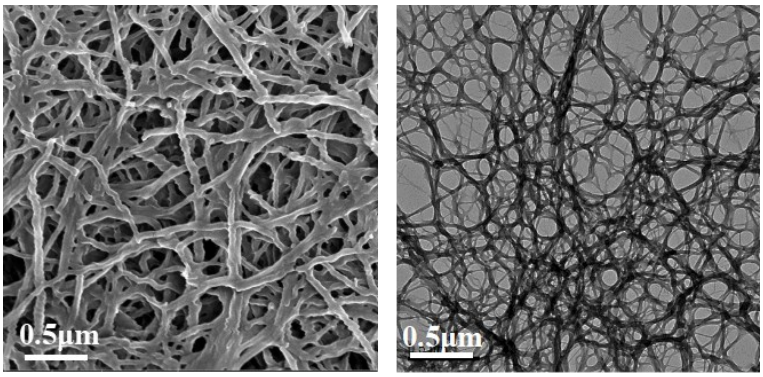

Figure S1: SEM and TEM images of POSS core gelator assembled in liquid crystal (the TEM image is reproduced with permission.[2] Copyright 2017, American Chemical Society)

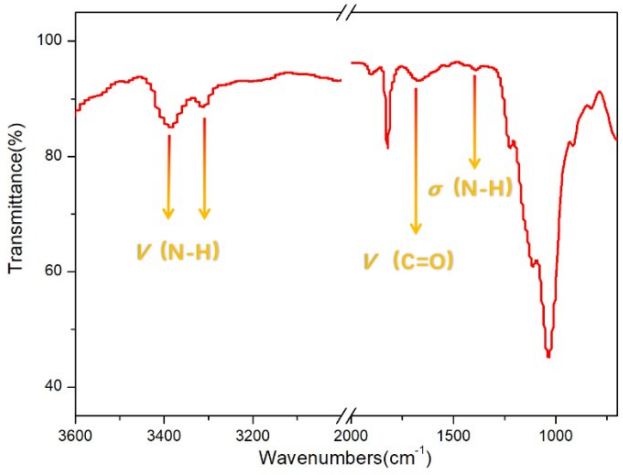

Figure S2: FT-IR spectra of gelator assembled in liquid crystal

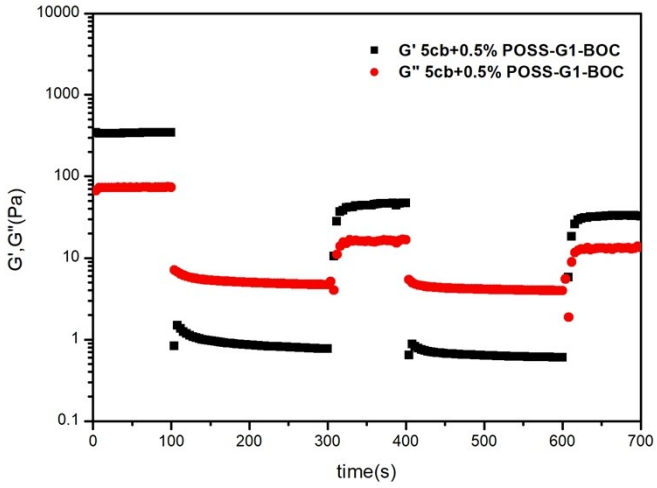

Figure S3: Rheological measurement of POSS-G1-Boc gel

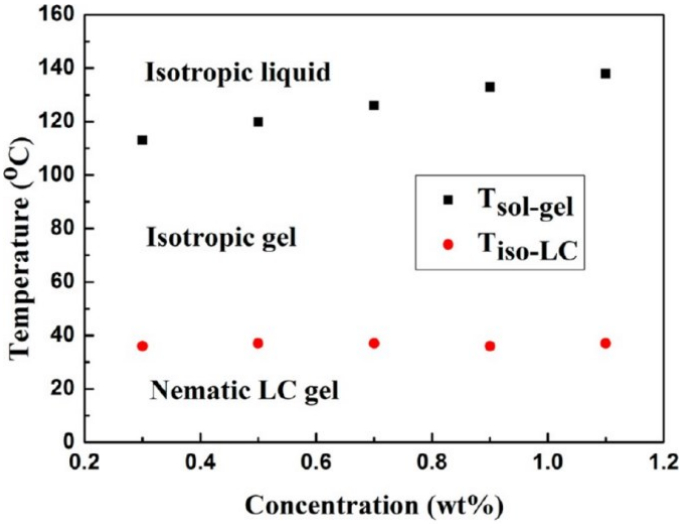

Figure S4: Sol−gel and phase transition temperature of the 0.3/0.5/ 0.7/0.9/1.1 wt % POSS-G1-Boc/5 wt % 2Azo2/5 wt % phosphor/ 5CB LC gel.

Reproduced with permission.[2] Copyright 2017, American Chemical Society.

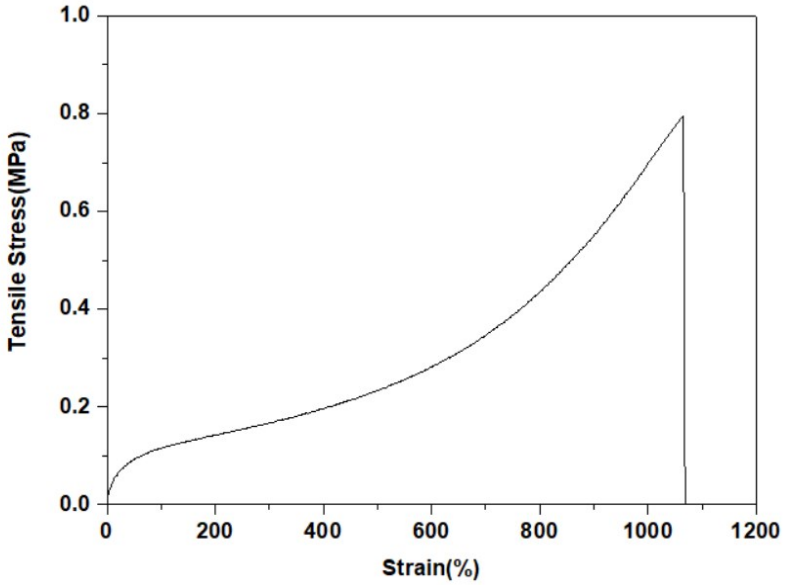

Figure S5: Mechanical properties of the supporting film

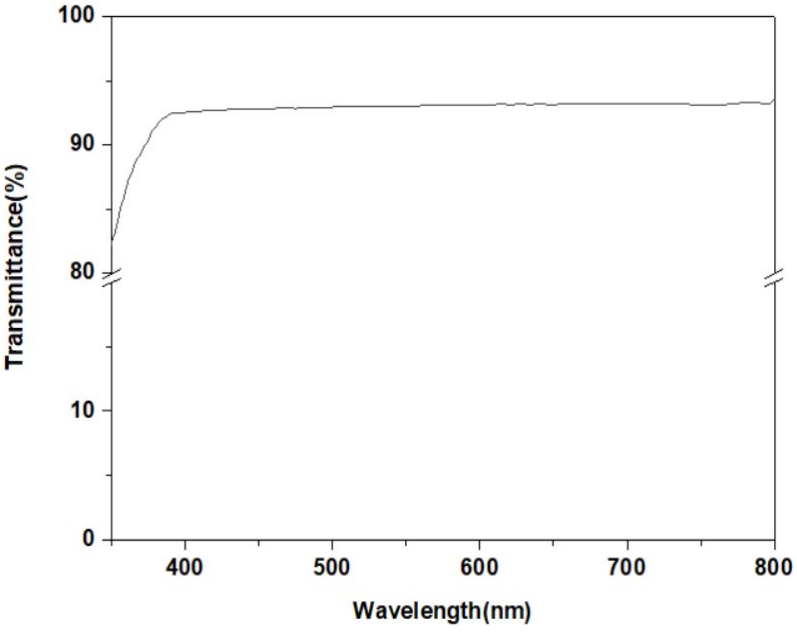

Figure S6: Transmittance properties of the supporting film

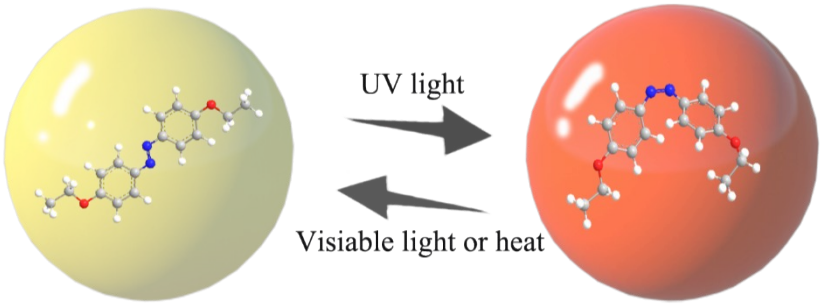

Figure S7: Schematic diagram of cis-trans isomerism transformation of the photo-responder azobenzene

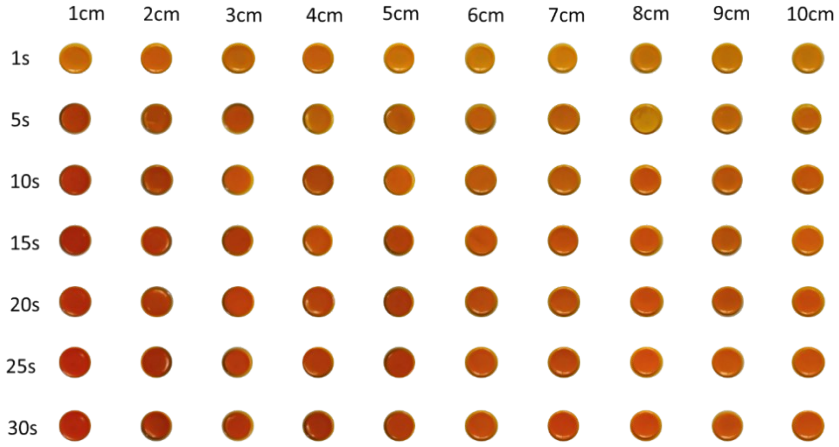

Figure S8: Different shades of orange after different exposure ways (height to the light and exposure time)

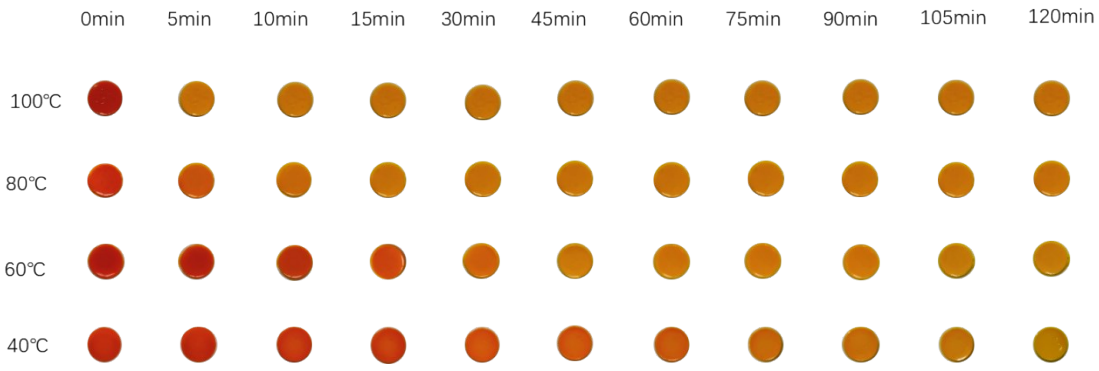

Figure S9: the retention time of stored information in different temperatures (Conditions for writing information: keeping the smallest distance and exposure time the same about 1cm and 8min respectively)

Supporting notes 1:

In this experiment, here we chose 4,4' –diethoxylazobenzene as the photochemically transformed material. Azobenzene derivatives are the most widely studied photoresponsive groups. While exposed to light or heat, azobenzene can realize the exchange between cis and trans isomerization. So under the irradiation of ultraviolet light, the trans azobenzene isomerizes can transfer into cis-azobenzene. And this state has sharp color contrast to the original one. Since cis-azobenzene conformation is thermally unstable, it can gradually return to the natural state of trans, either by visible light irradiation or by heat. [3-4]

Further more, liquid crystal has synergistic effects[5-7] with other materials, that is, when a small amount of chemical changed its arrangement mode, the whole arrangement of liquid crystal will be influenced. When we introduce the optical materials into the LC system, isomerized photoresponders have great impact on the whole liquid crystal compound system even with a tiny stimus. In this research, azobenzene plays a role in disturbing the arrangement of LC compounds, increasing the disordered contents when trans azobenzene transfer into cis aobenzene, which renders each direction of LC domain area become the same, thus part of devices which exposed to ultraviolet light turn orange and transparent.

Supporting notes 2:

In order to learn more about the regularity and variation between ultraviolet light and color changes. Additional experiments changed the exposure height to the UV light source and the total exposure time. As is shown in the chart, we can see that the more exposure time, the deeper color it is. And the same results will be come up when the distance between the light source and gel gets smaller. As a conclusion, the azobenene itself can have sensitive reaction to the UV light, which can change its color in a short time, and the color of LC compounds was recombined depending on how much azobenzene transfer into ciszaobenzene among LC gel system.

References

[1] Shan, T.Y.; Gao, L.; Tong, X.Q. The Special "Morse Code" between Solvent Polarity and Morphology Flexibility in a POSS–Dendrimer Supramolecular System. *Chemistry – A European Journal*, **2019**, 25, 52.

[2] Chen, S.; Tong X.; He H. Body Temperature Controlled Optical and Thermal Information Storage Light Scattering Display with Fluorescence Effect and High Mechanical Strength. *ACS Applied Materials & Interfaces*, **2017**, 9, 11924-11932.

[3] Estíbaliz, M.; María, R. Control over molecular motion using the cis–trans photoisomerization of the azo group. *Beilstein Journal of Organic Chemistry*, **2012**, 8, 1071-1090.

[4] Bandara, H. M. D.; Burdette, S. C. Photoisomerization in different classes of azobenzene. *Chemical Society Review*s, **2012**, 41, 1809.

[5] Legge, C. H.; Mitchell, G. R. Photo-induced phase transitions in azobenzene-doped liquid crystals. *Journal of Physics D Applied Physics*, **1992**, 25, 492-499.

[6] Lutfor, M. R.; Hegde, G.; Kumar, S. Synthesis and characterization of bent-shaped azobenzene monomers: Guest–host effects in liquid crystals with azo dyes for optical image storage devices. *Optical Materials*, **2009**, 32, 176-183.

[7] Liu, J.; Zhang, Q.; Zhang, J. Photochromism of the star-like liquid crystals containing azobenzene. *Chinese Journal of Chemical Physics*, **2005**, 18, 817-820.