

SUPPORTING INFORMATION

Printable Photonic Polymer Coating Based on a monodomain Blue Phase Liquid Crystal Network

Jiajia Yang^{a,b}, Zhou Yang^{*a}, Wanli He^a, Jingxia Wang^{*b}, Tomiki Ikeda^b and Lei Jiang^b

^a Department of Materials Science and Engineering, University of Science and Technology Beijing, Beijing, 100083, China

^b CAS Key Laboratory of Bio-inspired Materials and Interfaces Sciences, Technical Institute of Physics and Chemistry, Chinese Academy of Sciences, Beijing, 100190, China

Corresponding author e-mail address:

yangz@ustb.edu.cn (Z. Y.); jingxiawang@mail.ipc.ac.cn (J. W.)

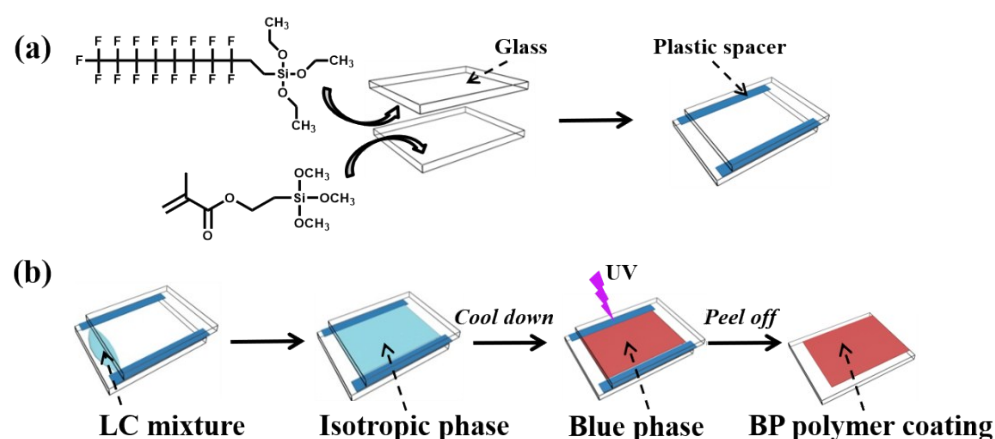


Figure S1. (a) Fabrication of LC cells. (b) Fabrication of BP polymer coating. The LC mixture was filled in a surface-modified cell. The cell placed on a temperature-controlled stage was cooled from isotropic phase to BP at a rate of 0.05 °C/min, then the cell was irradiated by 365 nm UV for 80 s for photopolymerization. Finally, a monodomain BP polymer coating was obtained after carefully removing the top glass of the cell.

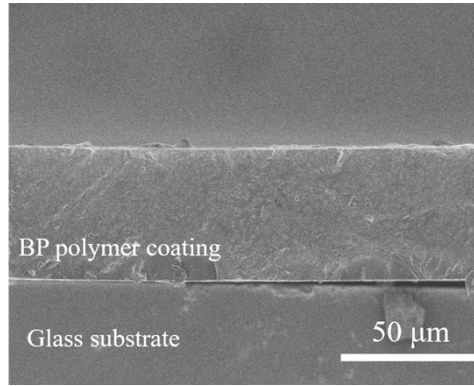


Figure S2. Cross-sectional SEM image of a BP polymer coating. The film thickness is about 50 μm .

(a)

	HTG135200	RM105	RM257	LC756	TMPTA	I-651
(wt%)	100					
a	30.0	46.5	15	5.5	2.0	1.0
b	30.0	46.0	15	5.5	2.5	1.0
c	30.0	45.5	15	5.5	3.0	1.0

(b)

Sample a

Sample b

Sample c

Figure S3. (a) Chemical composition of the samples. (b) POM image of the three samples after BP self-assembly. TMPTA is non-mesogenic monomer, which is trapped in BP disclination lines during self-assembly, forming large platelets BP with high reflectivity. In our system, the best content of TMPTA for fabricating monodomain BP is about 2.5 wt%. It can only obtain multidomain BP structure when TMPTA content is more or less than 2.5 wt% in the LC mixture.

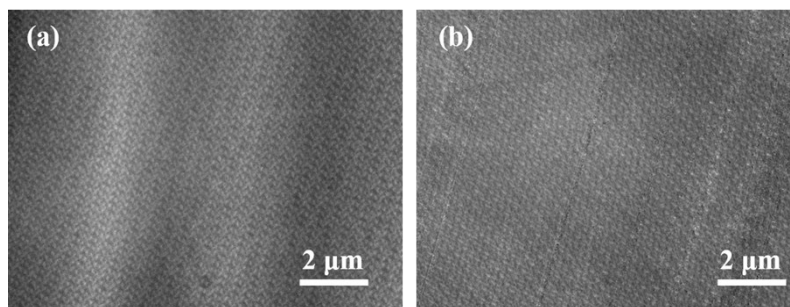


Figure S4. TEM images of monodomain BP polymer films. TEM slices were obtained under different conditions: (a) The sample was cut after freeze fracture of the polymer network; (b) The sample was cut at room temperature. Owing to 30 wt% non-reactive LC in the polymer film, the TEM image obtained by freeze fracture showed higher contrast and clearer arrangement of the double-twist cylinders than that obtained at room temperature.

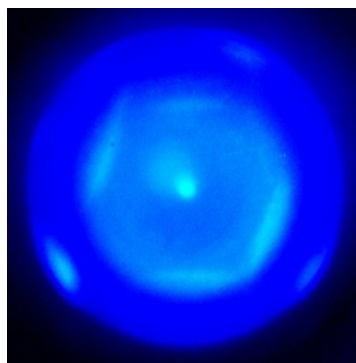


Figure S5. The corresponding Kossel diagram (probing with 452 nm light) of the BP polymer coating.

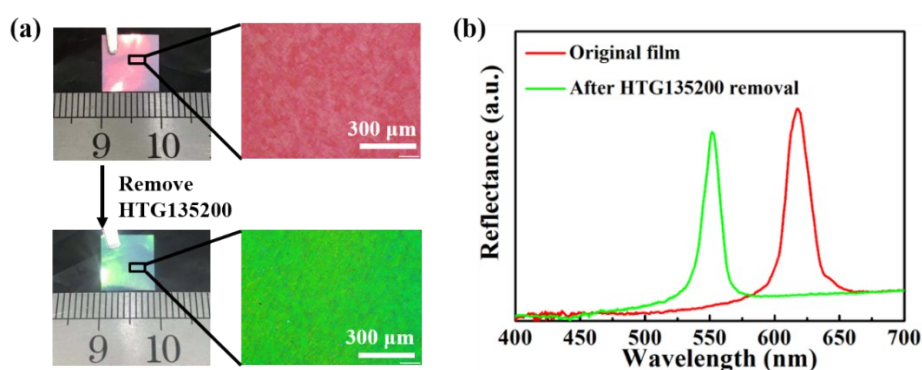


Figure S6. (a) Photographs, POM images and (b) Reflection spectra of the original freestanding BP polymer and the polymer after removing non-reactive LC HTG135200. The color of freestanding polymer changed from red (618 nm) to green (552 nm), revealing 10.6 % reduction in the vertical direction. In addition, 21 % shrinkage of the surface plane area of the BP polymer take places, indicating that 29.4 % shrinkage totally happened. This is in good agreement with the 30 wt% non-reactive LC in the original film. The free-standing BP film shrink three-dimensionally after removal of non-reactive LC HTG35200.

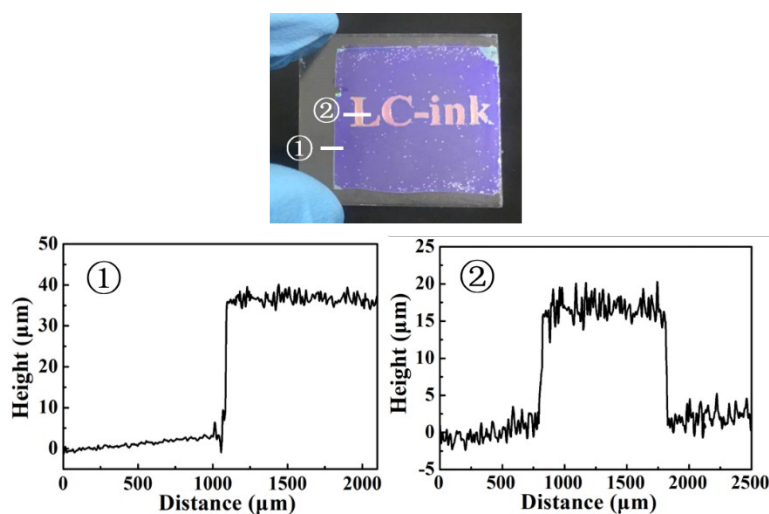


Figure S7. Height profile measured along the white lines.

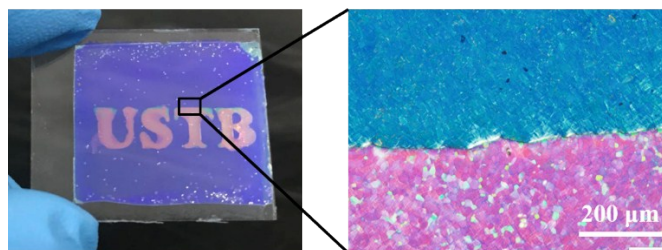


Figure S8. Photographs of “USTB” in the polymer coating and POM image of a part of “T” of the photonic pattern.