

## **Solid-state Reversible Optical Switch Based on Two Dendritic Molecules with dual sensitivity of mechanochromism and photochromism**

*Yuhui Yang,<sup>\*a,b,c‡</sup> Zhe He,<sup>a‡</sup> Junzhao He,<sup>a</sup> Yuqing Li,<sup>a</sup> Yilong Chen,<sup>a</sup> Guohua Jiang<sup>a,b,c</sup>*

<sup>a</sup> College of Materials Science and Engineering, Zhejiang Sci-Tech University, Hangzhou 310018, China

<sup>b</sup> Department of Polymer Materials, Zhejiang Sci-Tech University, Hangzhou 310018

<sup>c</sup> Institute of Smart Biomedical Materials, Zhejiang Sci-Tech University, Hangzhou 310018, China.

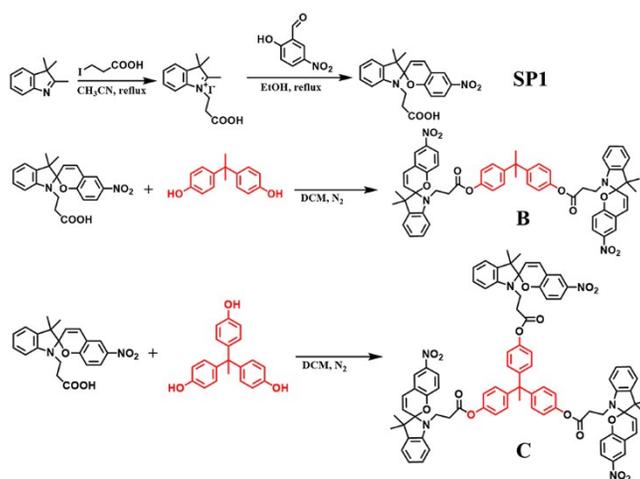
### **Materials**

4-dimethylaminopyridine (DMAP), (1-ethyl-3(3-dimethylpropylamine) carbodiimide (EDCI) and bisphenol A were purchased from Aladdin. 2,3,3-trimethyl-3H-indole, 3-iodopropanoic acid, ultra-dry dichloromethane, 2-hydroxy-5-nitrobenzaldehyde and 4,4',4''-(ethane-1,1,1-triyl) triphenol were purchased from J&K Scientific. Solvents were purchased from Hangzhougaojing Chemical Co., Ltd. All the chemicals were used as received without further purification.

### **Instruments and methods**

<sup>1</sup>H NMR were with a BRUKER AVANCE AV400MHz (<sup>1</sup>H: 400 MHz) spectrometer at room temperature. UV-vis spectra were measured on a spectrometer (solid: UH4150, HITACHI, Japan; liquid: UV1901PC, Aucy Instrument, China). Fluorescence spectra were conducted by using a fluorescence spectrophotometer (solid: F-46001, HITACHI, Japan; liquid: FluoroMax-4, HORIBA Scientific, French). Thermogravimetric analyzer was performed with a PYRIS 1

(PerkinElmer, USA). The surface morphology was tested with a Carl Zeiss SMT Pte Ltd vltra55 (Germany) SEM at an accelerating voltage of 3 kV. Mass spectrometry (MS) was performed with a XEVO-G2STOF (ESI) (Waters, USA). Contact angle were measured on a contact angle measurement instrument (JCY, Shanghai FangRui Instrument Co., Ltd, China). The film was prepared by Spin Coater (KW-4B, Beijing Saidecase Electronics Co., Ltd, China). The UV irradiation (365 nm) was offered by the Portable UV lamp (WFH-204B, Shanghai Chitang Industrial Co., Ltd, China).



**Scheme S1.** Synthesis routes for SP1, B and C.

## Computational methods

The ground state geometries were fully optimized by the density functional theory (DFT) method with the Becke three-parameter hybrid exchange and the Lee-Yang-Parr correlation functional (B3LYP) and 6-31G(d) basis set using the Gaussian 09 software package.

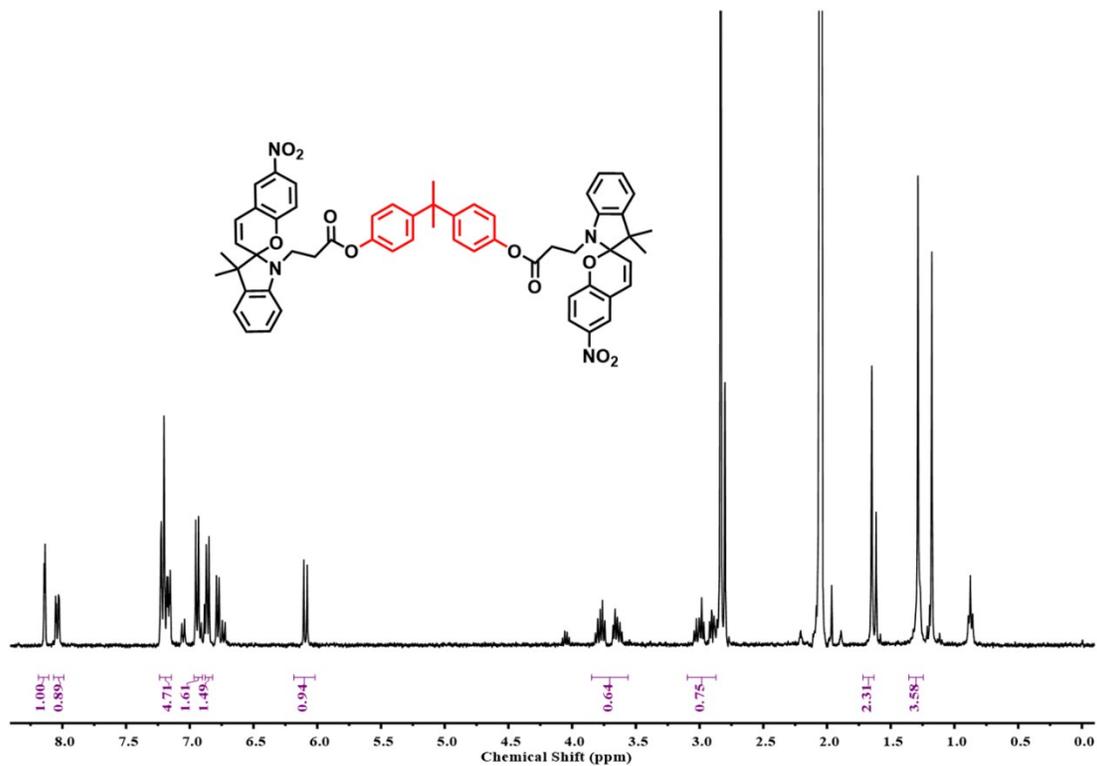


Figure S1. <sup>1</sup>H NMR spectra of B.

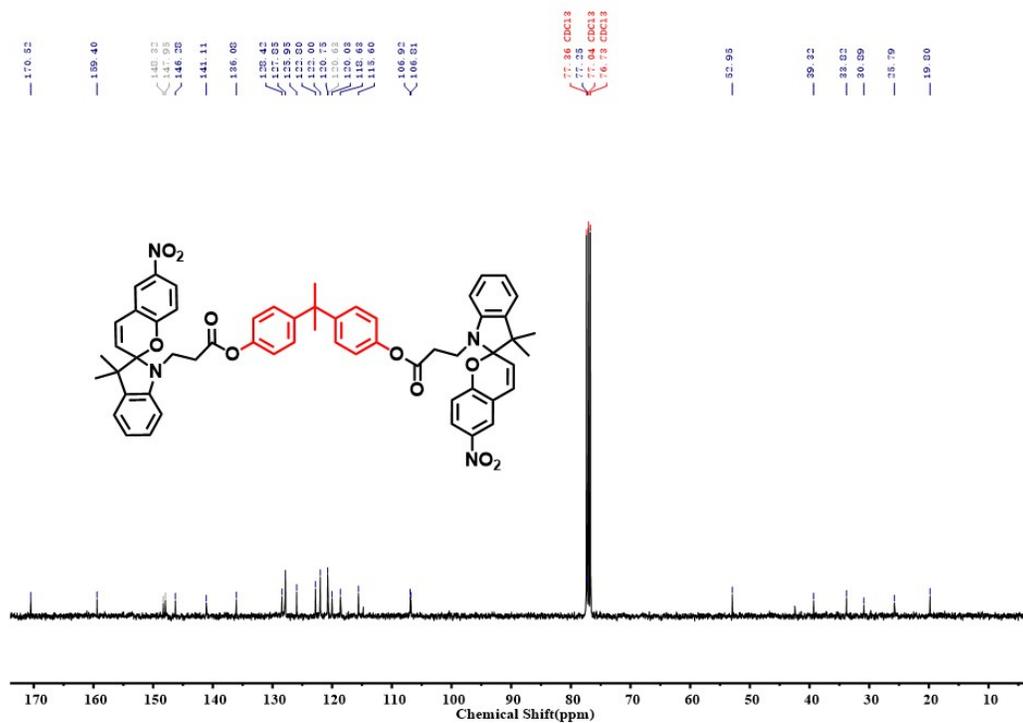


Figure S2. <sup>13</sup>C NMR spectra of B.

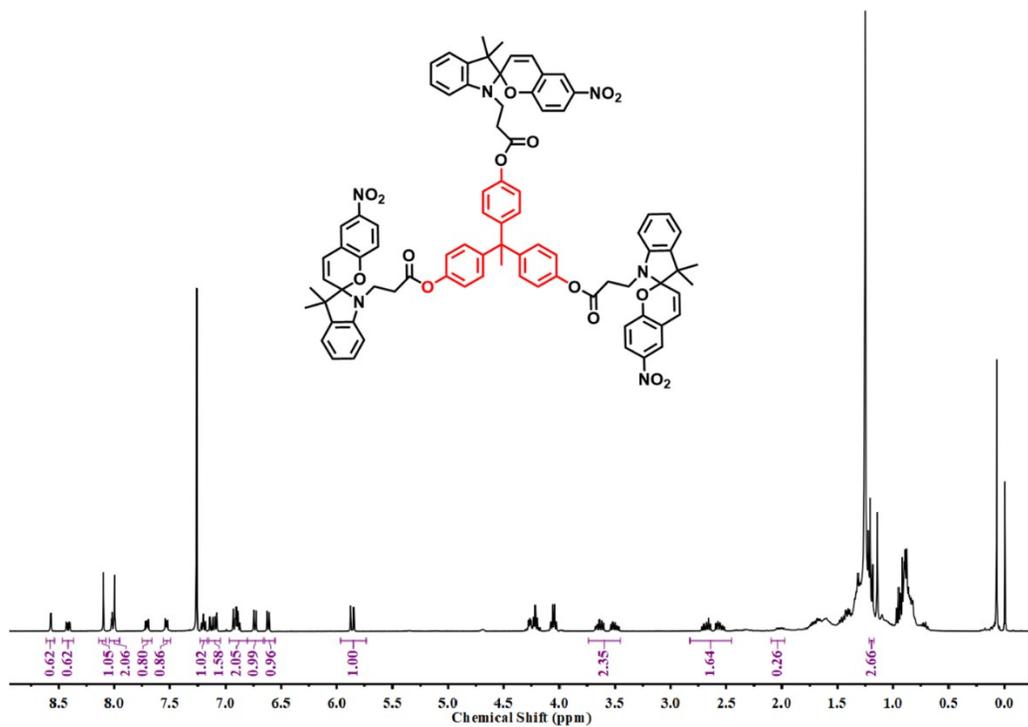


Figure S3. <sup>1</sup>H NMR spectra of C.

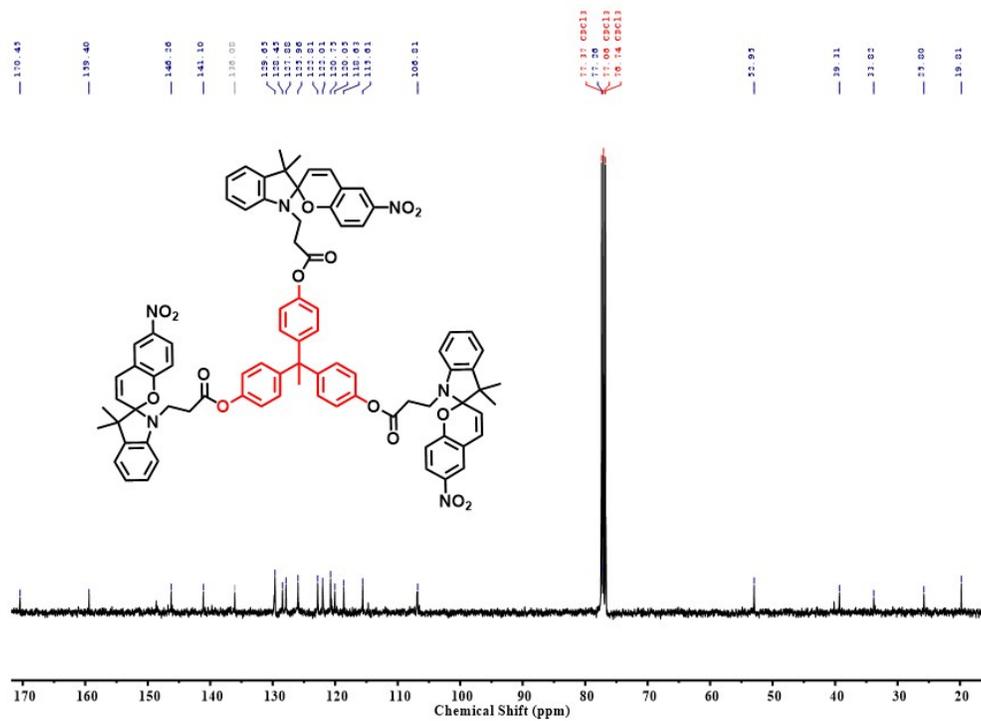
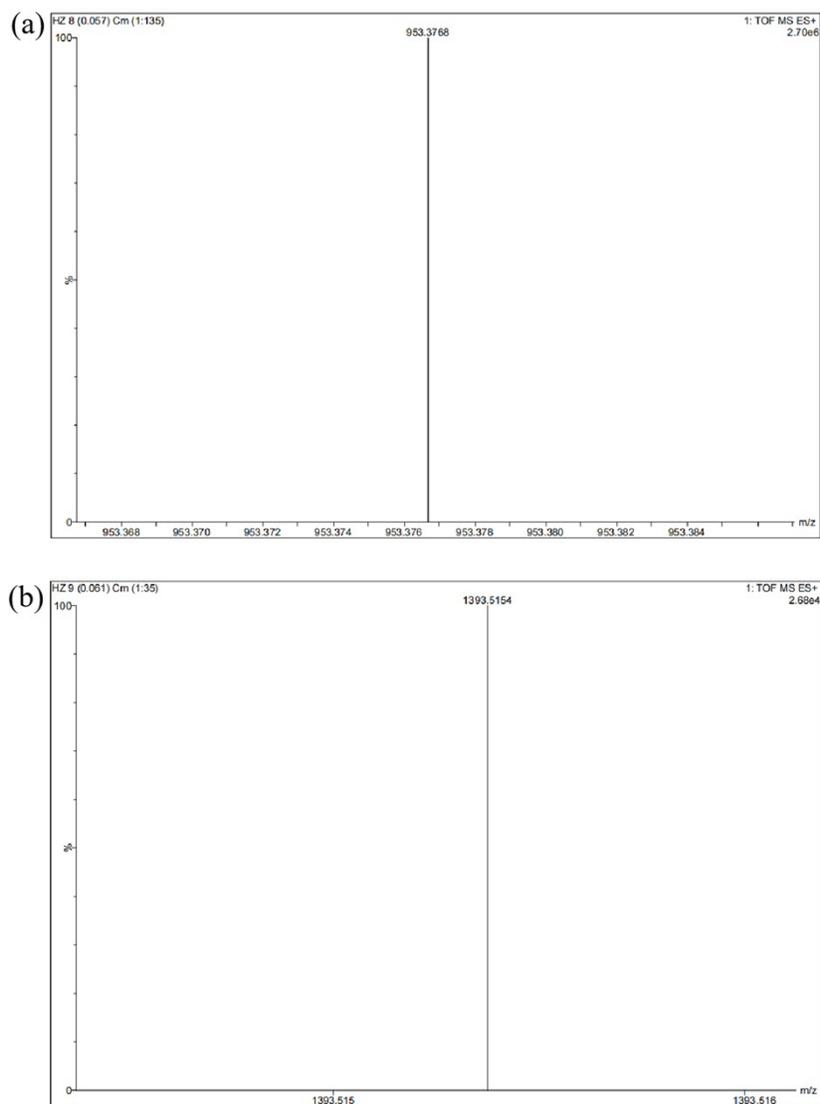


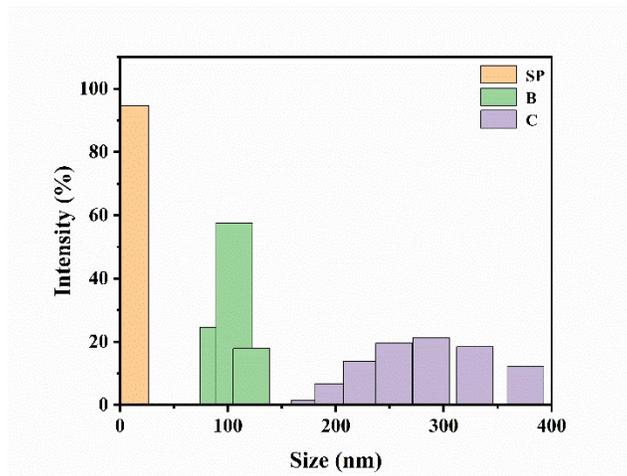
Figure S4. <sup>13</sup>C NMR spectra of C.



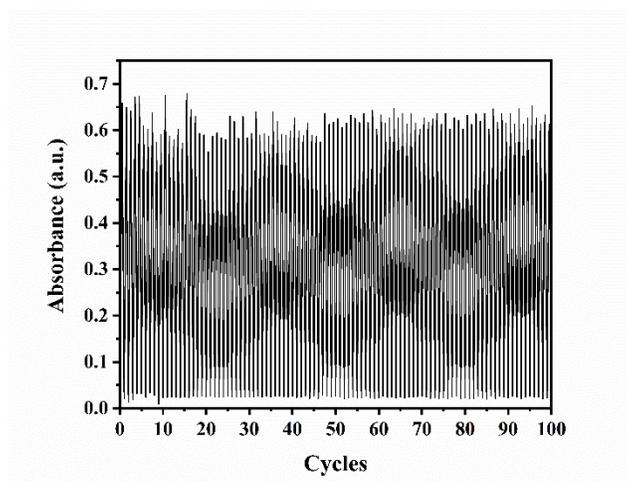
**Figure S5.** HRMS (ESI) of B.

**Table S1.** Fluorescence quantum efficiency of B and C in DCM solution before and after 365 nm UV irradiation.

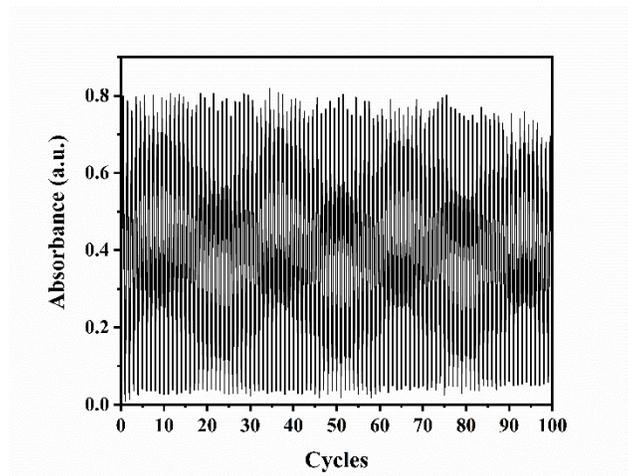
Solution in DCM	B	C
Before UV irradiation	4.44%	2.14%
After UV irradiation	-	-



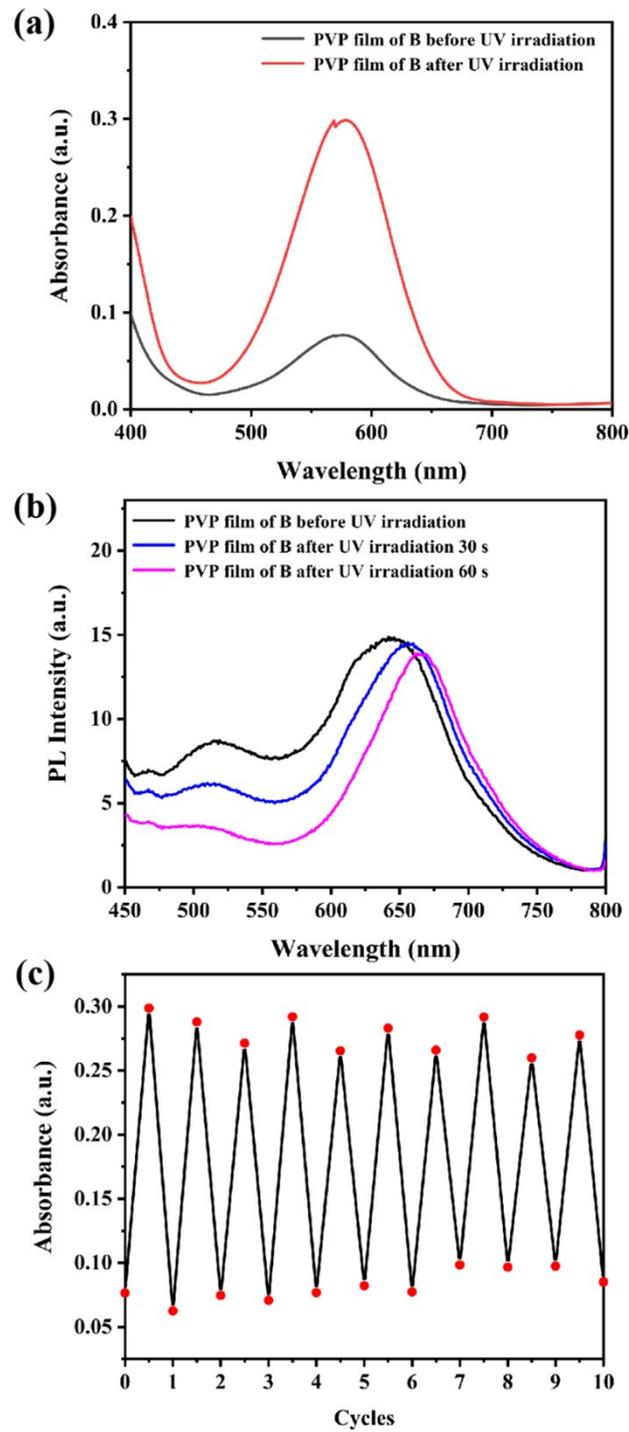
**Figure S6.** Size distribution of SP, B and C.



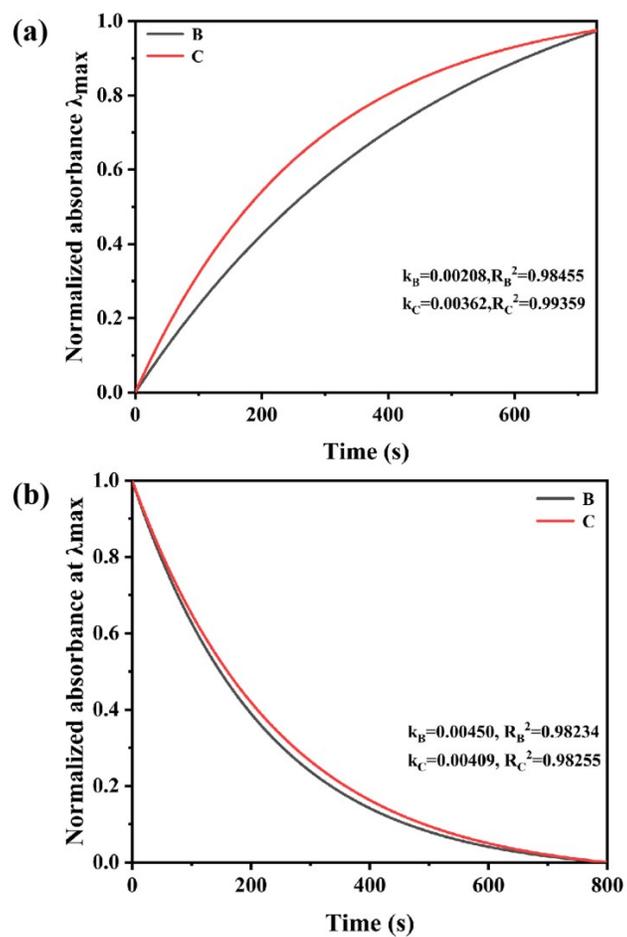
**Figure S7.** Photo-fatigue-resistant characteristics of BPMMAF upon UV irradiation (365 nm) for 1 min and heating for 8 min.



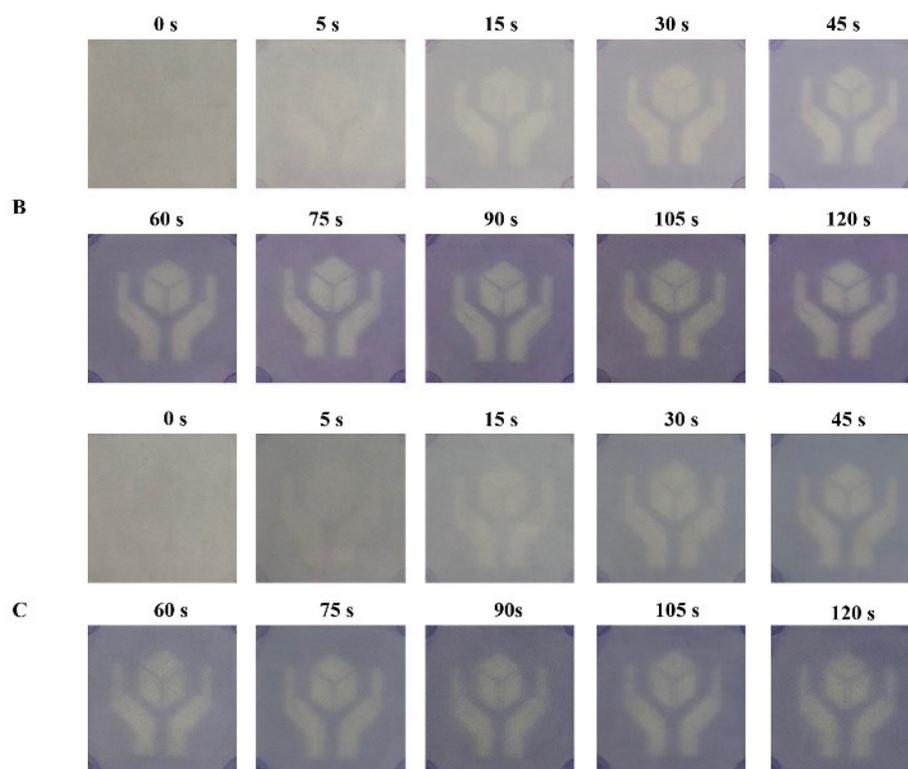
**Figure S8.** Photo-fatigue-resistant characteristics of CPMMAF upon UV irradiation (365 nm) for 1 min and heating for 8 min.



**Figure S9.** a) UV-vis absorption spectra. b) Fluorescence spectra and c) fatigue resistance of BPVPF.



**Figure S10.** (a) Coloration curves (25 °C) and (b) decoloration curves (70 °C) of B and C recorded in thin PMMA film.



**Figure S11.** Photo-writing on films (B, C) by different UV irradiation time.