

*Electronic Supplementary Information for*

**Circularly polarized luminescence with large dissymmetry factors based on perovskite and cholesteric liquid crystal polymer network film**

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## Experimental Section

In the CPL measurements, the excitation wavelength was 355 nm, the scan speed was 500 nm/min, the number of scans was 1, the slit width was 3000  $\mu\text{m}$  for excitation and the monitor, and the time constant of PMT (D.I.T.) was 1 s. The value of  $g_{\text{lum}}$  is experimentally defined as  $g_{\text{lum}} = [\text{ellipticity}/(32980/\ln 10)]/\text{PL (DC in volts)} = \Delta I/I = \Delta I/\text{PL (DC in volts)}$  at a CPL wavelength, while PL (DC in volts) stands for total luminescence  $I$ , and  $I = I_{\text{L}} + I_{\text{R}}$ .<sup>S1, S2</sup> To eliminate the effect of line polarization luminescence of the films, a plate holder was used to allow the samples to rotate 360°, and the CPL spectra from 4 scans at 90° intervals were algebraically averaged. For CLCN-coated PET films, considering the waveguide effect of the PET substrate, the excitation light was set to pass through the PET substrate and the CLCN coating subsequently in the CPL test.<sup>S3</sup>

## Materials and instruments

Compounds cesium bromide, cesium chloride, lead(II) bromide, lead(II) iodide, oleic acid, and oleylamine, were obtained from Aladdin Chemical Co., Ltd (Shanghai, China). *N,N*-Dimethylformamide (DMF), dichloromethane (DCM), ethyl acetate (EA), 1,2-dimethoxyethane (DME), and toluene were purchased from Shanghai Lingfeng Chemical Reagent Co., Ltd. PMMA was purchased from Sinopharm Chemical Reagent Co., Ltd. (Shanghai, China). Polyethylene terephthalate (PET) films were purchased from Nanya plastics Co., Ltd (Nantong, China). The photopolymerization was conducted using a UV-LED series equipment (UVSF81T, 365 nm, 400  $\text{mW cm}^{-2}$ , output power) produced by FUTANSI Electronic Technology Co., Ltd (Shanghai, China) and a high-pressure Hg lamp (MINHIO 4012-20, 350-450 nm, 1000 W, input power), produced by MINHIO Intelligent Equipment Co., Ltd (Shenzhen, China). FE-SEM images were obtained using a Hitachi Regulus8230 operating (Ibaraki Prefecture, Japan) at 5.0 kV. DRCD spectra were measured by using a JASCO 815 spectrometer (Tokyo, Japan). UV-*vis* spectra were measured by a UV-*vis*-NIR spectrophotometer (UV3600, Shimadzu, Japan). POM images of the target compounds were taken using a Leica Microsystems CMS GmbH fitted with a Linkam LTS420 hot stage. Fluorescence spectra and absolute quantum yields were measured by FLS 980 (Edinburgh Instrument, UK). Fluorescence lifetimes were measured on a steady-state lifetime fluorescence spectrometer FLS1000 (Edinburgh Instrument, UK). CPL spectra were measured on JASCO CPL-300 (JASCO, Japan).

## Preparation of CLCN-coated PET films

CLCN-coated PET films were prepared by photopolymerization of the CLC mixtures (Table S1). These mixtures were dissolved in a solvent mixture of cyclopentane and EA to form a solution with 20

wt% of solid content. The solutions were coated on rubbing-oriented PET film using a 40  $\mu\text{m}$  Mayer bar for controlling thickness. After coating, the samples were heated at 120  $^{\circ}\text{C}$  for 3-5 min to evaporate the solvent. Finally, the films were obtained by curing with a high-pressure Hg lamp (1000 W) for 5.0 s.

### **In situ preparation of PMMA-CsPbX<sub>3</sub> film**

CsBr (21.3 mg, 0.1 mmol) and PbBr<sub>2</sub> (36.7 mg, 0.1 mmol) were dissolved in DMF (3.0 mL). Oleic acid (0.3 mL) and oleylamine (0.2 mL) were added to stabilize the precursor solution. 1.0 mL of the precursor solution was quickly added into toluene (10.0 mL) under vigorous stirring. Due to the poor solubility of the precursors in toluene, phase separation occurred to form the CsPbBr<sub>3</sub> colloid. Similarly, CsPbBrI<sub>2</sub> colloid was prepared using 0.1 mmol of CsBr (21.3 mg) and 0.1 mmol of PbI<sub>2</sub> (46.1 mg) as starting materials, while CsPbClBr<sub>2</sub> colloid was prepared using 0.1 mmol of CsCl (16.8 mg) and 0.1 mmol of PbBr<sub>2</sub> (36.7 mg) as starting materials.

Then, 1.0 mL of the CsPbX<sub>3</sub> colloid, 50.0 mg PMMA, and 0.5 mL DCM solution were mixed. A thin layer was prepared by casting the solution onto the surface of a quartz plate. Finally, the PMMA-CsPbX<sub>3</sub> film was obtained by keeping the coated quartz plate at 90  $^{\circ}\text{C}$  for 5.0 min.

### **Preparation of PAN-CsPbBr<sub>3</sub> film**

The CsPbBr<sub>3</sub> colloid described above was centrifuged for 10 min at 2000 rpm to afford the precipitation. The CsPbBr<sub>3</sub> powder was obtained after washed with acetone and toluene.

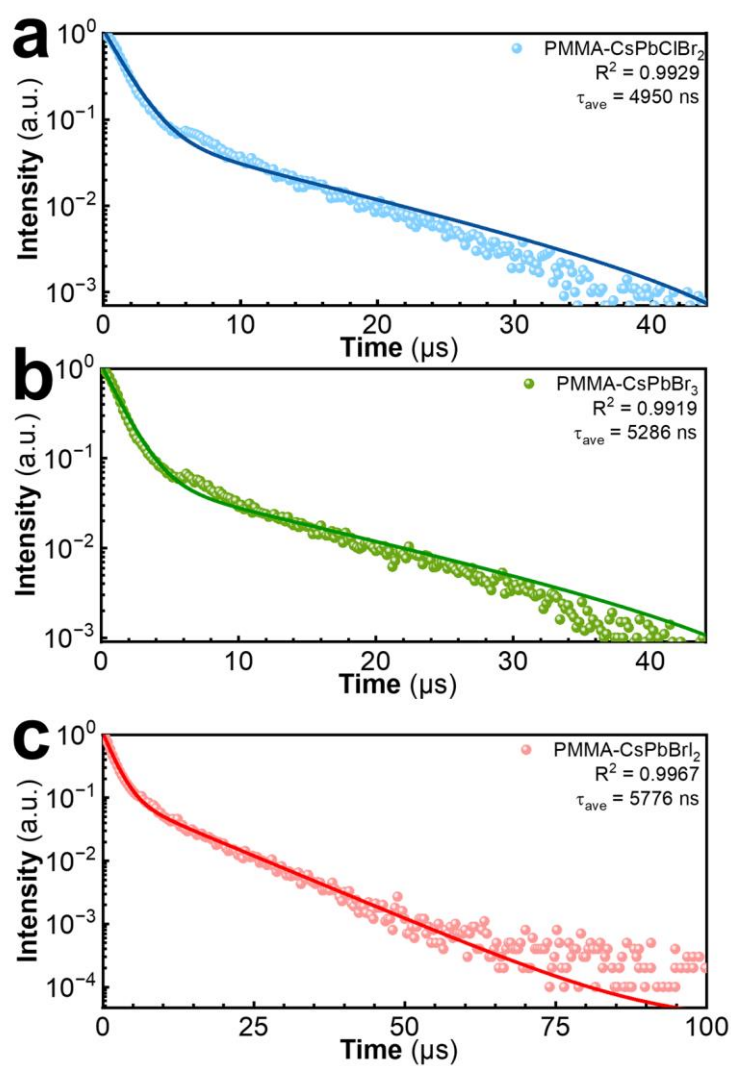
PAN powder (1.0 g) and CsPbBr<sub>3</sub> powder (20.0 mg) were fully dissolved in 9.0 mL of anhydrous DMF. After stirring for 3 h at 70  $^{\circ}\text{C}$ , the solution was used to produce nanofibers by electrostatic spinning with an applied low potential of 5.0 kV, high potential of 12.5 kV, collection distance of 15.0 cm, and inflow rate of 0.1 mm min<sup>-1</sup>. The as-prepared PAN-CsPbBr<sub>3</sub> nanofibers were collected by the CLCN-coated PET film.

### **References**

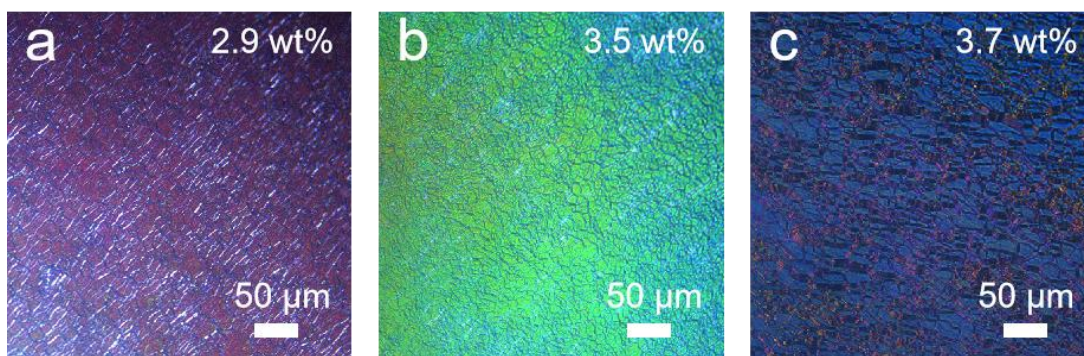
- S1. S. Ito, K. Ikeda, S. Nakanishi, Y. Imai and M. Asami, *Chem. Commun.*, 2017, **53**, 6323–6326.
- S2. H. Chen, Z. G. Gu and J. Zhang, *J. Am. Chem. Soc.*, 2022, **144**, 7245–7252.
- S3. T. Lian, R. Yu, W. Liu, Y. Li and Y. Yang, *J. Mater. Chem. C*, 2023, **11**, 10993–11000.

**Table S1** Mass percentages of compounds in CLC mixtures with different concentrations of CA-iso.

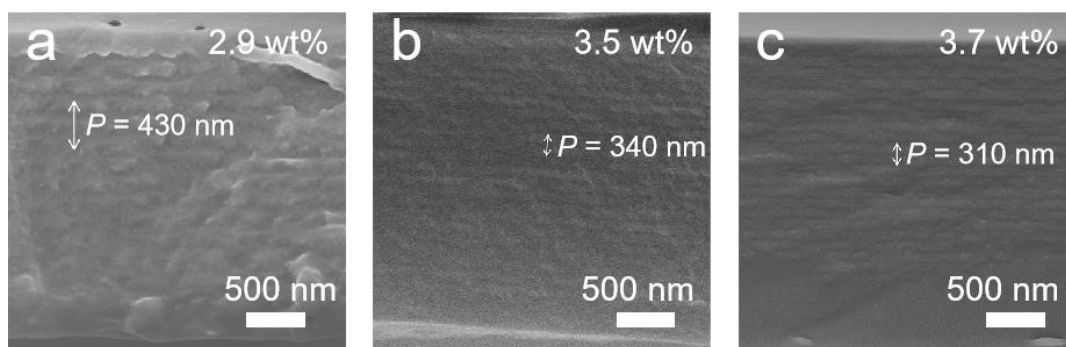
Colour	LC242	C6C1	Irgacure 369	CA-iso
Red	82.6	10.0	4.5	2.9
Green	82.0	10.0	4.5	3.5
Blue	81.8	10.0	4.5	3.7



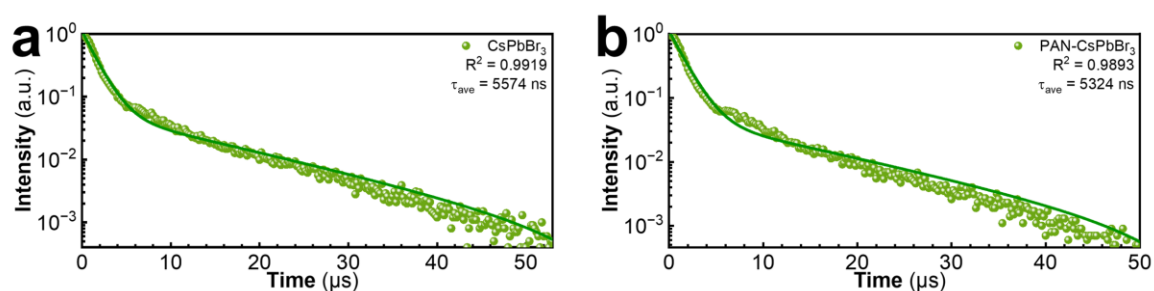
**Fig. S1** Emission decay curves with fitted curves (using double exponential functions) of (a) PMMA-CsPbClBr<sub>2</sub>, (b) PMMA-CsPbBr<sub>3</sub>, (c) PMMA-CsPbBrI<sub>2</sub> films.



**Fig. S2** POM images of CLC mixtures at 80 °C with different concentrations of CA-iso: (a) 2.9, (b) 3.5, and (c) 3.7 wt%.



**Fig. S3** Cross-sectional FE-SEM images of CLCN films with different concentrations of CA-iso: (a) 2.9, (b) 3.5, and (c) 3.7 wt%.



**Fig. S4** Emission decay curves with fitted curves (using double exponential functions) of (a) CsPbBr<sub>3</sub> at solid state and (c) the PAN-CsPbBr<sub>3</sub> film.