

Supplementary Information

Firefly-inspired Bipolar Information Indication System Actuated by White Light

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TABLES

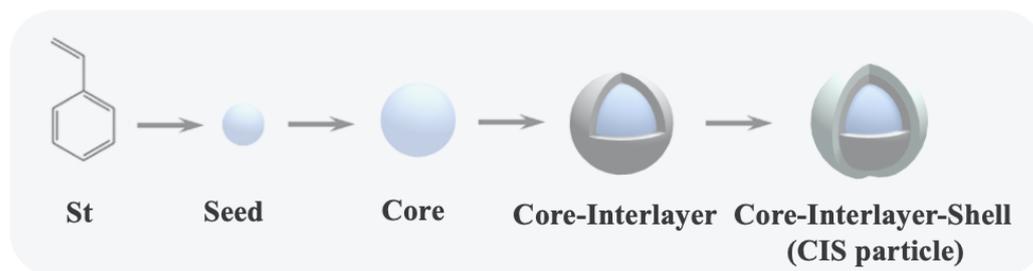
Supplementary Table 1. DLS size, polymer dispersity index (PDI) after each step of emulsion polymerization for red, gold, green and blue photonic crystal films. Samples were prepared by 500 mL stepwise emulsion polymerization with 0.08 g (Red), 0.09 g (Gold), 0.10 g (Green) and 0.13 g (Blue) SDS in the seed preparation, respectively.

Sample Name		Size (nm)	PDI
Red	Seed	52	0.056
	Core	188	0.033
	CI	207	0.039
	CIS	225	0.037
Gold	Seed	47	0.062
	Core	166	0.012
	CI	190	0.031
	CIS	204	0.017
Green	Seed	40	0.057
	Core	140	0.019
	CI	159	0.026
	CIS	186	0.028
Blue	Seed	32	0.069
	Core	113	0.032
	CI	121	0.035
	CIS	147	0.025

Supplementary Table 2. Absorption peak, emission peak and FWHW (full width at half maximum) of different emitters.

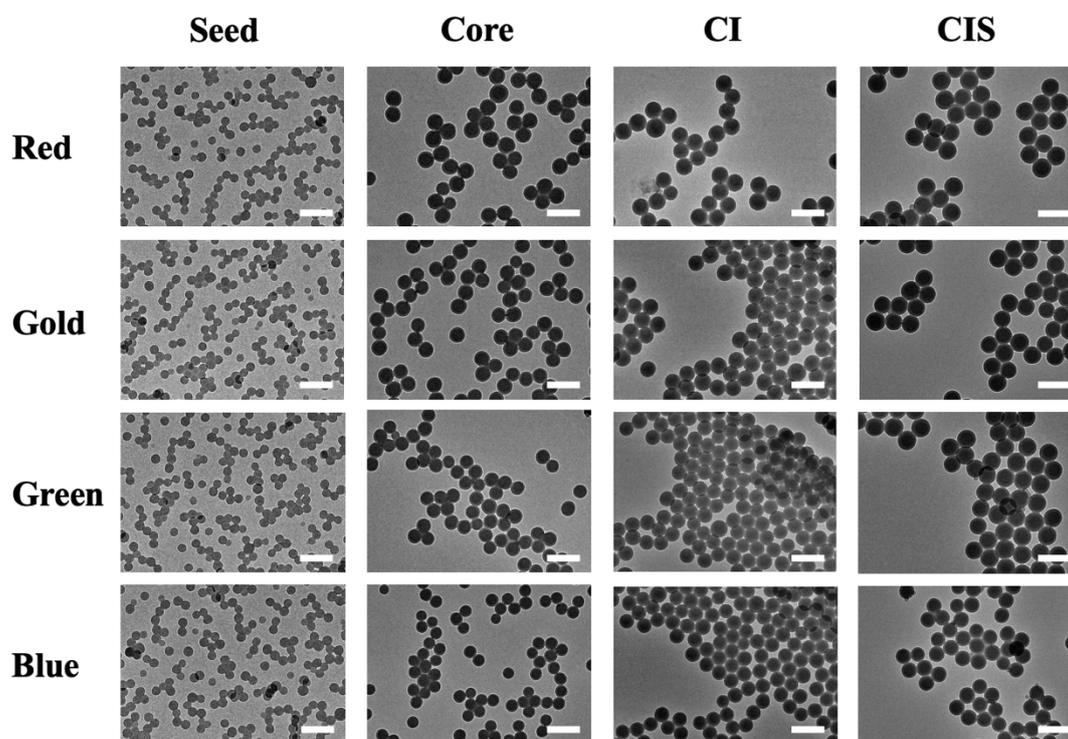
Emitter	Absorption peak/nm	Emission peak/nm	FWHW/nm
Perylene	436, 409, 388	450, 470, 504	39
Bodipy	500	525	32
Eu complex	342	614	8

FIGURES



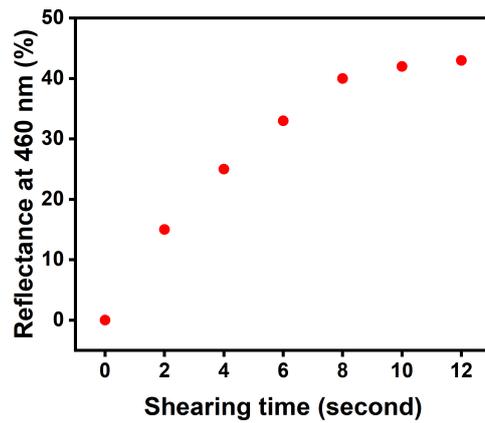
Supplementary Figure 1. Schematic diagram.

Schematic of stepwise emulsion polymerization to fabricate CIS particles.



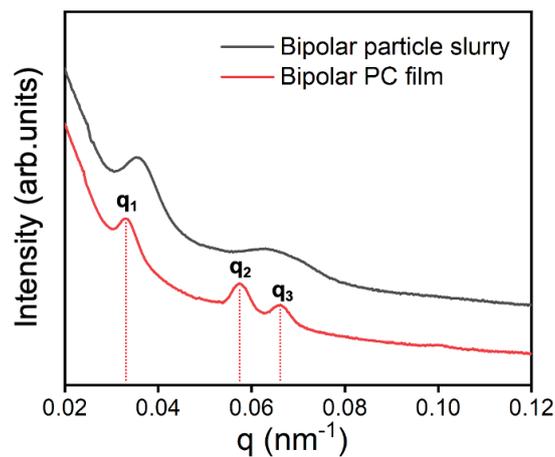
Supplementary Figure 2. TEM images.

TEM images of particles after each step of emulsion polymerization for red, gold, green and blue photonic crystal films. Samples were prepared by 500 mL stepwise emulsion polymerization with 0.08 g (Red), 0.09 g (Gold), 0.10 g (Green) and 0.13 g (Blue) SDS in the seed preparation, respectively. The scale bar is 350 nm.



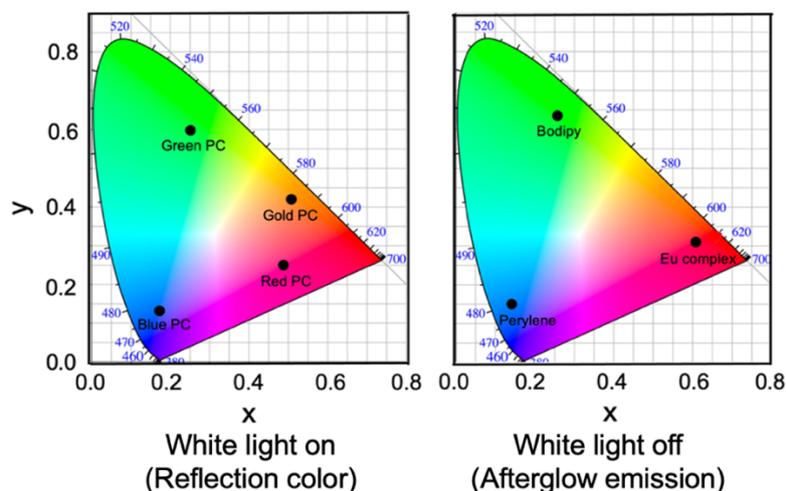
Supplementary Figure 3. Reflectance.

Reflectance of blue photonic crystal film undergoing different shearing time (the rotation-shearing angular velocity was $1/3$ rad/s and rotation-shearing amplitude $1/6$ rad with corresponding rotation-shearing frequency at 0.5 Hz).



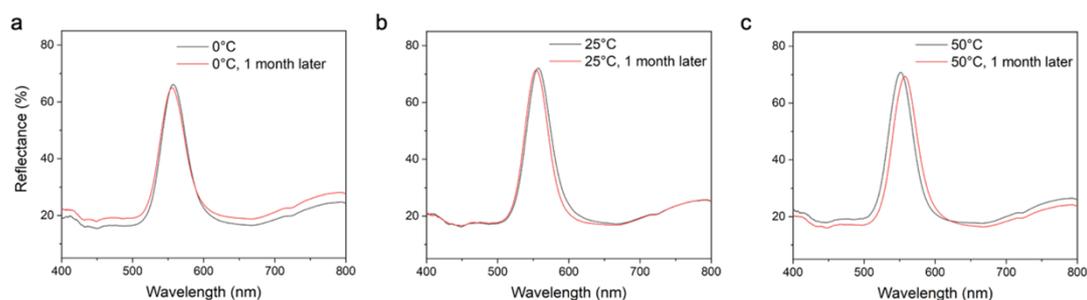
Supplementary Figure 4. 1D USAXS.

1D USAXS curves of bipolar particle slurry (disordered, before SIOT) and bipolar photonic crystal film (ordered, after SIOT).



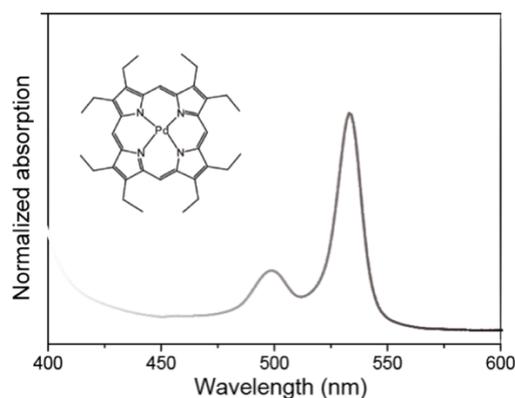
Supplementary Figure 5. CIE diagram.

CIE diagram of bipolar information indication system with different reflection colors and afterglow when white light is on and off, respectively.



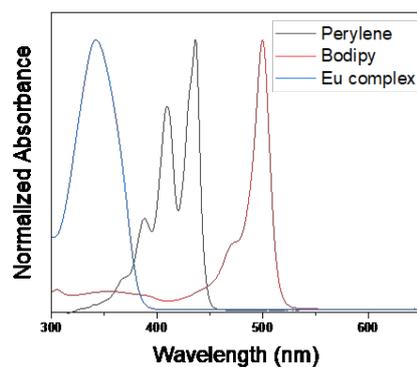
Supplementary Figure 6. Reflectance.

Reflectance of photonic crystal films stored under (a) 0°C, (b) 25°C and (c) 50°C for 1 month.



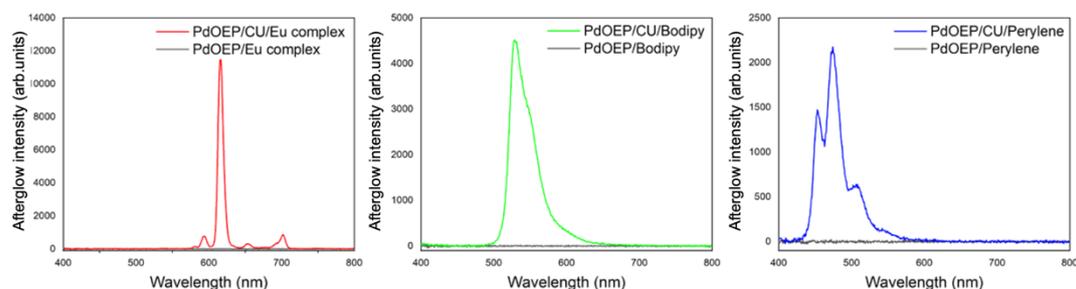
Supplementary Figure 7. Absorbance.

Absorbance spectrum of sensitizer PdOEP.



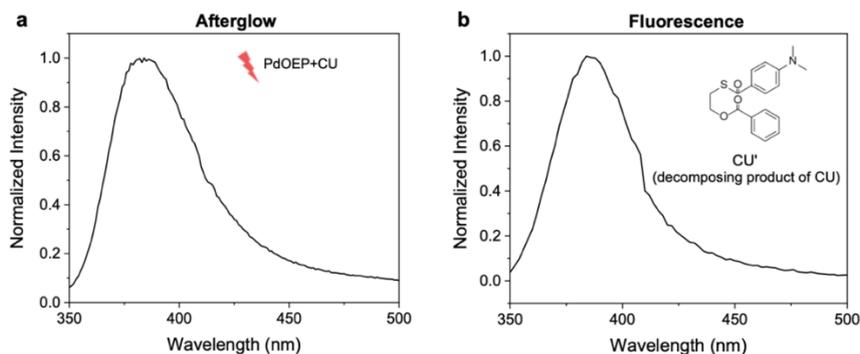
Supplementary Figure 8. Absorbance.

Absorbance spectra of different emitters.



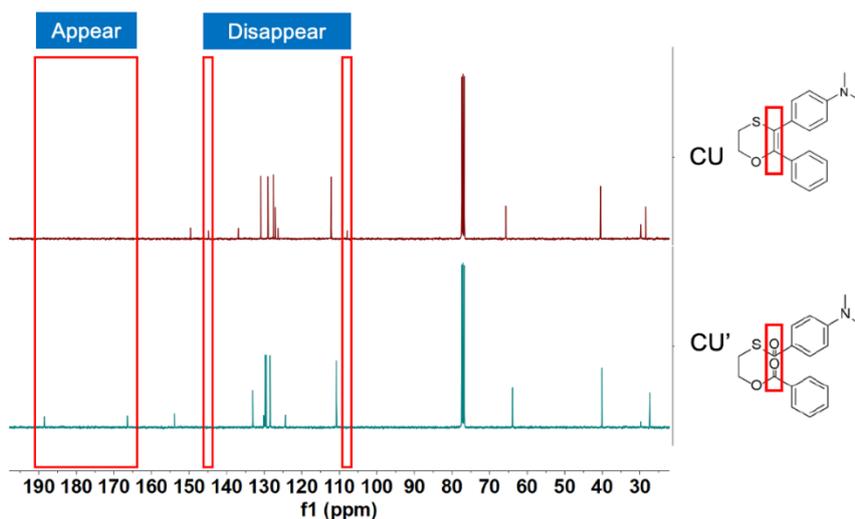
Supplementary Figure 9. Afterglow emission spectra with and without CU.

Afterglow emission spectra of photochemical reactions with different emitters, with and without the presence of CU. The afterglow emission spectrum was collected after being irradiated with white light for 1 min with a fixed power density of 50 mW/cm².



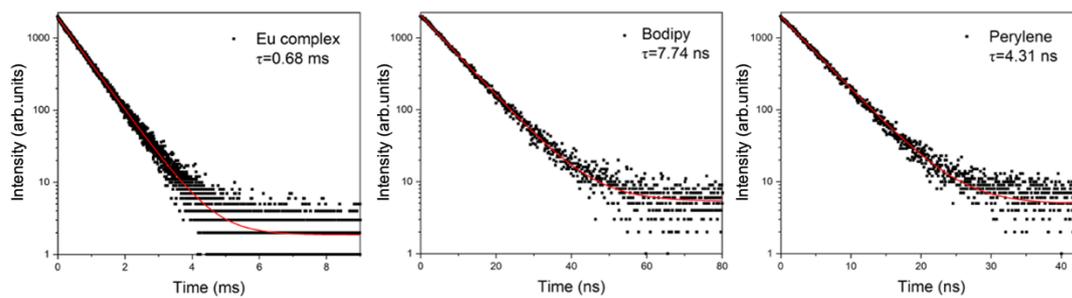
Supplementary Figure 10. Afterglow emission spectra without emitter.

(a) Afterglow emission spectra of CU sensitized by PdOEP without adding emitter. The afterglow emission spectrum was collected after being irradiated with white light for 1 min with a fixed power density of 50 mW/cm². (b) Photoluminescence emission spectrum of decomposing product of CU in toluene ($\lambda_{\text{Ex}}=330$ nm).



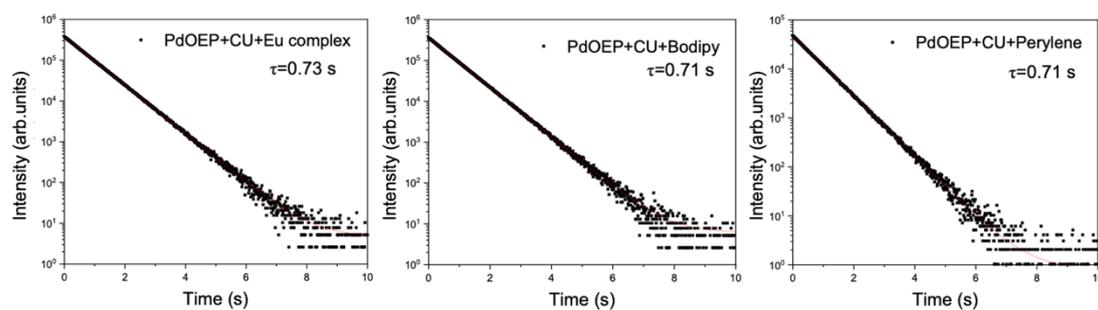
Supplementary Figure 11. Nuclear magnetic resonance (NMR) spectra.

¹³C NMR spectra of CU and CU', with deuterated chloroform (CDCl₃) as solvent.



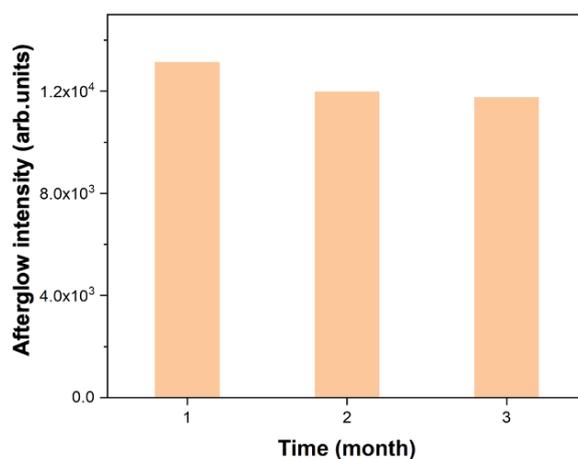
Supplementary Figure 12. Fluorescence decays.

Fluorescence decays and lifetime of different emitters.



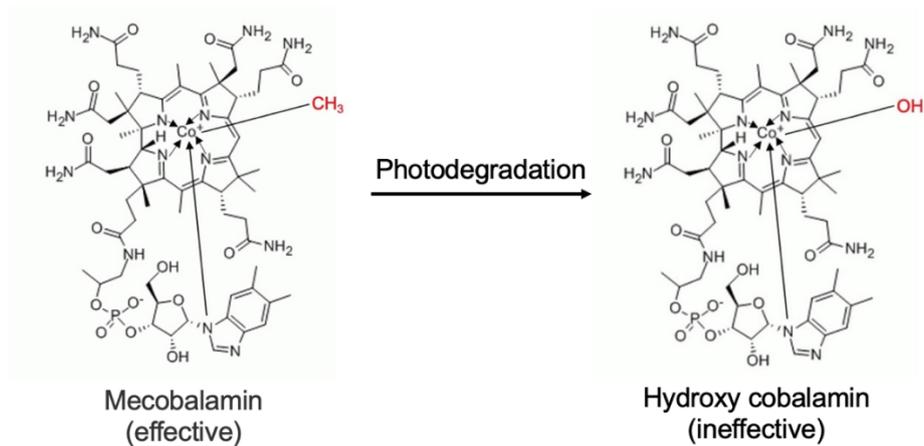
Supplementary Figure 13. Afterglow decays.

Afterglow decays of photochemical reaction systems with different composition of emitters and their lifetime.



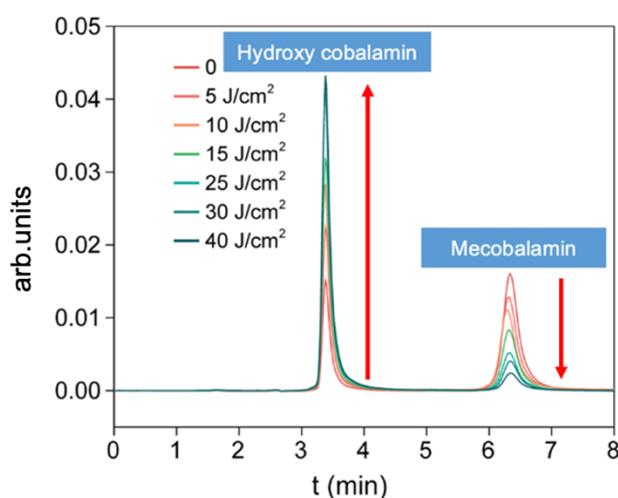
Supplementary Figure 14. Afterglow intensity.

Afterglow intensity of bipolar PC film at a CU concentration of 12 mM stored in darkness for different time periods.



Supplementary Figure 15. Chemical formula.

The chemical formula of mecobalamin and hydroxy cobalamin.



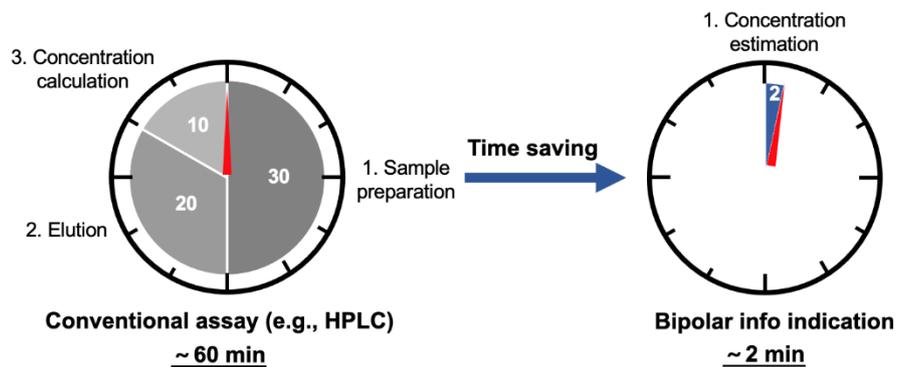
Supplementary Figure 16. High performance liquid chromatograph (HPLC) chromatogram.

A typical HPLC of mecobalamin under different white light dose.



Supplementary Figure 17. Anti-counterfeiting patterns.

Pictures of anti-counterfeiting patterns at different viewing angles.



Supplementary Figure 18. Schematic diagram.

Schematic illustration of time required for indicating the photodegradation level of photosensitive medicine through conventional assay and bipolar information indication.