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

Optimizing the performance of the near-infrared (NIR) photothermal conversion via modulating the domain size of chiral nematic phase in the co-assembled cellulose nanocrystals composite films

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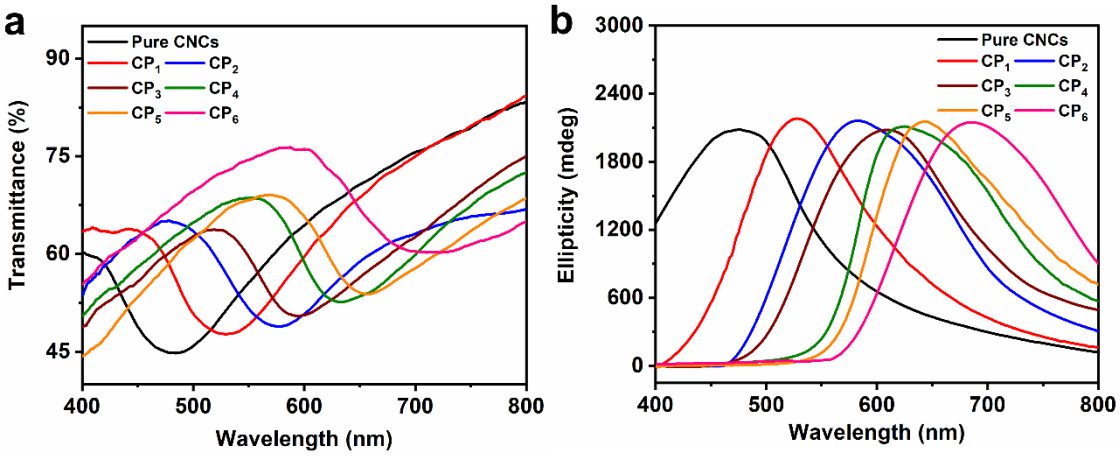

Fig. S1 The vis-NIR transmittance spectra (a) and CD spectra (b) of pure CNCs and CP_x composite films.

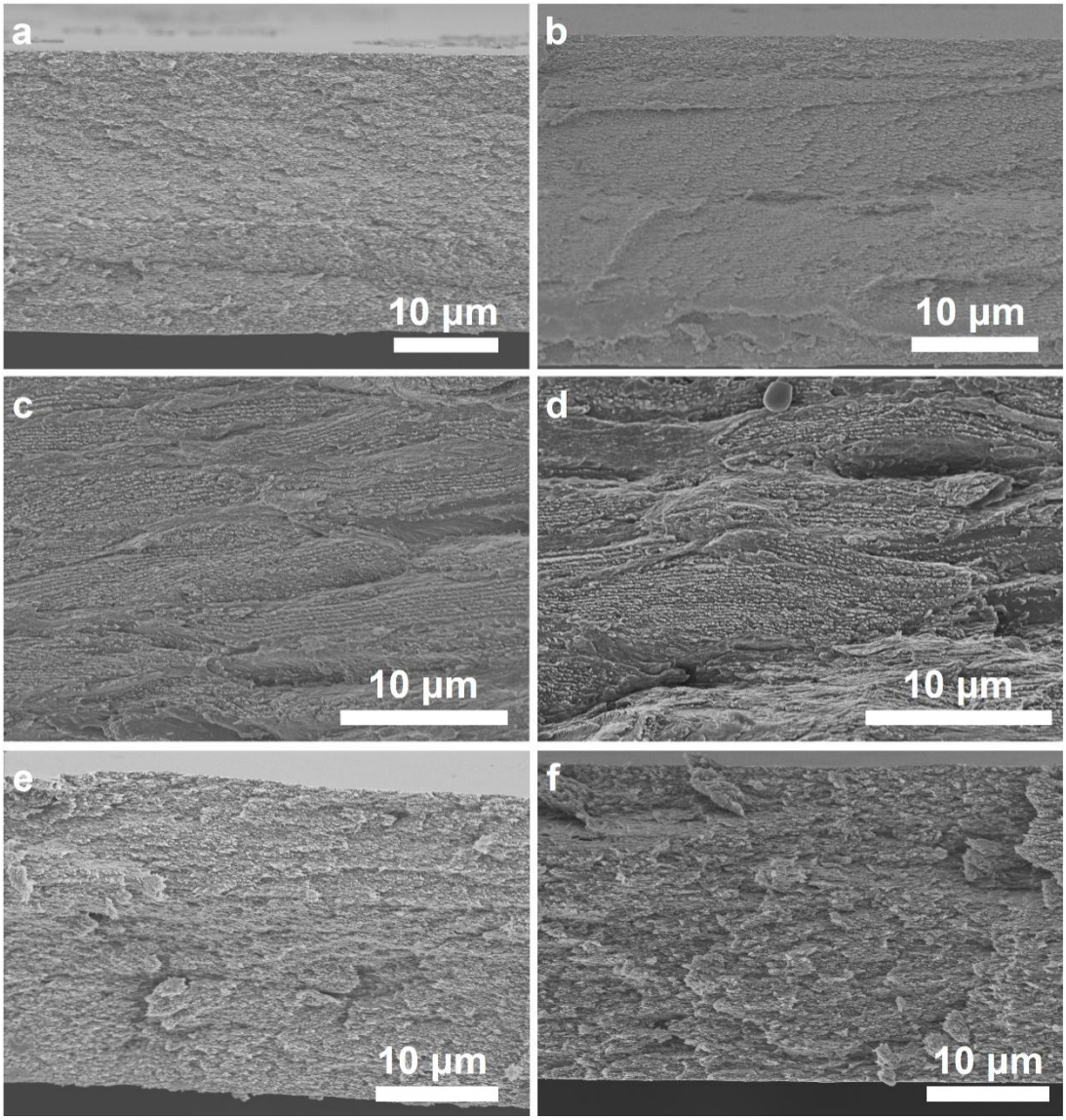

Fig. S2 Cross-sectional SEM images of (a) CP_1; (b) CP_2; (c) CP_3; (d) CP_4, (e) CP_5 and (f) CP_6 composite film.

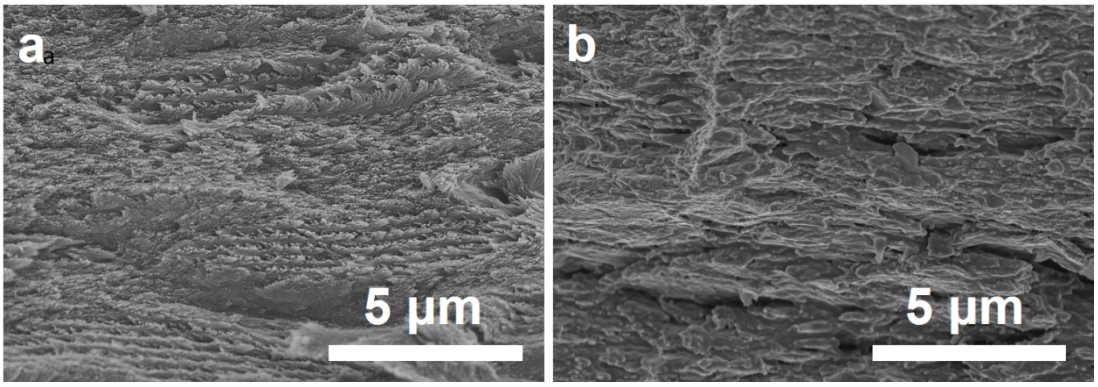

Fig. S3 The magnified cross-sectional SEM images of (a) CP_5 and (b) CP_6 composite film.

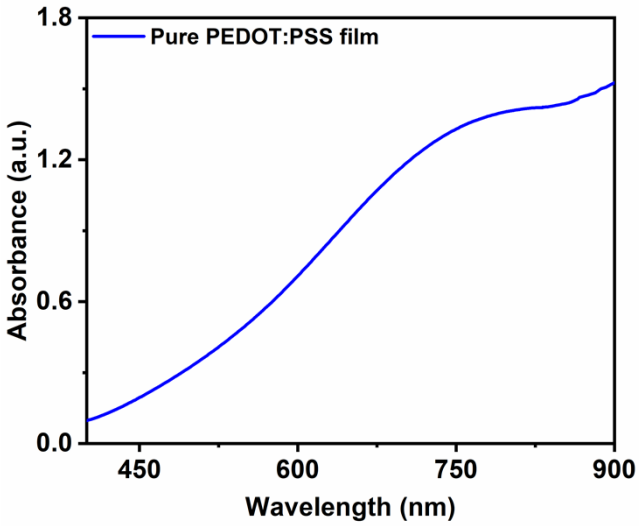

Fig. S4 UV-vis-NIR absorption spectrum of pure PEDOT: PSS film.

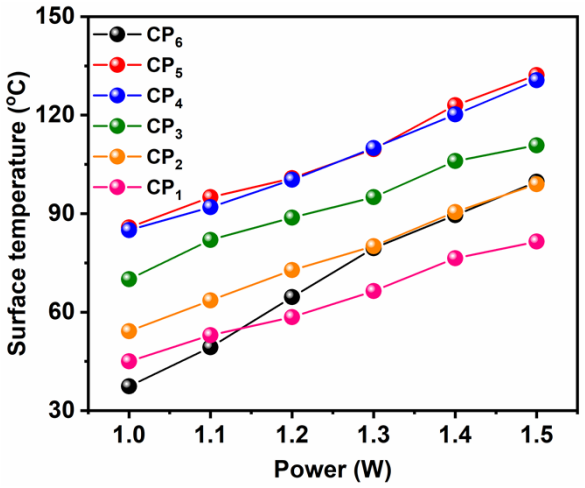

Fig. S5 The surface temperature of CP_x composite films induced by NIR light irradiation (750 nm) under different power of light.

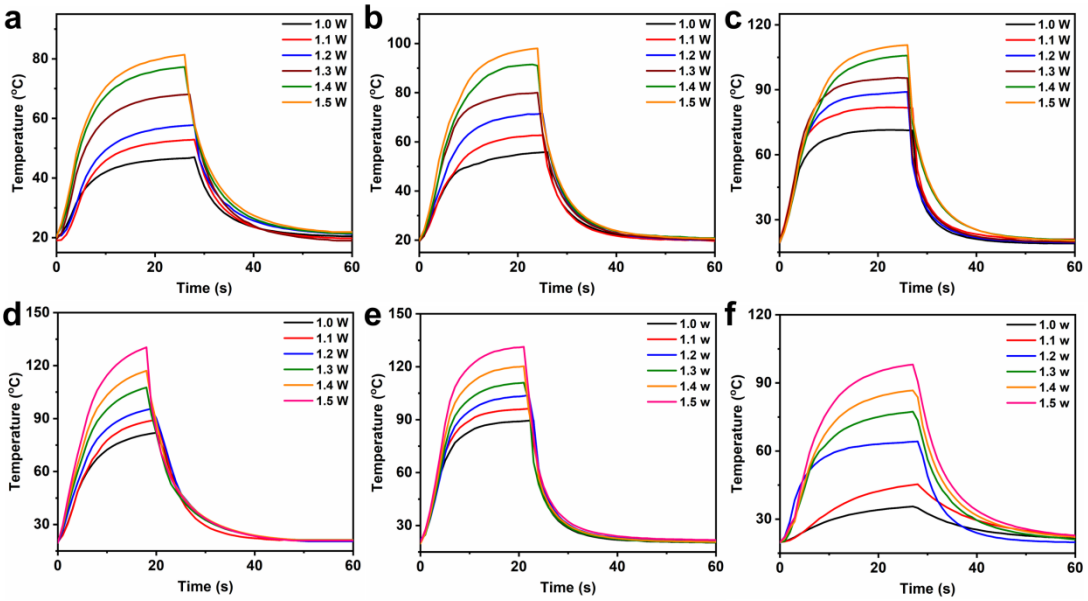

Fig. S6 The surface temperature of CP_x film increases and decreases through alternatively turn-on and turn-off light irradiation under different power. (a) CP_1; (b) CP_2; (c) CP_3; (d) CP_4; (e) CP_5; (f) CP_6 composite film.

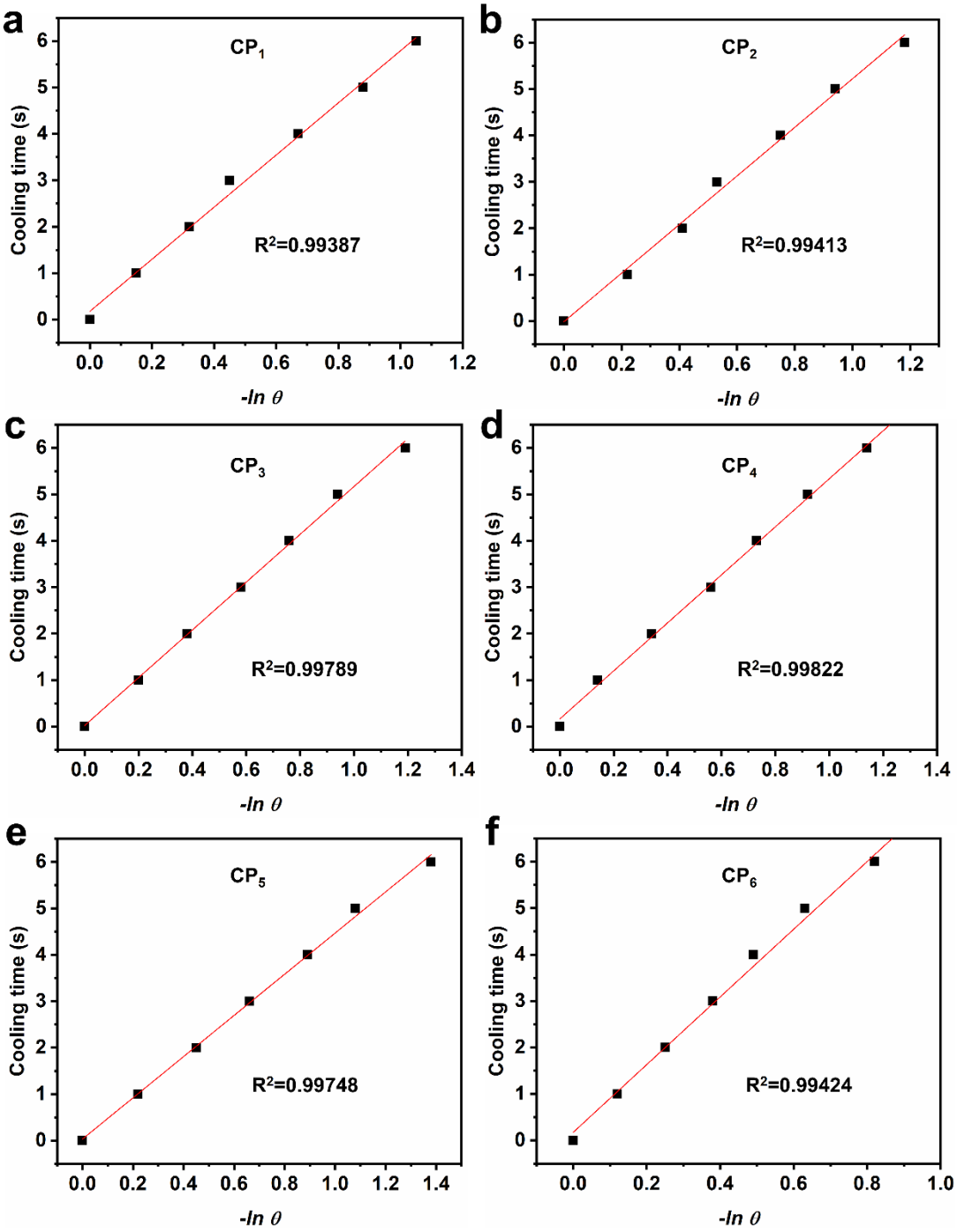

Fig. S7 A linear fitting correlation between cooling period (t) and $-ln\theta$ with an R-squared value of over 0.99. θ refers to the ratio of ΔT to ΔT_{max}.

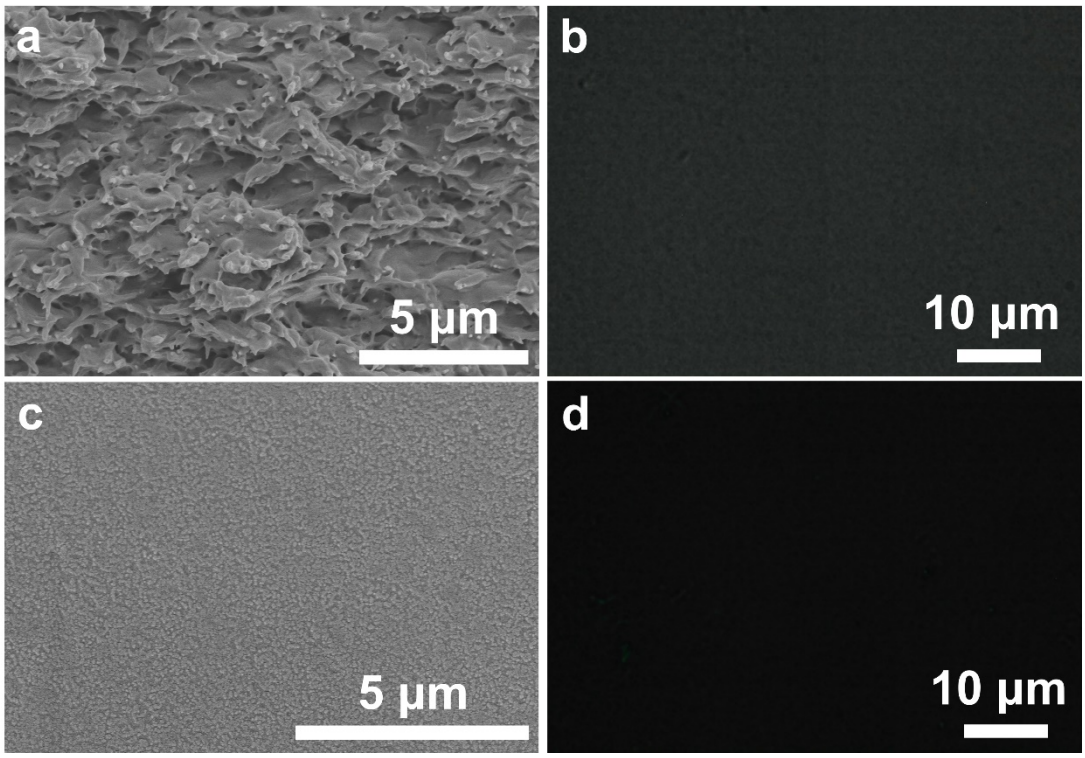

Fig. S8 Characterizations of HPC/PEDOT: PSS/OS/TA (a, b) and PVP/PEDOT: PSS/OS/TA (c, d). Both samples contained 3.43 wt.% PEDOT. (a, c) The cross-sectional SEM images. (b, d) POM images. These images confirmed that there was no chiral nematic nanostructure in these composite films.

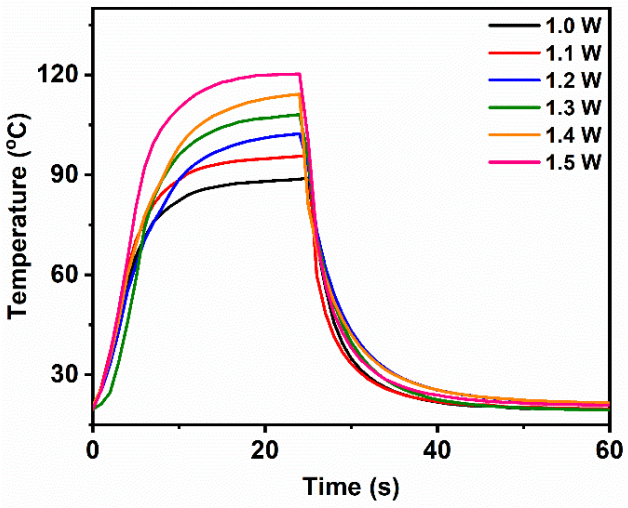

Fig. S9 The increase and decrease of the surface temperature of pure PEDOT: PSS film through alternative turn-on and turn-off light irradiation under different power.

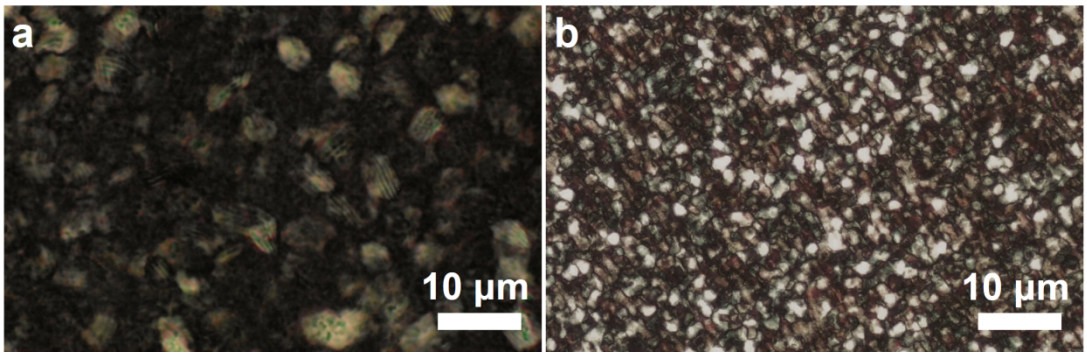

Fig. S10 POM images of (a) CNCs/PEDOT: PSS/OS and (b) CNCs/PEDOT: PSS/TA film.

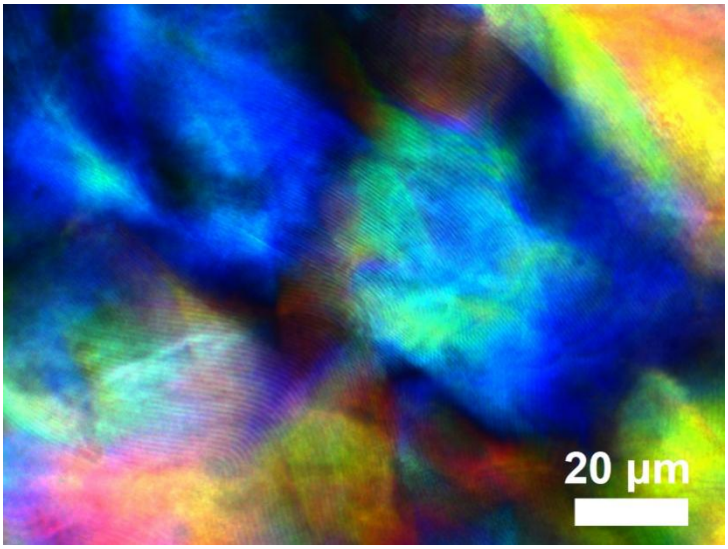

Fig. S11 POM image of pure CNCs film.

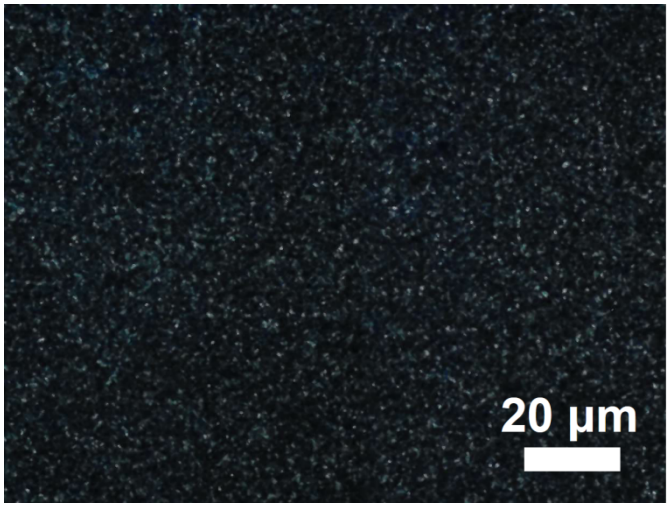

Fig. S12 POM image of CP_6 composite film.

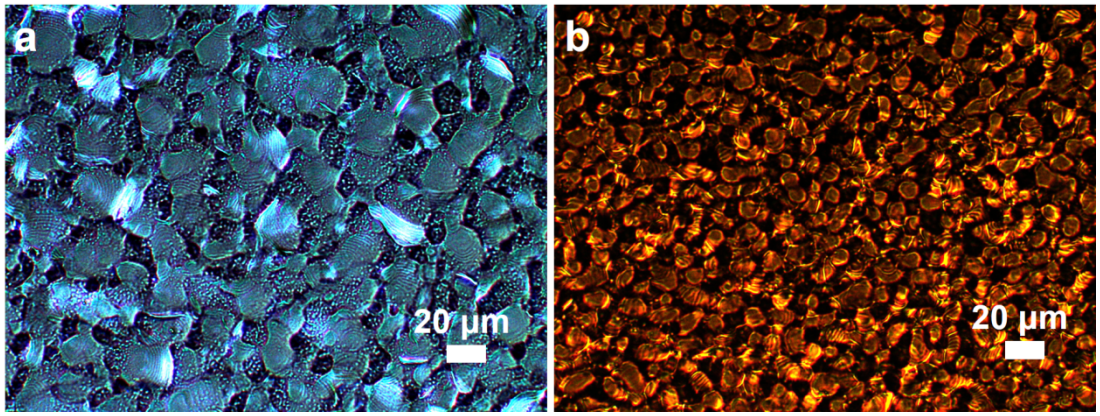

Fig. S13 POM images of CNCs/PEDOT: PSS composite films with the mass ratio of (a) CNCs : (PEDOT: PSS) = 95:5; (b) CNCs : (PEDOT: PSS) = 80:20.

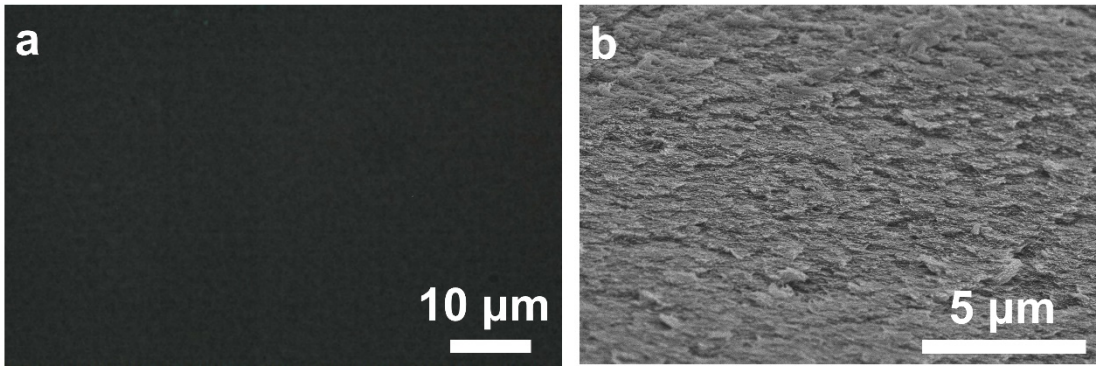

Fig. S14 (a) POM image of pure CNCs (b.d.) film. (b) The cross-sectional SEM image of pure CNCs (b.d.) film.

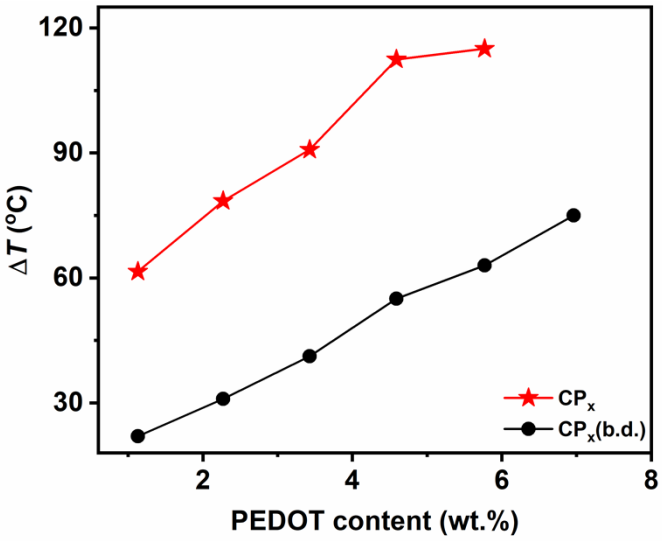

Fig. S15 The comparison of temperature changes of CP_x composite films (the red line) and CP_x (b.d.) films (the black line) with different PEDOT: PSS contents, under the 1.5 W light radiation (750 nm laser).

Table S1 Sample codes of CP_x composite films.

Sample codes	Weight ratio CNCs : (PEDOT:PSS) : OS : (TA + zonyl)[a]
CP_1	75.19 : 3.96 : 8.35 : 12.50
CP_2	71.60 : 7.95 : 7.95 : 12.50
CP_3	67.96 : 11.99 : 7.55 : 12.50
CP_4	64.29 : 16.07 : 7.14 : 12.50
CP_5	60.58 : 20.19 : 6.73 : 12.50
CP_6	56.83 : 24.36 : 6.31 : 12.50

[a] The ratios of TA and zonyl were kept at 10 % and 2.5 %, respectively.

Table S2 The compositions of CNCs/PEDOT: PSS, CNCs/PEDOT: PSS/OS, CNCs/PEDOT: PSS/TA, PEDOT: PSS/OS/TA, HPC/PEDOT: PSS/OS/TA, PVP/PEDOT: PSS/OS/TA and CNCs(b.d.)/PEDOT: PSS/OS/TA composite films.

Sample	Weight ratio
CNCs/PEDOT: PSS	CNCs : (PEDOT: PSS)
	93.54 : 3.96
	89.55 : 7.95
	85.51 : 11.99
	81.43 : 16.07
	77.31 : 20.19
CNCs/PEDOT: PSS/OS	CNCs : (PEDOT: PSS) : OS[a]
	84.19 : 3.96 : 9.35
	80.60 : 7.95 : 8.95
	76.96 : 11.99 : 8.55
	73.29 : 16.07 : 8.14
	69.58 : 20.19 : 7.73
CNCs/PEDOT: PSS/TA	CNCs : (PEDOT: PSS) : TA[a]
	83.54 : 3.96 : 10
	79.55 : 7.95 : 10
	75.51 : 11.99 : 10

	71.43 : 16.07 : 10
	67.31 : 20.19 : 10
PEDOT: PSS/OS/TA	(PEDOT: PSS) : OS : TA : Zonyl
	15.96 : 33.66 : 40.31 : 10.07
	27.99 : 27.99 : 35.21 : 8.81
	37.42 : 23.56 : 31.21 : 7.81
	45.00 : 19.99 : 28.00 : 7.01
	51.22 : 17.07 : 25.37 : 6.34
HPC (or PVP, CNCs(b.d))/PEDOT: PSS/OS/TA	HPC (or PVP, CNC(b.d)) : (PEDOT: PSS) : OS : TA[a]
	75.19 : 3.96 : 8.35 : 10
	71.60 : 7.95 : 7.95 : 10
	67.96 : 11.99 : 7.55 : 10
	64.29 : 16.07 : 7.14 : 10
	60.58 : 20.19 : 6.73 : 10

[a]: The zonyl content was kept at 2.5% if not specified.

Table S3 NIR photothermal conversion efficiency (η_{PT}) of pure PEDOT: PSS and CP_x composite films.

Samples	PEDOT content (wt.%)	η_{PT} (%)
(Pure PEDOT: PSS)	28.57	68.7
CP_1	1.13	71.2
CP_2	2.27	73.8
CP_3	3.43	77.0
CP_4	4.59	77.0
CP_5	5.77	77.6
CP_6	6.96	64.2