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SUPPORTING INFORMATION for

Tuning cellulose nanocrystals alignments for supramolecular assembly of chiral nematic films with highly efficient UVB shielding capability

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Fig. S1

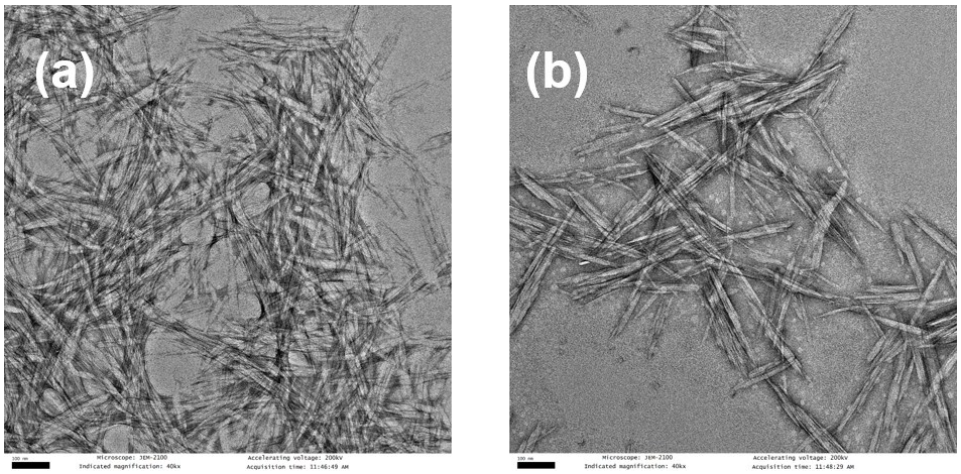

Fig. S1 The TEM images of CNCs and CNSP-X1 suspensions. Scale bar = 100 nm.

Morphology of nanoparticles were not affected by SP and Xyl modification. However, Xyl tuned CNSP samples tended to aggregate, which will affect the self-assembled cholesteric organization after evaporation.

Fig. S2

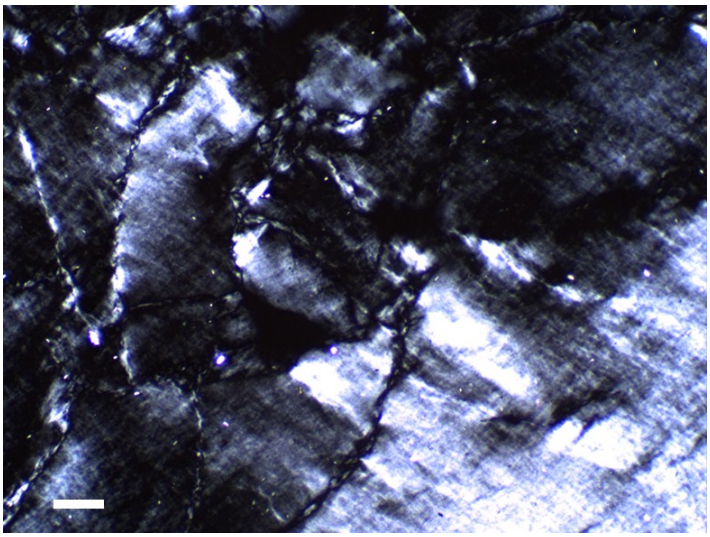

Fig. S2 The phase transition and self-assembly behavior of CNCs during the evaporation process under the polarized light. Scale bar = 100 μm.

The evaporation of CNC is a key process for self-assembly of the film, which is sensitive to temperature, pH, humidity and many other factors. It is shown that the phase is changing from dark to bright during the process, and iridescence color as illustrated in main text will appear afterwards.

Table S1. The degree of esterification for CNCs nanocomposites films determined by peaks deconvolution of FTIR spectra.

	Area of ester carboxyl peak (1844-1682 cm^{-1}) Ae	Area of non-ester carboxyl Peak (1682-1532 cm^{-1}) An	Degree of esterification Ae/(Ae+An)
CNC	0.0049	0.0283	14.76%
CNSP	0.0132	0.0157	45.68%
CNSP-X1	0.0233	0.0370	38.69%
CNSP-X2	0.0296	0.0437	40.38%
CNSP-X5	0.0238	0.0359	39.91%

Table S2. The crystal structure data (crystallinity, d-spacings and crystallites perpendicular to major lattice planes) of CNCs nanocomposites films determined by Rietveld analysis.

	CrI (%)	d-Spacing (Å)			Crystallite size (nm)		
		(1-10)	(110)	(200)	(1-10)	(110)	(200)
CNC	94.8	6.0	5.4	3.9	6.07	6.14	6.14
CNSP	97.6	6.0	5.4	3.9	6.14	6.16	6.20
CNSP-X1	86.7	6.0	5.5	3.9	7.88	5.07	6.04
CNSP-X2	82.5	6.1	5.5	4.0	7.34	5.16	6.48
CNSP-X5	87.5	6.0	5.4	3.9	6.29	5.97	5.76

Fig. S3

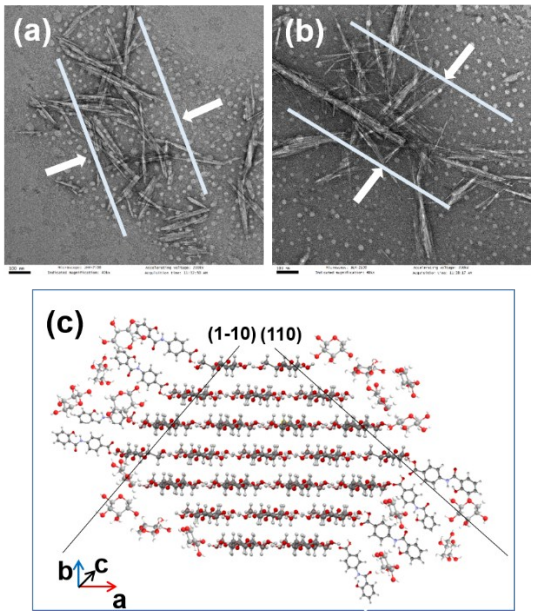

Fig. S3 The TEM images of CNSP-X2 (a) and CNSP-X5 (b) nanoparticles aggregating during the evaporation; The crystallite model for the interactions of cellulose with SP and Xyl (c).

Fig. S4

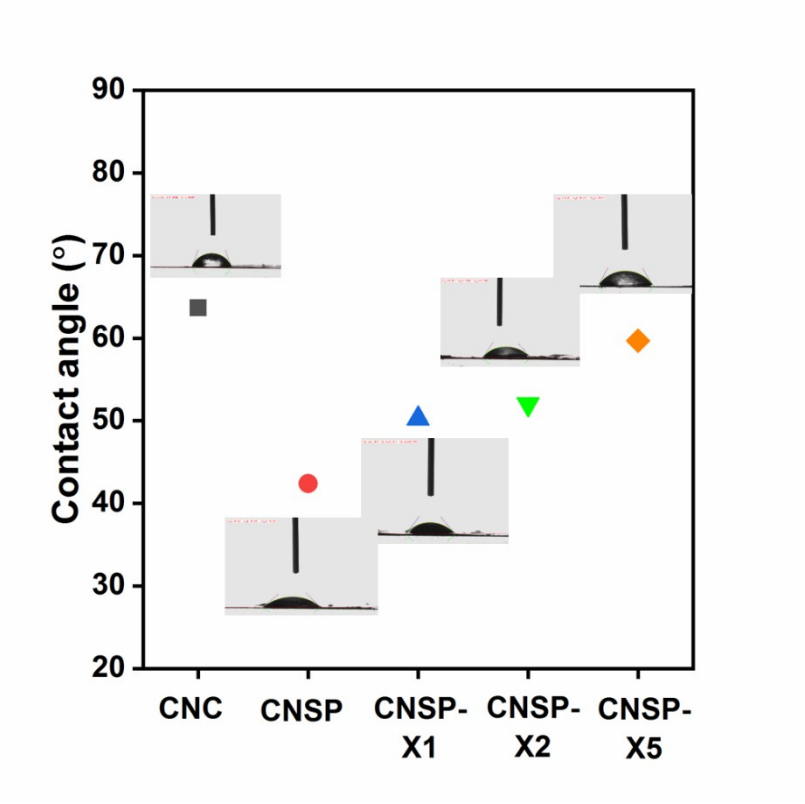

Fig. S4 The water contact angle of CNCs nanocomposite films.

The CNC based films all showed hydrophilicity on the surface. Compared to raw CNC, CNSP had low water contact angle mainly derived from more carboxyl groups from SP. Tuning by Xyl improved the water contact angle though they were still within hydrophilic range.