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

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Supporting information

Multifunctional Chiral Nematic Cellulose Nanocrystals/Glycerol Structural Colored Nanocomposites for Intelligent Responsive Films, Photonic Inks and Iridescent Coatings

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Table **S1** The relation between reflectance peak wavelength (λ_{max}) and helical pitch (P) of CNC/Gly iridescent film.

CNC/Gly(w/w)	n_{avg}	P (nm)	λ_{max}(nm)
100/0	1.54	215 ± 5	437
80/20	1.526	278 ± 8	542
60/40	1.512	424 ± 16	691
50/50	1.505	620 ± 40	834

The helical pitch of the CNC/Gly iridescent film is calculated by SEM image analysis. The n_{avg} is the average refractive index of CNC and Gly. Where the refractive index of CNC is 1.54, the refractive index of Gly is 1.47.

Table S2 The surface tension (σ) and viscosity (η) of CNC/Gly photonic inks with different Gly content.

CNC/Gly (w/w)	σ ($mN \cdot m^{-1}$)	η (mPa·s)
100/0	71.23	3.66
90/20	69.41	3.80
80/20	68.83	3.91
70/30	68.25	4.04
60/40	67.70	4.19
50/50	66.86	4.28

The surface tension and viscosity measurement were performed at 25°C. The surface tension of deionized water is 71.98 $mN \cdot m^{-1}$ and glycerol is 63.74 $mN \cdot m^{-1}$.

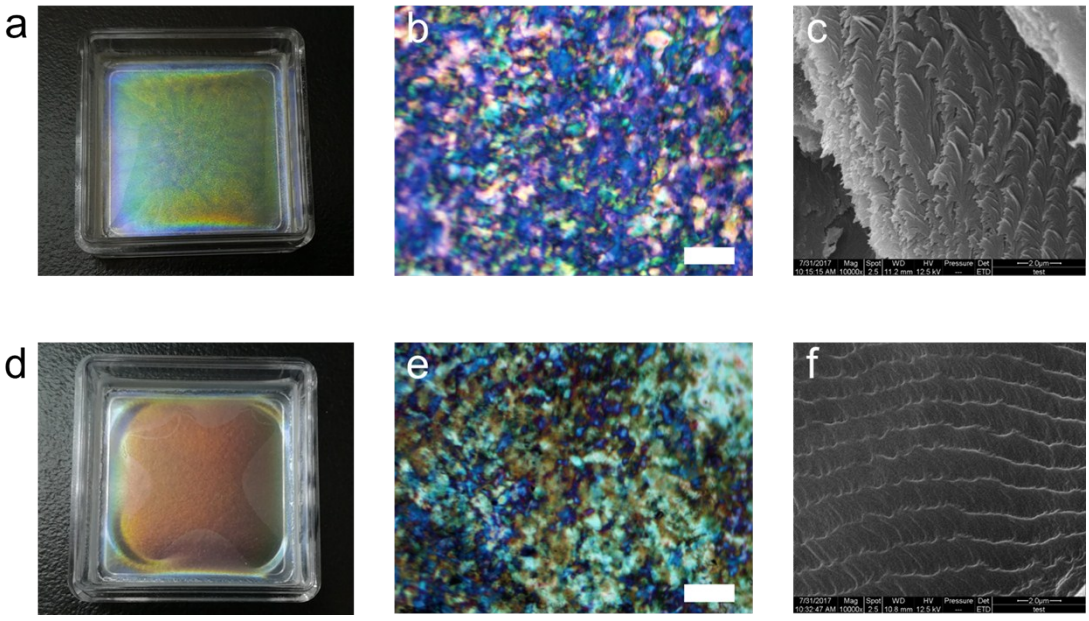

Figure S1 a-c) The CNC/Gly10 composite film: a) Photograph of the composite film under white light illumination, b) POM micrograph taken with crossed polarizers (scale bar, 500 um).c) SEM image for the cross section of the film (scale bar, 2 um).
d-f) The CNC/Gly30 composite film: a) Photograph of the composite film under white light illumination, e) POM micrograph of the composite film taken with crossed polarizers (scale bar, 500 um). f) SEM image for the cross section of the film (scale bar, 2 um).

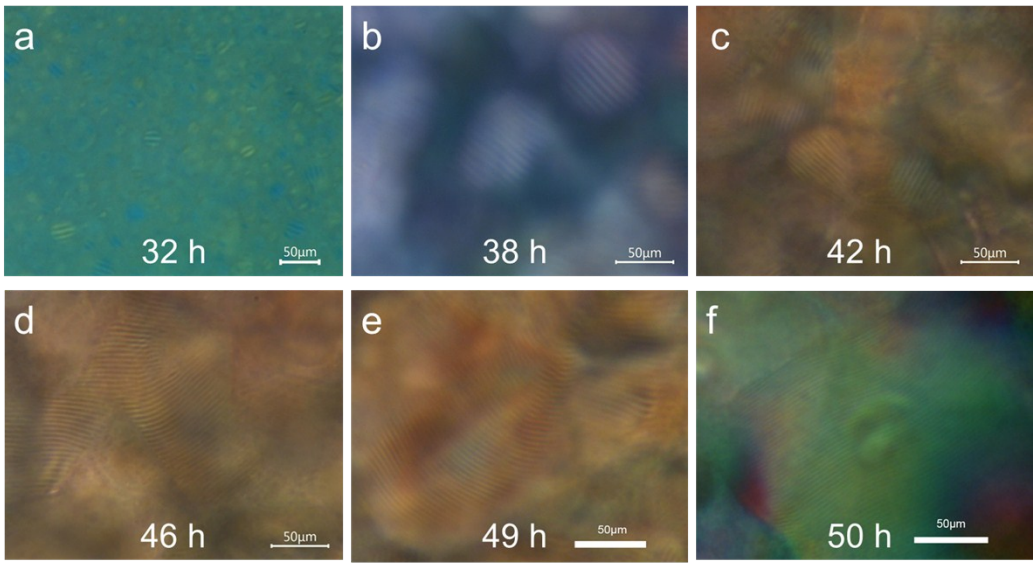

Figure S2 a-f) Formation, growth and fusion process on the time course of tactoids in CNCs/Gly20 composite suspension taken with crossed polarizers (scale bar, 50 μm)

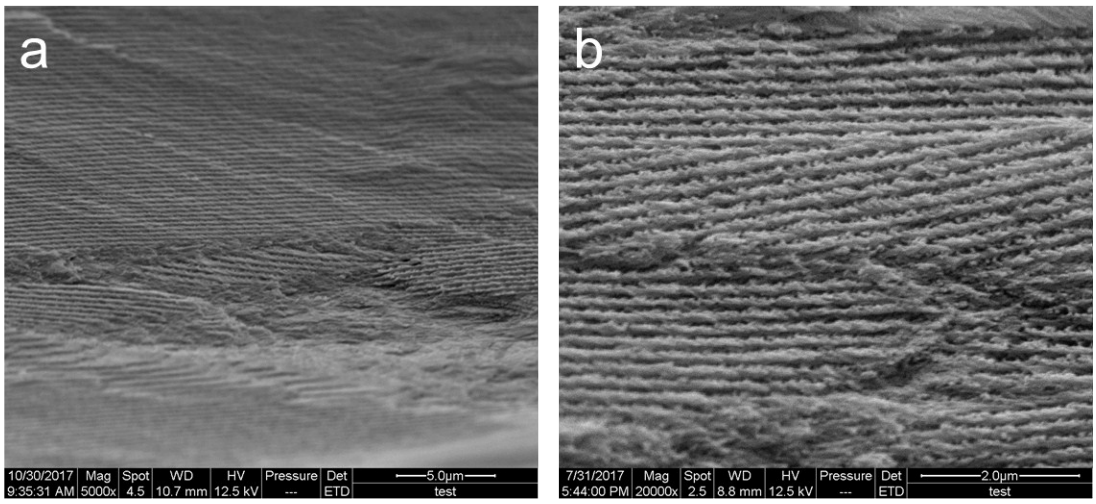

Figure S3 SEM images for the side view of defects in a) pure CNC film (scale bar, 5 µm) and b) CNC/Gly 20 film (scale bar, 2 µm).

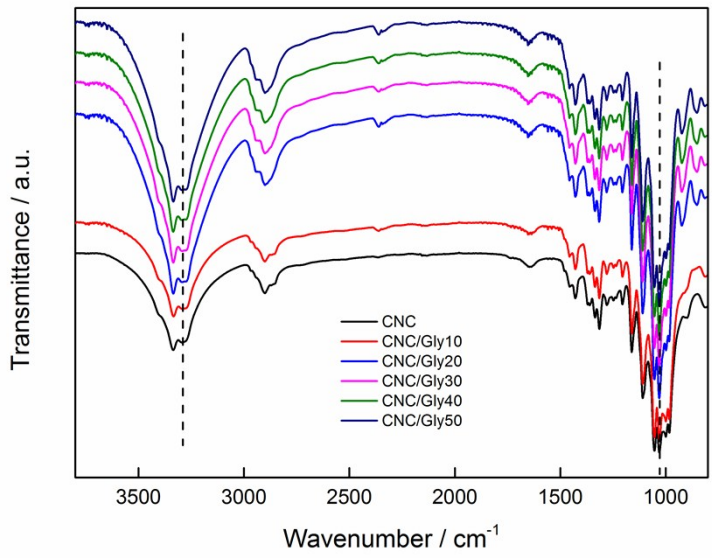

Figure S4 FT-IR spectra of pure CNC film and CNC/Gly composite films with different glycerol content.

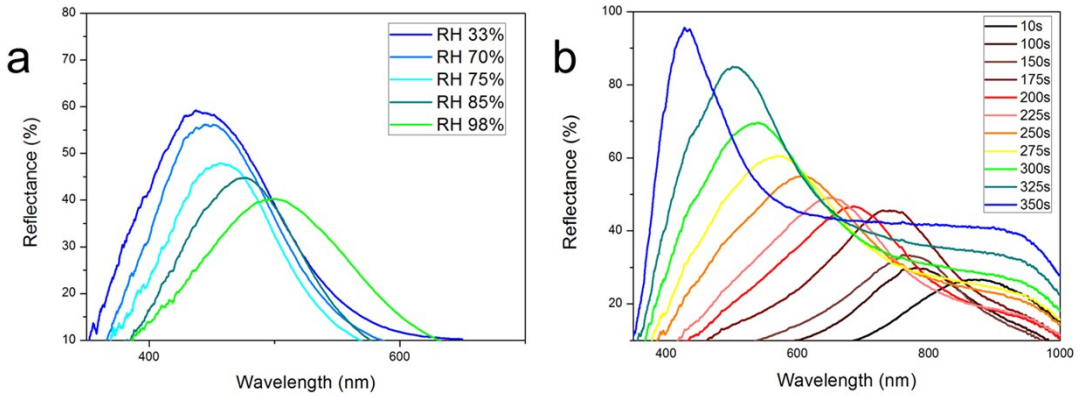

Figure S5 a) Reflection spectra of pure CNC film under different RH from 33% to 98%. b) The real-time reflection spectra of the pure CNC film after dropping a drop of water on it.

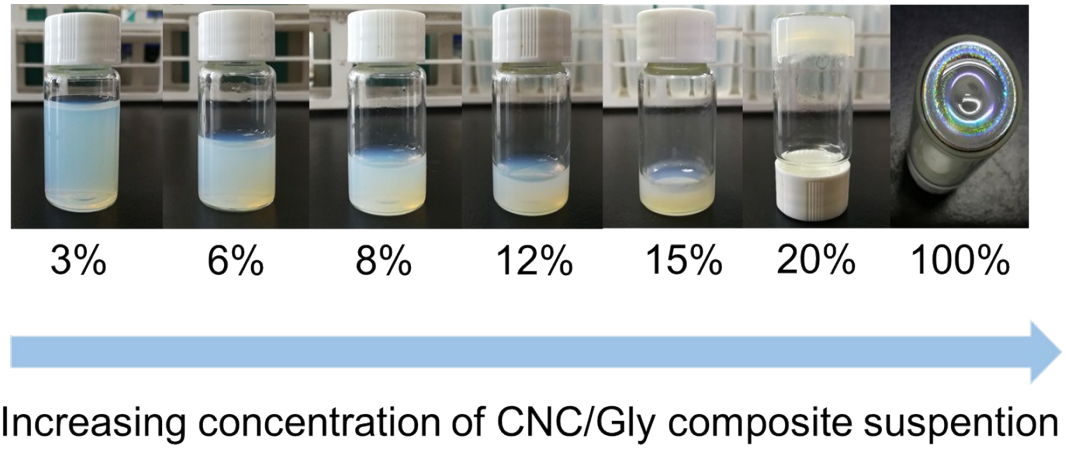

Figure S6 CNC/Gly20 suspension with different concentration of CNCs.

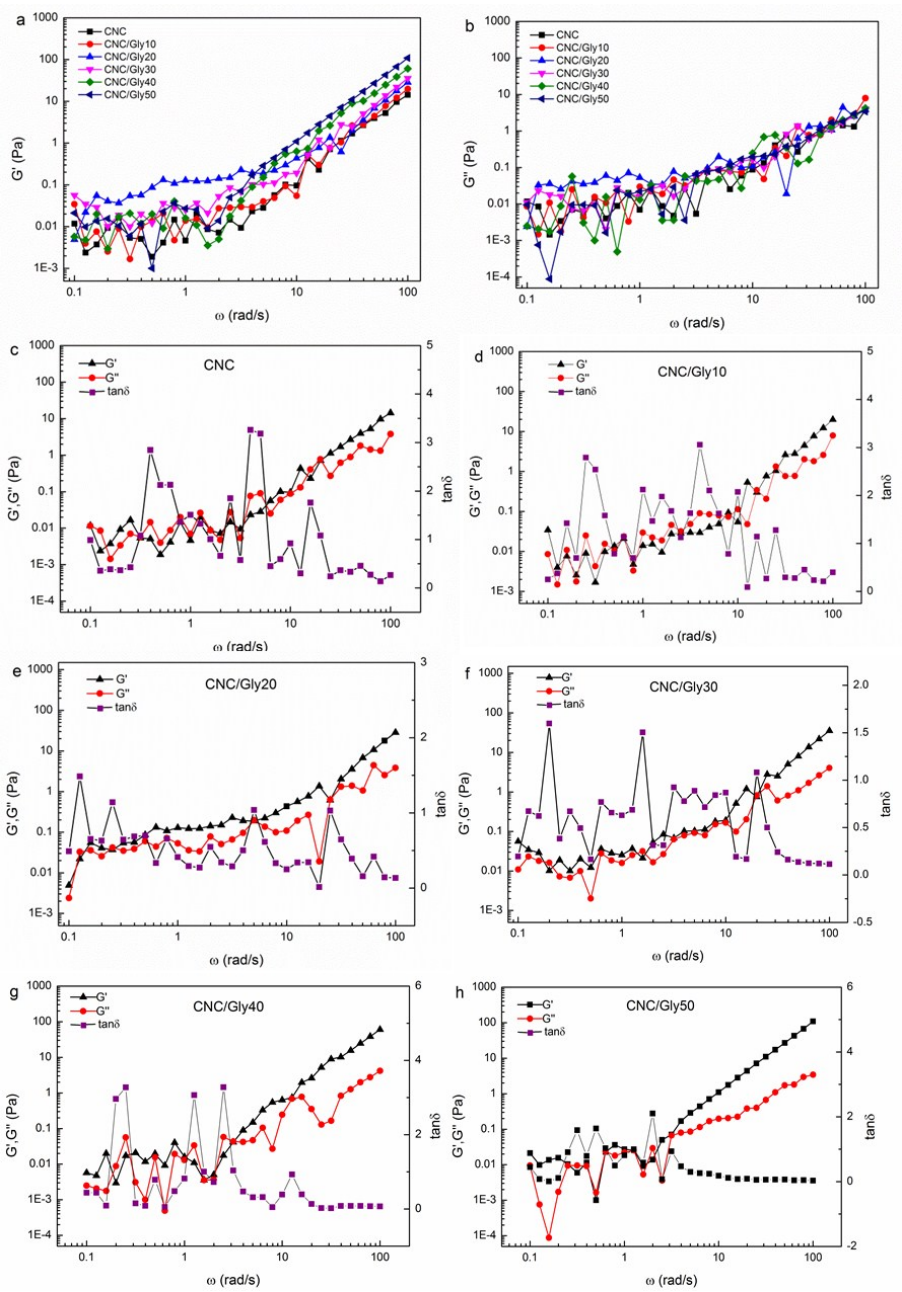

Figure S7 (a) Storage modulus and (b) loss modulus as a function of angular frequency at 25 ^{o}C for suspensions with CNC and CNC/Gly solutions; angular frequency dependence of storage modulus, loss modulus and loss tangent of CNC and CNC/Gly solutions: (c) CNC; (d) CNC/Gly10; (e) CNC/Gly20; (f) CNC/Gly30; (g) CNC/Gly40 and (h) CNC/Gly50.

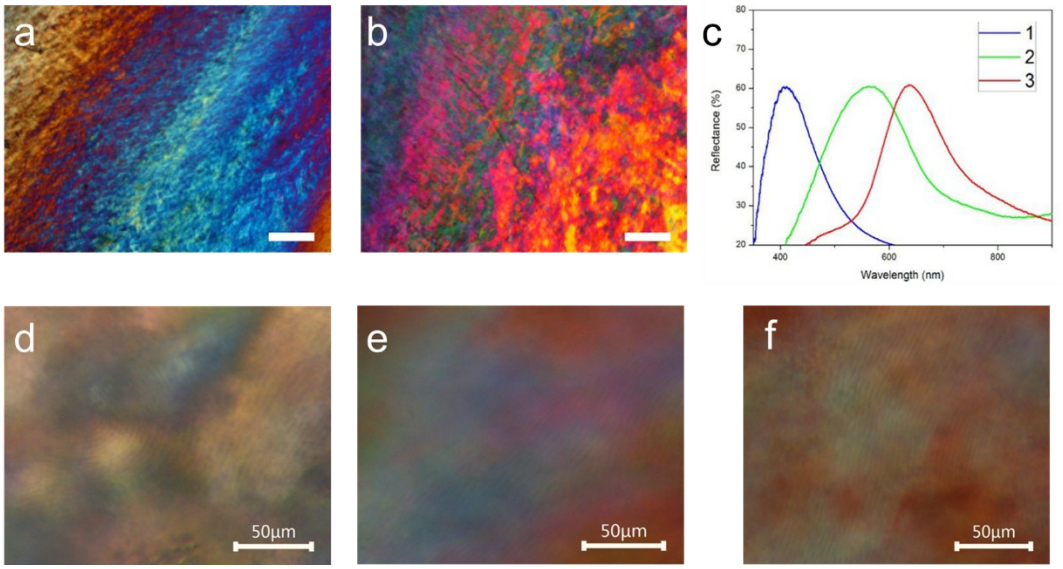

Figure S8 Optical characteristics of photonic writings. a) POM image of number "1" taken with crossed polarizers (scale bar, 500 μm). b) POM image of number "3" taken with crossed polarizers (scale bar, 500 μm). c) Reflection spectra of photonic writings of three number. d-f) Fingerprint textures showed by POM images of d) number "1", e) number "2" and f) number "3" taken with crossed polarizers (scale bar, 50 μm).

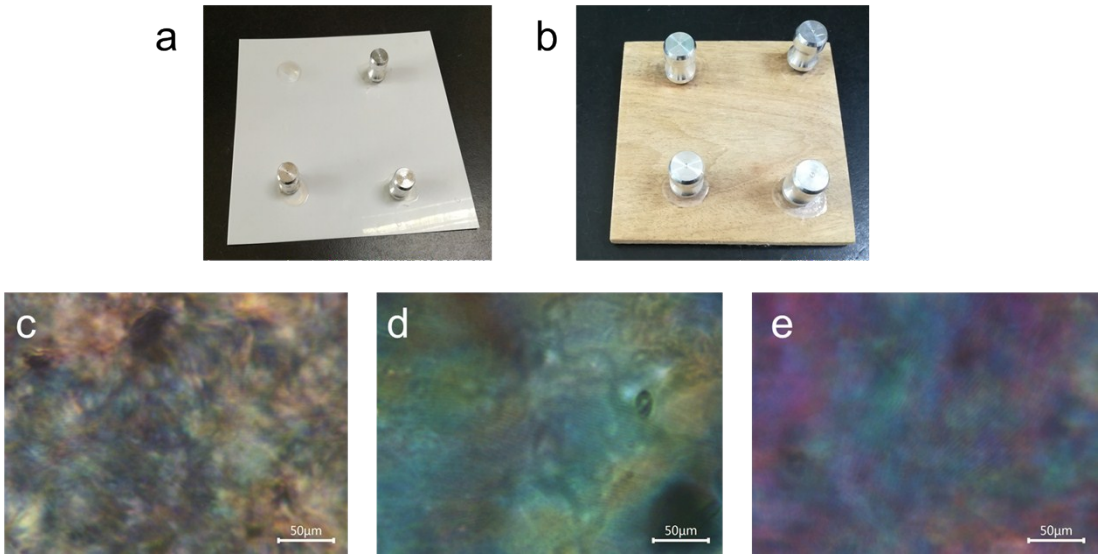

Figure S9 a,b) Aluminum dollies with diameter of 10 mm were glued on CNC/Gly iridescent coatings on a) ABS surface and b) wood surface. c-e) Photonic crystals settled on the paper of CNC/Gly coatings. c) Pure CNC coating, d) CNC/Gly20 coating and e) CNC/Gly40 coating (scale bar, 50 μm).