Supplementary Information (SI) for Physical Chemistry Chemical Physics.


Supporting information for

# Disappearing and reappearing of structure order in colloidal photonic crystals

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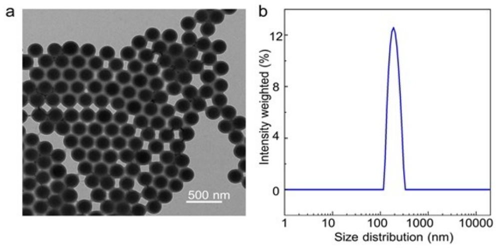


Figure S1. a) TEM image and b) size distribution of PS nanoparticles.

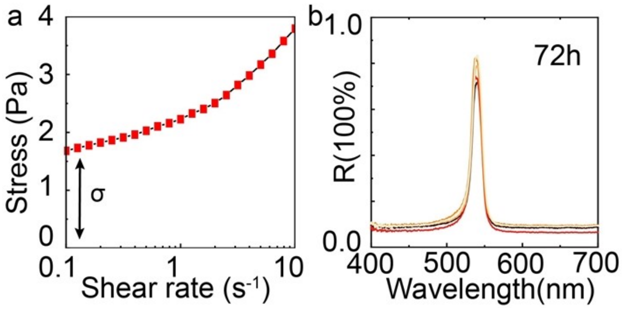


Figure S2. a) The stress-shear rate curve of photonic paste with 58 vol % PS nanoparticles, and $\sigma$ denotes yield stress. b) Normal reflection spectrum of CPC film after aged for 72h.

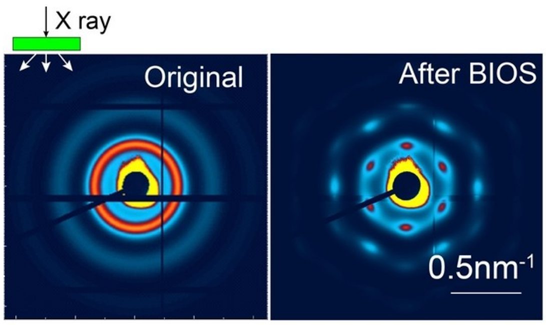


Figure S3. SAXS pattern of photonic paste before (left) and after (right) BIOS shear.

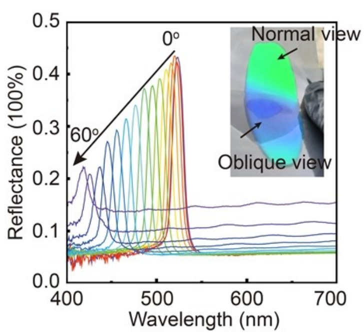


Figure S4. Angle-resolved reflection spectra of CPC film with detected angle ranging from 0 to 60$^{o}$. The inset figure is photo of a curved CPC film.

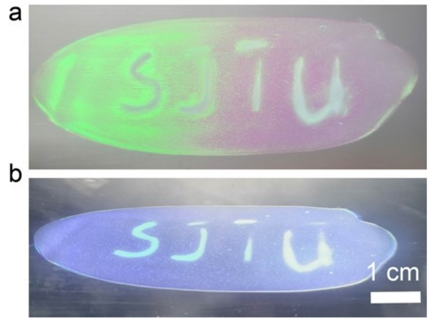


Figure S5 Photos of indented CPC film with a white background in a) normal view and b) tilt view.

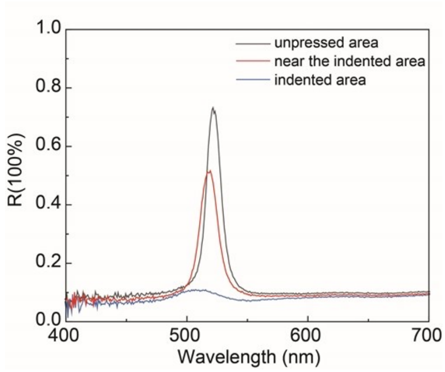


Figure S6 Extracted reflection spectra form Figure 2d.

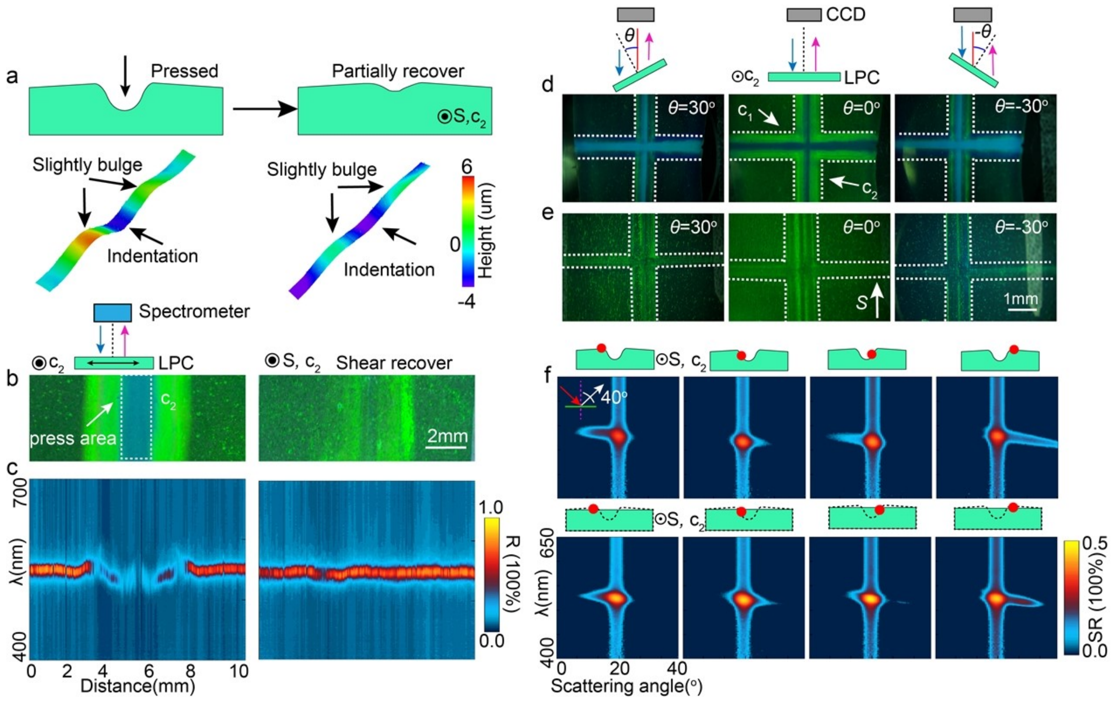


Figure S7 a) Surface profile of $c_2$ trace after bending shear. S denotes the shear direction, which is parallel to the $c_2$ traces. b) Photo of $c_2$ trace before (left) and after (right) shear. The top inset figure shows the measurement geometry. The shear direction S is parallel to the $c_2$ trace. c) The corresponding normal reflection spectrum mapping of $c_2$ trace before (left) and after (right) shear. d) Angle resolved photo of indented CPC film before shear. The top inset figure is test geometry. $\theta$ is the rotation angle. The $c_2$ trace is parallel to the rotation axis. e) Angle resolved photo of indented CPC film after shear. S denotes shear direction, which is parallel to $c_2$ direction. f) Reflected scattering spectra of the indented (fist row) and shearing-recovered (second row) $c_2$ trace at different surface site marked with red spot in the corresponding top inset, and 'SR' denotes the scattering intensity. The top-left inset shows the test geometry for reflected scattering. The incident light angle is 20°, and the scattering light was detected from 0° to 40°.

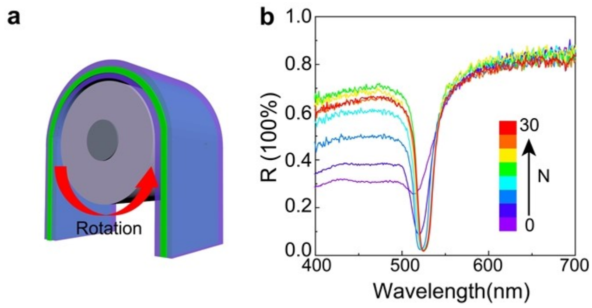


Figure S8. a) Schematic of bending shear process; b) Transmission spectrum evolution of indented CPC film under bending shear.

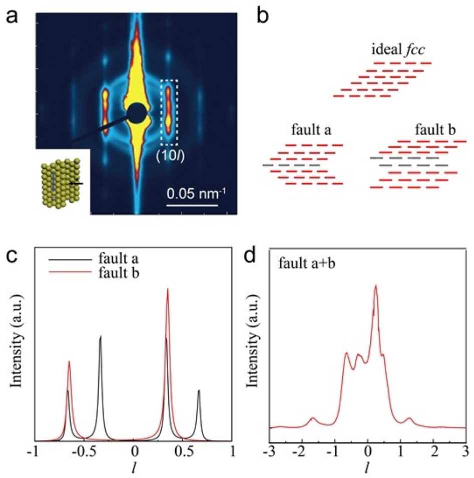


Figure S9 a) GSAXS pattern of shear-recovered CPC film; b) Schematic of the ideal *fcc* structure, *fcc* structure with fault a, and *fcc* structure with fault b, respectively; c) Theoretical scattering intensity distribution along the rod (10*l*) of the *fcc* structure with fault a and fault b, respectively; d) Scattering intensity distribution along the rod (10*l*) of the CPC film after bending shear recovery.

**Movie S1.** Color transition of CPC film under pressing and shear forces.