

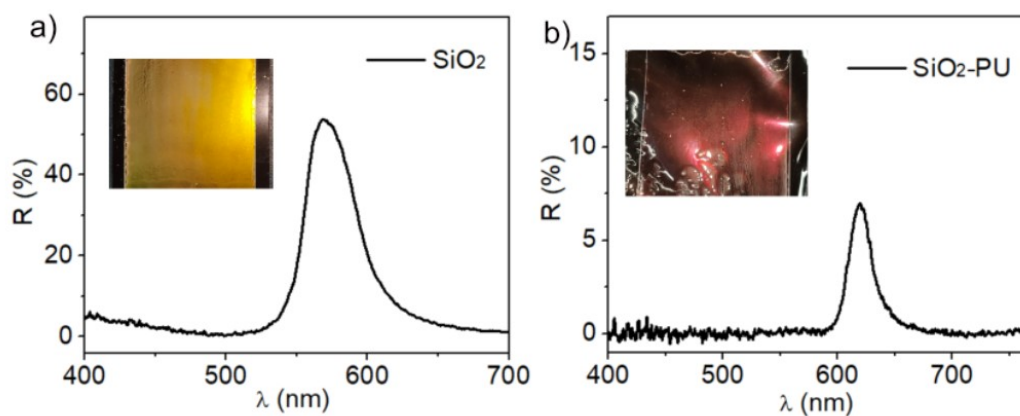
## Supporting information

# Dual-Responsive PU Inverse Photonic Crystal Film with High Flexibility for Anti-counterfeiting

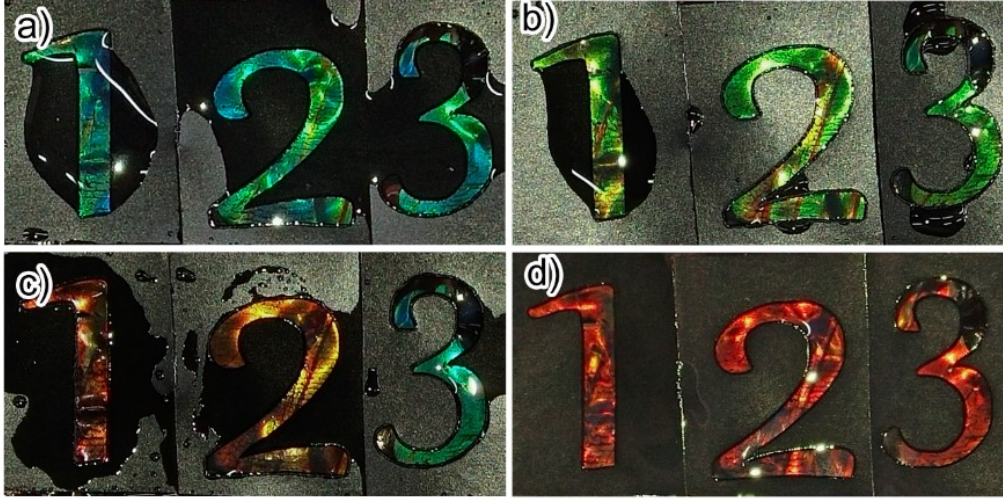
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**Figure S1.** The reflection spectra and digital photos of a) SiO<sub>2</sub> photonic crystal film, b) SiO<sub>2</sub>-PU composite photonic crystal film.



**Figure S2.** Digital photonic of the colored pattern on the PU-IPC film prepared by loading solvent with different ethanol concentration.

#### Calculation of the reflection wavelength of PU-IPC films in different solvents.

The diameter of SiO<sub>2</sub> colloid particle was measured to be 260 nm according to the SEM images. Based on the Bragg's law, the stop-band of the SiO<sub>2</sub> and SiO<sub>2</sub>-PU photonic crystal film could be calculated by Eq (1), where  $D$  is the diameter of the SiO<sub>2</sub> particle,  $f$  is the volume ratio of the SiO<sub>2</sub> particle (which is 74 % in a close-packed face centered cubic structure),  $n_{particle}$  and  $n_{voids}$  is the effective refractive index related to the composition of particle and interparticle voids.

$$\lambda = \left(\frac{8}{3}\right)^{1/2} \times D \times [n_{particle}^2 \times f_{particle} + n_{voids}^2 \times (1 - f_{particle})]^{1/2} \quad (1)$$

When SiO<sub>2</sub> was dissolved, the particle position was instead by air or other solvent, The reflection wavelength of SiO<sub>2</sub> photonic crystal films, SiO<sub>2</sub>-PU photonic crystal films and PU-IPC film were calculated and listed in Table S1.

Here, PU-IPC<sub>-water</sub> and PU-IPC<sub>-ethanol</sub> represents the calculated reflection wavelength when the interparticle voids of PU-IPC film being filled with water or ethanol.

**Table S1.** Reflection wavelength of SiO<sub>2</sub>, SiO<sub>2</sub>-PU photonic crystal films and PU-IPC film in different solvents.

Composition	n <sub>SiO2</sub>	n <sub>PU</sub>	n <sub>ethanol</sub>	n <sub>air</sub>	n <sub>water</sub>	λ(nm)
SiO <sub>2</sub> -PC	1.46	1.44	1.36	1	1.33	575
SiO <sub>2</sub> -PU-PC	1.46	1.44	1.36	1	1.33	620
PU-IPC	1.46	1.44	1.36	1	1.33	480
PU-IPC- <sub>Water</sub>	1.46	1.44	1.36	1	1.33	577
PU-IPC- <sub>ethanol</sub>	1.46	1.44	1.36	1	1.33	586