

## Supporting Information

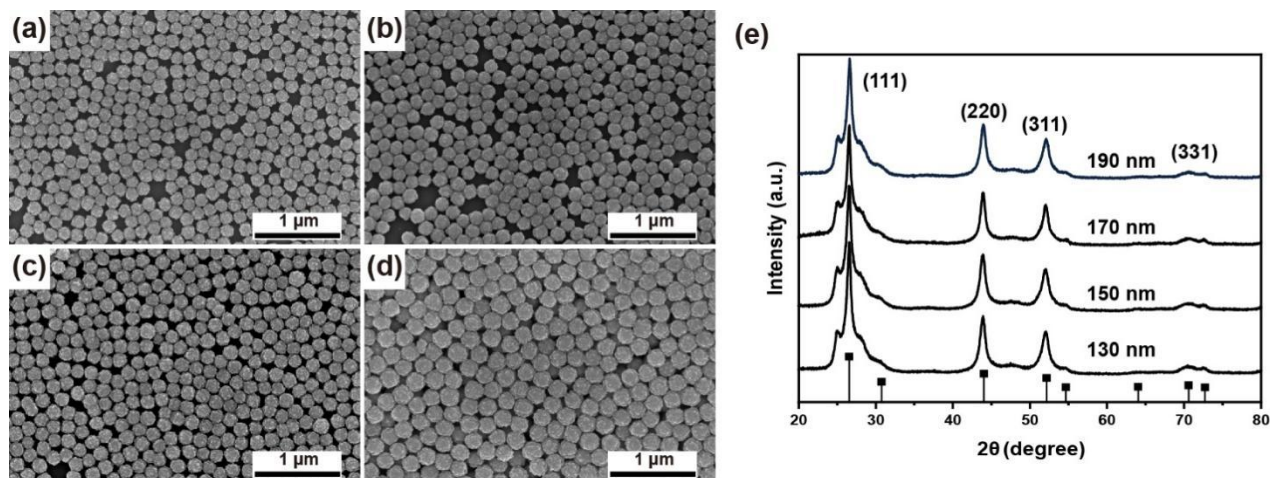
### Fabrication of flexible and robust CdS composite photonic crystal films through melt-compression

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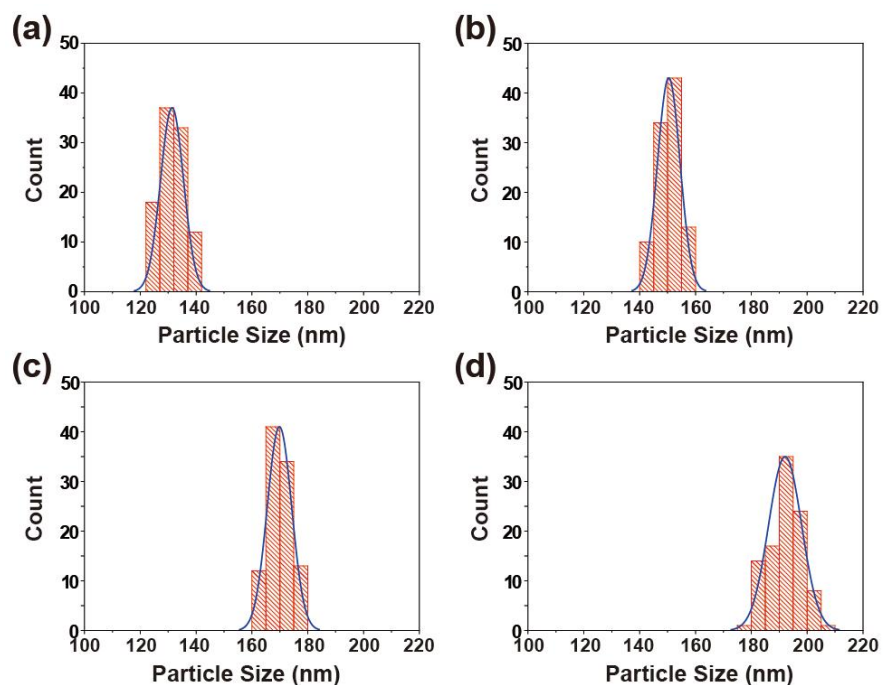
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**Table S1.** Recipes for preparing monodisperse CdS spheres with various diameters

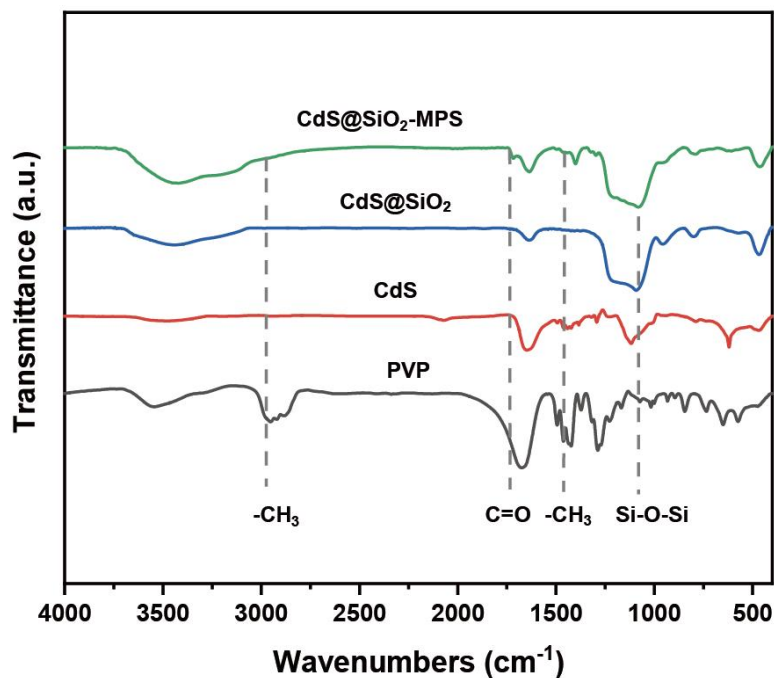
Cd(NO <sub>3</sub> ) <sub>2</sub> ·4H <sub>2</sub> O (g)	TU (g)	PVP (g)	DEG (mL)	Diameter (nm)
11.10	2.74	5	360	130
11.72	2.89	5	360	150
12.34	3.04	5	360	170
12.96	3.20	5	360	190



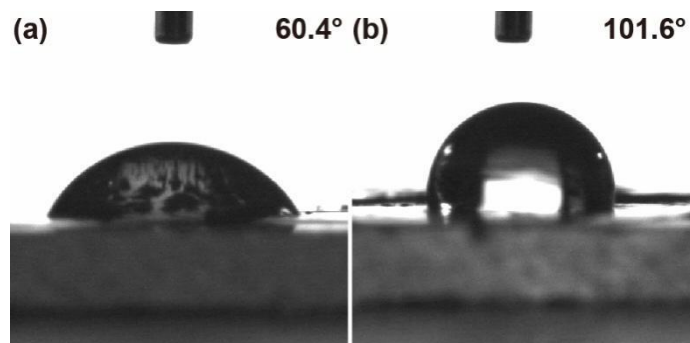
**Figure S1.** SEM images of monodisperse CdS spheres with different diameters: (a) 130 nm; (b) 150 nm; (c) 170 nm; (d) 190 nm; (e) XRD patterns of CdS spheres



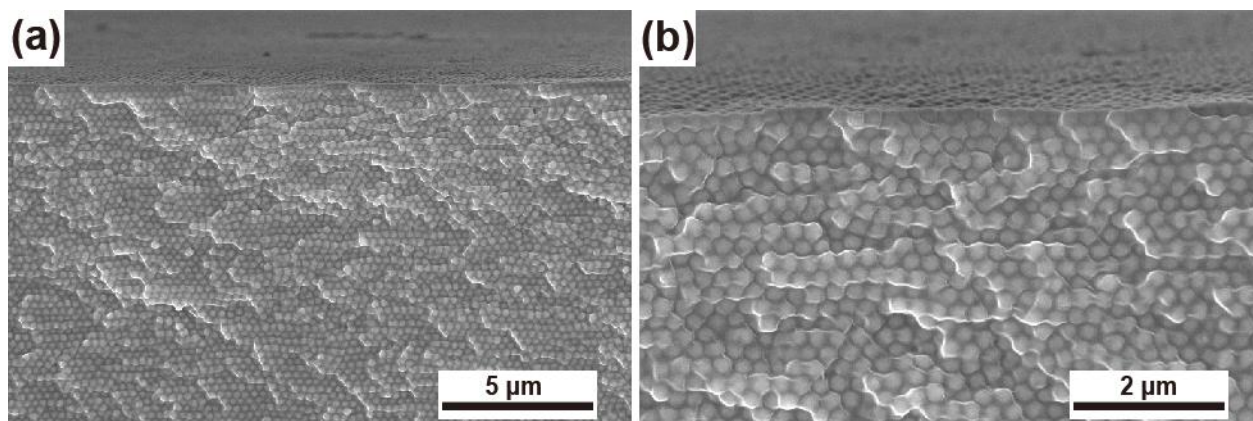
**Figure S2.** Size distribution of CdS spheres with various diameters: (a) 130 nm; (b) 150 nm; (c) 170 nm; (d) 190 nm;



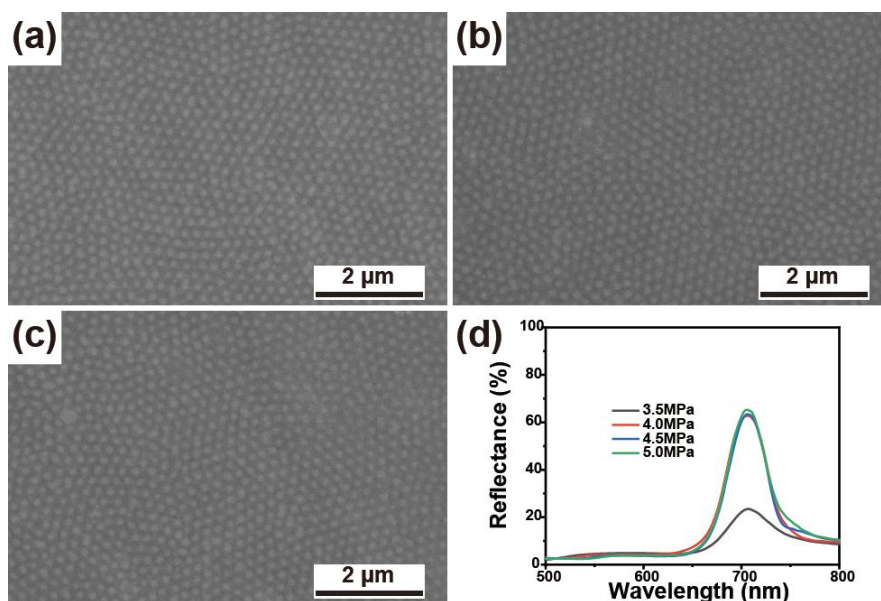
**Figure S3.** FTIR spectra of PVP, CdS spheres, CdS@SiO<sub>2</sub> spheres, CdS@SiO<sub>2</sub>-MPS spheres



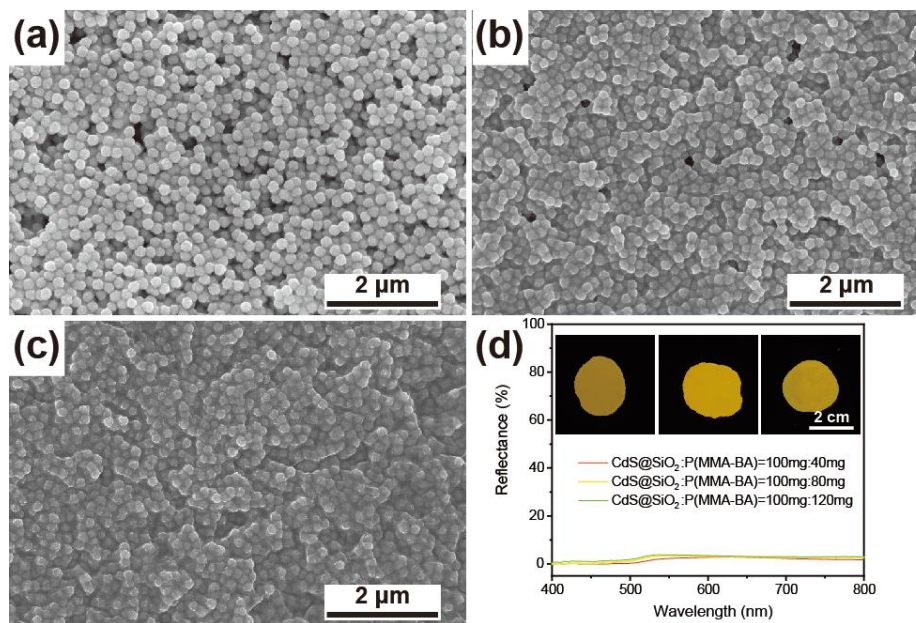
**Figure S4.** Optical images showing contact angles of water on the films of (a) CdS@SiO<sub>2</sub> spheres and (b) MPS-modified CdS@SiO<sub>2</sub> spheres



**Figure S5.** Cross-sectional SEM images near the surface of CdS/P(MMA-BA) composite PC films with different magnification times

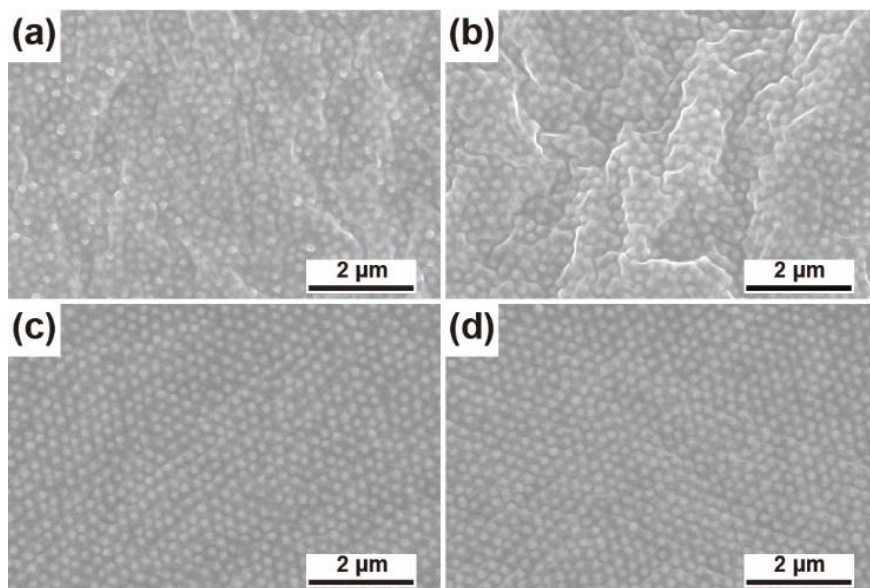


**Figure S6.** SEM images of composite PC films at various applied pressures using CdS@SiO<sub>2</sub>@P(MMA-BA) spheres with 25 nm polymer shell as building blocks: (a) 4.0 MPa; (b) 4.5 MPa; (c) 5.0 MPa; (d) reflectance spectra of corresponding films. The films were fabricated at 80 °C for 5 min.

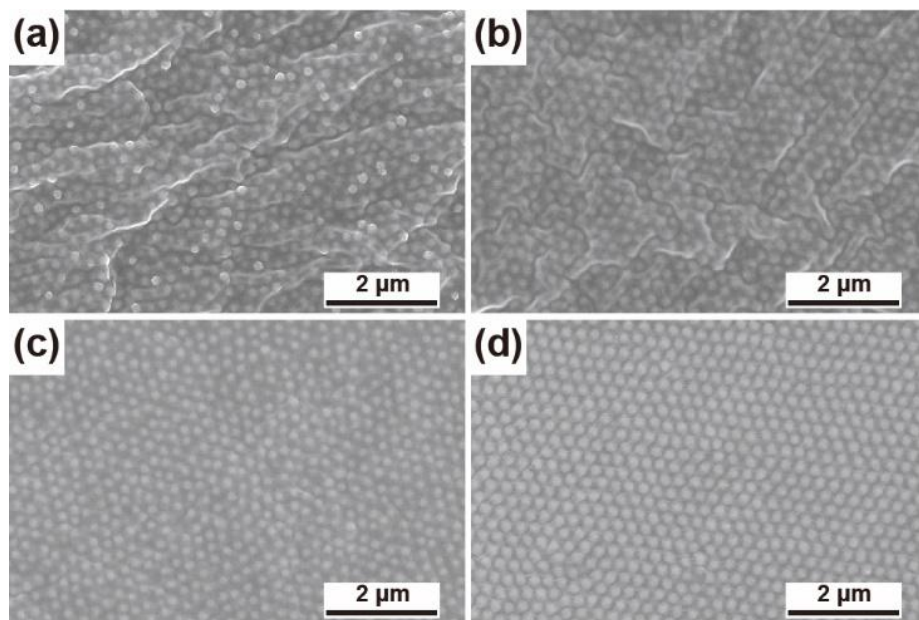


**Figure S7.** (a~c) SEM images of composite films from the mixture of CdS@SiO<sub>2</sub> spheres and P(MMA-BA) nanoparticles with different ratios; (d) reflectance spectrum of film a-c, the insets are the corresponding digital photographs.





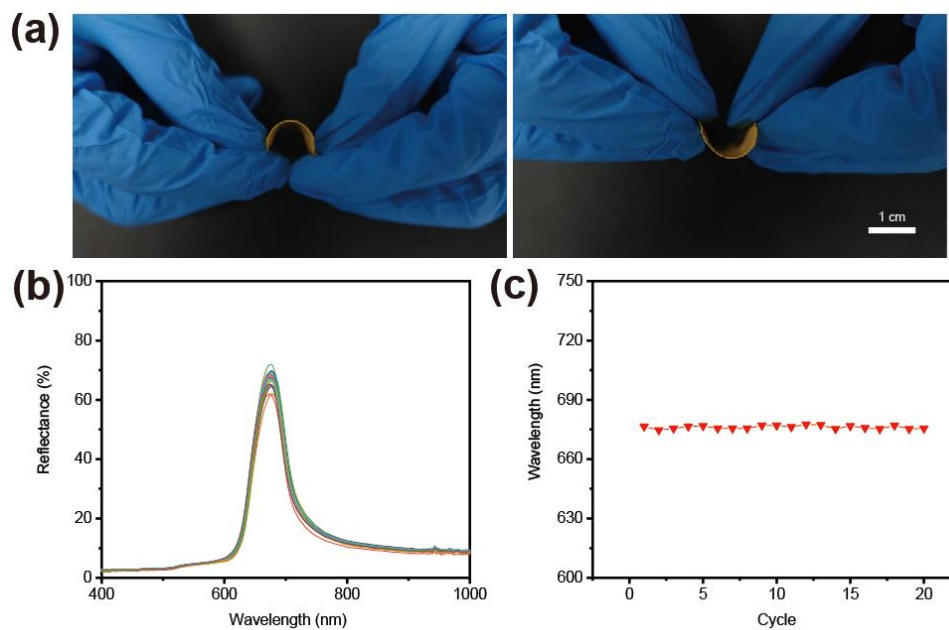
**Figure S8.** SEM images of compressed films at various conducting temperatures: (a) 60 °C; (b) 70 °C; (c) 80 °C; (d) 90 °C. The polymer shell thickness and applied pressure are 20 nm and 3.5 MPa, respectively.



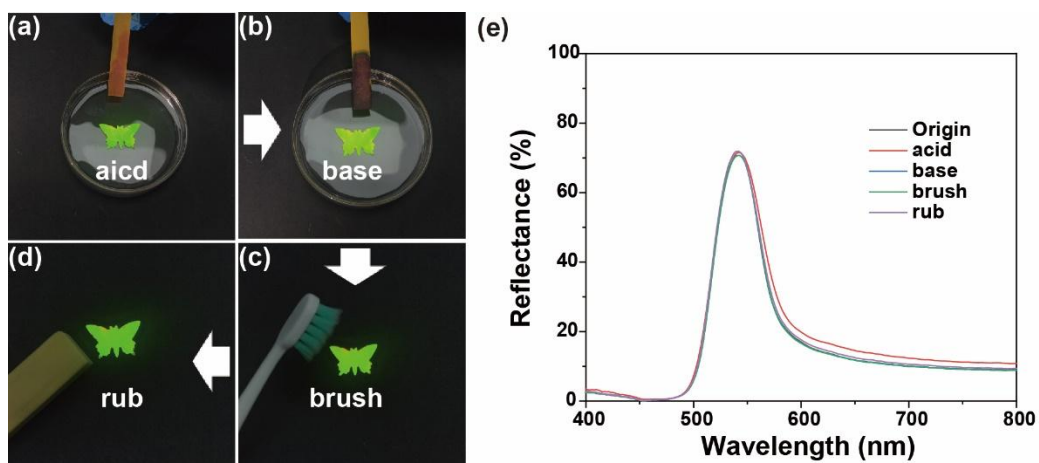
**Figure S9.** SEM images of compressed films at various applied pressures: (a) 0.5 MPa; (b) 1.5 MPa; (c) 2.5 MPa; (d) 3.5 MPa. The polymer shell thickness and conducting temperature are 20 nm and 80 °C, respectively.



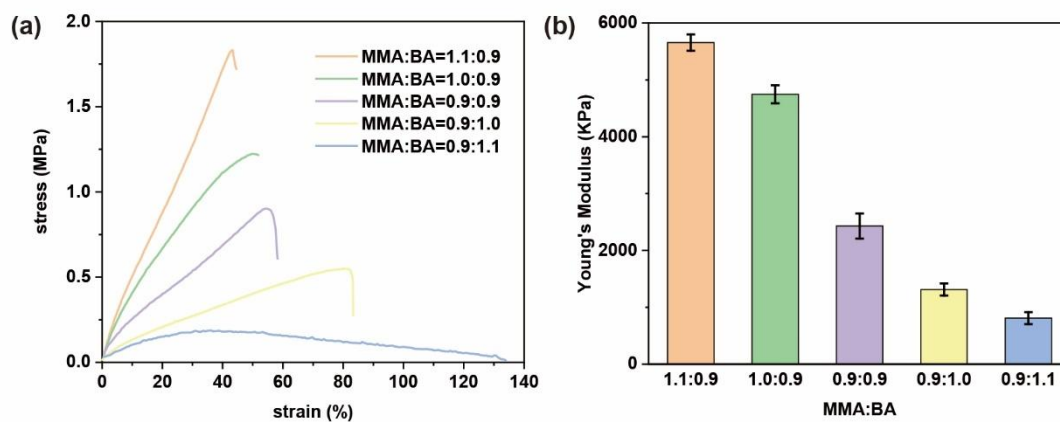
**Figure S10.** Equipment for the washing process test



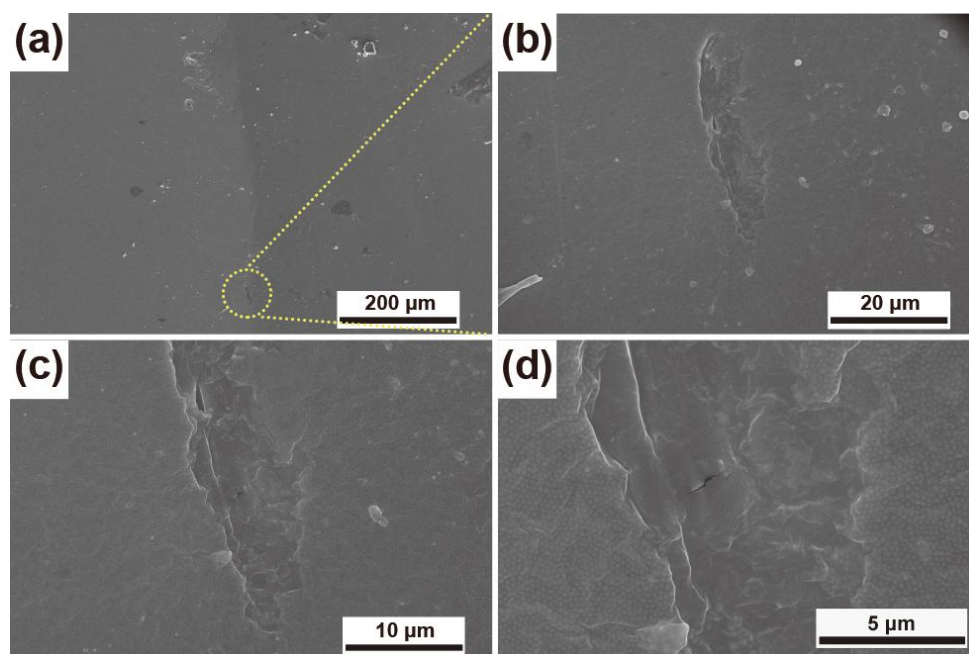
**Figure S11.** (a) Digital photographs demonstrating bending operations; (b) reflection spectra of the PC film after various cycles of bending; (c) peak positions of reflection spectra versus cycles



**Figure S12.** Digital photographs of a green butterfly-shaped composite film (a,b) soaked in acid solution (pH=2) and basic solution (pH=12) for 2 h; (c) brushed and (d) rubbed for 100 times; (e) reflectance spectra of the green film after certain treatment



**Figure S13.** (a) Strain-stress curves and (b) Young's modulus of composite PC films with different polymer shell compositions;



**Figure S14.** SEM images of the boundary of yellow and green pieces in a recombined pattern with different magnification times