

Electronic Supplementary Information

**Organic/Inorganic Hybrid Photonic Hydrogels as a Colorful
Platform for Visual Detection of SCN⁻**

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Experimental

Materials: Dimethylaminoethyl methacrylate (DMAEMA) and Ethylene glycol dimethacrylate (EGDMA) were distilled under vacuum and stored at 4 °C before using. AIBN was recrystallized twice in 95% alcohol before use. All other reagents were used as received. The silicon wafers (100) were cut into 20 mm×20 mm pieces, soaked in the mixture of 98% H₂SO₄/30% H₂O₂ (volumetric ratio 7:3) for 20 min under boiling (caution: strong oxide), and then rinsed with deionized water several times, at last were dried with N₂ stream.

Synthesis: The titania sol was prepared according to reference [1]. Briefly, 4 ml tetrabutyl titanate was dissolved into 2 ml isopropanol (IPA) in a conical flask for 5 min. 0.21 g water and 17 μl concentrated HCl were mixed with 4 ml IPA for 5 min, then dipping the mixing solution into the above conical flask for about 10 min, and then stirring 12 h at room temperature. The copolymer was prepared by solution radical polymerization. In details, 4 ml DMAEMA, 800 μl EGDMA and 20 mg azobisisbutyronitrile were dissolved into 50 ml chloroform, the solution was bubbled with N₂ for 30 min and put into 60 °C oil for reacting 6 h. In order to get different thickness film, the titania sol was diluted by different volume of IPA and the polymer solution was diluted by different volume of chloroform before using.

Preparation of the photonic hybrid films: The 1DPCs were fabricated by spin-coating the titania sol and the polymer precursor alternatively, both of titania sol and the polymer precursor were spin-coated at 3000 rpm for 60 s on silicon wafer. The titania layer was baked at 100 °C for 10 min and the polymer layer was baked at 135 °C for 10 min. The first layer was polymer layer and the last layer was titania layer in all our experiments. The number of total layers of the hybrid film was 10.

Characterization: SEM micrographs were taken with a JEOL FESEM 6700F electron microscope with primary electron energy of 3 kV. The samples were sputtered with a thin layer of Pt prior to imaging. A Shimadzu 3600 UV-VIS-NIR spectrophotometer with standard mirror optics was used to measure the specular reflectance in the 200-1600 nm range at the incidence angle of 5 degree. The ex-situ determinations of layer thicknesses and optical constants of layers were carried out using an ellipsometer (Woollam XLS-100) at an angle of 70 ° and within a spectral range of 315-720 nm.

SCN ⁻	I ⁻	NO ₃ ⁻	Br ⁻	Cl ⁻	F ⁻	HCO ₃ ⁻	SO ₄ ²⁻	Ac ⁻	CO ₃ ²⁻	H ₂ PO ₄ ⁻
-0.103	-0.068	-0.046	-0.032	-0.007	0.10	0.130	0.208	0.250	0.294	0.340

Table S1. The viscosity coefficients of anions.

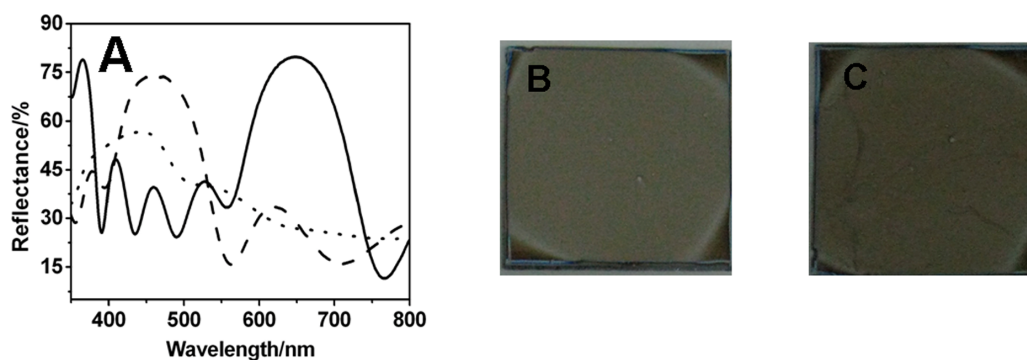


Figure S1. A) Reflective spectra of the photonic hydrogel in 10^{-3} mol/l SCN^- (the solid line); the mixture of 10^{-3} mol/l SCN^- and 10^{-2} mol/l CO_3^{2-} (the dash line) and the mixture of 10^{-3} mol/l SCN^- and 10^{-2} mol/l OH^- ; B) Photograph of a single layer titania in air; C) Photograph of a single layer titania in 0.2 mol/l NaOH for 5min.

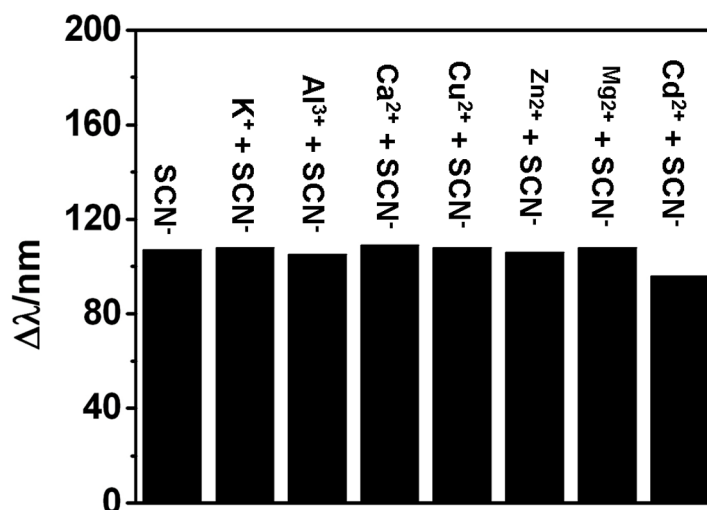


Figure S2. The shift of the photonic stop band in 10^{-3} mol/l SCN⁻ and mixtures of 10^{-3} mol/l SCN⁻ and 10^{-3} mol/l disturbing cations. The solutions are KCl, Al(NO₃)₃, CaCl₂, CuCl₂, Zn(NO₃)₂, MgSO₄ and CdCl₂ respectively.

Reference

1. Lü, C. L. Lü, B. Yang, *J. Mater. Chem.* **2009**, *19*, 2884.