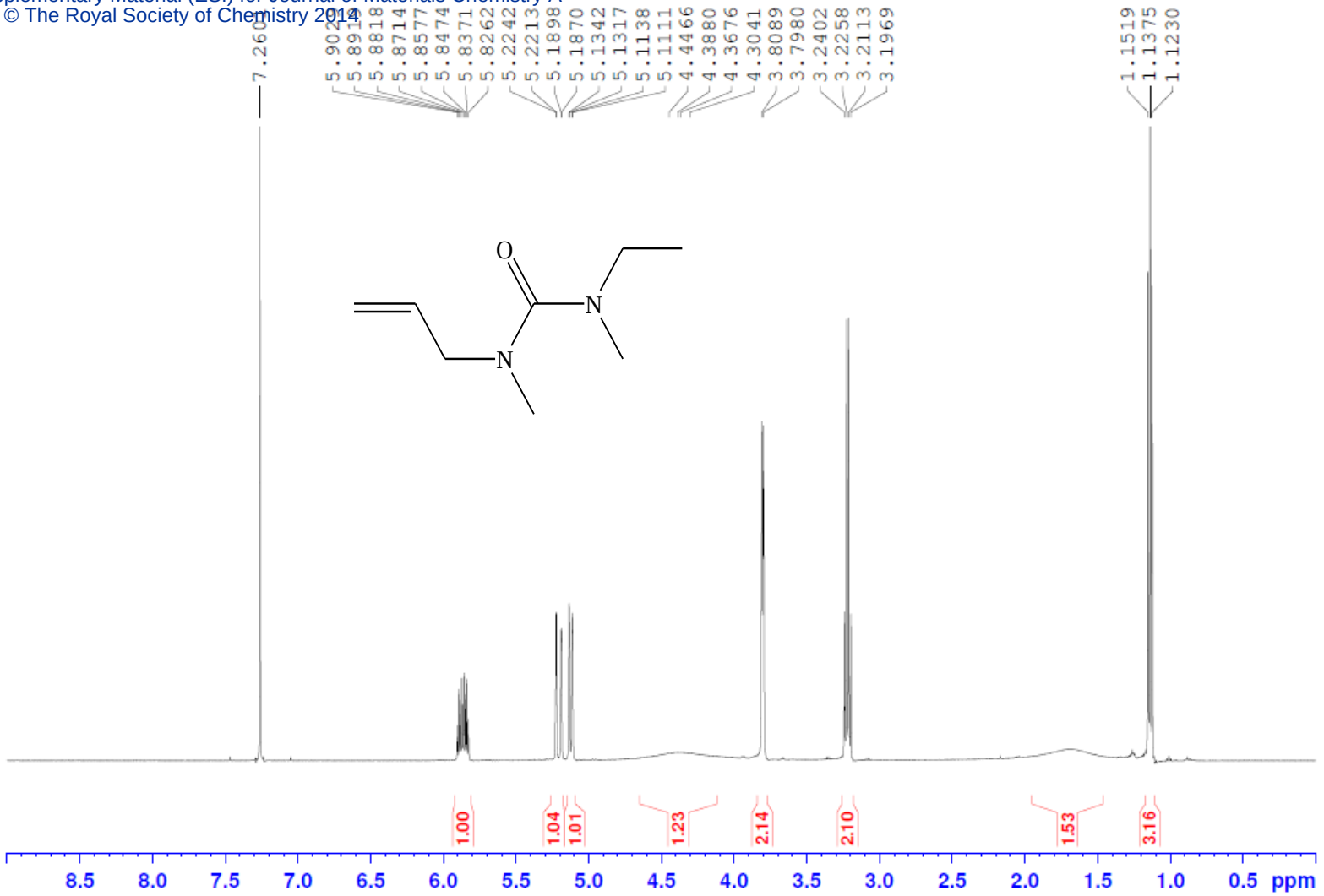
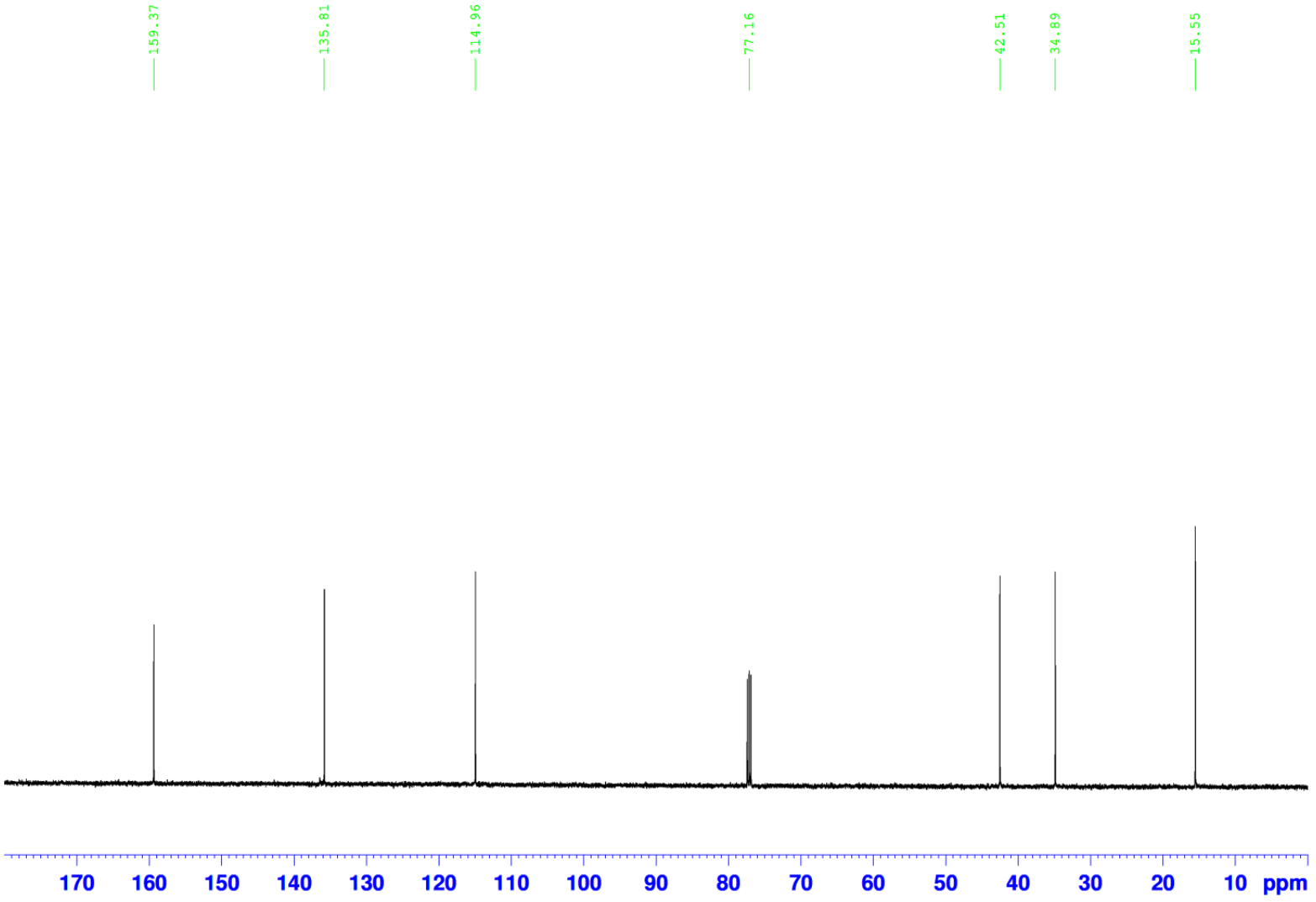


^{1}H-NMR (500 MHz, $CDCl_3$) δ 5.86 (dd, J=1.45, J=1.4, 1H) 5.22(d, J=1.45, 1H) 5.18(d, J=1.4, 1H) 4.38 (s, br, 1H) 3.80 (d, J=5.45, 2H), 3.21 (q, J=7.2, 2H) 1.72(s, br, 1H) 1.13(t, J=7.2, 3H)

Figure S1a. ^{1}H-NMR Spectrum of AEU



^{13}C-NMR (500 MHz, $CDCl_3$) δ 159.37, 135.81, 114.95, 77.16, 42.51, 34.89, 15.55

Figure S1b. ^{13}C-NMR Spectrum of AEU

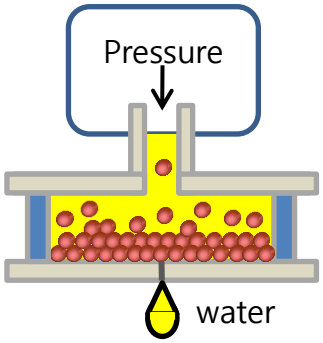
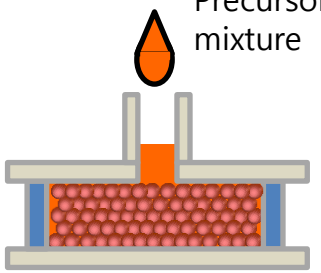
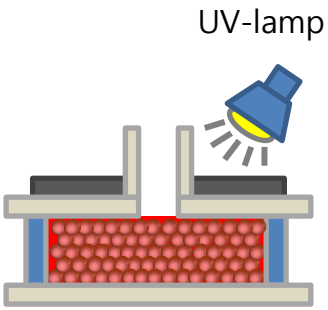
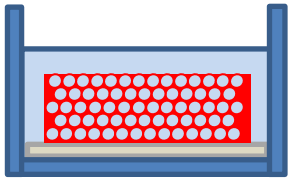
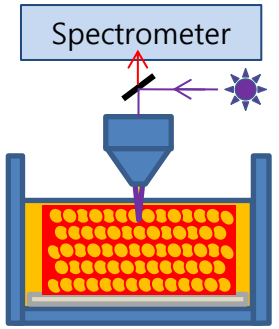
Colloidal crystallization	Infiltration of gel precursor	UV-curing of the photonic gel	Removal of PS in $CHCl_3$	Anion sensing measurement
				
1) Infiltrate PS nano-sphere emulsion in a 30 μm-thick cell with a thin channel for water outlet 2) Apply positive pressure to the cell for water drainage while the PS colloids are close-packed	1) Dry & anneal the PS opal film in vac. Oven at 90 deg C. 2) Fill the cell with the precursor mixture consisting of AEU, HEMA, crosslinker, UV-initiator and water	1) Cover the cell with an optical filter to adjust UV intensity for photo-polymerization 2) Expose 100W UV light for 1 h until the monomers are cured to the crosslinked gel	1) Soak a disassembled cell in $CHCl_3$ to dissolve PS colloidal crystal template 2) Upon complete removal of PS nanospheres, rinse the inverse-opal photonic gel with MeCN several times	1) Soak the photonic gel in MeCN solution of an anion sample with known concentration 2) Monitor the reflectance of visible light from the swollen gel

Figure S2. Schematic illustration for the fabrication of an anion sensing photonic gel. Brief explanations of experimental procedure for each step are given.

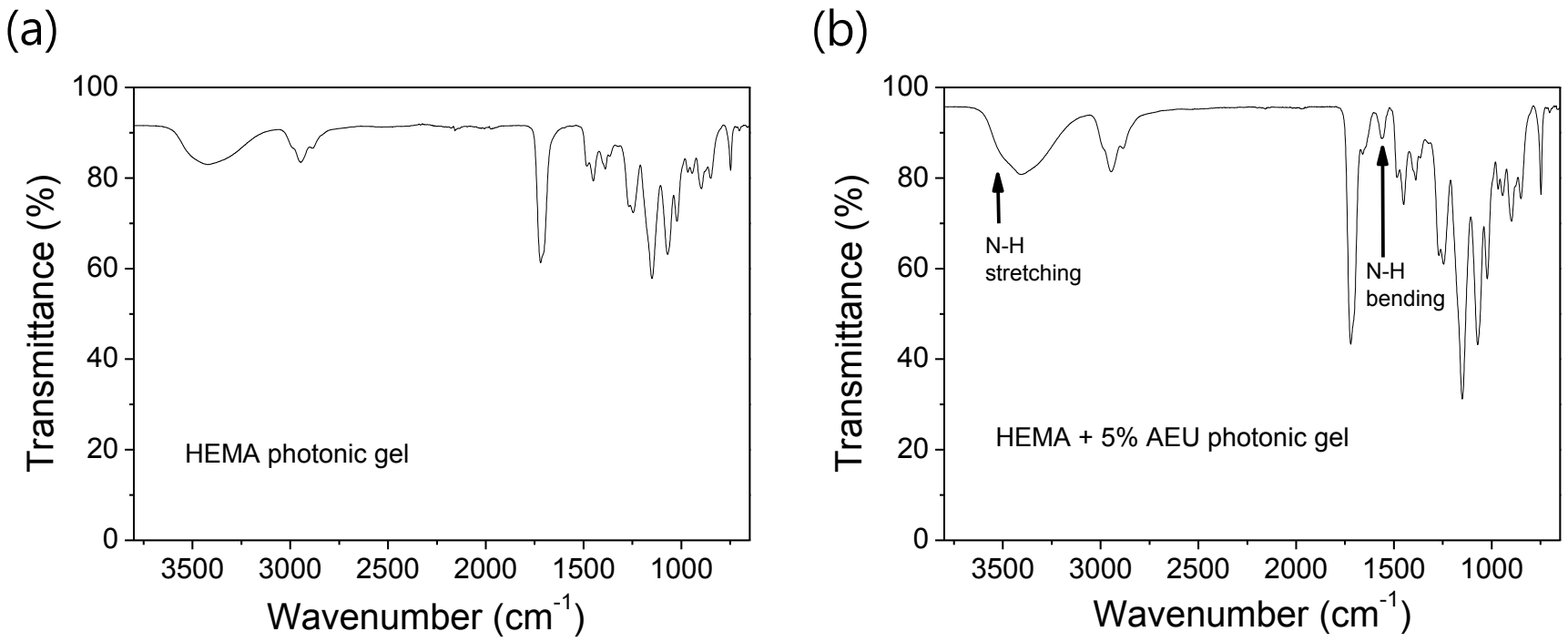


Figure S3. FT IR Spectra of (a) HEMA gel, and (b) Anion sensing gel containing 5mol % AEU after treatment in Chloroform overnight. For AEU containing gel, the signals from N-H bending at ~ 1600cm^{-1} and N-H stretching at ~3500cm^{-1} are evident.

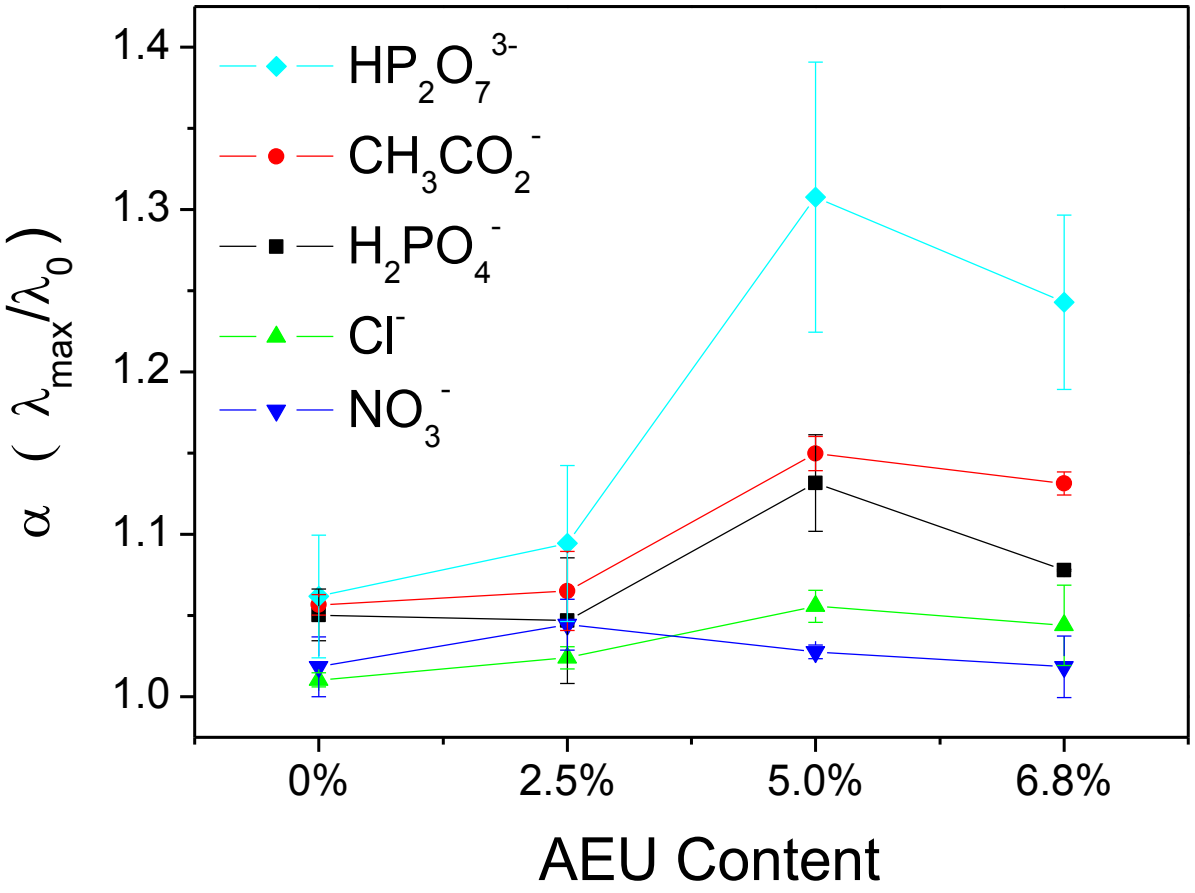


Figure S4. Swelling ratio (α) vs. AEU content in photonic gel at 10^{-3}M solution of each anion in MeCN. As expected, a photonic gel swelled more at higher content of AEU. However, at above 5.0% of AEU mixed with HEMA, α was deteriorated probably because of the limited solubility of AEU in the monomer mixture.

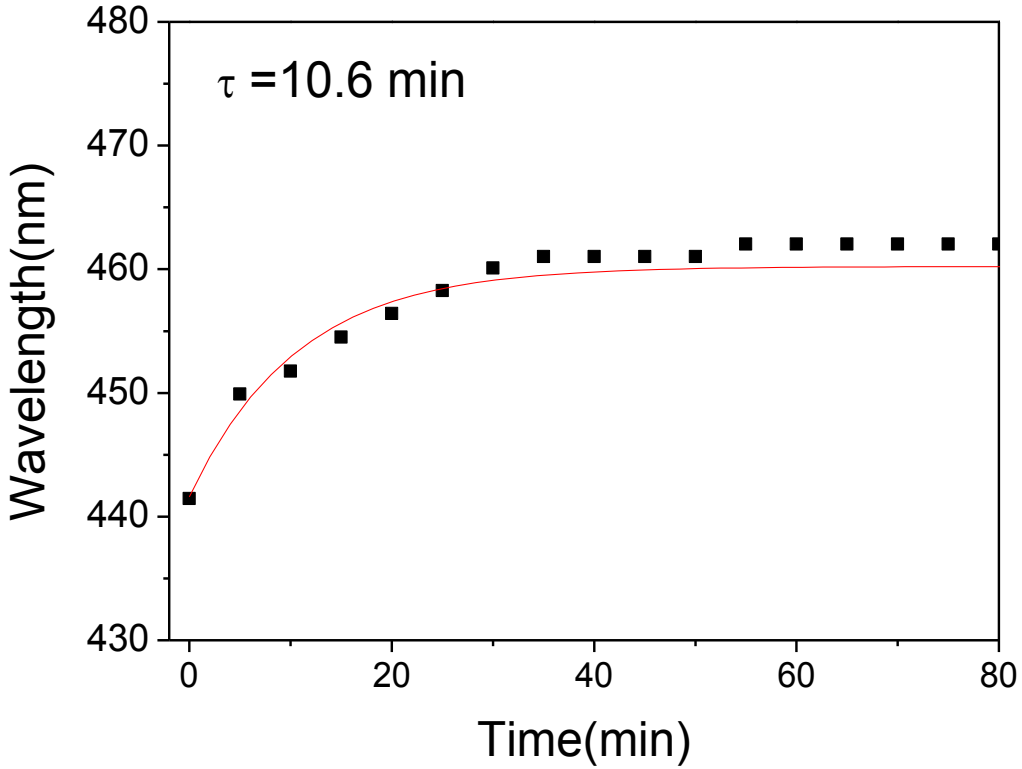


Figure S5. Response kinetics of anion sensor. The reflectance peak shift was measured after moving a photonic gel sensor from pure MeCN to 10^{-4}M Tetrabutyllammonium acetate solution. Experimental data was fitted by a single exponential fitting curve as shown in the figure, and the response time τ was calculated to be 10.6 min. Slight mismatch of the fitted function with original data can be attributed either to the deformation of IO cavity by restricted lateral swelling through which the analyte diffusion can be hampered, or a trace amount of solvent evaporation during the the measurement.

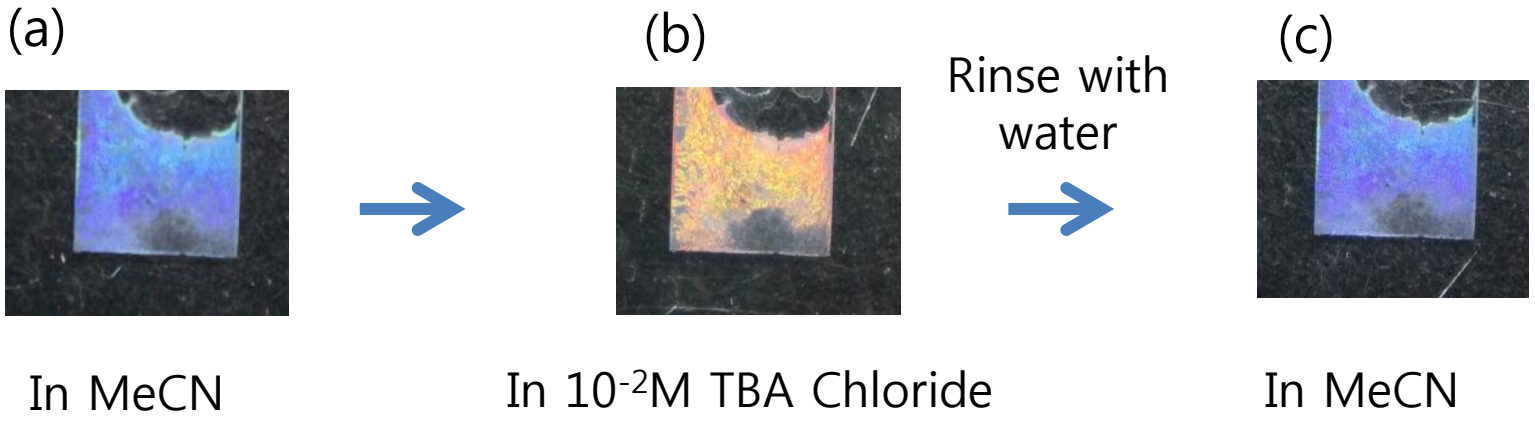


Figure S6. Reflective colors of an anion sensing photonic gel (a) in MeCN, and (b) in10^{-2}M TBA Chloride/MeCN solution, and (c) in MeCN after rinsing the photonic gel with distilled water. By rinsing with water or MeCN, the crosslinked photonic gel sensor comes back to original blue color by deswelling, and can be reused multiple times.