Supporting Information for

A CO₂-responsive hydrogel film for optical sensing of dissolved CO₂

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Fig. S1. (A) Experimental setup for film swelling study. (B) Schematic diagram for measurement of the reflection spectra of the hydrogel film using a fiber optic spectrometer. White light from the lamp in the spectrometer is reflected by the thin hydrogel film. The reflected light is collected and directed to and analyzed by the detector. Because of the interferences between beams reflected at the two interfaces of the film, Fabry-Perot fringes appear on the reflection spectra.
**Fig. S2.** The relationship between $pCO_2$ and the concentration of NaHCO$_3$ solution at 25 and 37°C.

**Fig. S3.** FTIR spectra of a BPEI/PO-Dex2.5 film and the component polymers, BPEI and PO-Dex2.5.
**Fig. S4.** AFM images (5 μm×5 μm) of 3 BPEI/PO-Dex films. A: (BPEI/PO-Dex2.5)200 film, B: (BPEI/PO-Dex5)200 film, C: (BPEI/PO-Dex7.5)200 film.

**Fig. S5.** Film thickness of BPEI/PO-Dex2.5 film with various bilayer numbers. The film thicknesses were determined by stylus profiler.
Fig. S6. Changes in $\Delta S_w$ of 3 BPEI/PO-Dex films to dissolved CO$_2$ as a function of $p$CO$_2$ value (calculated from the concentration of NaHCO$_3$ solution). $T=25^\circ$C.