Supplementary Information

User-friendly point-of-care detection of influenza A (H1N1) virus using light guide in 3-dimensional photonic crystal

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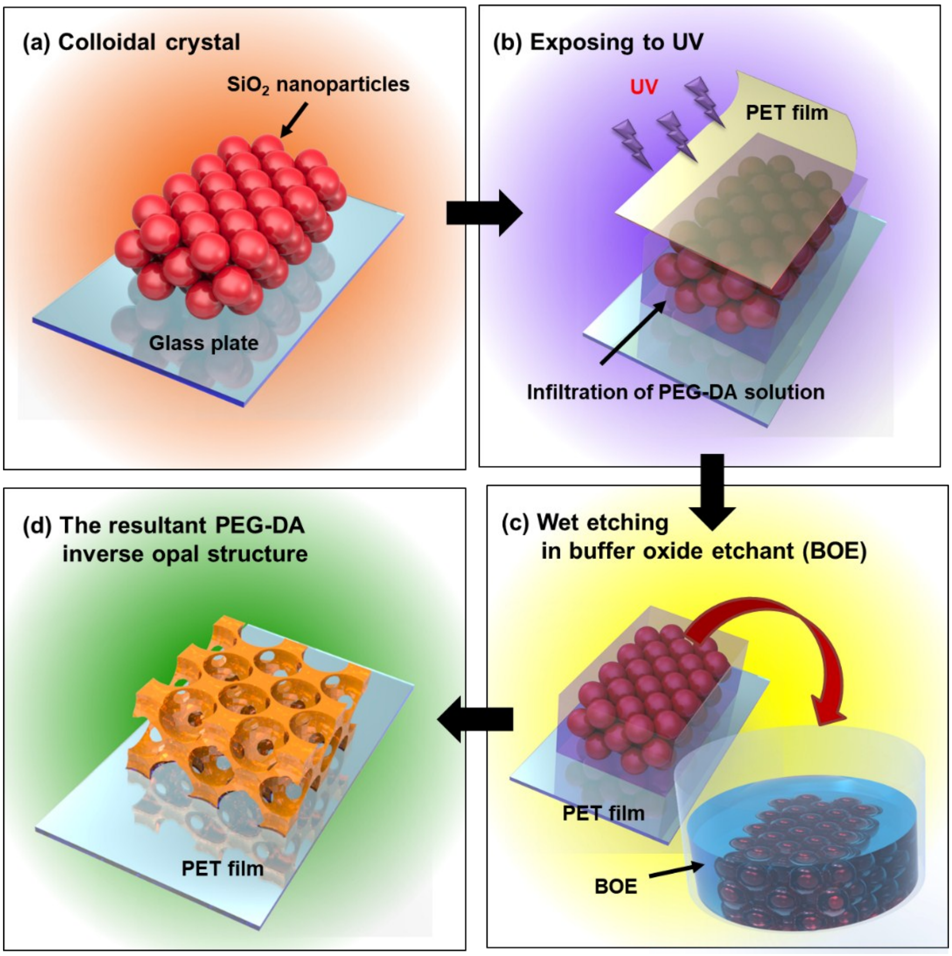

Fig. S1 Schematic diagram of fabrication process of PEG-DA hydrogel-based 3-dimensional nanoporous photonic crystal. (a) First, the silica nanoparticles were self-assembled on the silica substrate during evaporation of the solution. (b) Then, the colloidal crystals were immersed into photocurable PEG-DA solution. PET film modified with urethane groups was covered on it. The sample was exposed to UV for a few tens of seconds. (c) The polymerized PEG-DA layer with the PET film was peeled off from silica substrate and immersed in BOE for several hours to remove the silica nanoparticles by wet etching. (d) Finally, the resultant inverse opal structures were obtained.

In order to enhance the fluorescent signals and improve the sensitivity of the proposed thrombin sensor, the reflected peak wavelength in the PC was engineered to be similar with the emission peak wavelength of fluorophore. This can be realized by changing the pore size of 3D PC structures which is directly associated with the size of nanoparticles. The resulting reflected wavelength in the fabricated sensor can be predicted by Bragg's equation for normal incidence as follows:

$$\lambda = 2d\eta_{eff}\,, \tag{1}$$

where λ is the peak wavelength of reflected light, $d = 0.816D$ is the interlayer spacing in the [111] direction, D = 300 nm represents the diameter of nanoporous holes, and η_{eff} is the effective refractive index of the sample. The effective refractive index of a two-phase structure can be estimated as follows:

$$\eta_{eff} = f\eta_{air} + (1-f)\eta_{PEG}\,, \tag{2}$$

where f = 0.74 is the void fraction of the porous structures for an ideal face-centered cubic (FCC) package, and η_{air} = 1 and η_{PEG} = 1.49 represent the refractive index of air and PEG-DA materials, respectively. When water penetrates into nanoporous structures, the effective refractive index becomes:

$$\eta_{eff}^{*} = f\eta_{w} + (1-f)\eta_{PEG}\,, \tag{3}$$

where $\eta_w = 1.33$ is the refractive index of water. If we assume that there is no swelling in PEG-DA material (interlayer spacing *d* is fixed), the reflective wavelengths in dry and wet states are 552 nm and 673 nm, respectively, as shown in **Fig. S2a**. The optical microscope images of the samples in dry (**Fig. S2b**) and wet states (**Fig. S2b**) were shown in **Fig. S2**.

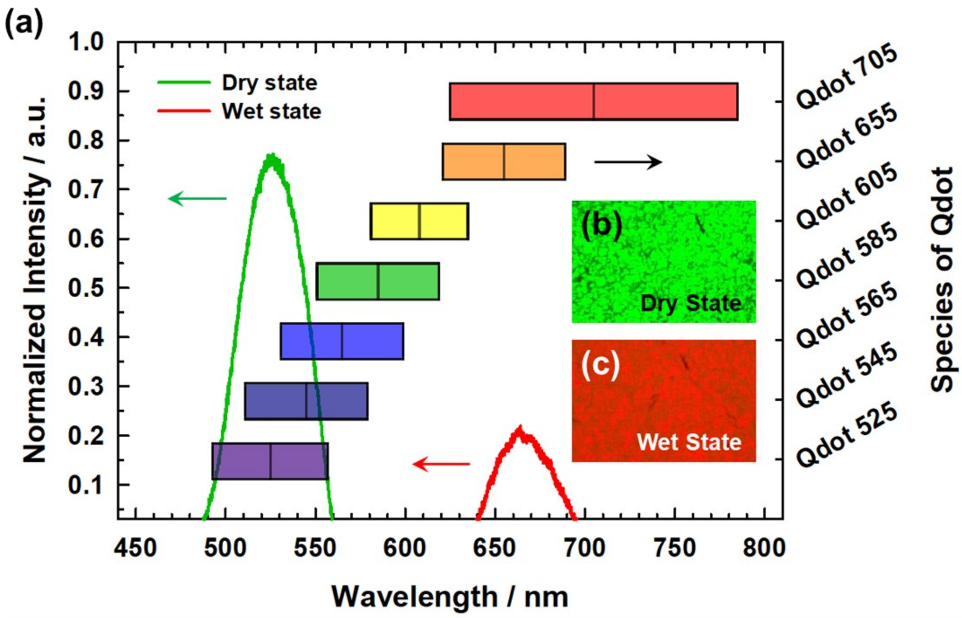

Fig. S2 Spectral profiles (a) and optical microscope images of the nanoporous PCs (pore size: 300 nm) in dry (b) and wet state (c), and the horizontal box plot shows the peak wavelength of fluorescence emission (middle line of box) and full width at half maximum intensity (length of box) of different species of Qdot streptavidin conjugate (data from Molecular Probes, Inc.).