

Supplementary Material (ESI) for Analytical Methods

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## Supporting Information

for

### Enhanced Sensitivity in Hg<sup>2+</sup> Sensor by Photonic Crystals

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## **Experimental section**

### **Detection of Hg<sup>2+</sup> in the solution**

Rhodamine B thiolactone was used as the probe molecule in aqueous media and 1,4-dioxane was used as cosolvent. Rhodamine B thiolactone itself displayed a colorless solution and emitted no fluorescence. However, the addition of Hg<sup>2+</sup> produced a strong yellow fluorescence. So, Hg<sup>2+</sup> could be detected by Rhodamine B thiolactone and the detailed procedure was reported in the previous literature.<sup>1</sup>

### **Fabrication of PC films**

The PC films were fabricated on the glass substrates by the vertical deposition method<sup>2</sup> from monodispersed latex spheres of poly(styrene-methyl methacrylate-acrylic acid) (Poly(St-MMA-AA)) with a concentration of 0.15 wt.% at 60 °C and 60% relative humidity for *ca.* 24 h. The glass substrates were treated with a chromic-sulfuric acid solution to ensure clean surfaces. The resulting latex spheres were used directly without purification.

### **Fabrication of Hg<sup>2+</sup> detection PC films**

The fabrication of Hg<sup>2+</sup> detection PC films were by immersing as-prepared PC films into Hg<sup>2+</sup> detection system for 30 min and then the films were taken out and dried for 2 h at room temperature. The Hg<sup>2+</sup> detection system was the aqueous solution of Rhodamine B thiolactone with the addition of Hg<sup>2+</sup>. The schematic illustration of the fabrication of Hg<sup>2+</sup> detection PC film was shown in Fig. S1.

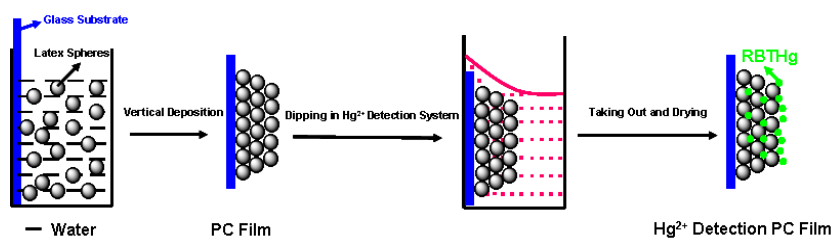
### **Characterization**

The SEM images were obtained with a field-emission scanning electron microscope (JEOL JSM-6700, Japan). Transmission spectra were recorded on a U-4100 UV-visible spectrophotometer (Hitachi, Japan). Reflectance spectra were measured with an ocean optic HR 4000 CG & NIR-256 fiber optic UV-vis-NIR spectrometer (wavelength range: 400-2500 nm). Single spectrum mode of a Witec-Alpha scanning

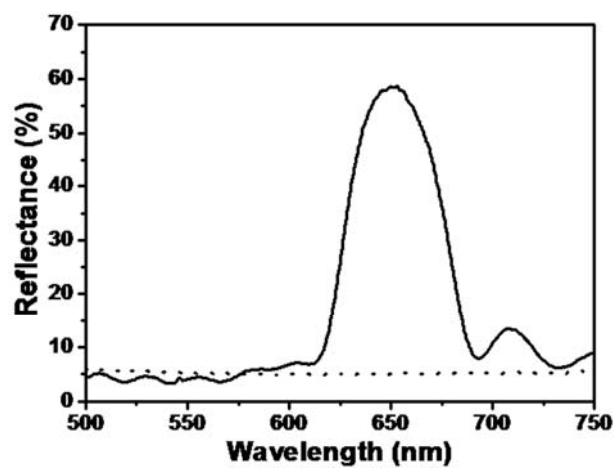
near-field optical microscope equipped with a liquid-nitrogen cooled (-56 °C) CCD camera detector was used for photoluminescence measurement, with 532 nm excitation (low power, to prevent bleaching of the dye). The integration time was 0.5 s. All spectra were recorded normal to the  $hkl = 111$  planes of the PCs.

## References

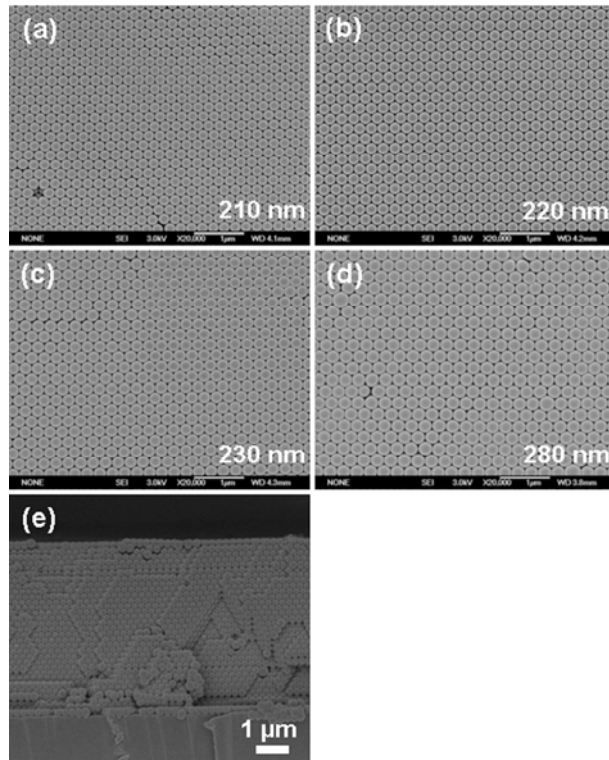
- (1) W. Shi and H. M. Ma, *Chem. Commun.* **2008**, 1856-1858.
- (2) P. Jiang, J. F. Bertone, K. S. Hwang and V. L. Colvin, *Chem. Mater.* **1999**, *11*, 2132-2140.



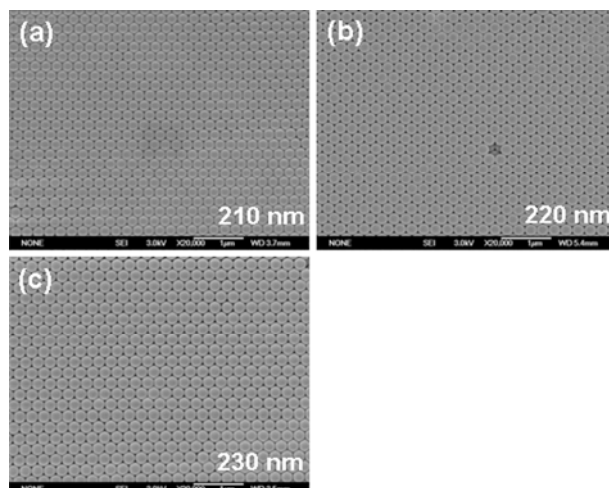
**Figure S1.** A schematic illustration of the fabrication of Hg<sup>2+</sup> detection PC film.



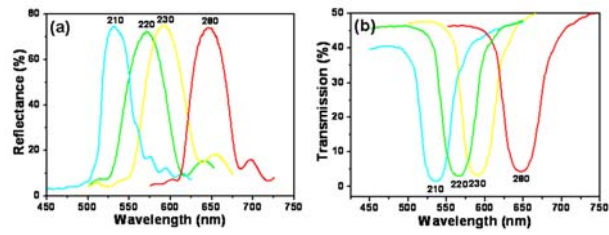
**Figure S2.** The reflectance spectra of Hg<sup>2+</sup> detection PC films (solid curve) and the corresponding control sample (dot curve). The spectra indicate the structure of PCs have been destroyed by toluene.



**Figure S3.** (a) - (d) Typical top-view SEM images of PC films and (e) side-view SEM image of (a). The inserts in (a) - (d) were the diameters of latex spheres used. The top-view SEM images clearly indicate the latex spheres are arranged in a well-ordered close-packed fashion with its (111) plane oriented parallel to the surface of the substrates. The side-view image shows the thickness of as-prepared PC films is  $\sim 7$   $\mu\text{m}$ .



**Figure. S4.** Typical top-view SEM images of  $\text{Hg}^{2+}$  detection PC films and the inserts in (a) - (c) were the diameters of latex spheres used. The top-view SEM images indicate that the periodic structure of the PC films still remains perfect and immersing PC films in  $\text{Hg}^{2+}$  detection system has little effect on the PC structure.



**Figure. S5.** (a) Reflectance and (b) transmission spectra of as-prepared PC films. The spectra measured with a light incident along the normal surface ([111] direction) indicate the good crystalline quality of as-prepared PC films.