

# Fabrication of Inverse Opal Photonic Crystal with Mesopores Using Binary Colloidal Co-assembly Method for Signal Enhancement in Formaldehyde Detection

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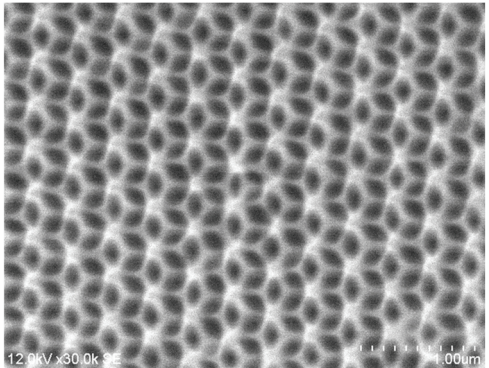
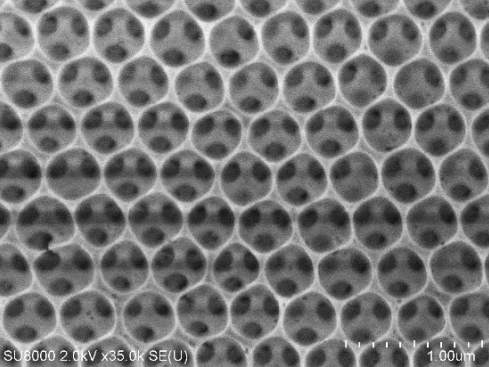
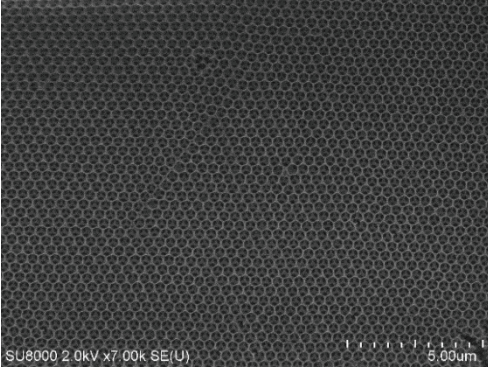
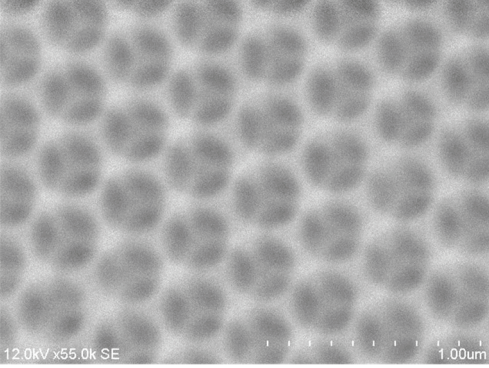
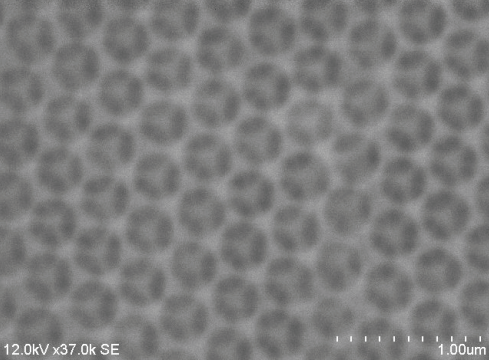
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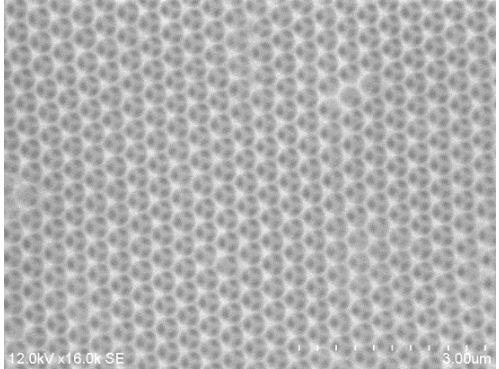
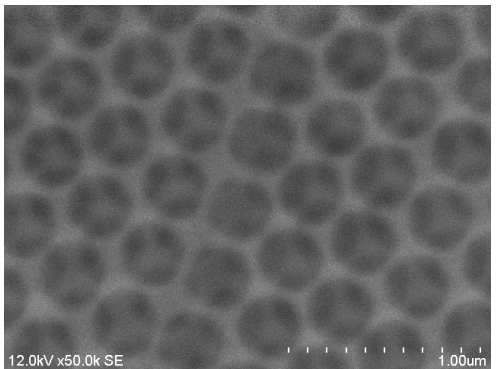
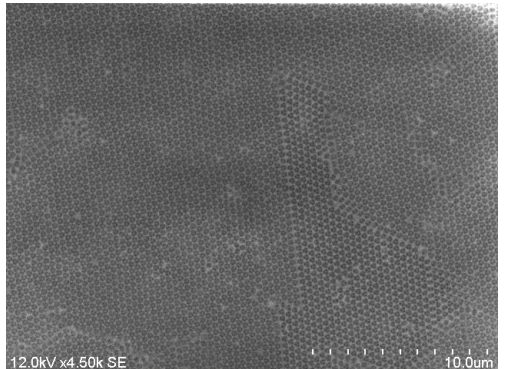
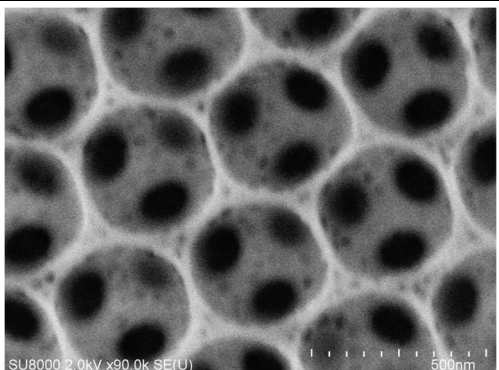
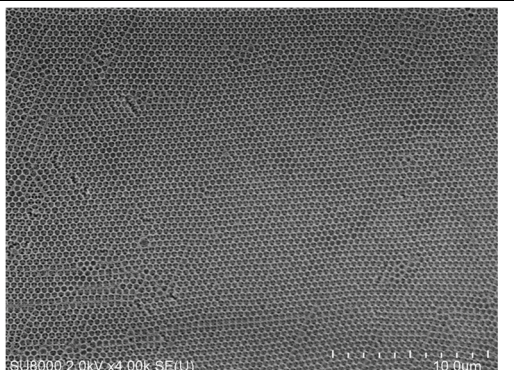
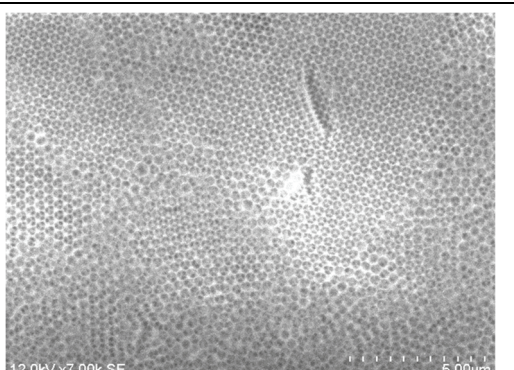
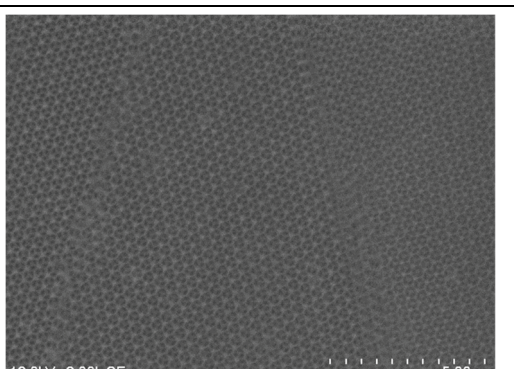
Supporting Information

## **Fabrication of IOPC with Mesopores (50 nm-350IOPC and 100 nm-350IOPC) Using Binary Colloidal Co-assembly Method**

A precursor solution was prepared in the same manner as 350IOPC, then 0.10 mL of the precursor solution and 1.0 mL of 0.35 Micron Microspheres were placed in 20 mL of MilliQ water and the mixture was stirred. Next,  $x$  mL (or  $y$  mL) of 50 nm (or 100 nm) PS nanoparticle solution was added to the mixture and stirred. The subsequent process was the same as that for 350IOPC. When many defects or cracks were observed by SEM observation upon increasing by  $x$  mL (or  $y$  mL) the amount of PS solution in the IOPC, the amount of precursor solution was concluded to be insufficient. In such cases, the amount of precursor solution added to the solution was increased by 0.10 mL. The fabrication conditions of 50 nm-350IOPC and 100 nm-350IOPC, and the SEM images obtained under these conditions are summarized in Tables S1 and S2, respectively. The high-resolution SEM images were taken by the SU8000 SEM and the low-resolution images were taken by the S-3400N type II SEM.

Table S1. Fabrication conditions of 50 nm-350IOPC and SEM images obtained under the conditions.

x [50 nm PS volume (mL)]	Precursor solution (mL)	SEM image (high magnification) Scale bar: 500 nm – 1 μm	SEM image (low magnification) Scale bar: 5 μm–10 μm
0	0.1		
0.01048	0.1		
0.10	0.1		
0.15	0.1		

0.16	0.1		
0.16	0.2		
0.165	0.2		
0.17	0.2		
0.17	0.2		

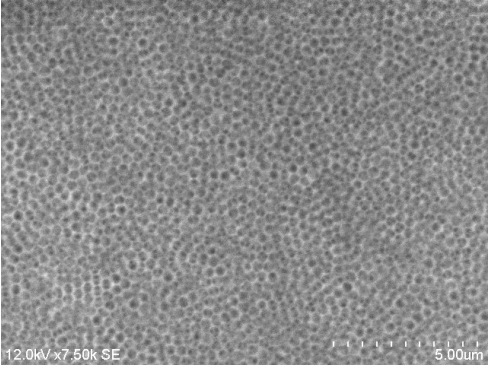
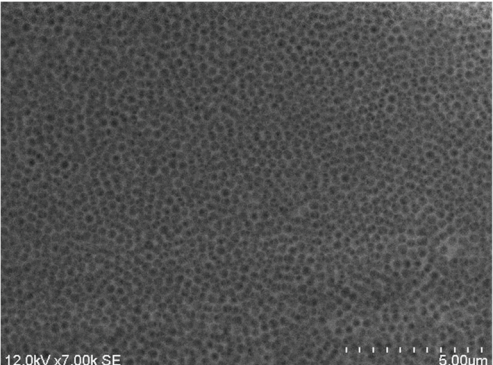
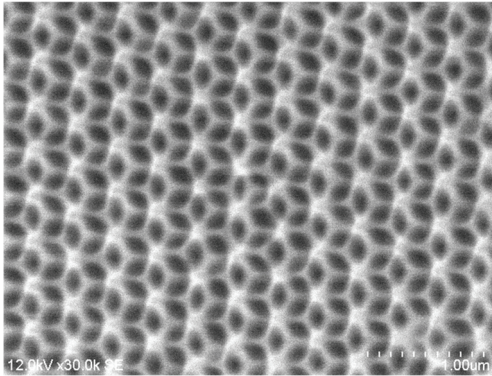
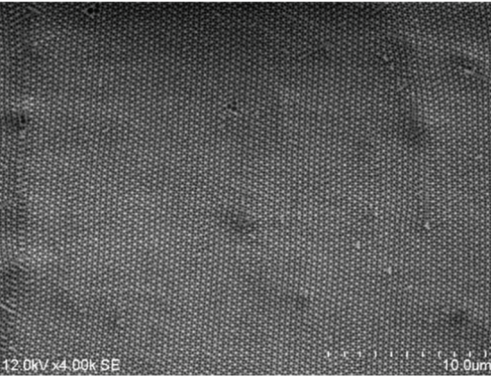
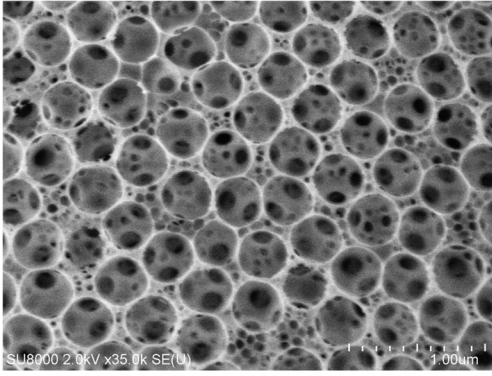
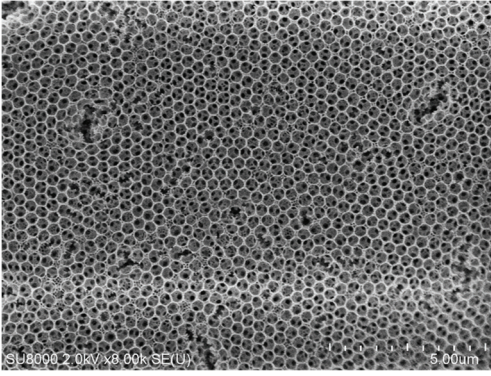
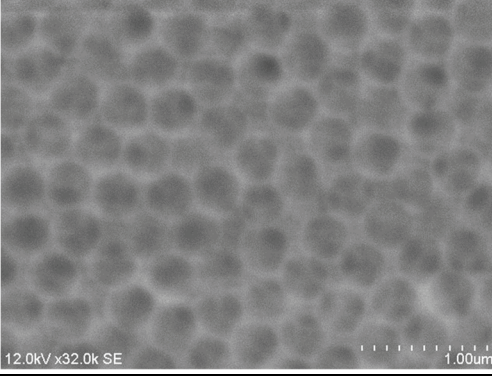
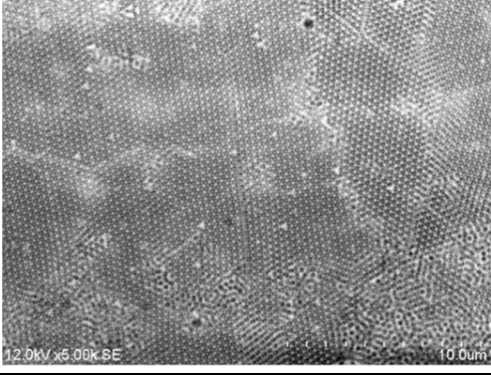
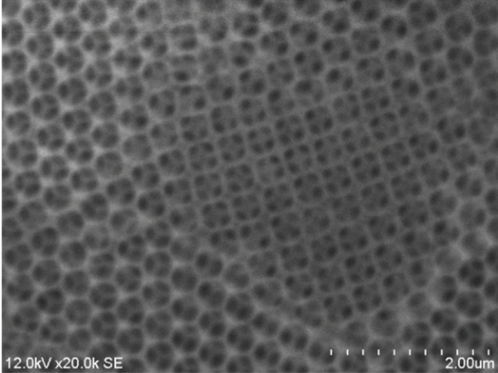
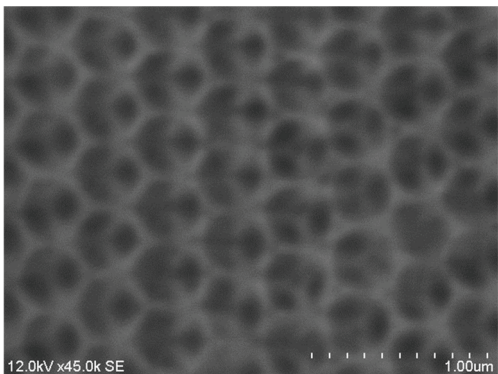
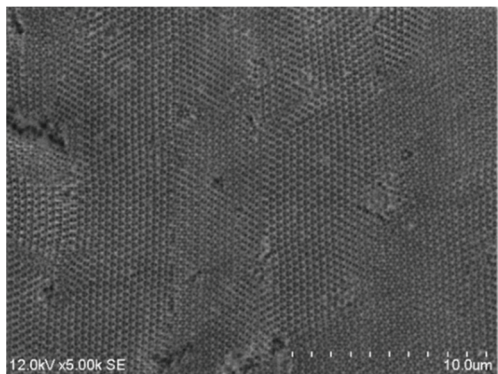
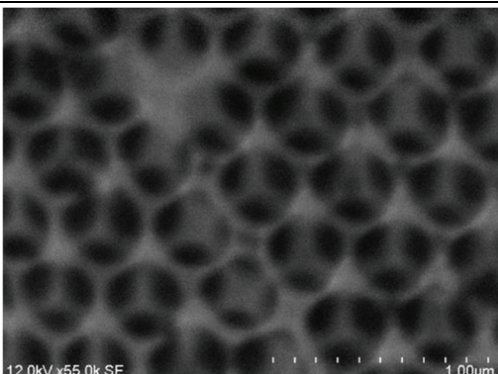
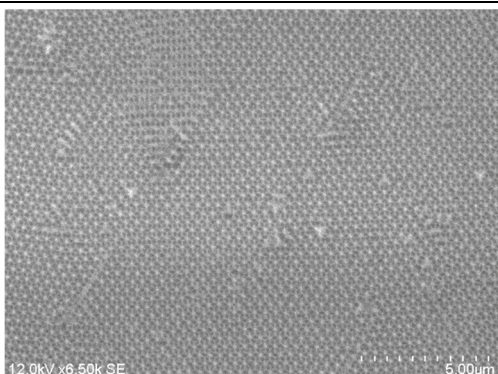
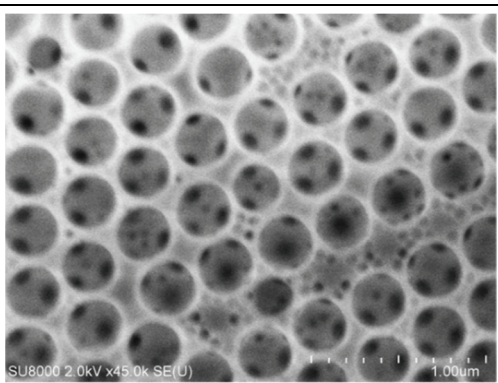
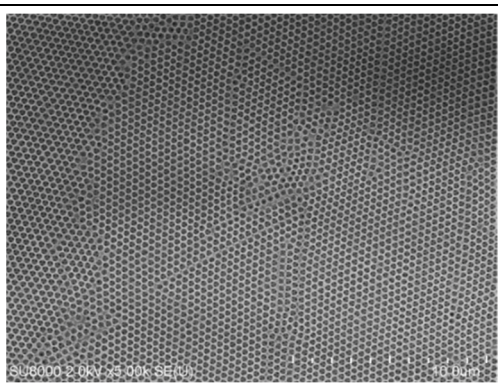
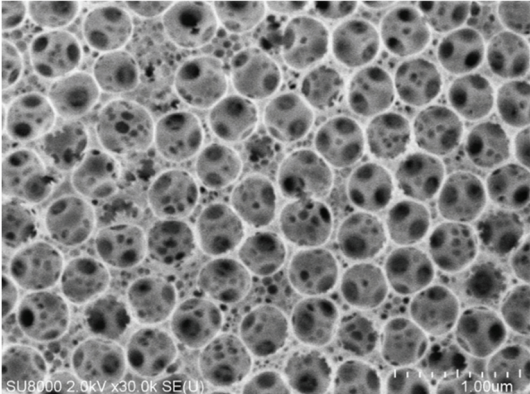
0.18	0.2		 <p>12.0kV x7.50k SE</p> <p>5.00um</p>
0.20	0.2		 <p>12.0kV x7.00k SE</p> <p>5.00um</p>

Table S2. Fabrication conditions of 100 nm-350IOPC and SEM images obtained under the conditions.

y [100 nm PS volume (mL)]	Precursor solution (mL)	SEM Image (high magnification) Scale bar: 1–2 $\mu\text{m}$	SEM image (low magnification) Scale bar: 5–10 $\mu\text{m}$
0	0.1		
0.08387	0.1		
0.10	0.1		
0.075	0.1		

0.060	0.1	 <p>12.0kV x20.0k SE 2.00um</p>	
0.050	0.1	 <p>12.0kV x45.0k SE 1.00um</p>	 <p>12.0kV x5.00k SE 10.0um</p>
0.040	0.2	 <p>12.0kV x55.0k SE 1.00um</p>	 <p>12.0kV x6.50k SE 5.00um</p>
0.045	0.2	 <p>SU8000 2.0kV x45.0k SE(U) 1.00um</p>	 <p>SU8000 2.0kV x5.00k SE(U) 10.0um</p>

0.050	0.2	 <p>SU8000 2.0kV x30.0k SE(U)</p> <p>1.00um</p>	
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