

Electronic Supplementary Information (ESI)

Avoiding coffee ring structure based on hydrophobic silicon pillar arrays during single-drop evaporation

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SUPPLEMENTARY MOVIE LEGENDS

Movie S1 Water drop evaporation (4 μL) on HSPA at room temperature. The movie showed that the CA decreased, while base diameter remained constant during water drop evaporation, which was resulted from the pinning of the CL.

Movie S2 Drop evaporation (4 μL) on HSPA at room temperature. The movie indicated that a drop of a colloidal suspension of latex spheres evaporated with the CA reducing and base diameter unchanging, which demonstrated the pinning of the CL.

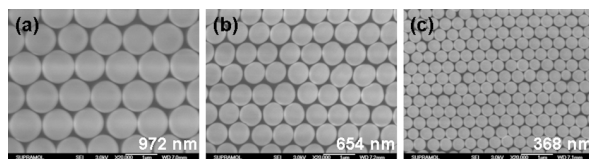


Figure S1 Typical SEM images of 2D SiO₂ colloidal photonic crystals with (a) 972 nm, (b) 654 nm and (c) 368 nm in diameter. It could be seen that the packing structure of SiO₂ microspheres was face-centered cubic (fcc) with the (111) plane parallel to the substrate surface.

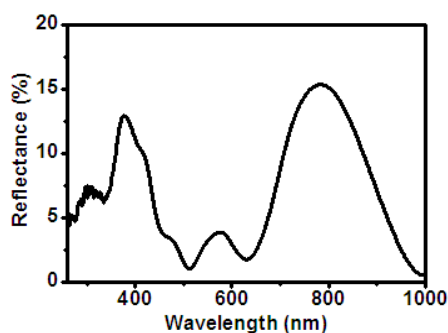


Figure S2 The reflectance spectrum of as-prepared HSPA. It could be seen that the HSPA exhibited reflection peak at about 377 nm and 783 nm, which was in consistent with the color of the substrate.

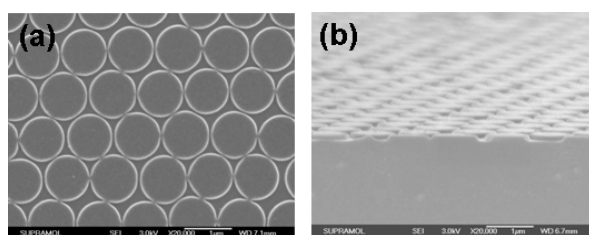


Figure S3 (a) Typical top view and (b) cross-sectional SEM images of HSPA with 972 nm in period prepared by RIE for 2 min. It could be seen that the hexagonally non-close-packed silicon pillar was 119 nm in height and the distance between top rim of the adjacent silicon pillars was 94 nm.

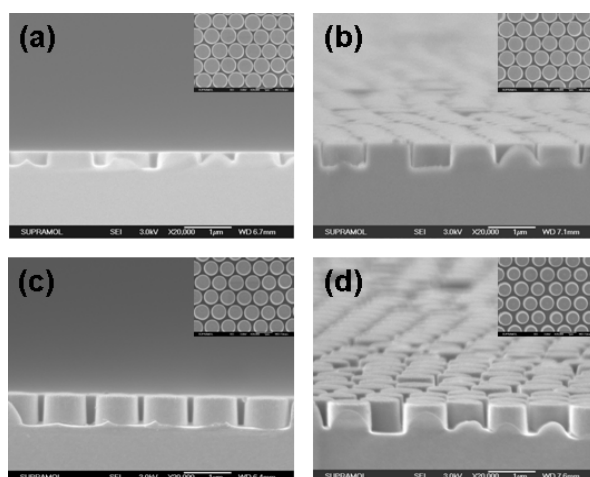


Figure S4 Typical cross-sectional SEM images of HSPA with 972 nm in period prepared by RIE for (a) 4 min, (b) 6 min, (c) 8 min and (d) 10 min. The insets were corresponding top view SEM images. It could be seen that the surface of hexagonally non-close-packed silicon pillar was smooth.

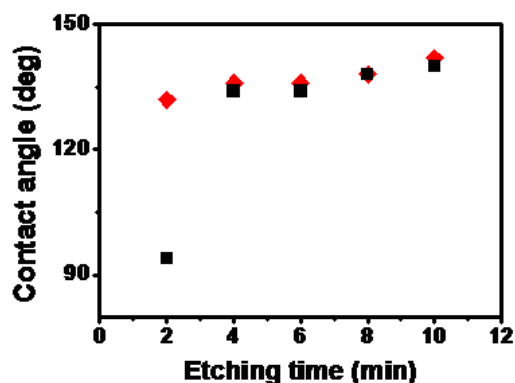


Figure S5 The CA values of HSPA with different etching time without modification trichloro(1H, 1H, 2H, 2H-perfluorooctyl)silane (black square) and with modification trichloro(1H, 1H, 2H, 2H-perfluorooctyl)silane (red rhomb). This indicated the change of CA value was little when the etching time varied from 4 to 10 min.

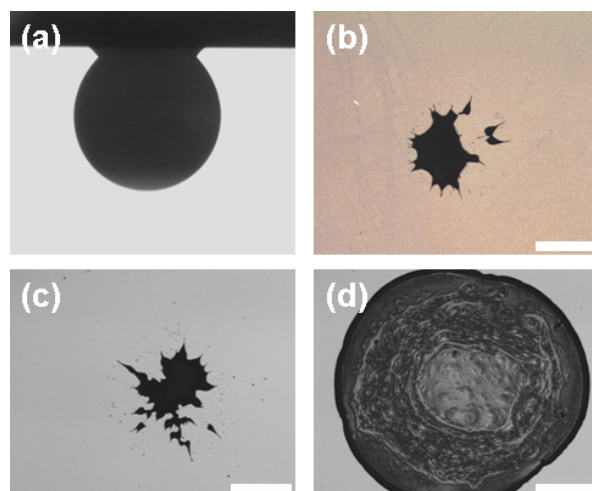


Figure S6 (a) Optical image of a drop of a colloidal suspension of latex spheres pinned to the substrate when the tilting angle was $\sim 180^\circ$. The etching duration of the substrate was 6 min. The optical microscope images of deposition pattern of a drop of a colloidal suspension of latex spheres on (b) HSPA with modification trichloro(1H, 1H, 2H, 2H-perfluorooctyl)silane, (c) flat silicon with modification trichloro(1H, 1H, 2H, 2H-perfluorooctyl)silane and (d) flat silicon substrate. The scale bar is 1 mm. It showed the drop on HSPA was in high CA hysteresis.

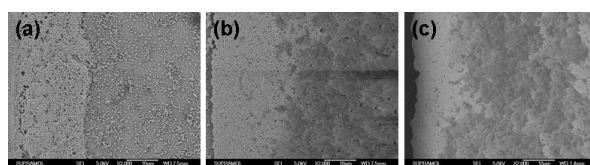


Figure S7 Typical top view SEM images of the edge of drop deposition with the concentration of (a) 0.1 wt%, (b) 1 wt% and (c) 10 wt% poly(styrene-methyl methacrylate-acrylic acid) latex spheres. It demonstrated the number of latex spheres deposited at the edge of drop deposition was increasing with enhancing the concentration of latex spheres.

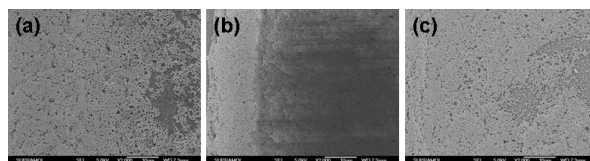


Figure S8 The SEM images of the edge of drop deposition at (a) 40 °C, (b) 60 °C and (c) 80 °C. It displayed the latex spheres distribution was relatively uniform at the edge of drop deposition during drop evaporation at 60 °C.

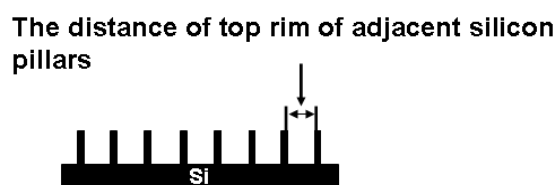


Figure S9 It indicates the distance of top rim of adjacent silicon pillars.

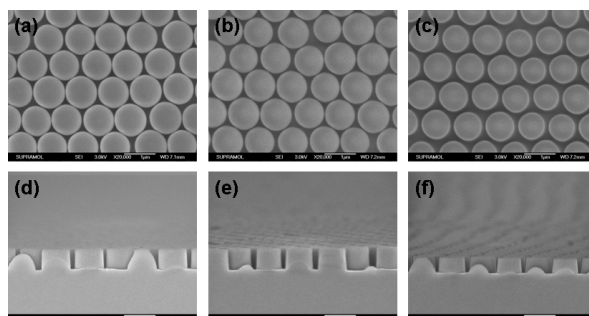


Figure S10 Top view SEM images of non-close-packed SiO₂ colloidal photonic crystals fabricated by RIE for (a) 2 min, (b) 4 min, (c) 8 min and cross-sectional SEM images of HSPA prepared for (d) 6 min, (e) 5.5 min and (f) 3.3 min etching. Figure (a)-(c) indicated the SiO₂ spheres became small with increasing etching time, and Figure (d)-(f) displayed the HSPA were smooth.