Electronic Supplementary Information

DNA Transcription into Diverse Porous Silicas by Co-structure Directing Route: Chiral, Ring and Ordered Nanochannel Arrays

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1. Experimental Section

Materials: DNA sodium salt from salmon testes is from Sigma, formly listed as Type Ⅲ. N-trimethoxysilylpropyl-N,N,N-trimethylammonium chloride (TMAPS) (50% in methanol) is from TCI, Japan. And tetraethyl orthosilicate (TEOS) is from TCI and Acros Organics. All the regents are used as received.

Synthesis: In a typical synthesis, 10mg DNA was dissolved in 10g deionized water by stirring under room temperature (approximately 298K). pH value of the solution is 6.9 by now. For samples synthesized under pH 5.5 or pH 11.5, 40ul 0.1M HCl or 120ul 0.5M NaOH was added to 10ml DNA solution with stirring. Then 22.67ul TMAPS and 106.4ul TEOS were added with stirring successively. The mixture was stirred for 15 min at 15^{o}C, and then allowed to react under static conditions at 15^{o}C for 7 days. Gel-like products were collected by centrifugation and washed with deionized water twice to remove unreacted DNA and silica source. Then the gel was freeze-dried and generated white powder.

The molar number of phosphate groups of DNA was determined as follows: The %G-C content for DNA from salmon testes is reported to be 41.2% (D1626, Sigma). So the average molecular weight for every base pair (two phosphate groups) is 660.

Extraction of samples: Approximately 0.3g white powder was added to 40ml 0.05M HCl. The mixture was treated by ultrasonic for 80min to break the fibers. Then the mixture was stirred at 60^{o}C for 12h to undergo depurination of DNA. After that the mixture was titrating by 0.5M NaOH till pH = 7. 2.5ml 0.5M ethylene diamine – 0.5M $MgCl_2$ solution was added to the mixture. The final mixture was stirred at 60^{o}C for 24h to break DNA at apurinic site and remove DNA template. The solids were recovered by centrifugation, washed with deionized water and dried at 40 ^{o}C overnight.

0.5M ethylene diamine – 0.5M $MgCl_2$ solution was prepared as follows: Ethylene diamine was soluted in water and HCl was added till pH = 7. And more water was added till the final concentration was 1M This neutralized ethylene diamine solution was mixed with equal volume 1M $MgCl_2$.

Characterization: The microscopic characteristics of the sample were observed with SEM (JEOL JSM-7401F). The accelerating voltage is 1.0 kV. TEM was performed with a JEOL JEM-3010 microscope operating at 200 kV (Cs = 0.6 mm, resolution 1.7 Å). For TEM measurements, all samples were dispersed in ethanol and deposited on a microgrid.

Solid-state ^{13}C magic-angle spinning (MAS) NMR spectra of the mesoporous materials were collected on a Bruker Avance Ⅲ 400 NMR spectrometer. Solid-state diffuse-reflectance circular dichroism (DRCD) spectra and the corresponding adsorption spectra were taken on a Jasco J-820 spectropolarimeter modified for solid materials. The elemental analysis of the materials was obtained from a Perkin-Elmer Series II CHNS/O Analyzer 2400.

1. DNA configuration under different pH.

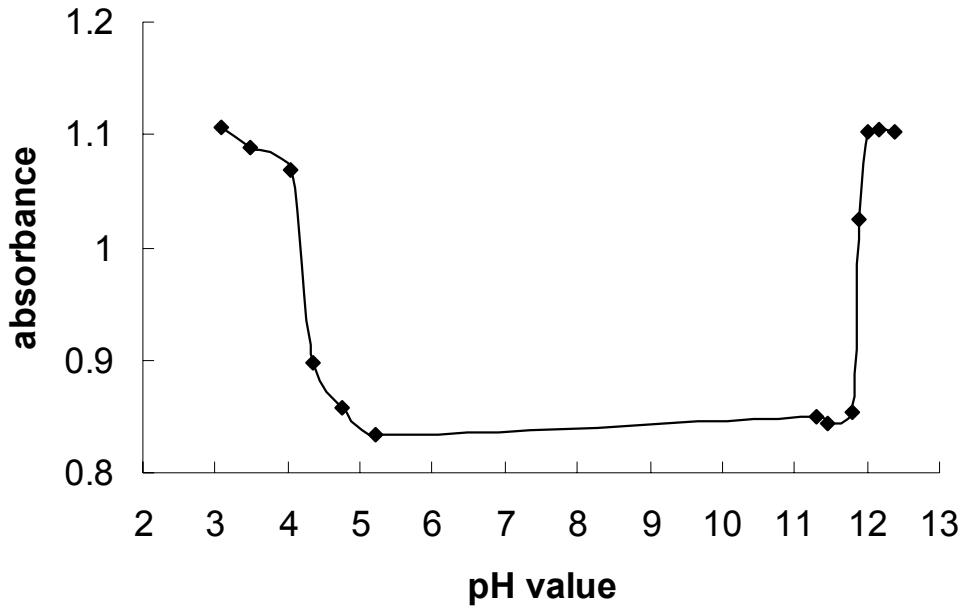

Figure S1 Absorbance of light at wavelength 260 nm of 0.01 w.t. % DNA solution under different pH. pH value of DNA solution was controlled with addition of HCl or NaOH.

2. Low-magnification SEM images

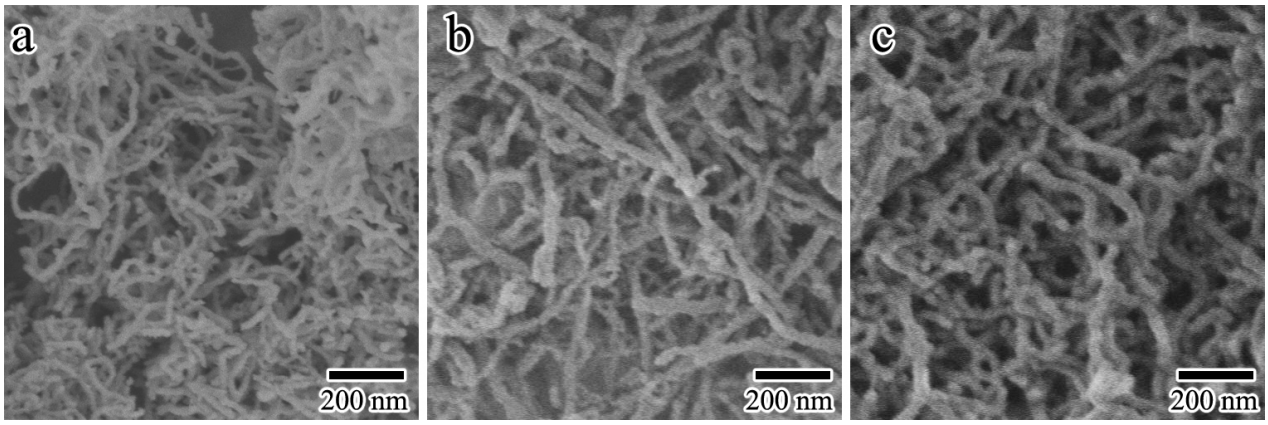

Figure S2 Low-magnification SEM images of samples shown in Fig.1. DNA transcribed silica fiber synthesized under different pH values of 5.5 (a), 6.9 (b) and 11.5 (c).

3. SEM and TEM images of non-fiber samples

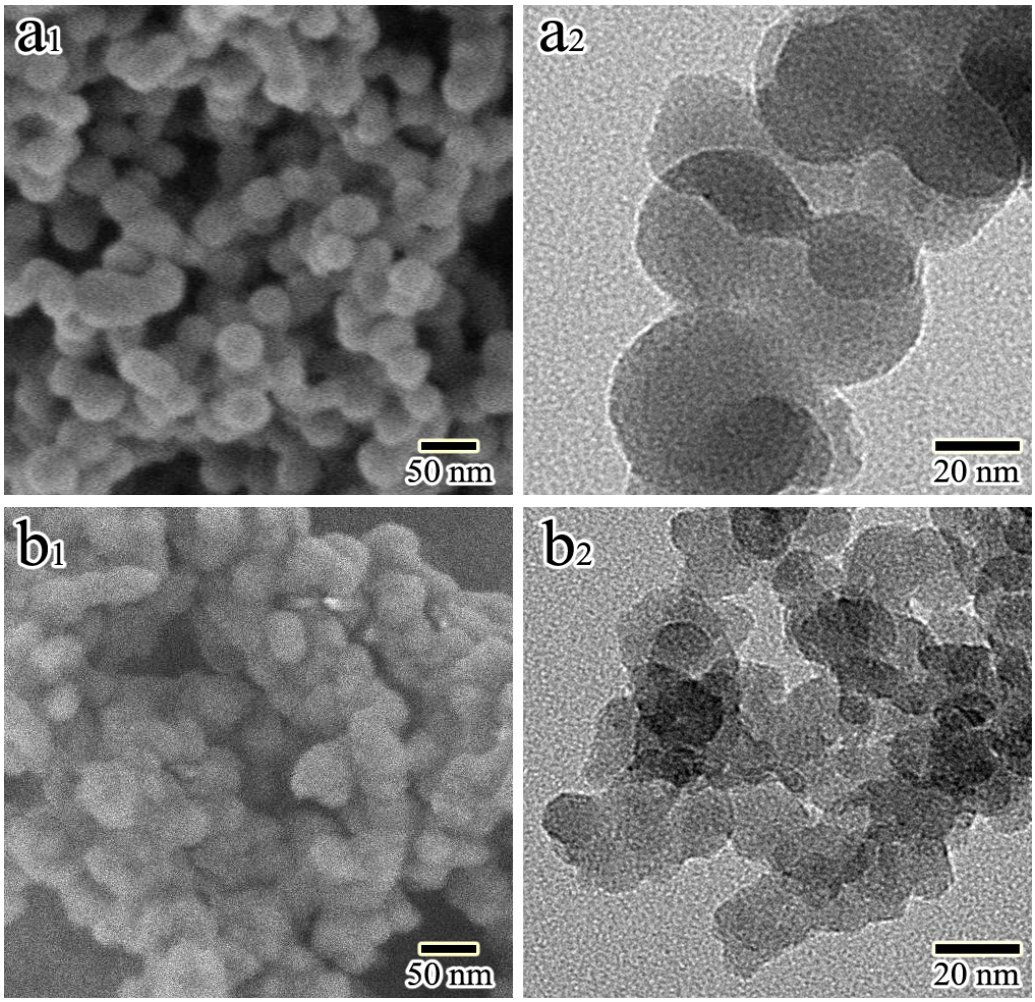

Figure S3 SEM and TEM images of samples synthesized under pH value of 3.0 (a) and 12.0 (b)

4. DRCDs and UV-vis spectras of PPAS loaded in the extracted chiral mesoporous silica transcribed by DNA.

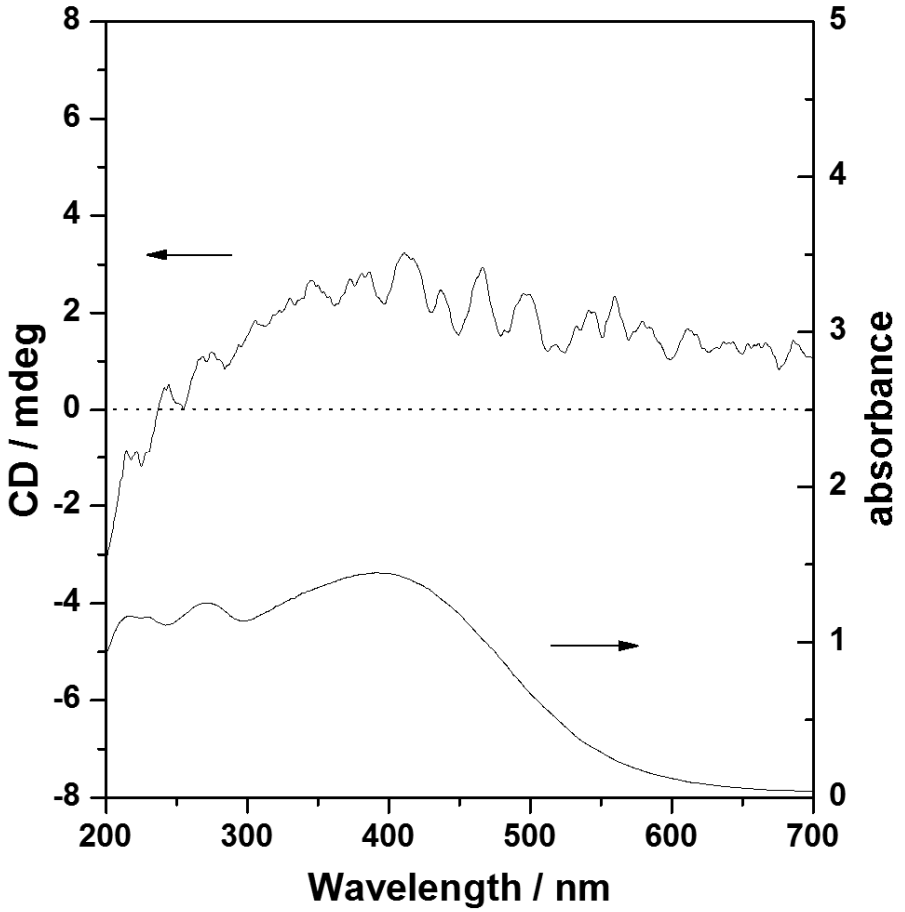

Figure S4. DRCDs and UV-vis spectras of PPAS loaded in the extracted samples synthesized under pH values of 11.5 .