Supplementary information

1. Experimental section

1.1. Materials

4-Cyano-4'-pentylbiphenyl (5CB), β-cyclodextrin (β-CD), sodium dodecyl sulfate (SDS), hexadecyl trimethyl ammonium bromide (CTAB), methylene blue (MB), dopamine, methyl violet, alizarin red, and phenolphthalein were obtained from Sinopharm Chemical Reagent Co., Ltd. A commercial grade alkyl polyglucoside (APG) with an average carbon number of 8-10 was obtained from Tianjin Fu Chen Chemical Reagents Factory. Ethanol was purchased from Chengdu Changzheng Glass Co., Ltd. All chemicals were used without further purification. Glass microscopy slides and Copper TEM grids (18 μm thickness, 285 μm grid spacing, and 55 μm bar width) were obtained from Beijing Zhongjingkeyi Technology Co., Ltd.

1.2 UV–Vis spectrophotometry

The absorbance of 5CB (0.03 mM) in alcohol and water mixture solutions containing an excess of β-CD (0 to 4.2 mM) was determined with the use of a Specord 50 one-beam spectrophotometer (Analytic Jena).

1.3. Preparation of the Air-Supported LC System

The LC optical cells were prepared following procedures reported previously [1, 2]. Briefly, glass slides were cleaned by sonication in ethanol for 15 min and then dried in a 100 ^{o}C oven for 30 min. Next, a silicon plate support with wells (diameter 5mm and depth 0.5 mm) was placed onto the slide and bubbles between the slide and the plate were removed using pressure. The silicon plate was then adhered to the slide. TEM copper grids (75 mesh, 18 μm thickness, 285 μm grid spacing, and 55 μm bar width) were cleaned in methanol, ethanol, and acetone (sonication for 15 min in each solvent), then heated overnight at 100 ^{o}C to evaporate residual solvents. The copper grid was then impregnated with about 0.5 μL of 5CB using a capillary tube. Excess 5CB was removed by contacting the LCs with the other end of the capillary tube. The grids containing LCs were then put on the wells of the plate containing samples of interest. This optical cell was then ready for examination under cross-polarized lighting.

1.4. Optical observation

The optical texture of the 5CB films added to the pores of the copper grids was examined by using plane-polarized light in transmission mode on an Olympus BX60 microscope with crossed polarizer. All optical microscopy images were taken at room temperature with a digital camera (C2020 Zoom, Olympus) mounted on the polarizing optical microscope. Arthroscopic examinations were performed with the source light intensity set to 50% of full illumination and the aperture set to 10% so as to collimate the incident light.

2. Supporting Figures

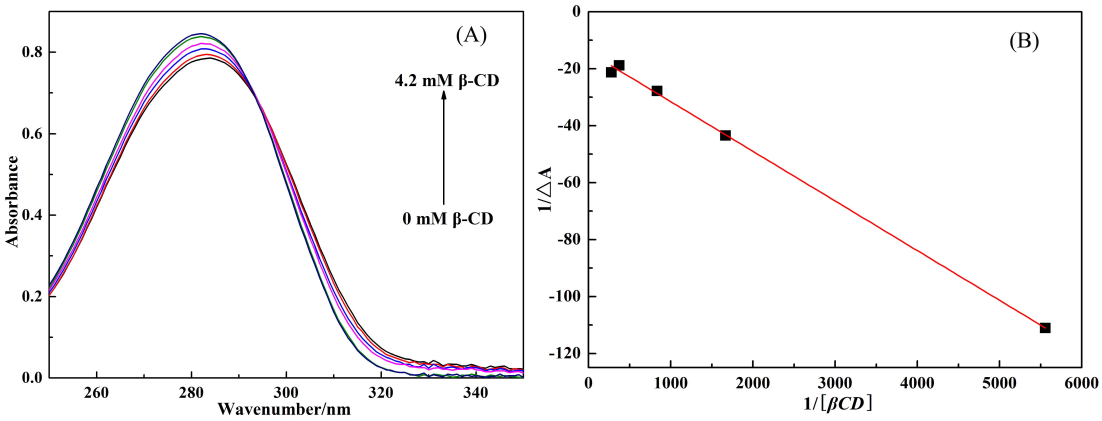

Figure 1S. (A) Absorption spectra of 5CB (0.08 mM) in alcohol and water mixture solution in the absence and in the presence of β-CD, some spectra are omitted for the sake of clarity; (B) Benesi – Hildebrand plot of 5CB interaction with β-CD in alcohol and water mixture solution. The inclusion constant (K) value was calculated as 810 M^{-1} using the equation [3, 4]: $\frac{1}{\Delta A} = \frac{1}{\Delta A_{max}} + \frac{1}{K\Delta A_{max}} \frac{1}{[\beta CD]}$, where: ΔA is the difference of 5CB absorbance in the presence and in the absence of β-CD; ΔA_{max} is the maximum difference in absorbance; $[\beta CD]$ is the concentration of cyclodextrin. R^2=0.99794.

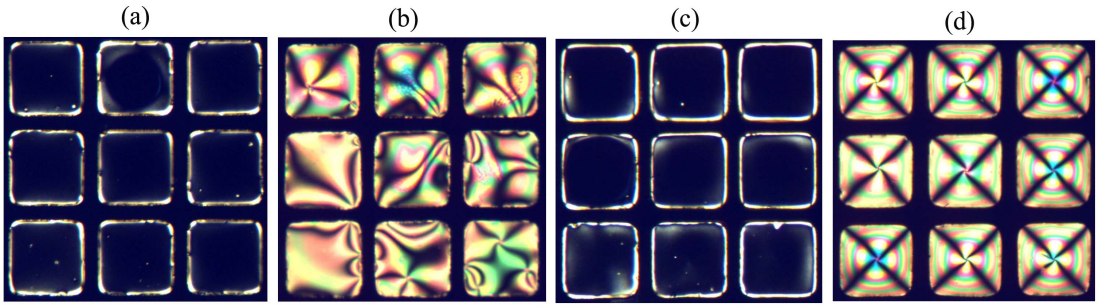

Figure 2S. Cross-polarized optical images of 5CB confined within a copper grid exposed to aqueous solutions of: (a) 0.01 mM CTAB, (b) 0.01 mM CTAB + 0.7 mM β-CD, (c) 0.6 mg/mL APG, (d) 0.6 mg/mL + 1.0 mg/mL β-CD.

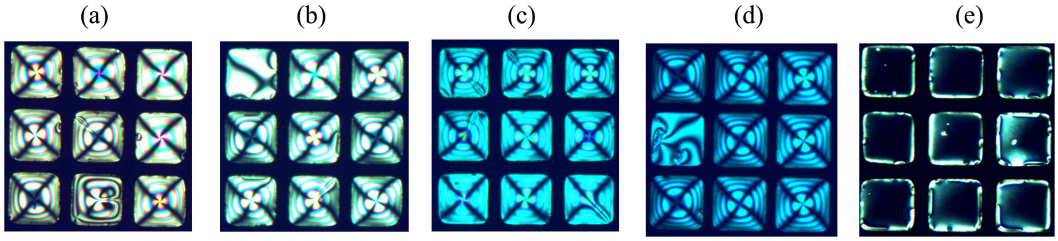

Figure 3S**.** Cross-polarized optical images of 5CB confined within a copper grid exposed to aqueous solutions of MB at various concentrations: (a) 0.05, (b) 0.1, (c) 0.3, (d) 0.5; and aqueous solution (e) 0.3 mM MB + 0.25 mM SDS.

References

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4. S. Belica, D. Jeziorska, P. Urbaniak, V.U. Buko, I.B. Zavodnik and B. Pałecz, J. Chem. Thermodynamics, 2014, **70**, 160–167.