Electronic Supplementary Information (ESI)

Design of β-CD/surfactant complex-coated liquid crystal droplets for the detection of cholic acid via competitive host-guest recognitions

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Materials

4-cyano-4'-pentylbiphenyl (5CB, 98% purity), cholic acid (CA, ≥ 98% purity), β-cyclodextrin (β-CD), and alkyl trimethylammonium bromide (C_nTAB, 99% purity) with n= 12, 14 and 16 were obtained from Sigma-Aldrich (St. Louis, MO). Synthetic urine was purchased from RICCA Chemical Company (Arlington, TX); Cholyl-lysyl-fluorescein (CLF) was obtained from BD Biosciences (Woburn, MA). All chemicals were used without further purification. Water used in experiments was purified with Easypure II system (18.2 MΩ cm and pH 5.7). D_2O was from Sigma-Aldrich.

Preparation of C_nTAB/β-CD complex-coated 5CB droplets

C_nTAB/β-CD inclusion complexes were formed by mixing C_nTAB and β-CD in deionized water at the molar ratio of 1:1 with a bath sonicator (Bradson 2510) for 5 min at room temperature. The mixed solution was then magnetically stirred overnight. C_nTAB/β-CD complex-coated 5CB droplets were formed by mixing 3 μL 5CB in 3ml C_nTAB/β-CD complex solution with a tip sonicator (FB505, Fisher Scientific, Pittsburgh, PA) at the amplitude of 20% for 20s at room temperature.

Characterization

The formation of C_nTAB/β-CD complexes in D_2O was characterized by ^1H NMR spectroscopy (Bruker AvanceIII 400 spectrometer, Bruker, Billerica, MA) at room temperature. Surface tension measurements were carried out with a NIMA Wilhelmy plate. A polarizing optical microscope (BX 40, Olympus) was used to observe the director configuration of C_nTAB/β-CD complex-coated 5CB droplets. The concentration of C_nTAB/β-CD complex-coated 5CB droplets was analyzed with an optical microscope, in which a drop (2 μL) of the droplet solution was placed between two cover glass slides and a large number of optical microscopy images were captured to represent the whole sample area. The number of the droplets confined by the two cover glass slides was carefully counted from the optical microscopy images and then used to calculate their concentrations in the initial solution. The fluorescence microscopy images were acquired with a confocal fluorescence microscope (Nikon Eclipse Ti, Nikon Instrument) with 488 nm excitation. ζ-potential measurements were carried with a Zetasizer Nano ZS90 (Malvern Instruments Inc.).

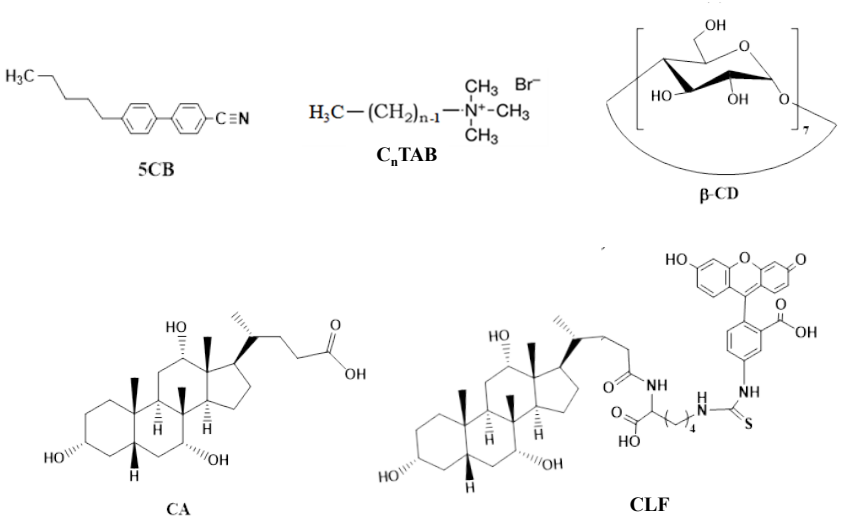

Fig. S1 Chemical structures of 5CB, C_nTAB, β-CD, CA, and CLF.

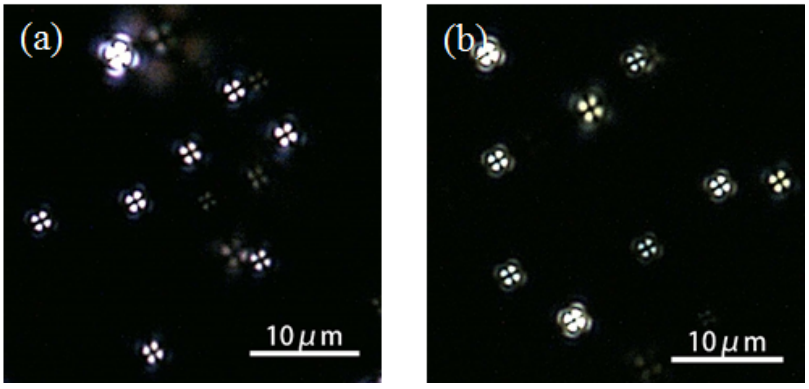

Fig. S2 polarizing optical microscopy images of C_{14}TAB/β-CD complex-coated 5CB droplets in NaOH aqueous solution at pH 7.4 after the addition of 1mM UA (a) and 3 mM urea (b).