Electronic Supplementary Material (ESI) for Soft Matter

Surfactant-DNA Interactions at the Liquid Crystal / Aqueous Interface

Supplementary Information

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Additional Methods and Materials

dsDNA Preparation

Two reverse complementary ssDNA strands (5'TATTAGGGGATGAAGGGCACGAAGTTTTTTCT3'; 5'AGAAAAAACTTCGTGCCCTTCATCCCCTAATA3'; Integrated DNA Technologies) were annealed by adding equal parts into a microcentrifuge tube, heating to 95 ºC for 5 min and then slowly cooling to room temperature for 2 hours. The annealed dsDNA (T_M = 61.1 ºC) was then treated with exonuclease I (New England Biolabs), suspended in 67 mM Glycine-KOH, 6.7 mM $MgCl_2$, and 10 mM 2-Mercatoethanol at pH~9.5 (New England Biolabs) for 1 hour to digest any residual ssDNA in solution into individual nucleotides. The dsDNA solution was then purified with a QIAquick nucleotide removal kit (Qiagen) to separate the residual nucleotides and enzyme from the annealed dsDNA. The purified dsDNA pellet was resuspended in 10 mM Tris-Cl and 1 mM EDTA buffer (Qiagen). An aliquot of purified dsDNA was stained with ethidium bromide, xylene cyanol, and bronopheonol blue then electrophoresis was run in a 15% acrylamide gel for 1hr with buffer conditions of 89 mM Tris-Cl, 89 mM Borate, 2mM EDTA buffer (Sigma) to verify that the DNA was in fact dsDNA. Furthermore, UV-vis analysis indicated that the purified dsDNA was free of any impurities. The remaining purified dsDNA was then precipitated with ethanol and sodium acetate and resuspended to 39 µM.

Flow Cell Assembly

In certain experiments a LC film was prepared in a flow cell environment to facilitate an efficient buffer exchange of the aqueous phase. Mixtures of surfactant in LC were prepared as described in the main text. An electron microscopy grid was placed onto a 1" diameter circular glass cover slip (Electron Microscopy Sciences). The desired mixture of surfactant in LC was then housed within the pores of the electron microscopy grid as described in the main text and the entire glass cover slip was placed onto the base of the flow cell assembly. The base of the flow cell assembly contains a circular opening,

slightly less than 1" in diameter, in which an o-ring (Kalrez, McMaster-Carr) of the proper diameter was placed. The cover slip was then placed on top of this o-ring. Custom fabricated Teflon spacers (~240uM thick) designed with a hole in the center was placed directly on top of the glass cover slip to create a gap between the cover slip and the top glass (fused silica, Mark optics). The base of the flow cell has channels built into it that allow for one to introduce flow through this gap created by the Teflon spacers. The top glass slide was fastened into place by the top piece of the flow cell assembly through which screws were used to clamp the entire flow cell assembly together. Buffer was introduced through the inlet port using care to flush out any air bubbles that may be present in the cavity created by the Teflon spacers. Once assembly is complete, ssDNA was introduced through the inlet port at the desired concentration and at a total load of ~250µL to ensure that the entire volume in the flow cell cavity was flushed out. When a buffer exchange of the aqueous phase was conducted, excess volumes on the order of ~0.5-1mL of the buffer were introduced through the inlet port to ensure an efficient buffer exchange.