Asymmetric Nanoparticle Interaction with Nematic Liquid Crystals

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Abstract

Liquid crystals (LCs) have been attracted a lot of attention due to their unique intermediate state structure. Their orientation ordering revealed anisotropic structure, and ability to produce topological defects with extraordinary sensitivity to any interface. These remarkable features have been widely used in electronical device, including displays and optical fibers.[1] In this study, we introduced nanoparticels into the LC system to investigate the long-range-order defects and distortions. 5CB(4-Cyano-4'-pentylbiphenyl) were originally mixed with nanoparticles in different diameter and tail length and injected into different anchoring cell (**Figure 1A**). The nanoparticle size- and cell anchoring- dependent morphologies have been brought great interests in soft matter system (**Figure 1B, Figure 1C**). This would bring a footprint on biomedical applications, including cargo transport and drug delivery. The polarized microscope is utilized to settle changes in the deformation and morphologies in LC field induced by asymmetric nanoparticles. Our results can guide a new perspective by controlling anchoring and asymmetric nanoparticles.

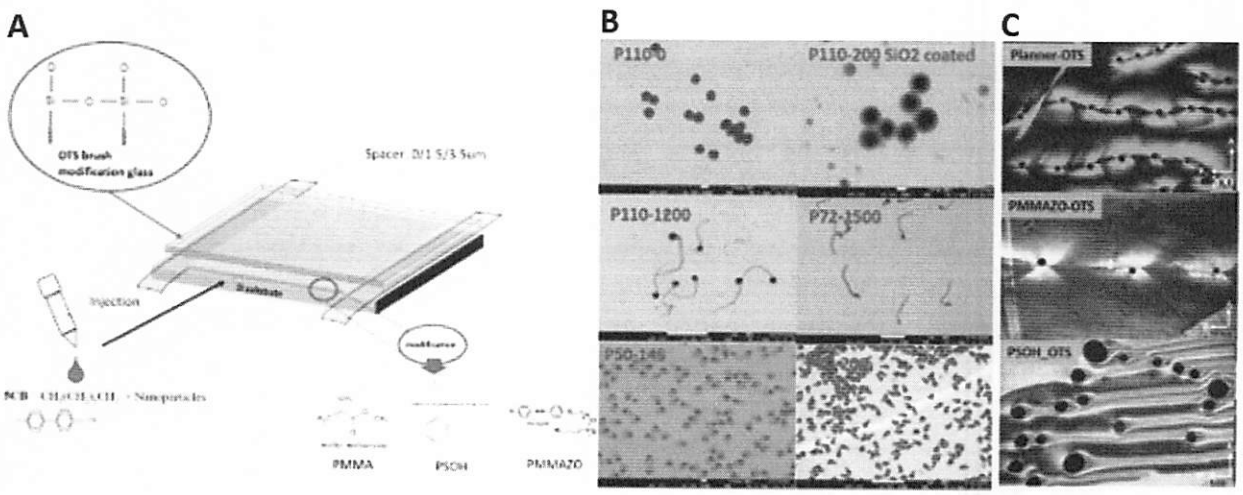

Figure 1. (A) Illimitation of experiment setup of the constructed cells, the top surface glasses were modified with OTS chemical brush, and the silicon substrates were anchored with different brush, three different thickness of cells were employed by different spacers: 0um, 1.5um, and 3.5um, respectively. (B) The SiO2 coated gold nanoparticles with different diameter and tail size, and (C) surface morphologies on different polymer brush.

Reference:

[1] Larsen, T. T., Bjarklev, A., Hermann, D. S. & Broeng, J. Optical devices based on liquid crystal photonic bandgap fibres. *Opt. Express* 11, 2589–2596 (2003).