One-step assembly of multi-layered structures with orthogonally oriented stripe-like patterns on the surface of a capillary tube

Y. LIN, Y. SUN
State Key Laboratory of Polymer Physics and Chemistry, Changchun Institute of Applied Chemistry, Chinese Academy of Sciences, Changchun, 130022, P. R. China
linyuan@ciac.ac.cn

The construction of nano- or micro-structured surfaces is important for both theoretical research and practical applications. Confined evaporative self-assembly (CESA) is a kind of fast, cheap, facile and large-scale patterning technique based on solvent evaporation.[1] When a solution is injected into a geometrical constraint, a thin meniscus is formed at the three-phase contact line (CL), under which droplet evaporation is restricted to occur only at the edge, thus, the evaporation process can be precisely controlled. With the evaporation of the solvents, the solutes would be brought to the CL by convective flow, thereby obtaining highly regular patterns.

In this work, we presented a facile, rapid and controllable method for the construction of orthogonal stripe patterns in one-step on the inner and outer surfaces of a capillary tube using the confined evaporative self-assembly (CESA) method. The sizes of the stripe patterns could be tuned by varying the concentration of polymer solutes, i.e. P3HT and PLA, in the blending solutions and the diameters of the concentrically aligned glass capillary tubes. More importantly, these ordered stripe patterns with orthogonal orientations have the ability to induce cell alignment by "contact cue guidance". These structures mimic the structures and functions of colon tissues. This strategy can potentially be utilized in the self-assembly of other polymers and has the ability to better mimic the tubular scaffolds for in *vivo* and tissue engineering applications.

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[1] Lin, Y.; Balizan, E.; Lee, L. A.; Niu, Z.; Wang, Q. *Angew. Chem., Int. Ed.*, **2010**, 49, 868 – 872.

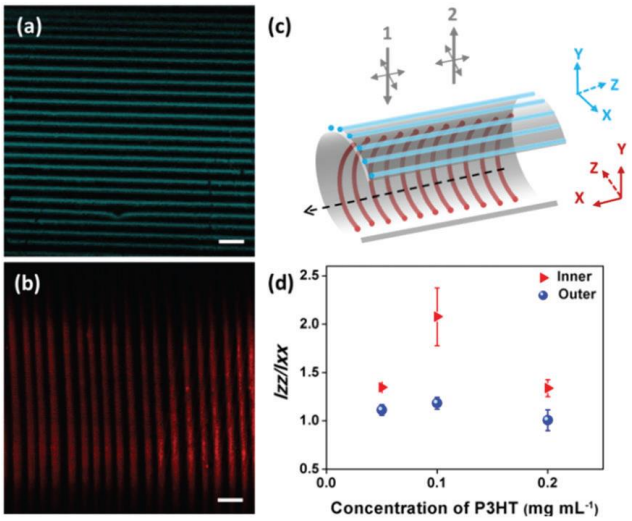

Figure 1: Typical fluorescence images of the pattern self-assembly from P3HT & PLA solution formed on the inner capillary tube: on the outer surface (a) and on the inner surface (b). Different colors are just to distinguish the structures formed at different layers. (c) Schematic illustration of polarized Raman detection and the experimental geometry on a single stripe on the inner and outer surfaces. (d) Raman chain orientation of P3HT molecules in an individual stripe with different concentrations of P3HT. Scale bars are 50 μm.