

Supplementary information

Observation of Surface Corrugation-Induced Alignment of Lamellar Microdomains in PS-*b*-PMMA Thin Films

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As shown in Figure S1 (a) [same as Figure 1 (d)], the copolymer film undulates along the contour of substrate topography when the thickness of copolymer is comparable to the depth of topographic pattern. For this particular sample shown in Figure S1, the height difference between center of the ridge and the center of groove is measured as approximately 17 nm using sectional analysis of height contrast AFM image. Thermal annealing of the copolymer reduces the height difference. Approximately 2 nm in the height difference is measured in Figure S1 (b) [same as Figure 1 (e)] which is an AFM image of a sample annealed at 200°C for 1 hr. Figure S1 (c) shows the cross-sectional profiles along the dotted lines in Figure S1 (a) [black line] and (b) [red line]. As schematically depicted in Figure S1 (d), thermal annealing induces capillarity driven flow of the copolymer to reduce the surface area. The correlation between kinetics of the capillarity driven flow, copolymer thickness, and microphase separation kinetics is potentially important to an understanding of the mechanism of lamellae alignment. As to the microphase separation kinetics, previous work suggests that block copolymer films initially spin coated on silicon substrates are microphase separated, and a short period of annealing at temperature above the glass transition temperature gives rise to a rapid local relaxation of the chains to a structure that approximated the equilibrium period of microdomains.^{1,2} Certainly the details of the correlation between microphase separation kinetics with the capillarity driven flow of copolymer films deserve more investigation, which will provide better understanding of the mechanism of lamellae alignment observed in this paper.

[1] A. M. Mayes, T. P. Russell, P. Bassereau, S. M. Backer, G. S. Smith, *Macromolecules*, 1994, 27, 749.

[2] T. P. Russell, I. Chin, *Colloid Polyme Sci.* 1994, 272, 1373.

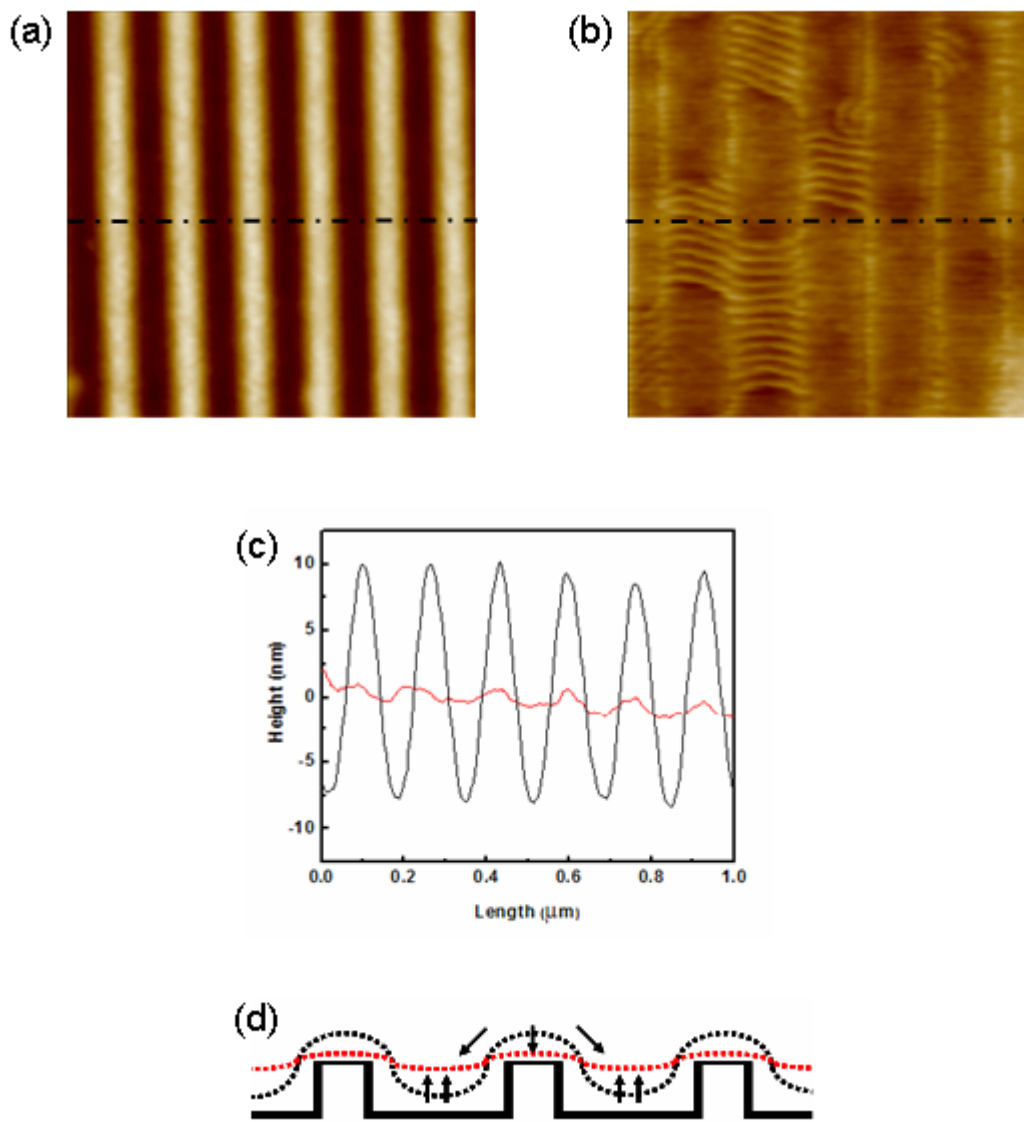


Figure S1: 36 kg/mol PS-b-PMMA thin films on a non-selective corrugated substrate ($R_c=24.25$) with $h = 47$ nm, $t/h=0.85$. (a) as-cast film; (b) after 1hr annealing at 200°C; (c) overlapped height profiles along the lines in (a) and (b). Black and red lines in (c) correspond to the profile of (a) and (b), respectively; (d) schematic representation of the film contour change during thermal annealing.