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Supporting Information

Uniform Hybrid Nanoribbons from Unidirectional Inclusion Crystallization Controlled by Size-amphiphilic Block Copolymers

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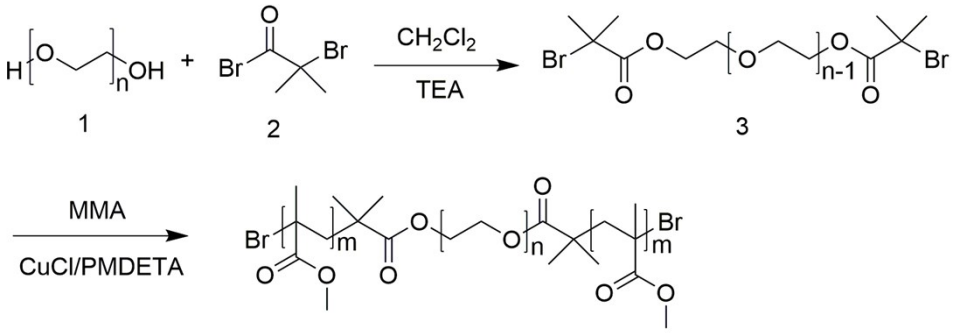
Additional Results

Synthesis of MEM BCP.

Poly(methyl methacrylate)-*block*-poly(ethylene oxide)-*block*-poly(methyl methacrylate) block copolymers (MEM BCPs) were synthesized by atom transfer radical polymerization (ATRP) according to previous report (Scheme S1).[1] Briefly, 10 g (1.0 mmol) PEO (10k, **1**) in 100 mL CH_2Cl_2 was mixed with 0.212 g (2.0 mmol) TEA. After cooling to 0 °C, 0.483 g (2.1 mmol) 2-bromoisobutyryl bromide (**2**) in 20 mL dry CH_2Cl_2 was added dropwise, subsequently the temperature was gradually rise to room temperature. After dissolution in absolute ethanol, the solution was stored overnight to recrystallize the product (**3**). The product was filtered, washed with cold diethyl ether, and dried in vacuum. MEM BCP was synthesized by using **3** as macroinitiator, CuCl and PMDETA as catalyst and ligand, respectively, for atom transfer radical polymerization (ATRP). In a typical run, MMA (0.6 g, 6.00 mmol), purified by filtering through a silica column, CuBr (2.87 mg, 0.02 mmol), PMDETA (3.46 mg, 0.02 mmol), and **3** (0.1 g, 0.01 mmol) together with Teflon coated stirrer were introduced into a 50 mL KJeldahl flask and sealed with a Teflon screw cap inside a glove box. The reaction was conducted in an oil bath at 50 °C for 3 hours. Polymerization was terminated by quenching in ice, and MEM BCP was dissolved in toluene to pass through a silica column to remove copper species. Then, by precipitating in ether, MEM BCP was obtained and dried in a vacuum oven overnight at room temperature.



Scheme S1. Synthetic route of MEM BCP.

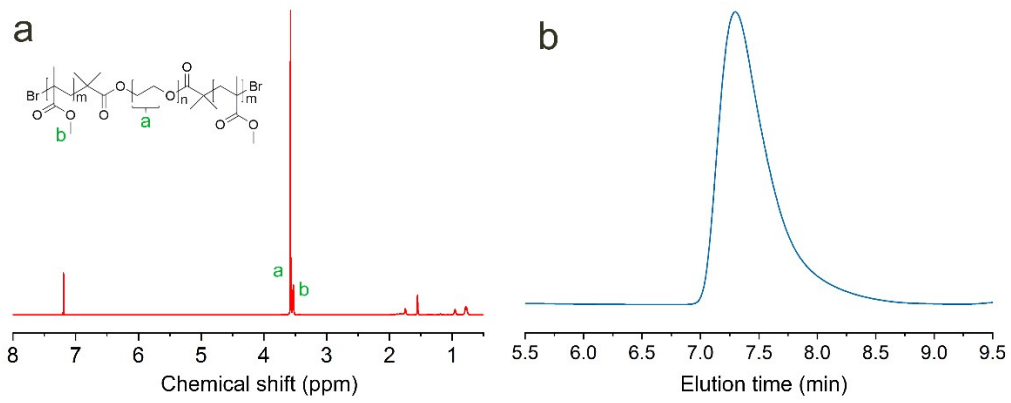


Figure S1. ^{1}H NMR spectrum (a) and GPC curve of MEM BCP.

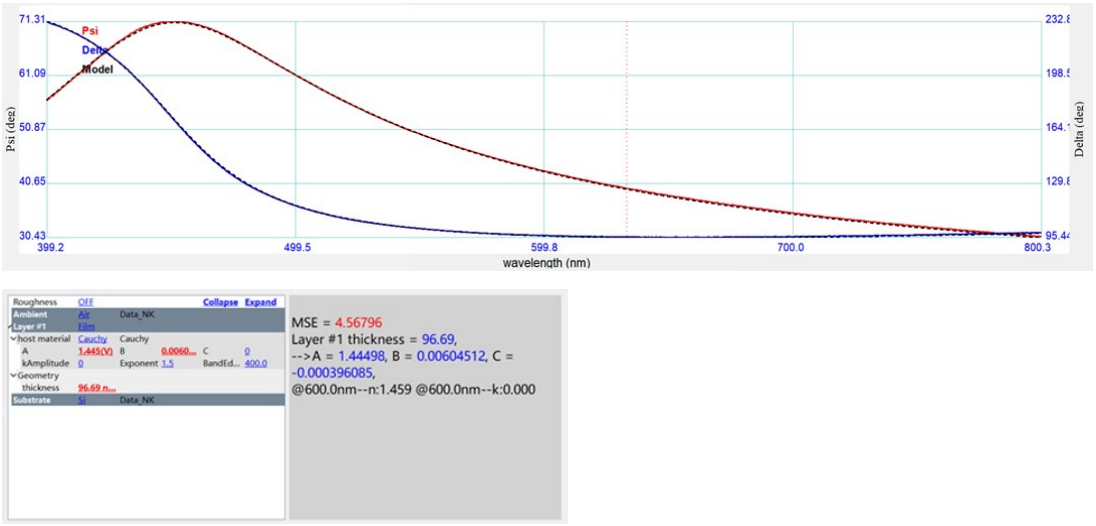


Figure S2. Ellipsometric spectrum of hybrid thin film of STA and MEM BCP and the fitting results. The measured thickness of the thin film is 96.69 nm.

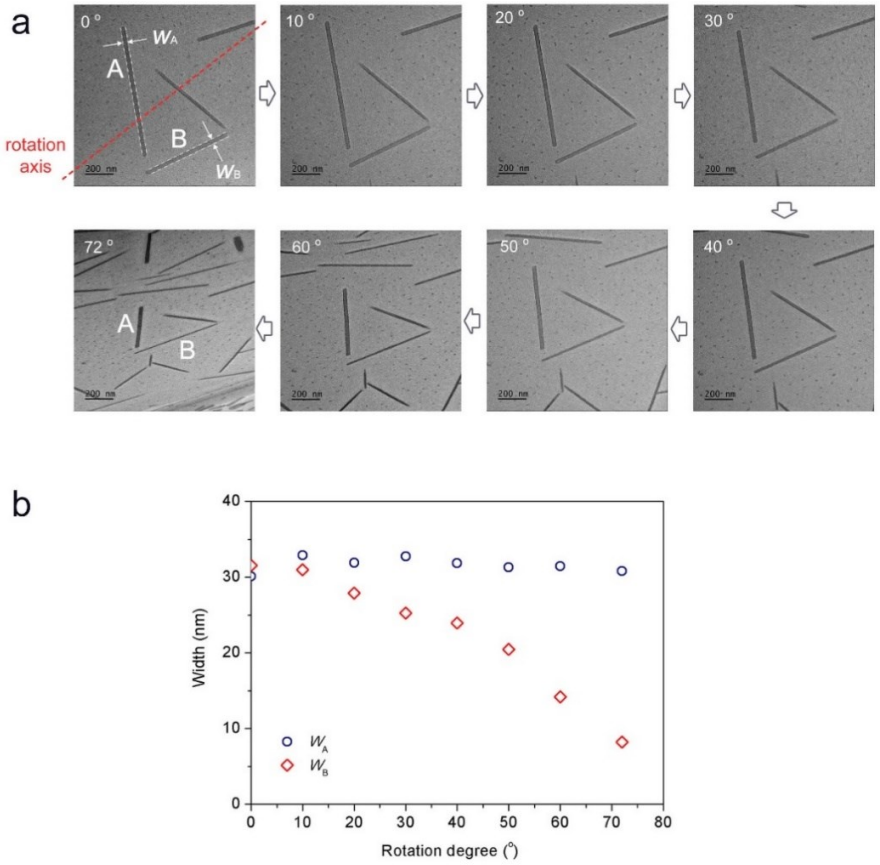


Figure S3. (a) A series of TEM micrographs captured at different tilting degrees in the same position. (b) The dependence of width for A and B on the rotation degree.

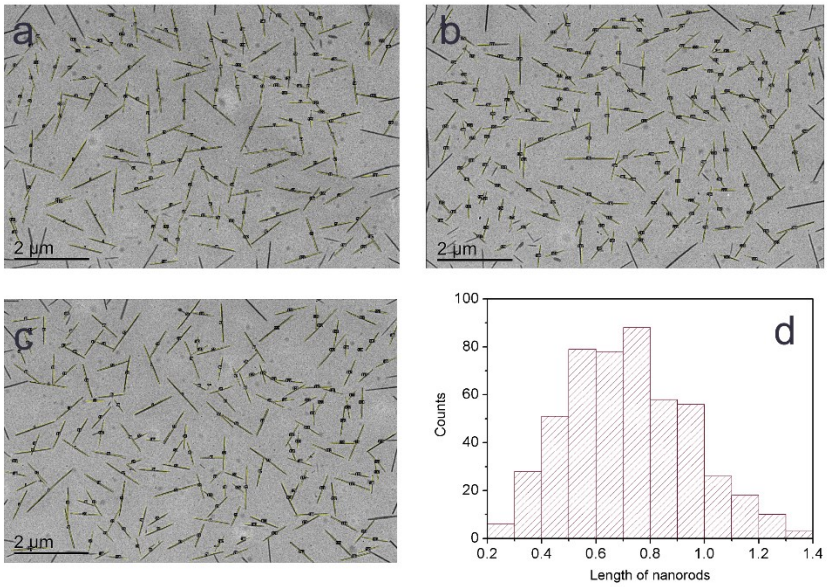


Figure S4. TEM micrographs of nanorods formed in STA/MEM BCP thin film after thermal annealing at 120 °C for 20 min for counting (a-c) and the histogram of the rod length (d).

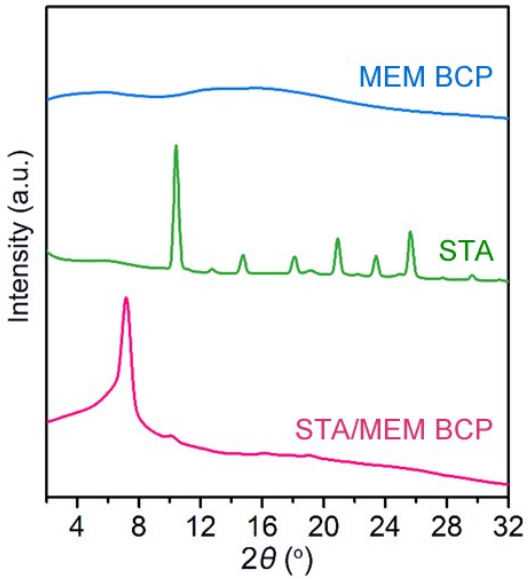


Figure S5. WAXS profiles of MEM BCP, STA and STA/MEM BCP nanocomposite.

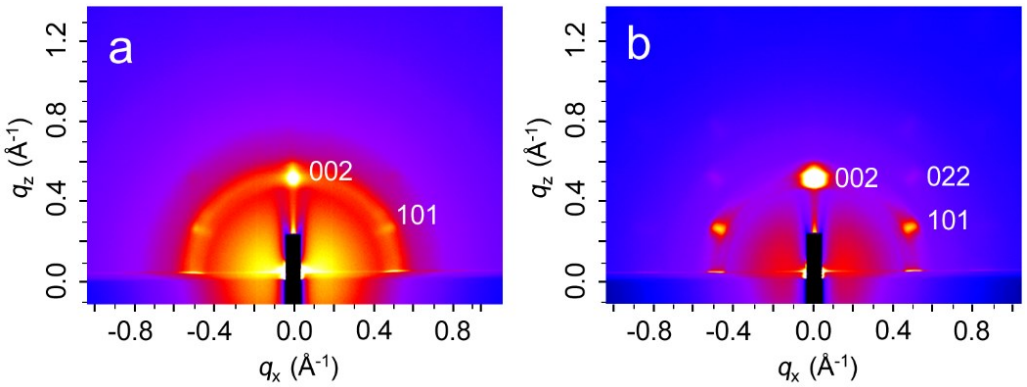


Figure S6. 2D grazing-incidence wide-angle X-ray scattering (GIWAXS) patterns of the STA/PMMA-PEO(10k)-PMMA (a), and STA/PMMA-PEO(35k)-PMMA (b) thin films annealed at 120 °C for 15 min.

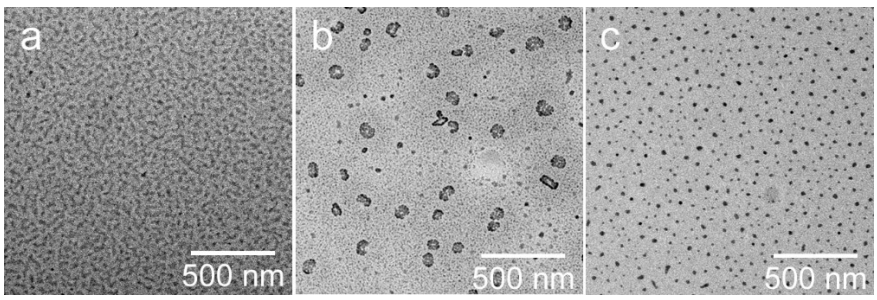


Figure S7. TEM micrographs of hybrid films of PTA (a), BTA (b) and CTA (c) with MEM BCP after thermal annealing at 120 °C for 15 min.

Table S1. Values of length and width of crystalline lamellae of STA/PMMA-PEO-PMMA annealed at 120 ºC for different times.

Time (min)	Length (nm)	Width (nm)
2	85.9 ± 25.0	15.3 ± 1.9
5	252.1 ± 66.5	17.3 ± 3.2
10	460.8 ± 106.4	15.5 ± 2.1
15	732.8 ± 115.0	18.9 ± 2.8
30	743.8 ± 159.2	18.1 + 2.9
45	1049.8 ± 385.1	18.6 + 3.2
60	1063.4 ± 131.2	17.2 + 3.0

Table S2. Values of length and width of crystalline lamellae of STA/PMMA-PEO-PMMA annealed at different temperatures for 15 min.

Temperature (ºC)	Length (nm)	Width (nm)
100	191.1 ± 90.5	20.6 ± 2.3
120	732.8 ± 115.0	18.9 ± 2.8
140	1491.8 ± 466.8	18.3 ± 3.0
160	1827.9 ± 727.1	28.1 ± 3.7
170	2432.9 ± 815.4	22.7 ± 3.2
180	2200.1 ± 594.9	27.4 ± 5.3

Reference:

1. Sun, X.; Zhang, H.; Zhang, L.; Wang, X.; Zhou, Q.-F. *Polym. J.* **2005,** 37, (2), 102-108.