

Electronic Supplementary Information

Molecular-Weight Effects of a Homopolymer on the AB- and ABC-stacks of Perforations in Block Copolymer/Homopolymer Films.

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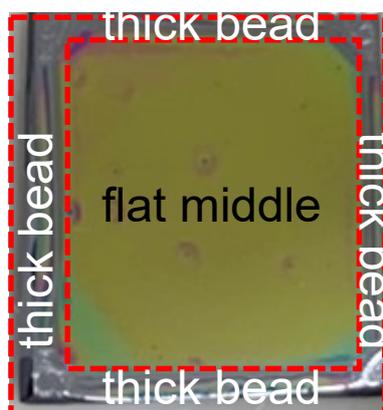


Figure S1. Photo of a spin-coated $B_{75}H_{25}^{17}$ film

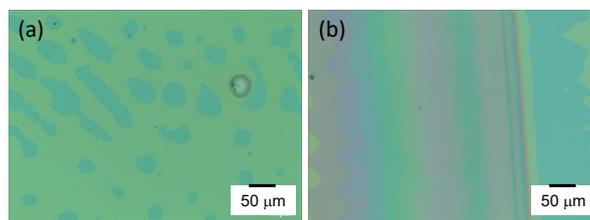


Figure S2. OM images collected at (a) the middle and (b) the periphery of the $B_{75}H_{25}^{17}$ -205 film.

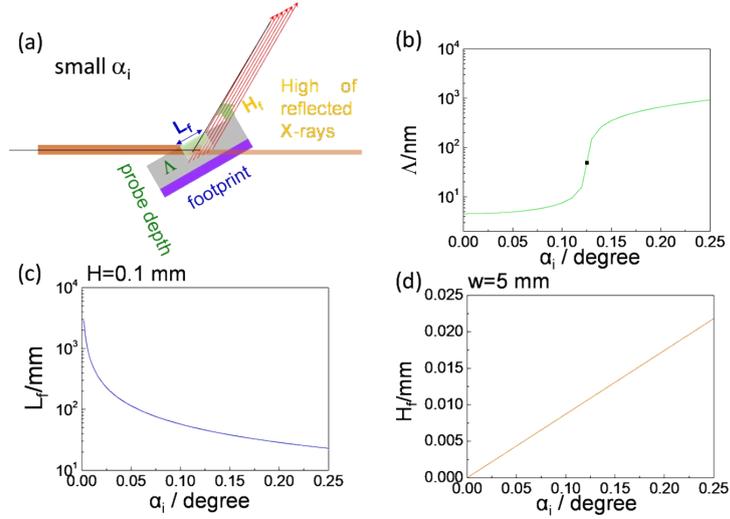


Figure S3. (a) scheme of X-rays impinging on a film at α_i , (b) probe depth, (c) footprint dimension, (d) reflected height of X-rays at different α_i in the range of 0–0.25°.

Figure S3a shows a scheme that describes the α_i -dependence probe depth (Λ), footprint dimension (L_f), and reflected height (H_f) of X-rays. The probe depth (Λ) was estimated by

$$\Lambda = \frac{\lambda}{4\pi} \sqrt{\frac{2}{\sqrt{(\alpha_i^2 - \alpha_c^2)^2 + 4\beta^2} - (\alpha_i^2 - \alpha_c^2)}} \quad (\text{S1})$$

In equation-(S1), λ is the wavelength of X-rays, α_c is the critical angle of a film and β denotes the imaginary part of the refractive index. At $\lambda = 1.24 \text{ \AA}$, $\alpha_c = 0.00221$ radian and $\beta = 2.8 \times 10^{-9} \text{ \AA}^{-2}$. The estimation of the α_c and β is based on a weight-fraction relationship of $\rho_{\text{PS}} = 1.06 \text{ g/cm}^3$ and $\rho_{\text{PMMA}} = 1.15 \text{ g/cm}^3$ in blend films.

The footprint dimensions were estimated by

$$L_f = \frac{H}{\sin(\alpha_i)} \quad (\text{S2}).$$

In equation-(S2), H denotes the vertical dimension of X-ray exposed to films and α_i denotes the incident angle. For the X-rays at TLS 23A, the full dimension of X-rays was 0.5 mm (horizontal) and 0.2 mm (vertical). Because a film was placed at the middle of X-rays, thus the bottom half of X-rays was blocked by the underlying substrate and

only the top half of X-rays was exposed onto the film. Thus, H was 0.1 mm.

The reflected height (H_f) was estimated by

$$H_f = \arctan(\alpha_i) \times w \quad (\text{S3})$$

In equation-(S3), w denotes a distance between the X-ray exposed position and the periphery of the substrate. Basically, the X-rays were exposed to the middle of a film.

Assuming that the dimension of a film is 10 mm \times 10 mm, w=5 mm.

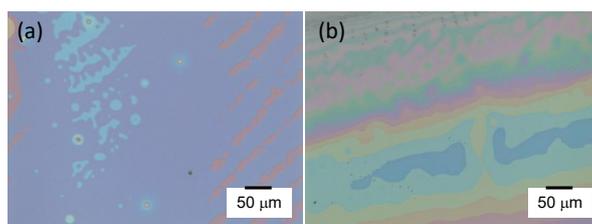


Figure S4. OM images collected at (a) the middle and (b) the periphery of the $B_{75}H_{25}^{17-240}$ film.

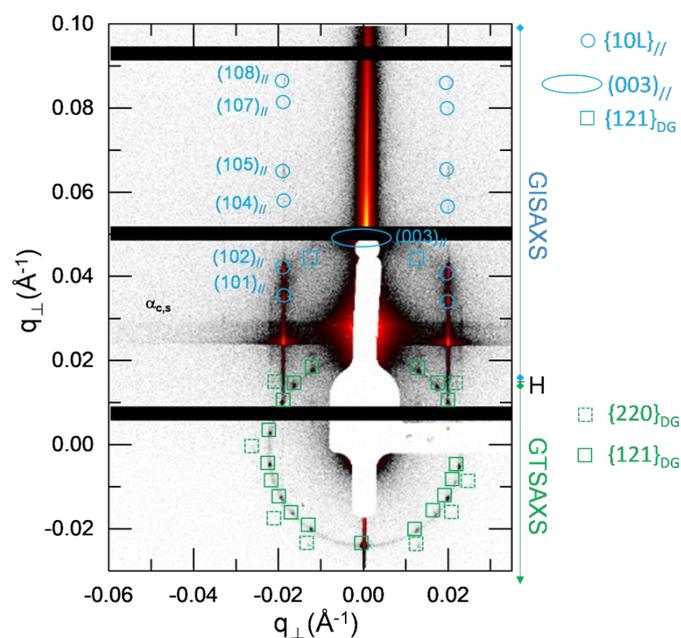


Figure S5. The signals of Figure 7k are indexed on the basis of hexagonally perforated layers and double gyroids. The signals of hexagonally perforated layers are marked by open circles and ovals, and the signals of double gyroids are marked by open squares.

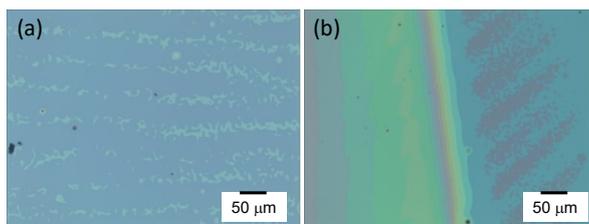


Figure S6. OM images collected at (a) the middle and (b) the periphery of the $B_{75}H_{25}^{2.8-205}$ film.

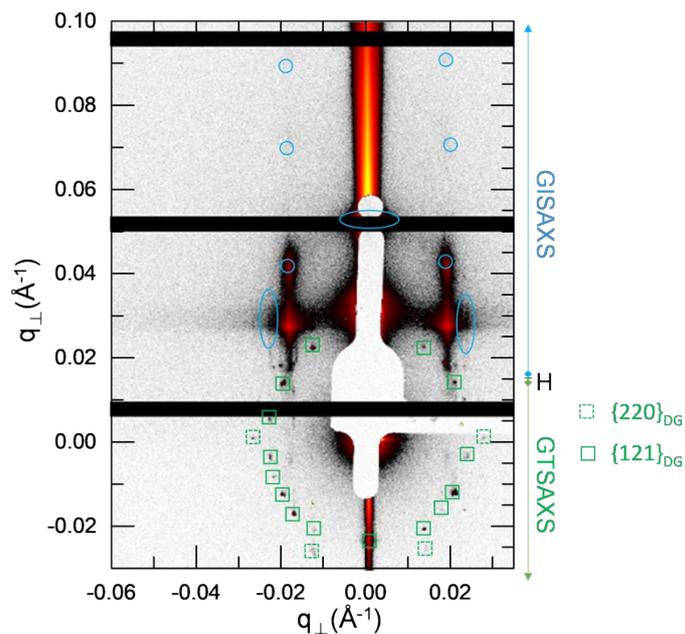


Figure S7. The signals of Figure 10l are indexed on the basis of perforated layers and double gyroids. The signals of perforated layers are marked by open circles and ovals, and the signals of double gyroids are marked by open squares. Because the phase of perforated layers lacks a long-range in-plane order, the quadrant spots and meridian arcs cannot be indexed by ABC- and AB-stacks of hexagonally perforated layers.

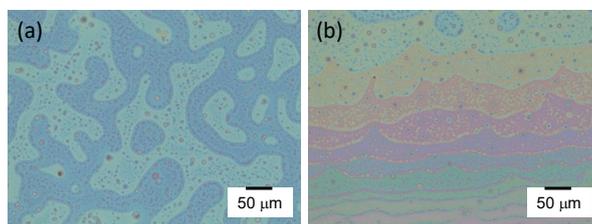


Figure S8. OM images collected at (a) the middle and (b) the periphery of the $B_{75}H_{25}^{2.8-240}$ film.