

Electronic Supplementary Information for:

Rapid Assessment of Crystal Orientation in Semi-Crystalline Polymer Films using Rotational Zone Annealing and Impact of Orientation on Mechanical Properties

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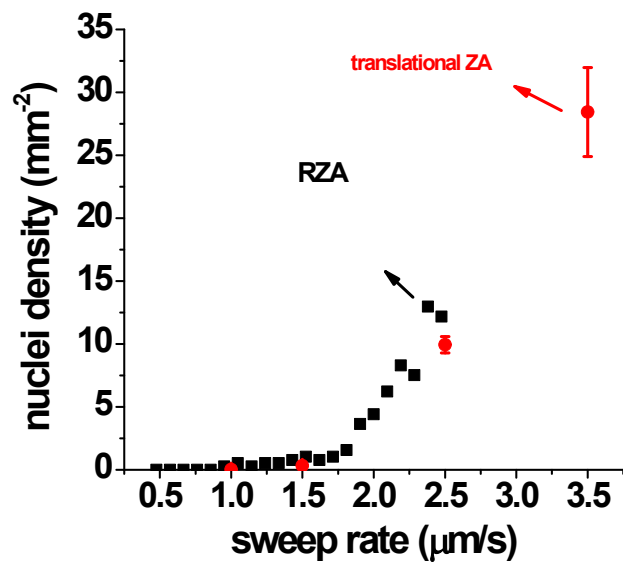


Figure S1. Nuclei density of PB-1 films using RZA and translational ZA at varied sweep rate.

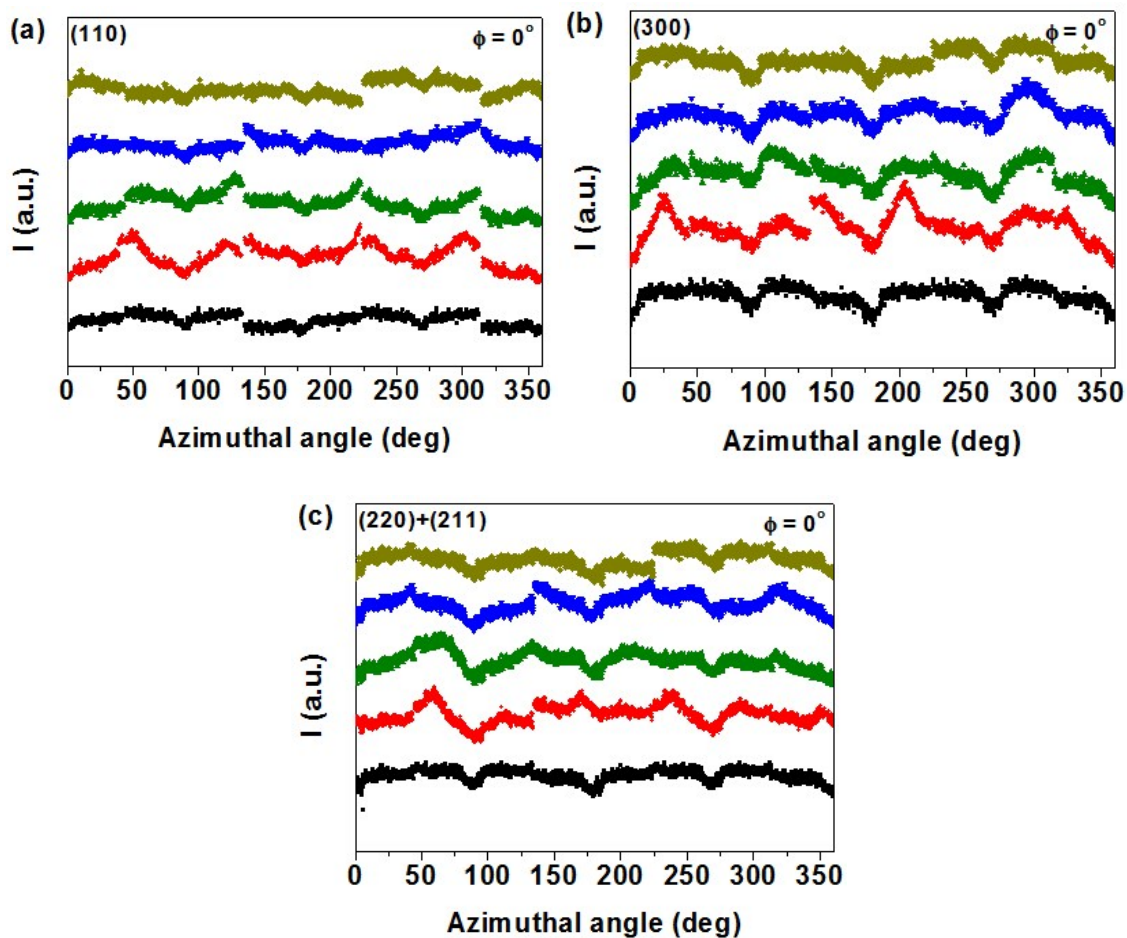
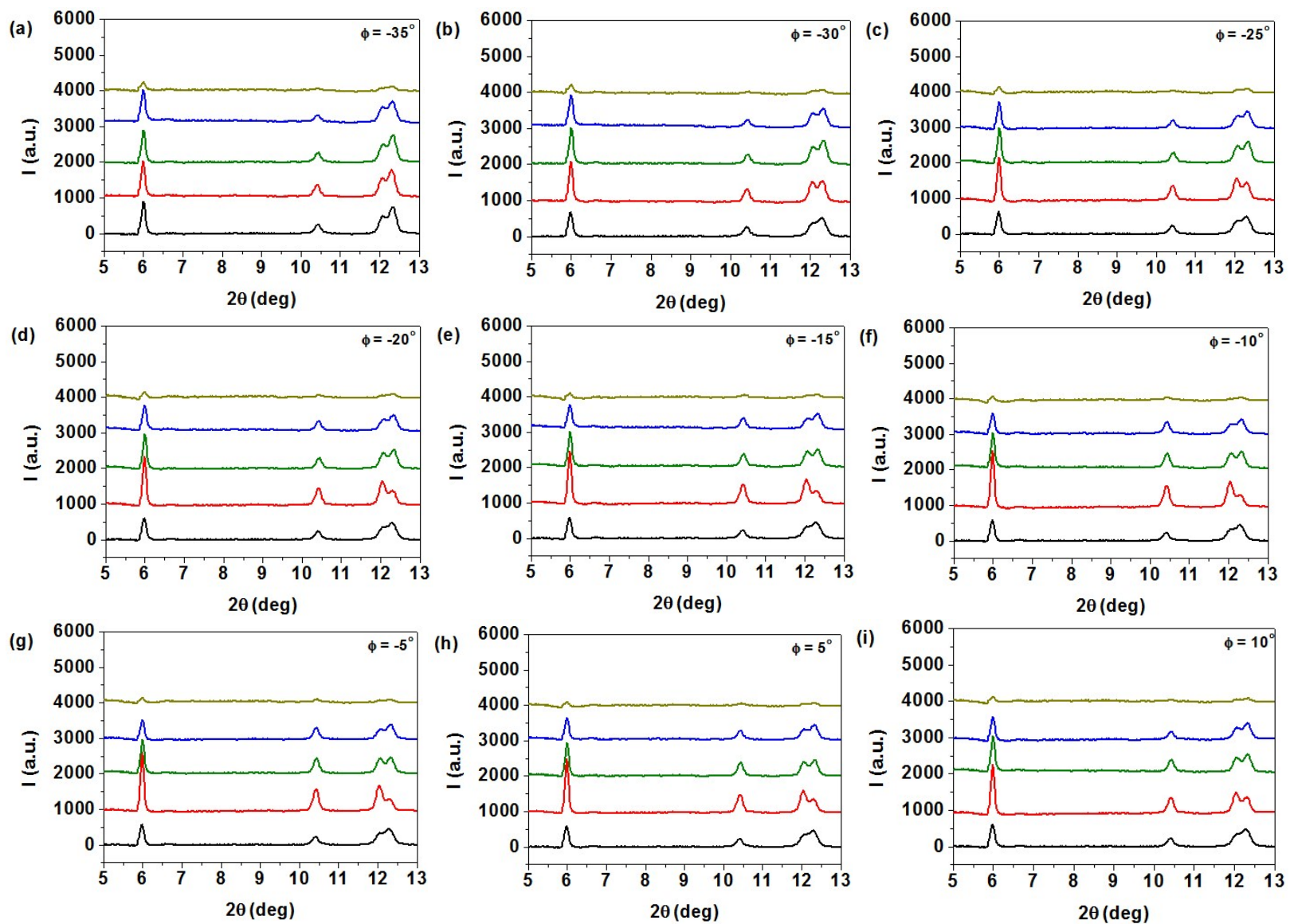


Figure S2. Azimuthal scattering intensity using 13.5 keV X-rays of (a) (110) plane, (b) (300) plane and (c) (220) + (211) plane for PB-1 films using isothermal crystallization and ZA with sweep rates of 1.0 (●), 1.5 (▲), 2.5 (▼) and 3.5 (◆) $\mu\text{m/s}$ at an incident angle $\phi = 0^\circ$. An azimuthal angle of 0° refers to the direction 90° clockwise to the zone annealing direction.



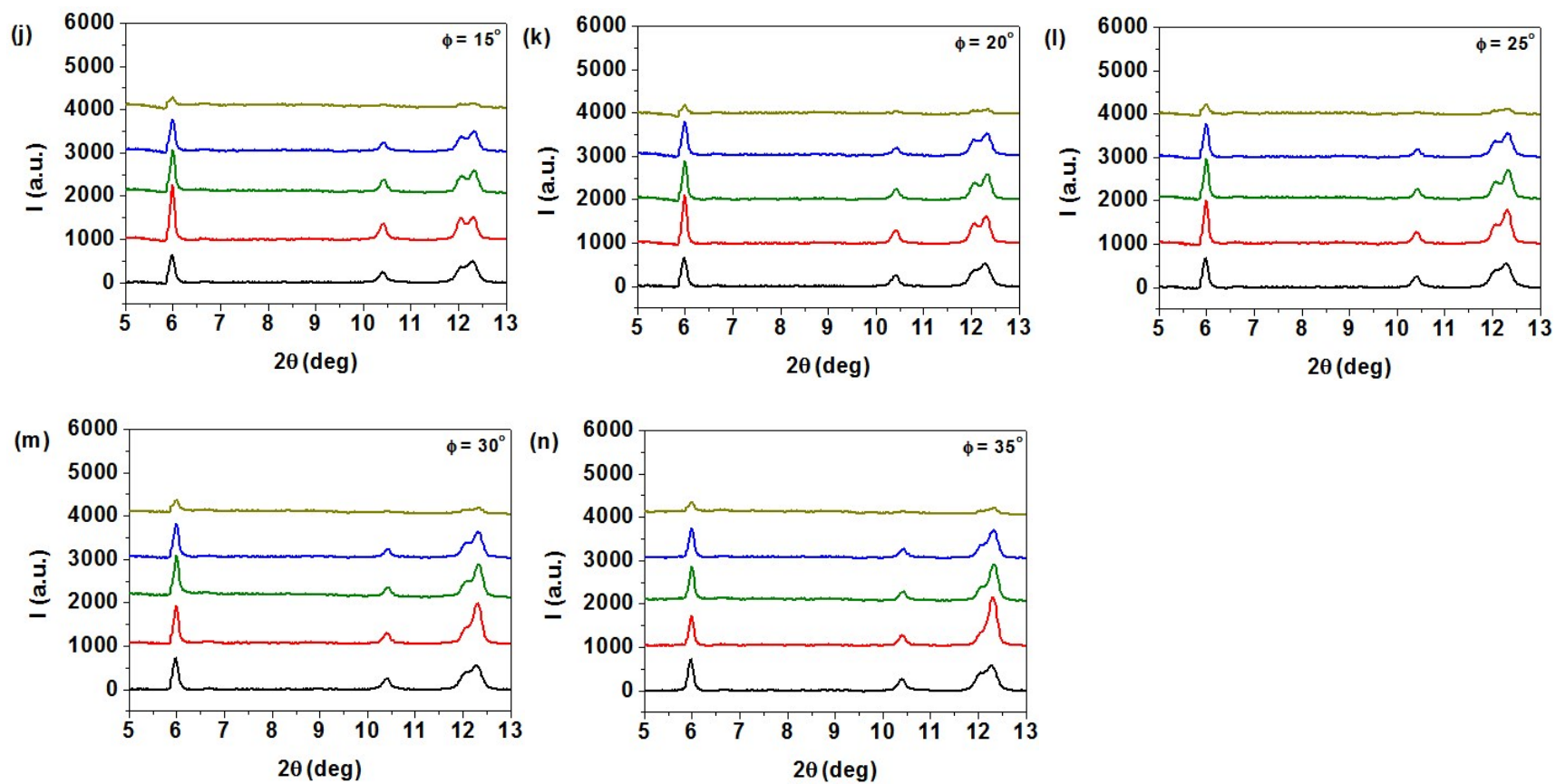


Figure S3. WAXD patterns using 13.5 keV X-rays at incident angles ϕ from -35° to 35° of PB-1 films using isothermal crystallization (black) and ZA with $V_{ZA} = 1.0$ (red), 1.5 (green), 2.5 (blue) and 3.5 (yellow) $\mu\text{m/s}$ after ~ 600 days of aging at room temperature. The diffraction patterns were vertically shifted to improve clarity.

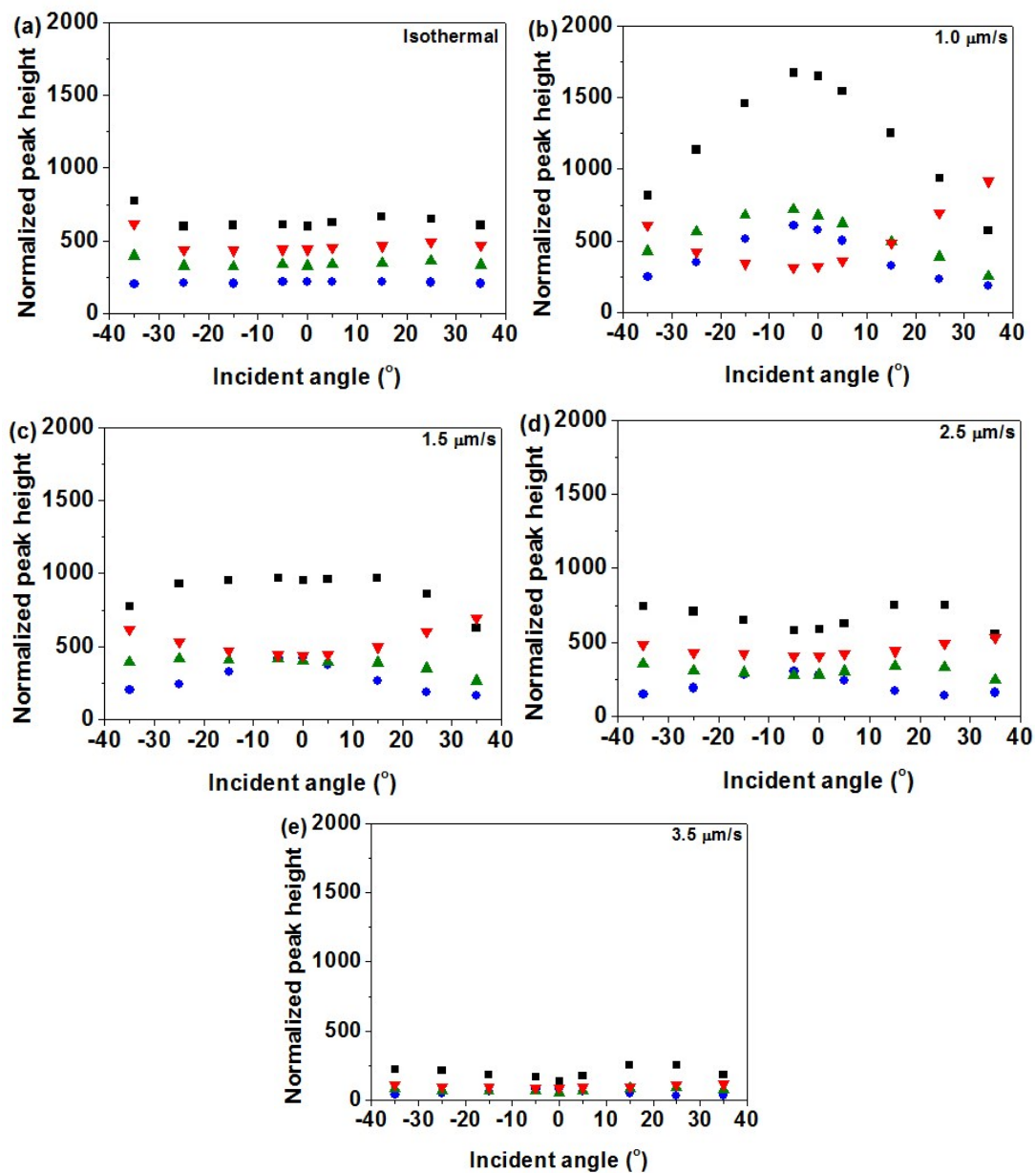


Figure S4. The relative intensities of the diffraction peaks associate with the crystallographic planes of (110) (■), (300) (●), (220) (▲) and (211) (▼) at different incident angles for PB-1 films processed by (a) isothermal crystallization, and ZA with V_{ZA} = (b) 1.0 μm/s (c) 1.5 μm/s (d) 2.5 μm/s and (e) 3.5 μm/s.

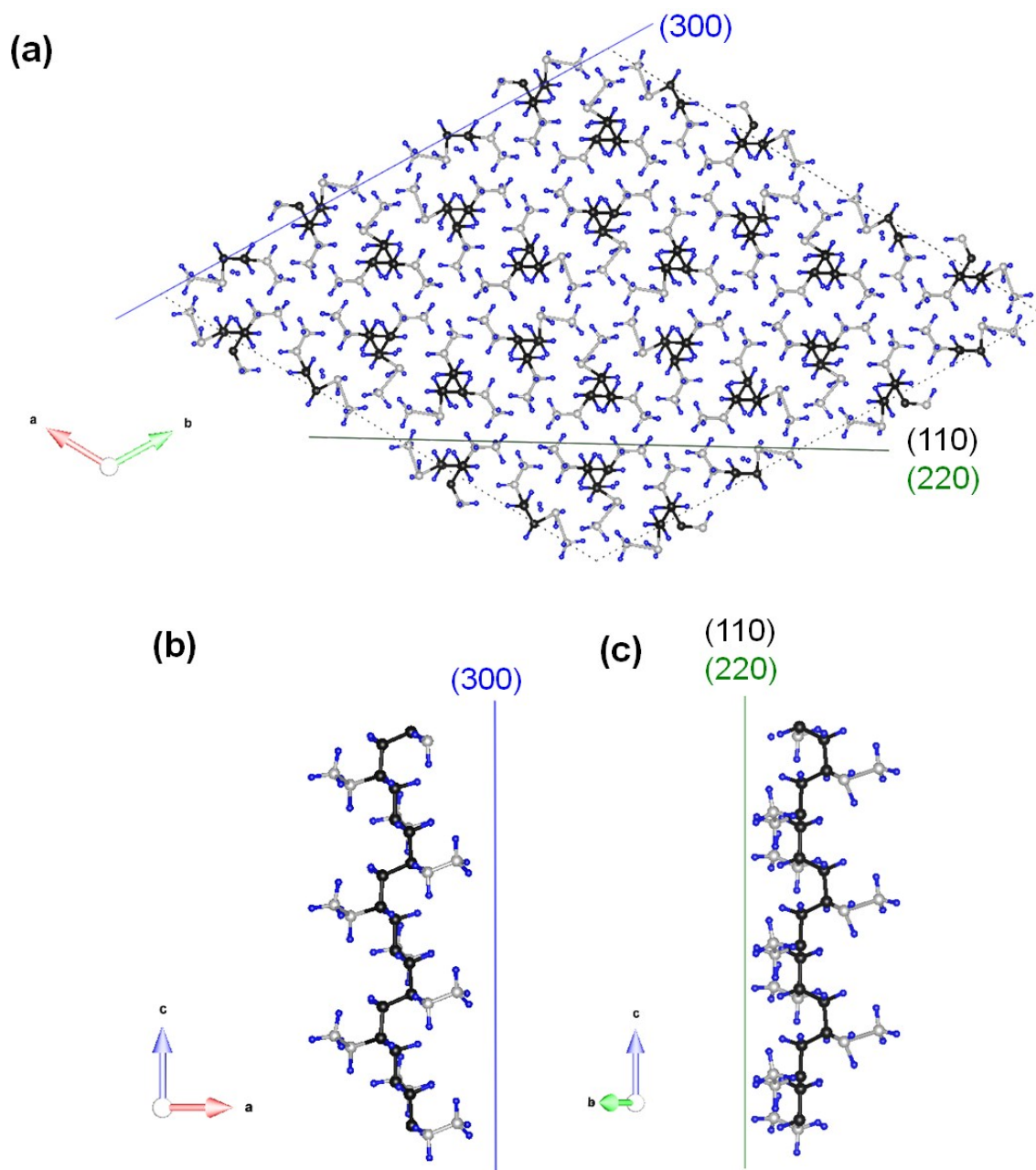


Figure S5. Schematic of the crystal structure of PB-1. The carbon atoms in the backbone are in black, the carbon atoms in the side chain are in silver, while the hydrogen atoms are in blue. The backbone of PB-1 is parallel to (110), (300) and (220) planes.

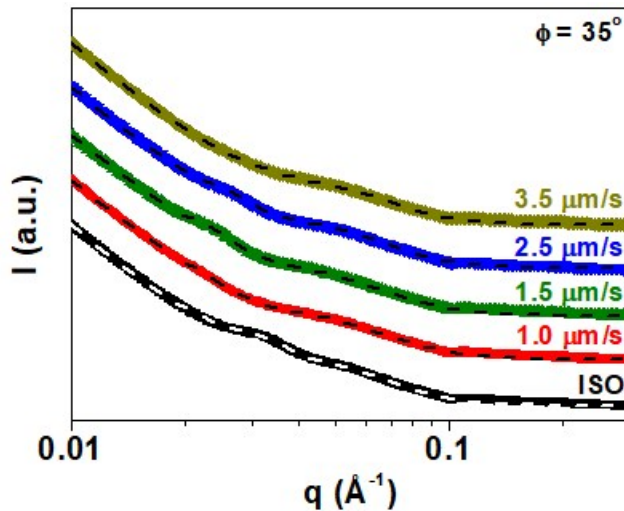


Figure S6. SAXS patterns using 13.5 keV X-rays of PB-1 films processed by isothermal crystallization (ISO, ■) and ZA with $V_{ZA} = 1.0$ (●), 1.5 (▲), 2.5 (▼) and 3.5 (◆) $\mu\text{m/s}$ at $\phi = 35^\circ$. The dashed lines are the fitted curves. The scattering patterns were vertically shifted to improve clarity.

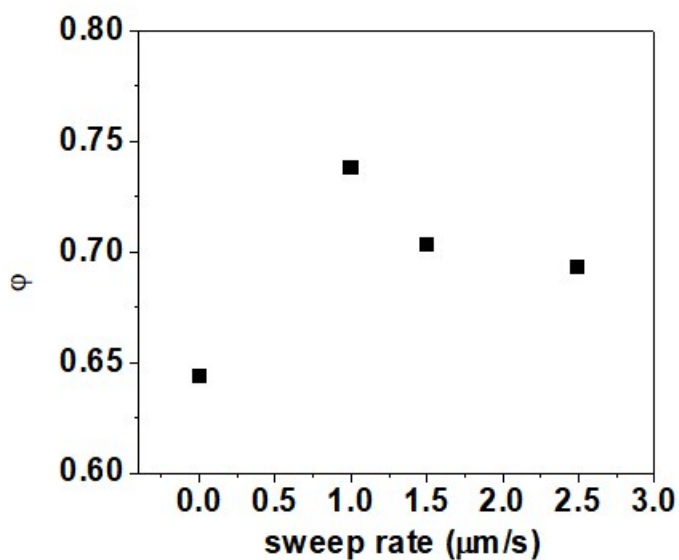


Figure S7. The crystallinity of the stacked lamellae (ϕ of PB-1 for isothermal crystallization and ZA with different V_{ZA} . For the isothermal crystallization, $V_{ZA} = 0$.

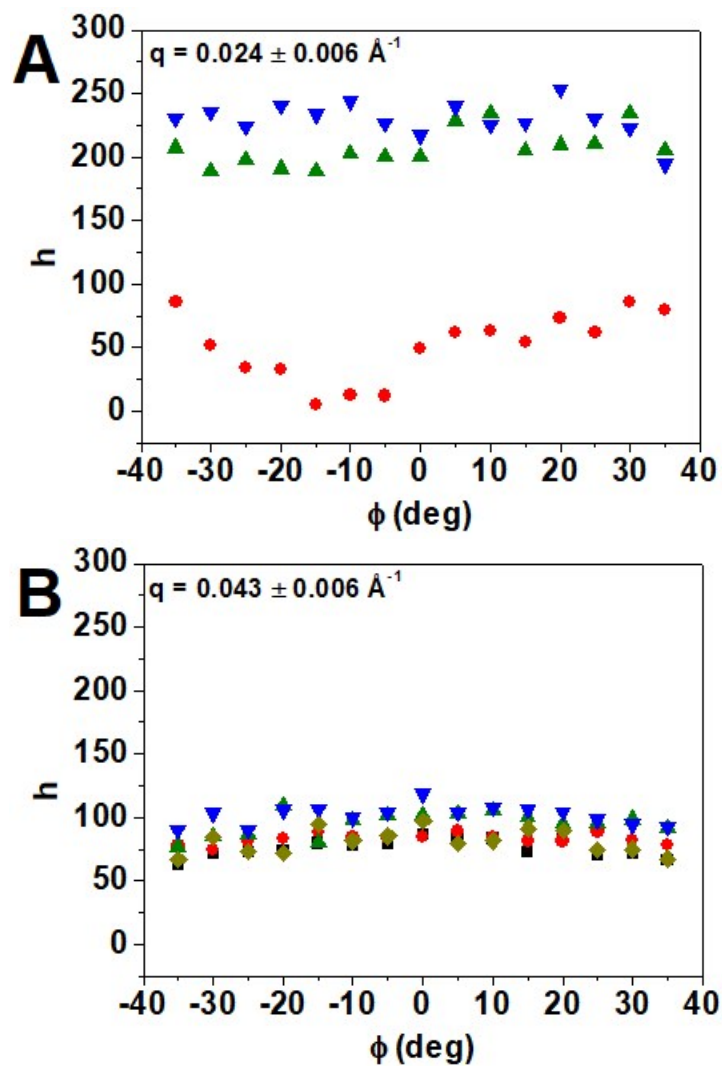


Figure S8. The maximum of the azimuthal angle dependence of the scattered intensity intensities near the shoulders at (A) $q = 0.024$ and (B) $q = 0.043$ at different incident angles (ϕ) for PB-1 films processed by isothermal crystallization (■) and ZA with $V_{ZA} = 1.0$ (●), 1.5 (▲), 2.5 (▼) and 3.5 (◆) $\mu\text{m/s}$.