

Supplementary

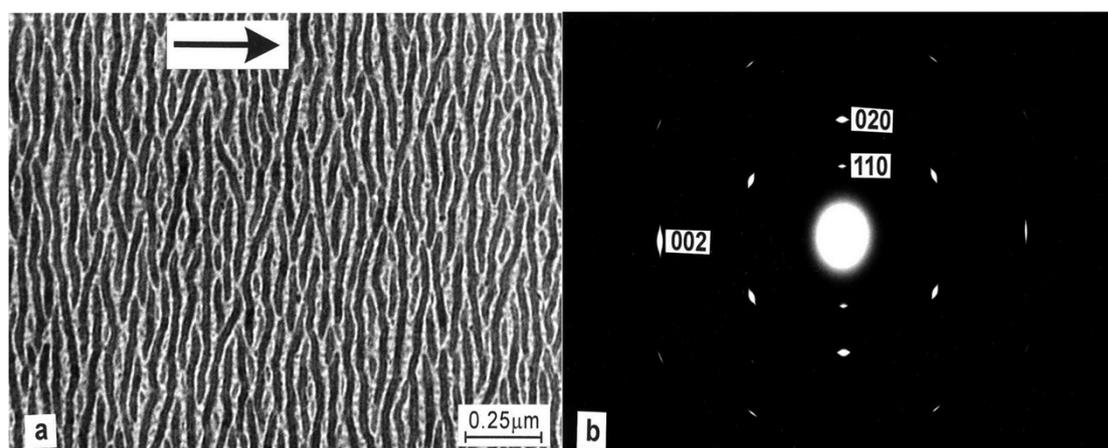


Fig. S1 (a) TEM analysis of bright-field electron micrograph and (b) the corresponding electron diffraction pattern of the melt-drawn PE highly oriented thin film

Fig. S1 shows the bright-field electron micrograph and the corresponding electron diffraction pattern of the melt-drawn PE highly oriented thin film in the as drawn state. The arrow indicates its molecular chain direction. It can clearly be seen that the PE oriented film consists of oriented lamellae aligned perpendicular to the drawing direction. On the corresponding electron diffraction pattern (**Fig. S1b**), the sharp reflection spots confirm that the melt-drawn PE film exhibits a high degree of fiber texture, which is concluded by the appearance of the (110), (200), and (020) reflections on the equator.¹

Characterization details

The optical microscopy image was obtained by using the Axioskop 40A Pol optical microscope (Carl Zeiss). The surface morphology of graphene films on the Si substrate was studied by using an Agilent Technologies 5500 atomic force microscope (Agilent Technologies Co. Ltd., U.S.) at room temperature in air. The images were obtained by means of tapping mode (height and phase) with a silicon cantilever having a spring constant of 20-30 N/m and a resonating frequency of 320-350 kHz, and the scanning rates varied from 0.5 to 2 μm/s. Raman spectra were recorded from 1100 to 3000 cm⁻¹ on a Renishaw Instruments Invia Flex Raman microprobe (England) using a 514.5 nm argon ion laser. Scanning electron microscopy (SEM) images of graphene on Cu and Si substrates were all obtained from JEOL JSM-6701F SEM with an accelerating voltage of 5 kV and an emission current of 10 μA. For transmission electron microscopy (TEM) examination, the graphene films were detached from Cu substrates with the help of poly (methymethacrylate) (PMMA) and mounted onto 300-mesh TEM copper grids. TEM observations were performed using a JEOL JEM-2100 with an accelerating voltage of 200 kV. Optical properties of graphene were measured by a hitachi u-2910 ultraviolet spectrometer. Electrical properties of graphene were tested by a variable temperature resistance instrument using four-probe method.

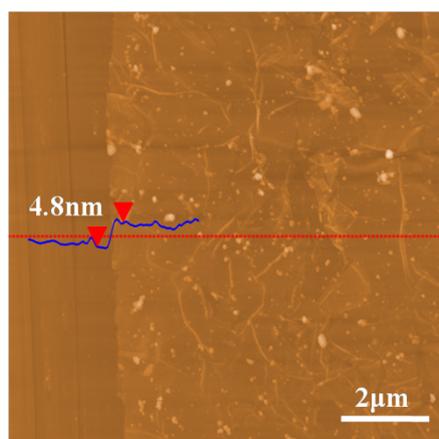


Fig. S2 AFM image and height analysis of OGP1 corresponding to the location denoted with number “2” in **Fig. 1a**.

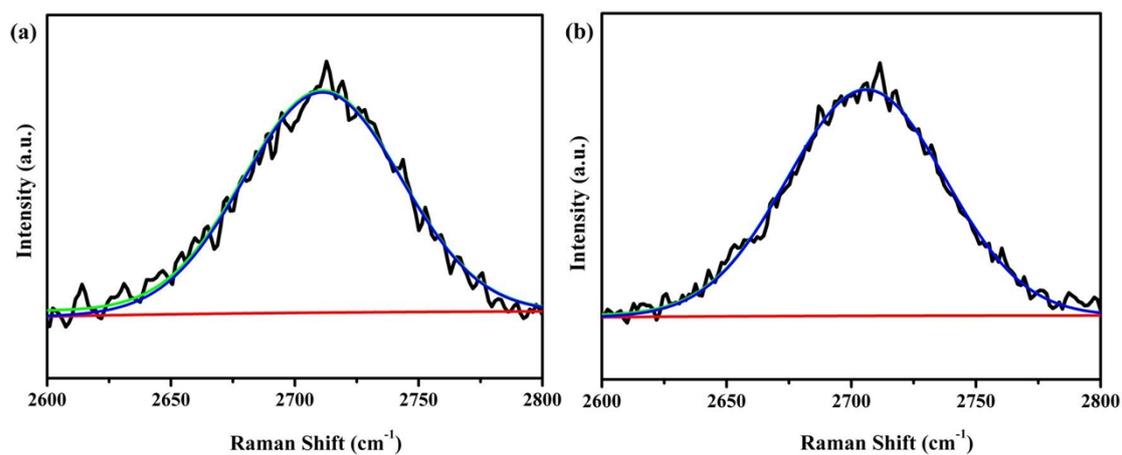


Fig. S3 2D-mode Raman spectra of OGP1 with well stacking order at different locations corresponding to Fig. 1a.

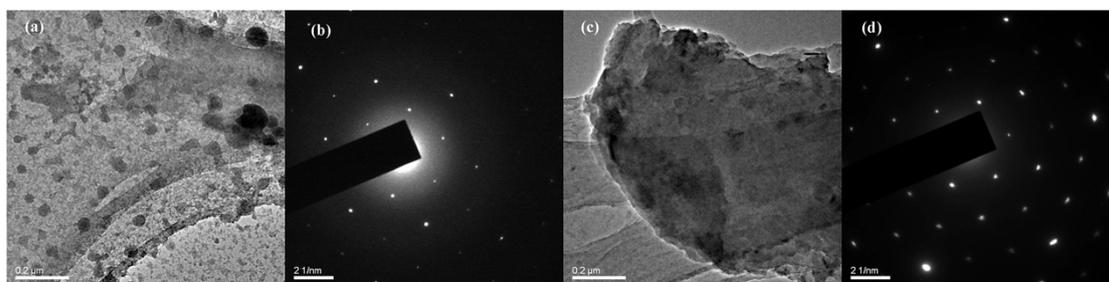


Fig. S4 TEM analysis of (a) bright field image and (b) corresponding SAED pattern of OGP1 at another random location. (c) Bright field image and (d) corresponding SAED pattern of OGP2 at another random location.

1. S. Yan and J. Petermann, *Polymer*, 2000, **41**, 6679-6681.