

Electronic Supplementary Information (ESI)

Vapor-assisted room temperature nanoimprinting-induced molecular alignment in patterned poly(3-hexylthiophene) nanogratings and its stability during thermal annealing

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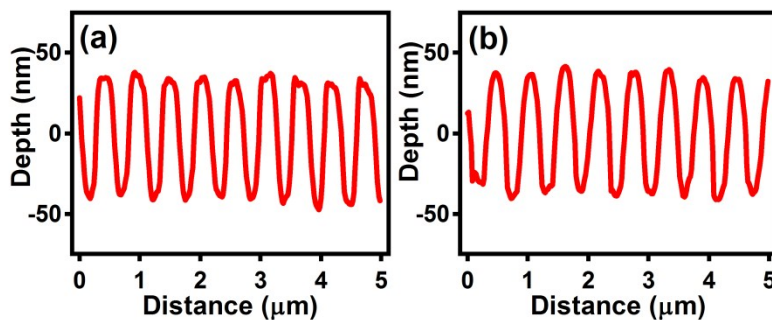


Fig. S1 Cross-sectional curves of AFM height images for PDMS mold (a) and patterned P3HT nanograting film (b). The source of data is obtained from the corresponding red lines of height images as shown in Fig. 2.

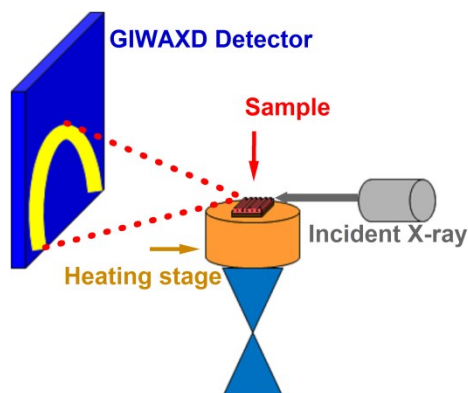


Fig. S2 Schematic illustration of GIWAXD measurement setup.

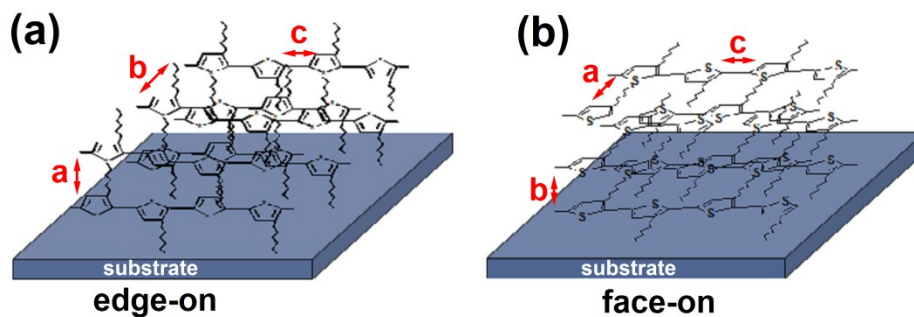


Fig. S3 Schematic illustration of typical edge-on and face-on molecular alignment of P3HT molecule chains on substrate.

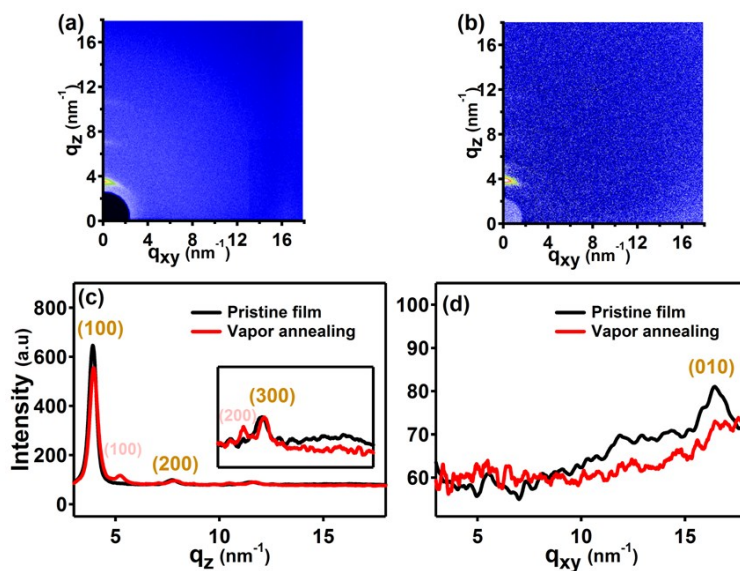


Fig. S4 2D GIWAXD images of P3HT film for: (a) pristine film and (b) vapor annealing film. 1D GIWAXD intensity profiles of pristine film and vapor annealing film integrated along the q_z direction (c) and q_{xy} direction (d). The integrated data is collected from the corresponding 2D images as shown in (a) and (b). Vapor annealing film is obtained by the same conditions as the fabrication of nanograting film with an unpatterned PDMS film rather than patterned PDMS film.

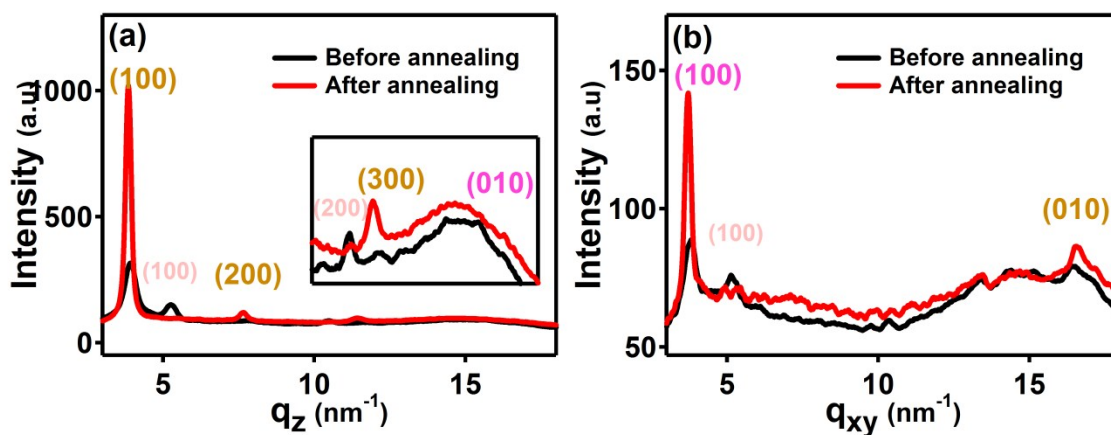


Fig. S5 The 1D GIWAXD intensity curves of P3HT nanograting film before and after thermal annealing treatment integrated along the q_z direction (a) and the q_{xy} direction (b). The integrated data are collected from the corresponding 2D images as shown in Fig. 4 and 5.

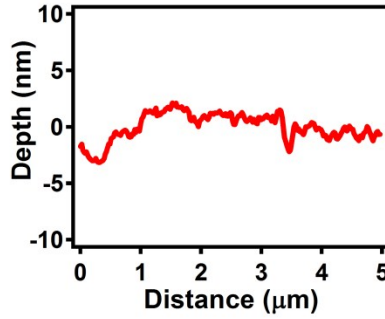


Fig. S6 AFM cross-sectional height curves of P3HT nanograting film after the thermal annealing treatment. The data is collected from the corresponding red lines of height image shown in Fig. 5.

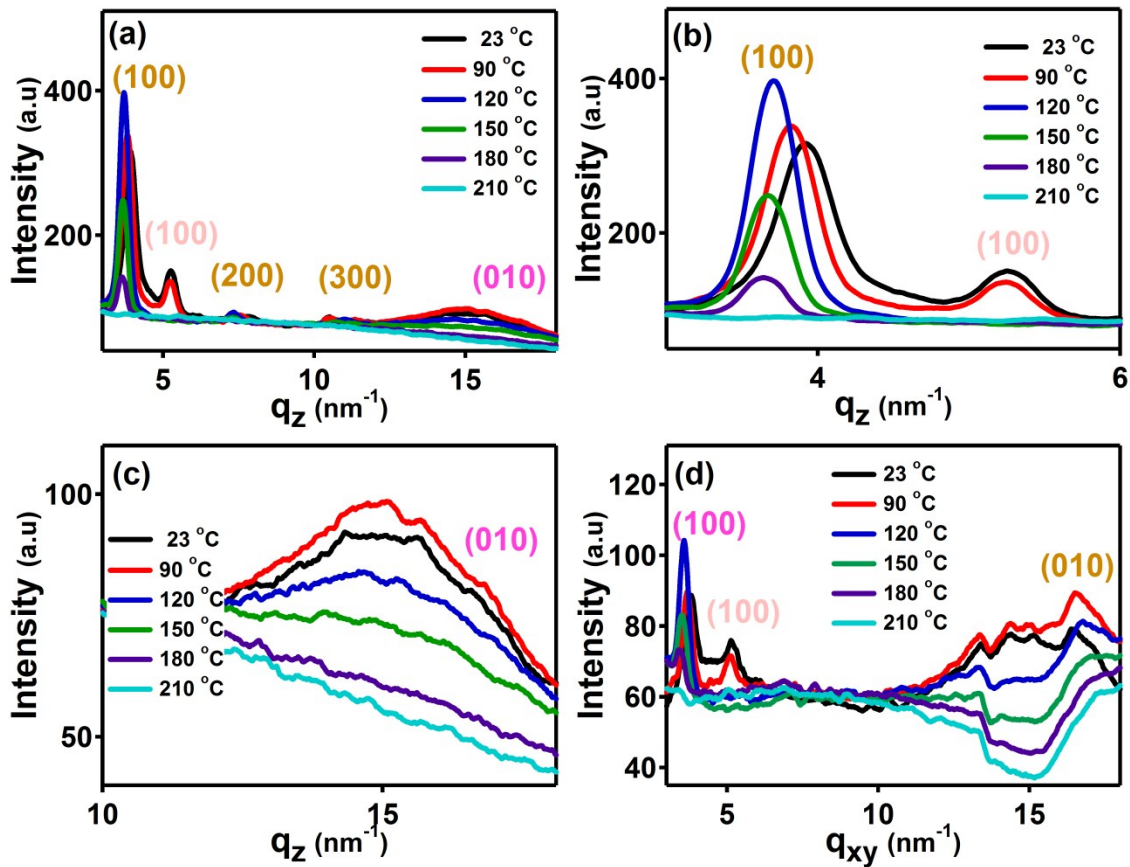


Fig. S7 The 1D GIWAXD intensity curves of P3HT nanograting film during the elevated temperature in situ integrated along the q_z direction (a-c) and along the q_{xy} direction (d). The integrated data are obtained from the 2D diffraction patterns shown in Fig. 6. The integrated figures (b) and (c) indicate magnified views of the (100) and (010) peaks along the q_z direction.

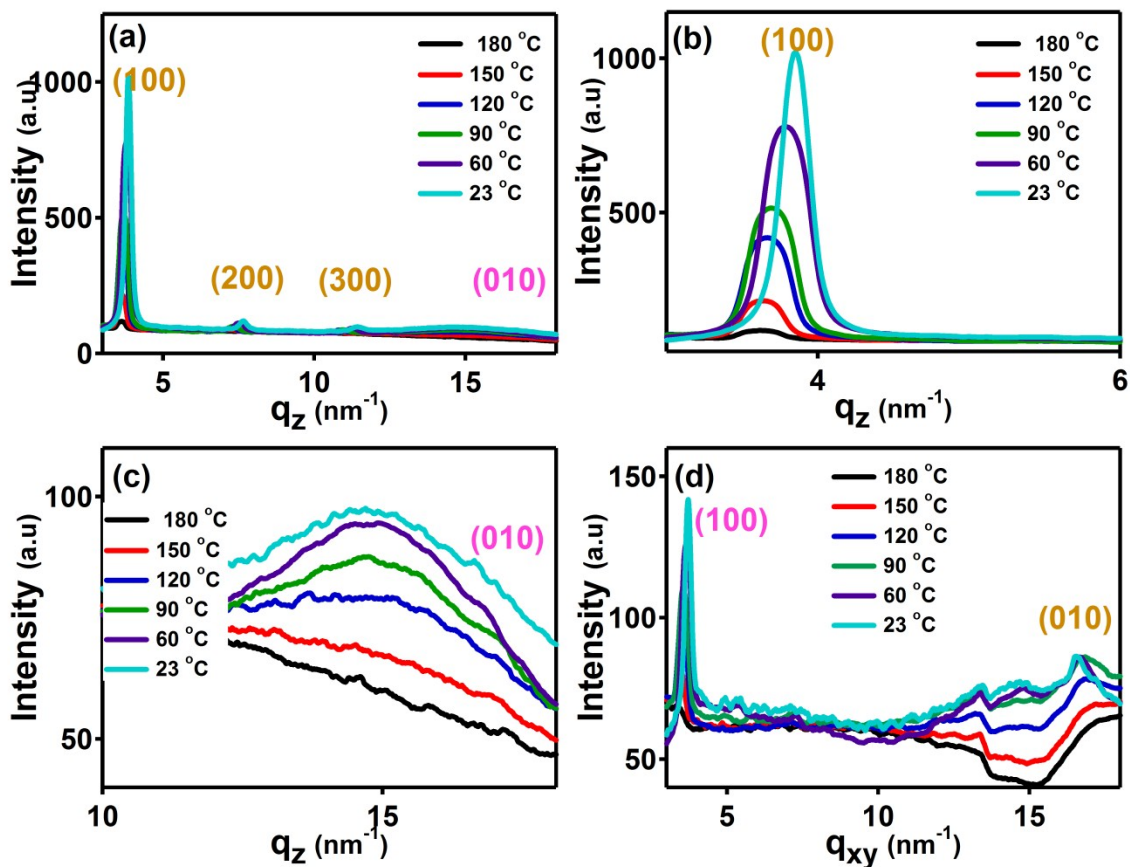


Fig. S8 The 1D GIWAXD intensity curves of P3HT nanograting film during the cooling temperature in situ integrated along the q_z direction (a-c) and along the q_{xy} direction (d). The integrated data are obtained from the 2D diffraction patterns shown in Fig. 7. The integrated figures (b) and (c) indicate magnified views of the (100) and (010) peaks along the q_z direction.

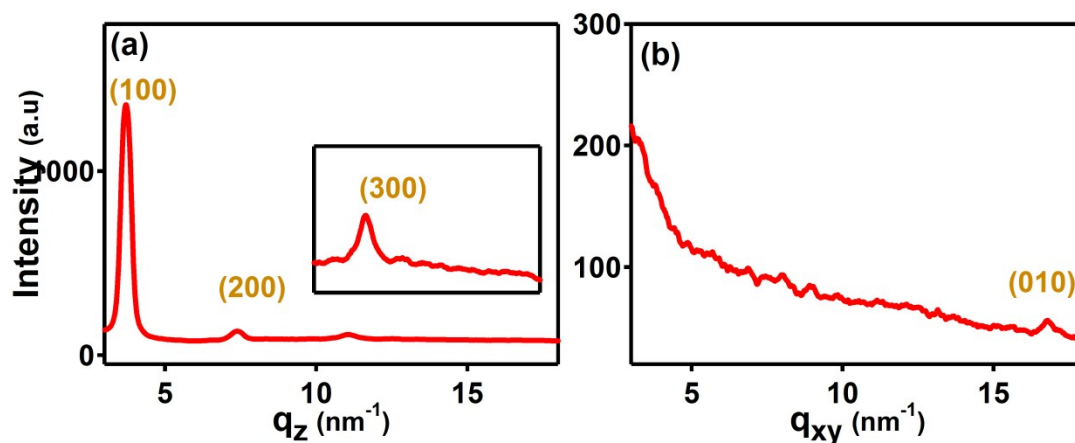


Fig. S9 The 1D GIWAXD intensity curves of vapor annealed P3HT film after thermal annealing treatment integrated along the q_z direction (a) and the q_{xy} direction (b). Vapor annealed P3HT film is obtained by the same conditions as the fabrication of nanograting film with an unpatterned PDMS film rather than patterned PDMS film (equal to the sample fabrication of Fig. S4). Then, the vapor annealed P3HT film is heated from 23 to 210 °C and next is cooled from 210 to 23 °C to complete the thermal annealing treatment process.

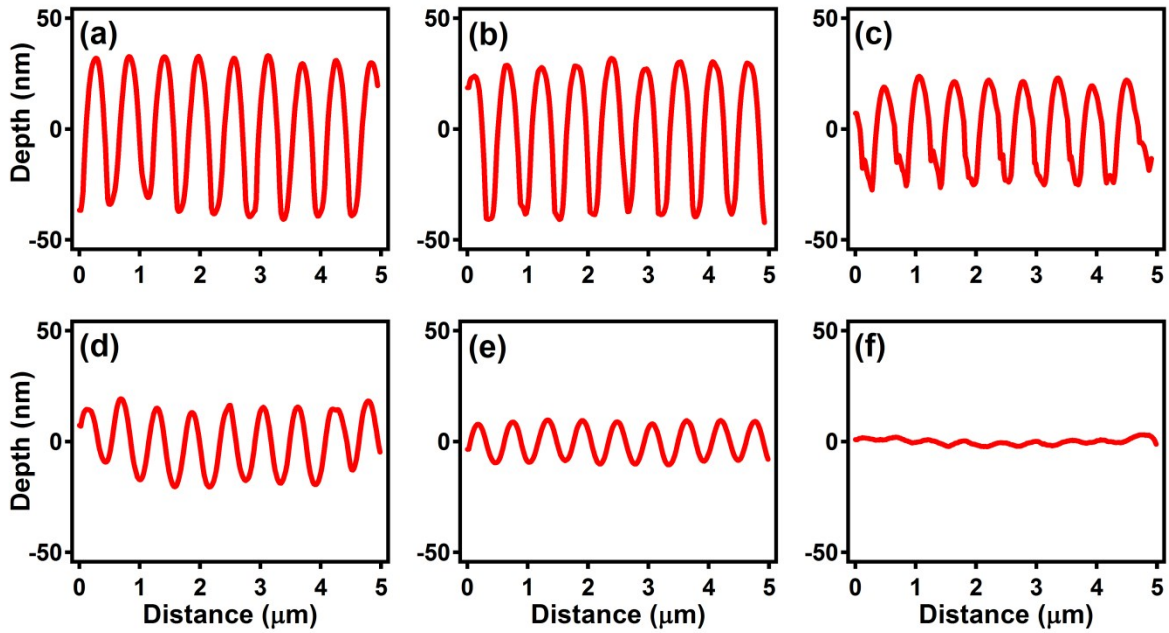


Fig. S10 AFM cross-sectional height profiles of P3HT nanograting film under the thermal annealing treatment in situ for various temperatures: (a) 50 °C, (b) 70 °C, (c) 90 °C, (d) 110 °C, (e) 130 °C, (f) 150 °C. The data are collected from the corresponding blue lines of height images shown in Fig. 8.