

## Supporting Information

### **A Rapid and Facile Soft Contact Lamination Method: Evaluation of Polymer Semiconductors for Stretchable Transistors**

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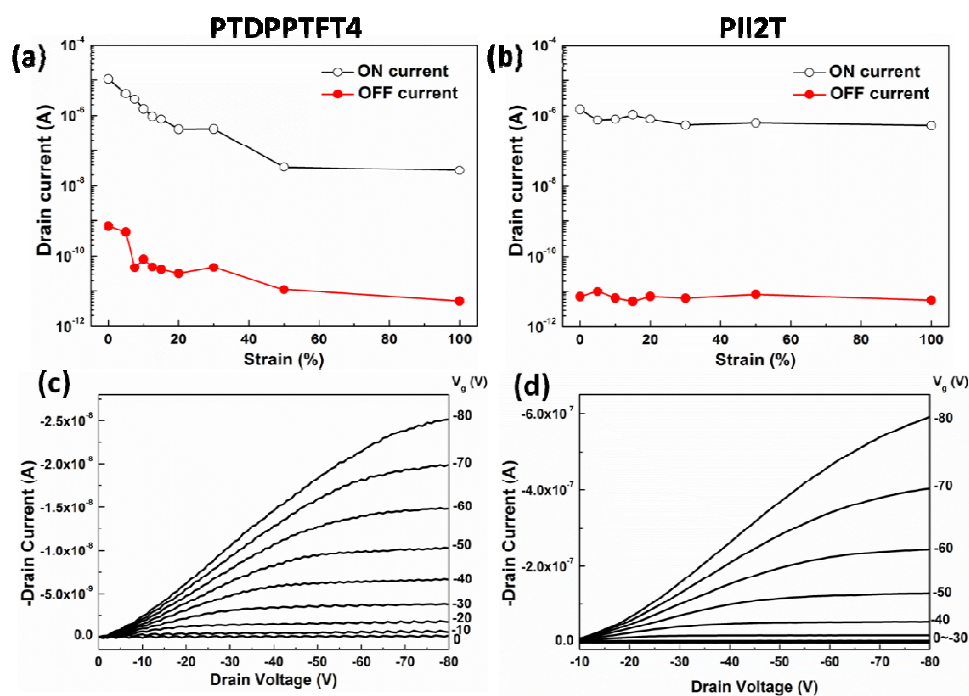


**Figure S1.** FET on- and off-currents of (a) PTDPPTFT4 and (b) PII2T. P-type output characteristics of (c) PTDPPTFT4 and (d) PII2T under 100 % strain, respectively.

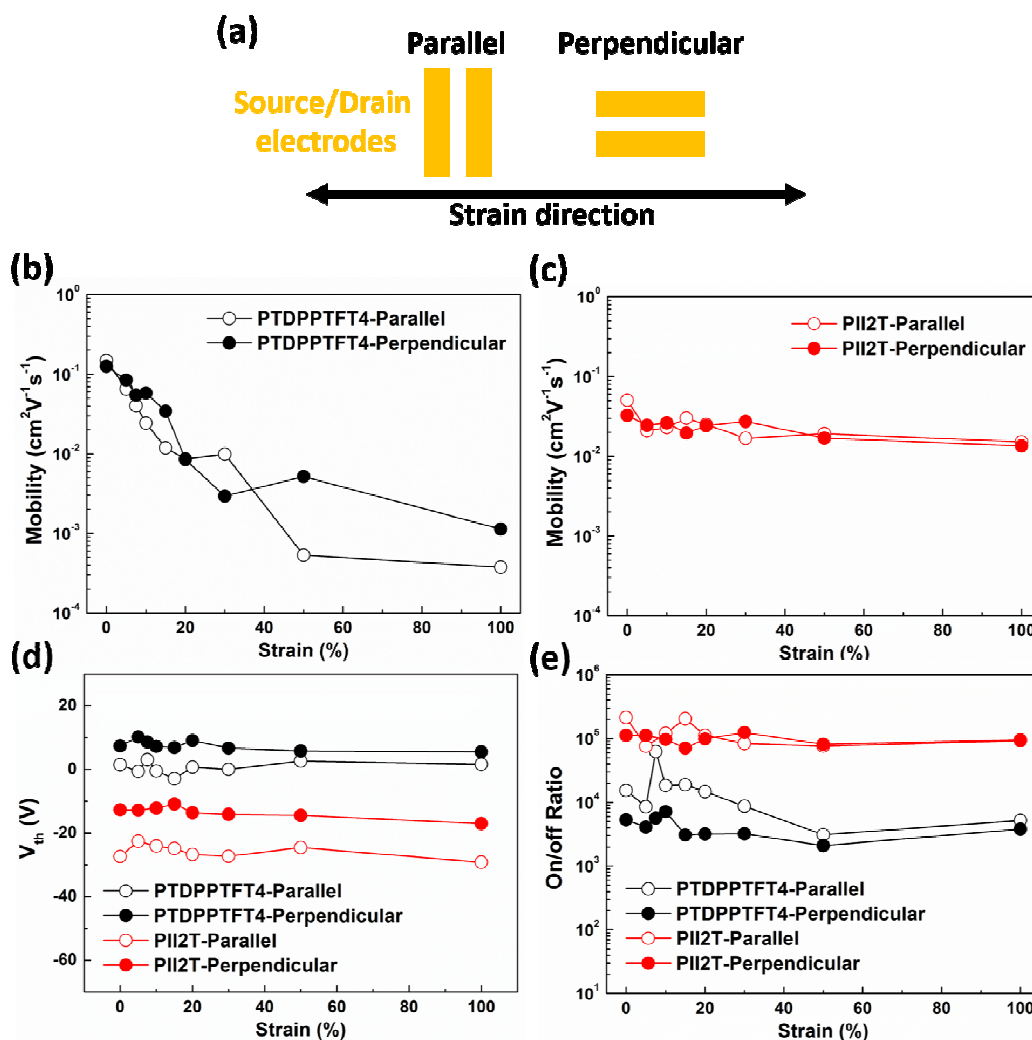


**Figure S2.** Electrical characteristics of PTDPPTFT4 and PII2T-based transistors under biaxially strain. (a) Illustration of the polymer films to be stretched parallel and perpendicular to the charge transport direction. Mobility changes of (b) PTDPPTFT4 and (c) PII2T under strain. (d) Threshold voltages and (e) on/off current ratios of the FETs under strain. The mobility of the studied FETs decrease at a similar rate in both parallel and perpendicular stretching direction; the threshold voltages and on/off current ratios of both devices exhibited stable performance as stretching in parallel or perpendicular direction.

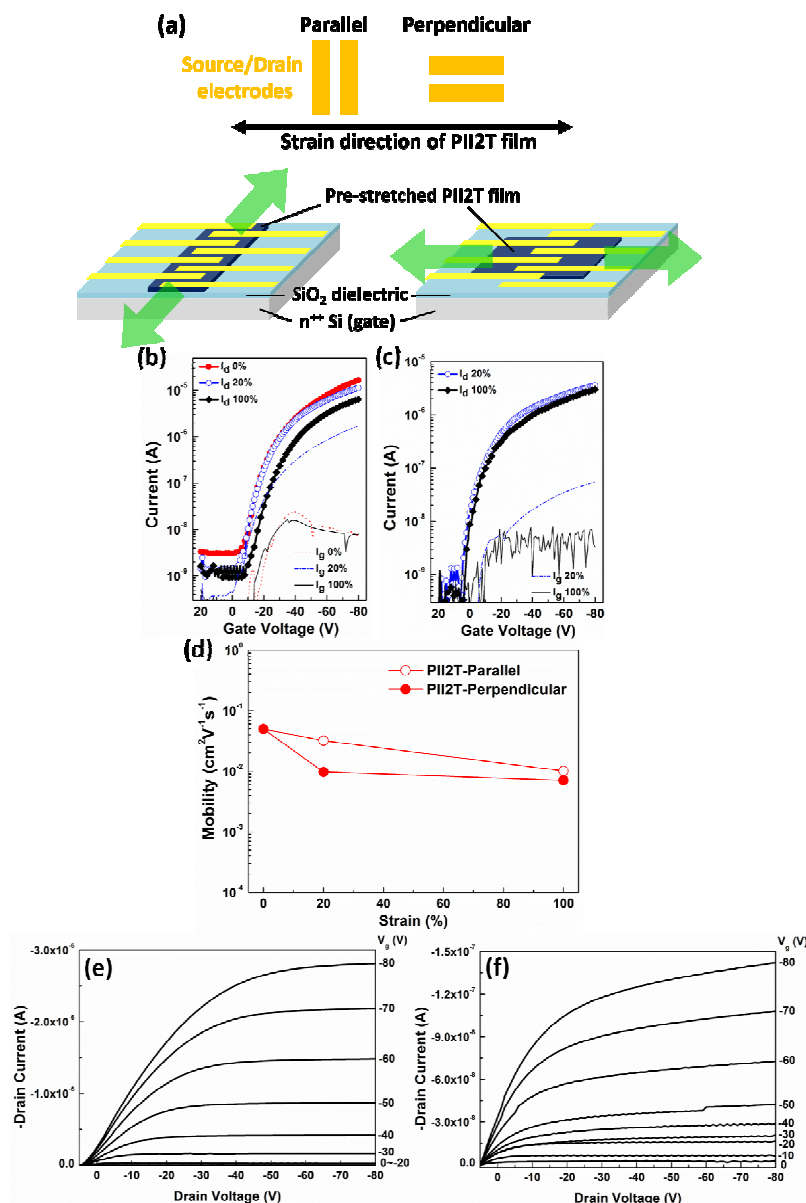


**Figure S3.** Electrical characteristics of PII2T-based transistors under biaxially strain using reported method by DeLongchamp et al.<sup>S1</sup> (a) Illustration of the polymer films to be stretched parallel and perpendicular to the charge transport direction. Transfer curves of PII2T at different strain levels as the polymer film is stretched in (b) parallel and (c) perpendicular direction, respectively. (d) Mobility changes of PII2T-based FETs under strain. Output characteristics of PII2T at different strain levels as the polymer film is stretched in (e) parallel and (f) perpendicular direction, respectively. The mobility of PII2T-based FETs decrease at a similar rate in both parallel and perpendicular stretching direction as the devices fabricated using reported method, and the results is consistent with the electrical properties by our lamination method.

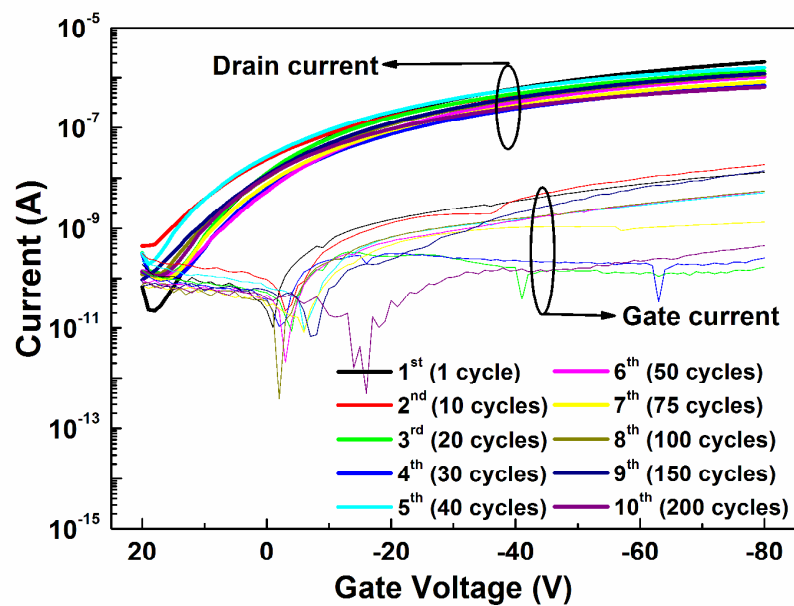


**Figure S4.** A cycle-dependent transfer characteristics of PTDPPPTFT4-based FETs at 5% strain. In the testing, 10 times lamination/delamination processes are provided for each electrical measurement (i.e. each transfer curve with 1, 10, 20, 30, 40, 50, 75, 100, 150, and 200 cycles between 0 and 5% strain), and there is no significant decay of the electrical properties.

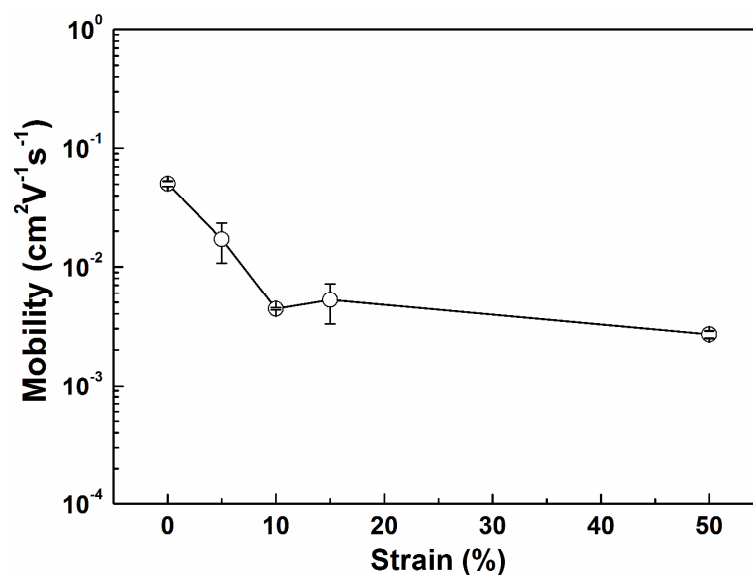


**Figure S5.** FET mobility characteristics of P3HT under strain.

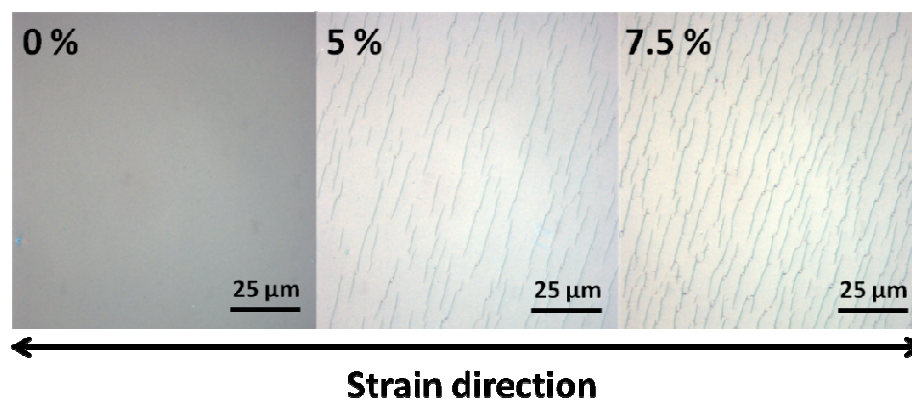


**Figure S6.** Optical micrographs of PTDPTFT4 films under stretching strain lower than 10 %.

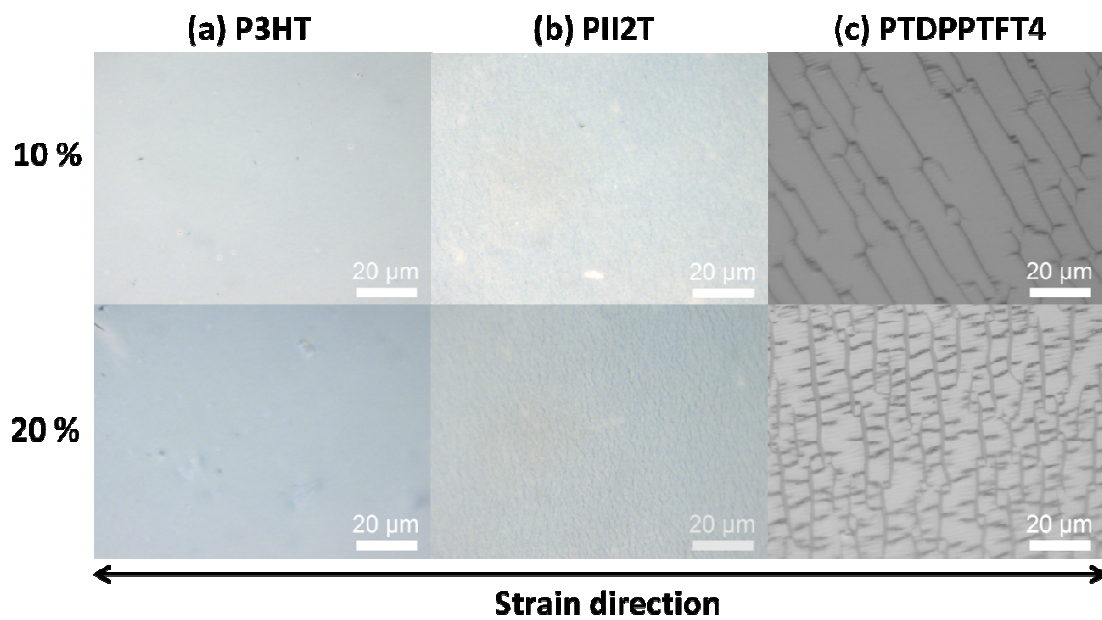


**Figure S7.** Optical micrographs of (a) P3HT, (b) PII2T, and (c) PTDPPTFT4 under various stretching ratios.

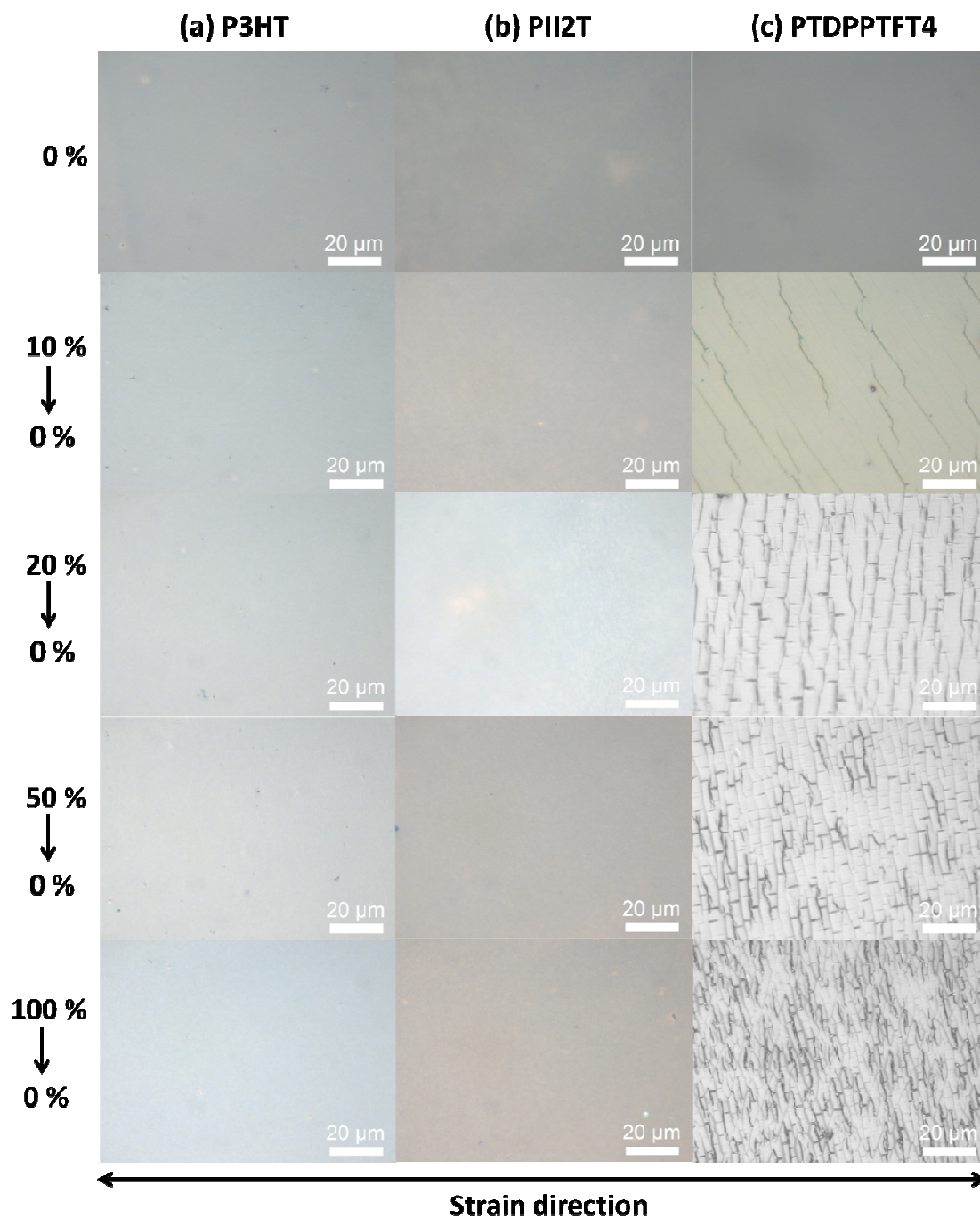


**Figure S8.** Optical micrographs of (a) P3HT, (b) PII2T, and (c) PTDPPTFT4 films recovered from various tensile strain ratios.

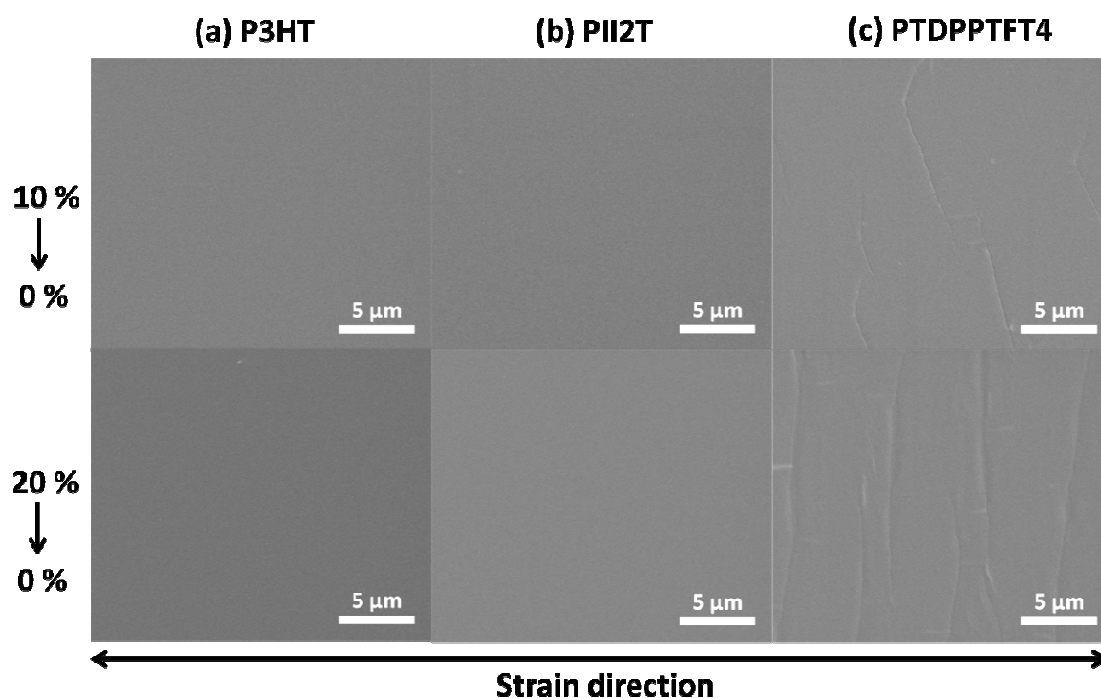


**Figure S9.** SEM images of (a) P3HT, (b) PII2T, and (c) PTDPPTFT4 films recovered from various tensile strain ratios.

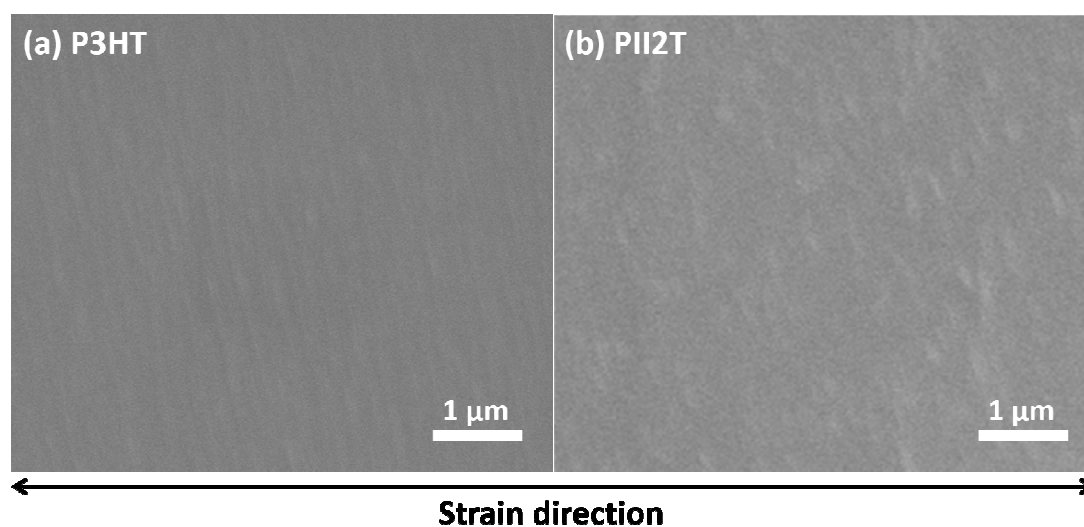


**Figure S10.** High magnification SEM images of (a) P3HT and (b) PII2T films recovered from 100% strain. Buckles perpendicular to the stretching direction were observed.

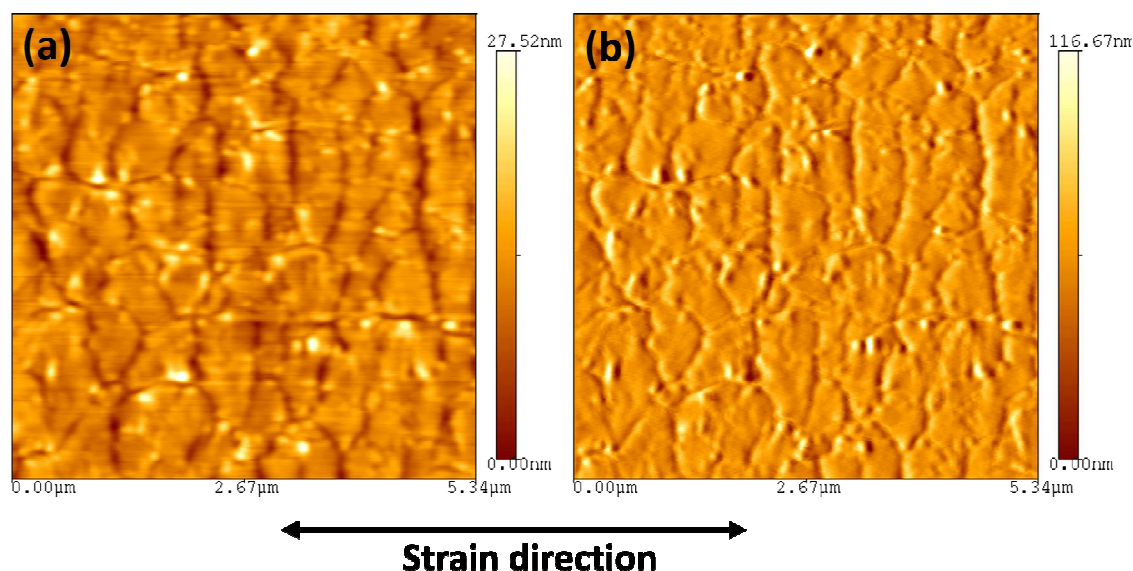


**Figure S11.** Atomic microscope (a) topographical and (b) error images of PII2T films recovered from 100% strain on PDMS substrate. These results suggest the nanoscale cracks perpendicular to the stretching direction were formed.

## Reference

- (S1) O'Connor, B.; Kline, R. J.; Conrad, B. R.; Richter, L. J.; Gundlach, D.; Toney, M. F.; DeLongchamp, D. M. *Adv. Funct. Mater.* **2011**, *21*, 3697.