Supplementary Information

Highly planar thieno[3,2-*b*]thiophene-diketopyrrolopyrrole-containing polymers for organic field-effect transistors

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1. NMR spectra of materials.



Fig. S1 The ¹H NMR spectra of 2,5-bis(2-decyltetradecyl)-3,6-bis(thieno[3,2-*b*]thiophen-2-yl)pyrrolo[3,4-*c*]pyrrole-1,4(2H,5H)-dione.



Fig. S2 The ¹³C NMR spectra of 2,5-bis(2-decyltetradecyl)-3,6-bis(thieno[3,2-*b*]thiophen-2-yl)pyrrolo[3,4-*c*]pyrrole-1,4(2H,5H)-dione.



Fig. S3 The ¹H NMR spectra of 3,6-bis(5-bromothieno[3,2-*b*]thiophen-2-yl)-2,5-bis(2-decyltetradecyl)pyrrolo[3,4-*c*]pyrrole-1,4(2H,5H)-dione.



Fig. S4 The ¹³C NMR spectra of 3,6-bis(5-bromothieno[3,2-*b*]thiophen-2-yl)-2,5-bis(2-decyltetradecyl)pyrrolo[3,4-*c*]pyrrole-1,4(2H,5H)-dione.



Fig. S5 The ¹H NMR spectra of the PTTDPPTVT in CDCl₃.



Fig. S6 The ¹H NMR spectra of the PTTDPPSVS in CDCl₃.



Fig. S7 The ¹H NMR spectra of the PTTDPPTVT in deuterated 1,1,2,2-tetrachloroethane (TCE-d₂).



Fig. S8 The ¹H NMR spectra of the PTTDPPSVS in deuterated 1,1,2,2-tetrachloroethane (TCE-d₂).

2. FT-IR spectra of the PTTDPPTVT and PTTDPPSVS.



Fig. S9 FT-IR spectra of the PTTDPPTVT and PTTDPPSVS.

3. GPC chromatograms of the PTTDPPTVT and PTTDPPSVS.



Fig. S10 GPC chromatograms of the PTTDPPTVT and PTTDPPSVS.

4. TGA thermograms of monomers and polymers.

The thermal properties of the PTTDPPTVT and PTTDPPSVS were studied by using TGA. In Figure S11, the temperature with 5% weight loss of the monomers M-TTDPP, M-TVT, and M-SVS is 301, 217, and 225 °C, respectively. In addition, PTTDPPTVT and PTTDPPSVS exhibit excellent thermal stability with 5% weight loss at 325 and 327 °C, respectively.



Fig. S11 TGA thermograms of (a) M-TTDPP, (b) M-TVT, (c) M-SVS, (d) PTTDPPTVT, and (e) PTTDPPSVS.

5. DSC curves of monomers and polymers.

In the DSC curves (Fig. S12), the melting peaks of the monomers M-TTDPP, M-TVT, and M-SVS were observed at the temperature of 124, 115, and 144 °C, respectively. During the cooling process, exothermic peaks at 94, 57, and 99 °C were observed, respectively. No thermal transition peaks were observed for PTTDPPTVT and PTTDPPSVS in the range of 25–250 °C.



Fig. S12 DSC curves of (a) M-TTDPP, (b) M-TVT, (c) M-SVS, (d) PTTDPPTVT, and (e) PTTDPPSVS.

6. Cyclic voltammograms of the PTTDPPTVT and PTTDPPSVS thin films.



Fig. S13 Cyclic voltammograms of the PTTDPPTVT and PTTDPPSVS thin films.

7. Mobility as a function of annealing temperature for the PTTDPPTVT and PTTDPPSVS.



Fig. S14 Mobility as a function of annealing temperature for the PTTDPPTVT and PTTDPPSVS.

8. TEM images of the PTTDPPTVT and PTTDPPSVS thin films.



Fig. S15 TEM images of (a-c) the PTTDPPTVT and (d-f) PTTDPPSVS thin films before and after annealing at different temperatures.