Supporting Information

Optoelectronic conversion and polarization hysteresis in organic MISM and MISIM devices with DA-type single component molecules

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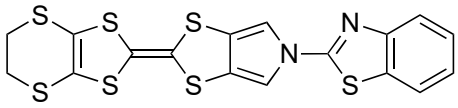
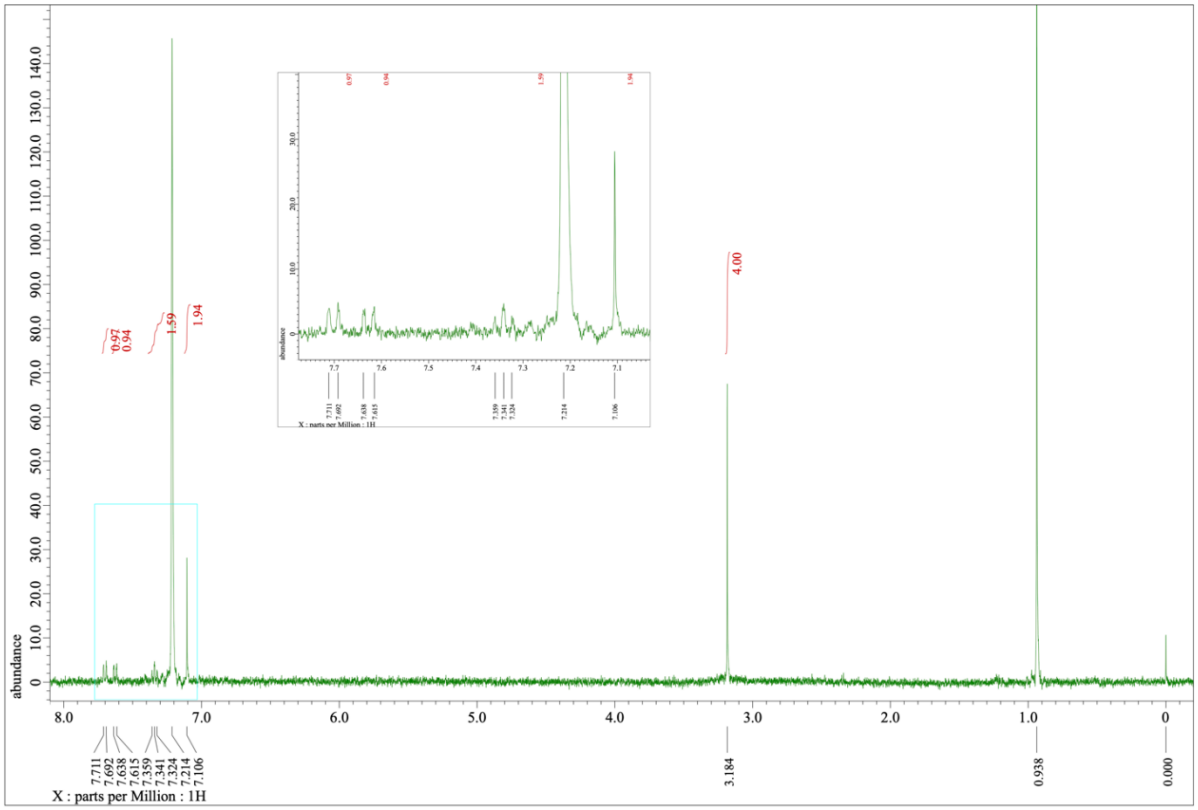
S1. NMR spectra

^{1}H NMR spectra were recorded on a Bruker Biospin AVANCE 400 spectrometers using CS_2/C_6D_6 solvent. The chemical shifts were referenced to tetramethylsilane.

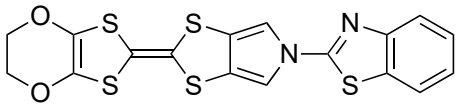


ET-PRBT

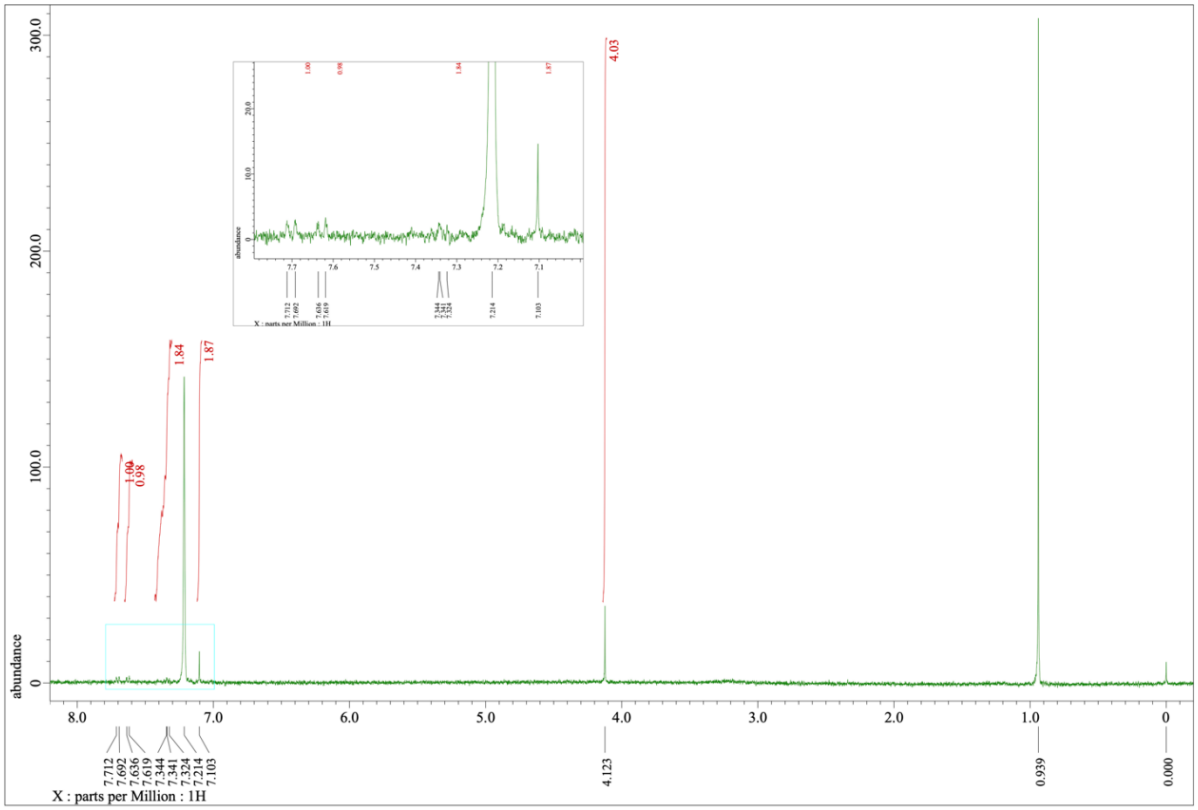


^{1}H NMR (400 MHz, CS_2/C_6D_6, 25 °C, TMS) δ 3.18 (s, 4H), 7.11 (s, 2H), 7.32–7.36 (m, 2H), 7.63 (d, 1H), 7.70 (d, 1H) ppm.

Figure S1. ^{1}H NMR spectrum of ET-PRBT in CS_2/C_6D_6 (400 MHz).



EO-PRBT



^{1}H NMR (400 MHz, CS_2/C_6D_6, 25 °C, TMS) δ 4.12 (s, 4H), 7.10 (s, 2H), 7.32–7.34 (m, 2H), 7.63 (d, 1H), 7.70 (d, 1H) ppm.

Figure S2. ^{1}H NMR spectrum of EO-PRBT in CS_2/C_6D_6 (400 MHz).

S2. Thin film XRD measurements

X-ray (Cu K_α) structural analysis was performed on thin films of ET-PRBT and EO-PRBT, using a Rigaku SmartLab diffractometer. The results are shown in Fig. S1.

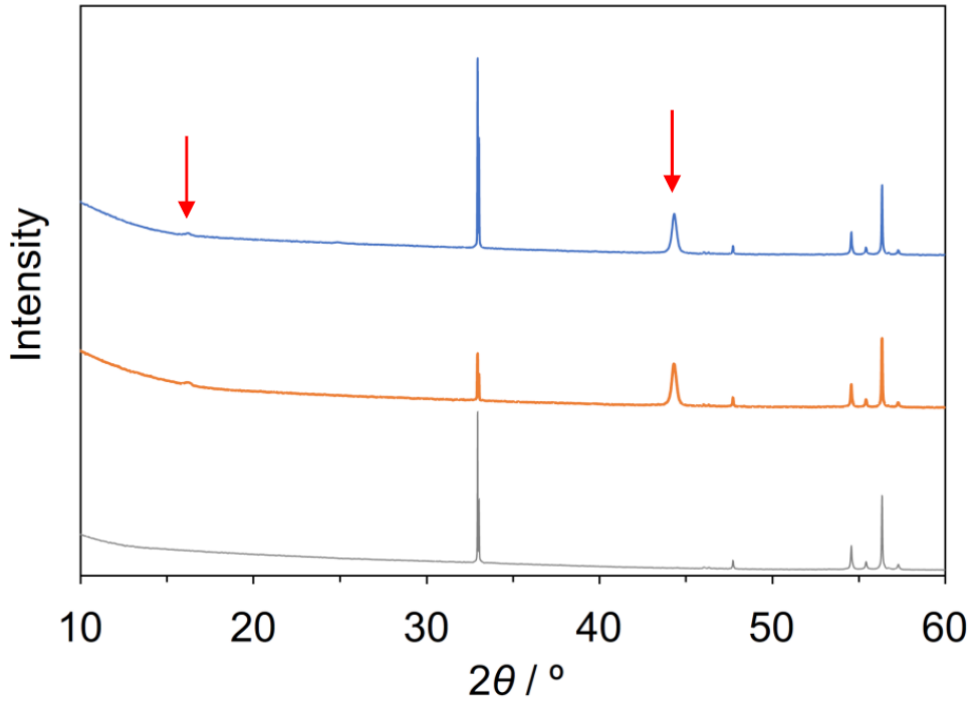
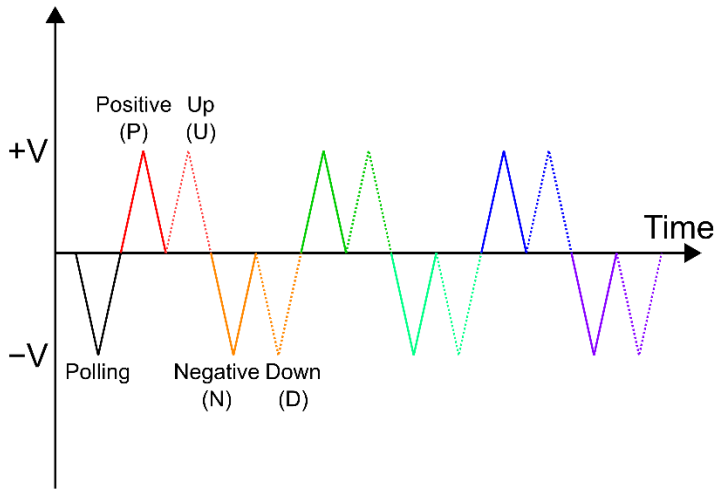


Figure S3. XRD patterns of the thin films (30 nm) of ET-PRBT (orange) and EO-PRBT (blue), together with Si substrate (gray). The intrinsic diffractions of ET-PRBT and EO-PRBT peaks appear at nearly the same positions, 2θ =16° and 44° (red arrows), indicating that they possess good crystallinity and are isostructural.

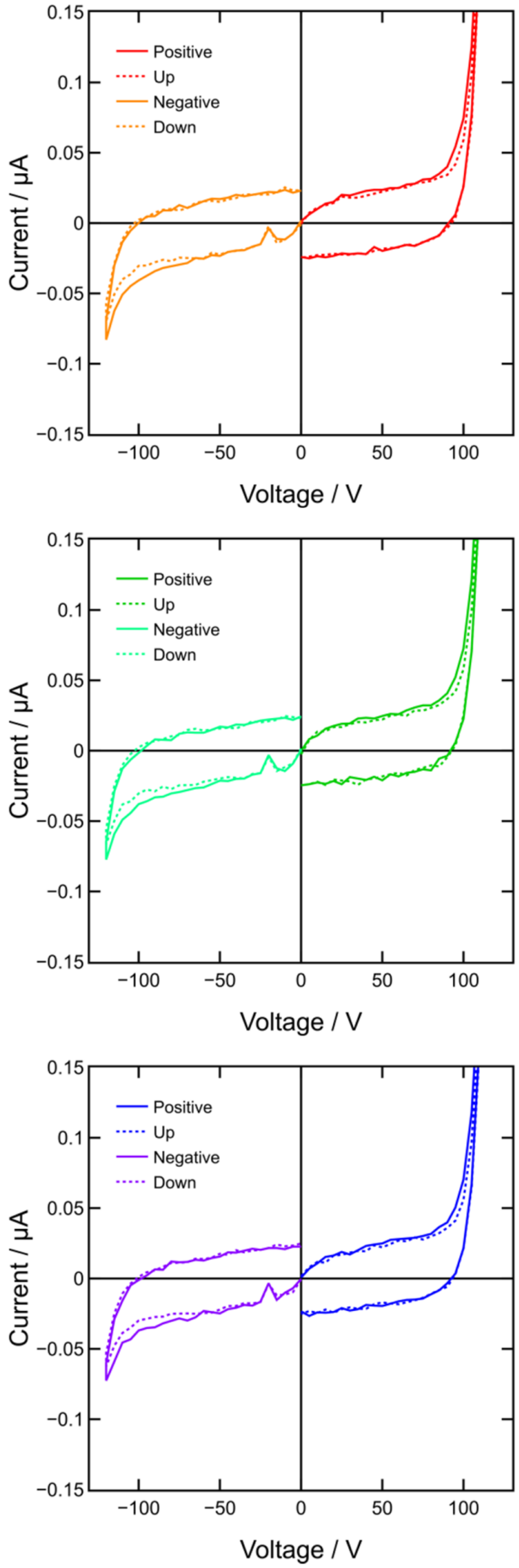
S3. Details of PUND method and ferroelectric displacement current

The $P-V$ curves in Fig. 6 are obtained by the procedure described in the caption of Fig. S2.

(a)



(b)


0.15
0.1
0.05
0
−0.05
−0.1
−0.15
Current / μA
−100
−50
0
50
100
Voltage / V
Positive
Up
Negative
Down

(c)

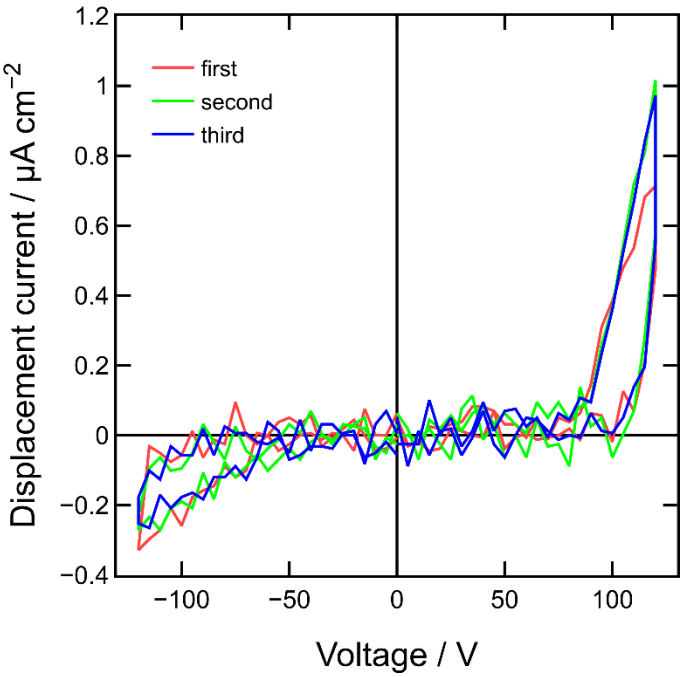


Figure S4. Details of the PUND method and ferroelectric displacement current: (a) Schematic diagram illustrating the voltage scan in the PUND method. (b) Current-voltage curves obtained in the P and N scans (solid curve) and in the U and D scans (dotted curves) on the PUND method. The same measurements were done for three times (upper, middle and bottom). (c) Difference in current between the P and U scans, as well as between the N and D scans, for the three scans. Polarization hysteresis is observed in the P and N scans, but they significantly contain a capacitive component. By subtracting the results of the U and D scans from the P and N scans, respectively, the pure ferroelectric component can be extracted. The $P-V$ curves in Figure 6 are obtained by integrating the curvatures shown in Fig. S2(c).