

Electronic Supplementary Material (ESI)

## **Electronic Supplementary Information**

### **Linear-type carbazoledioxazine-based organic semiconductors: the effect of backbone planarity on the molecular orientation and charge transport properties**

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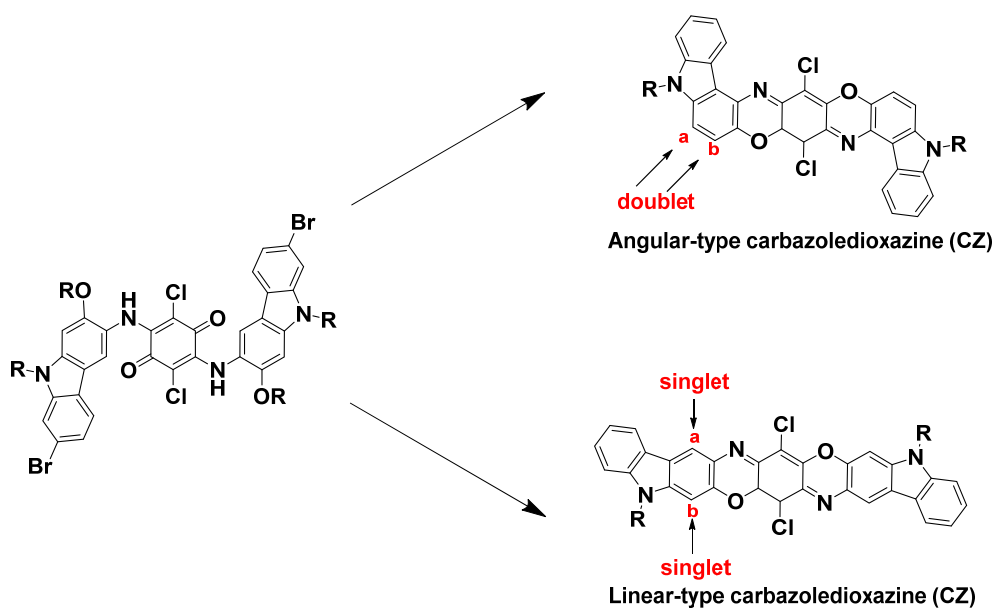
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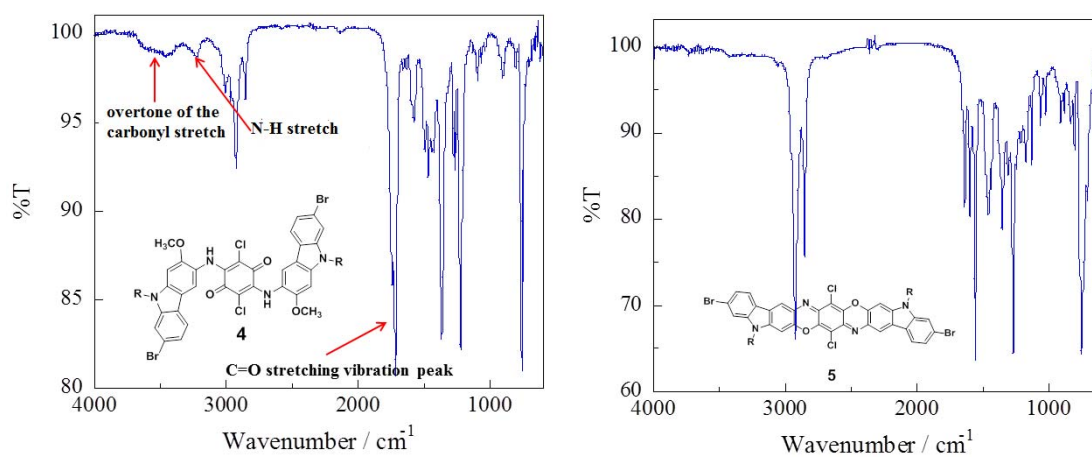
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## **Content**

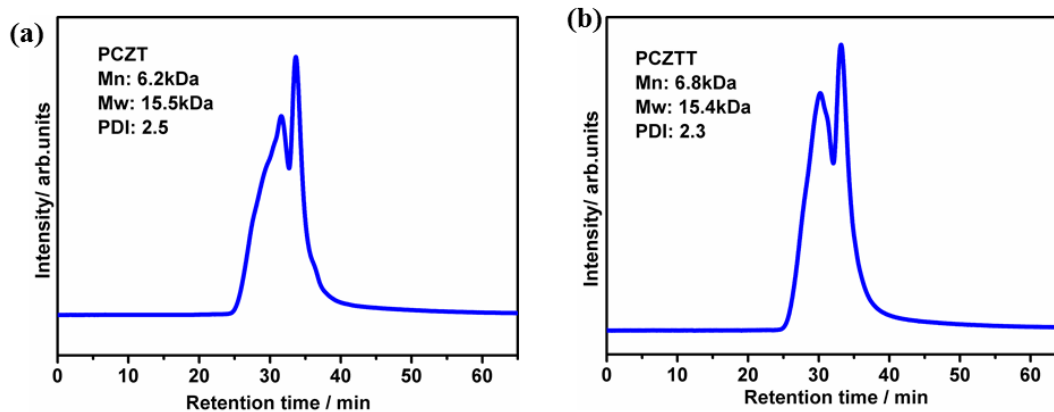
1. Angular-type and linear-type carbazoledioxazines (CZ)
2. FT-IR spectra
3. GPC curves
4. TGA curves
5. DSC curves
6. Annealing temperature dependence of the mobilities
7. Schematic illustration of the charge transport models
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9. NMR spectra



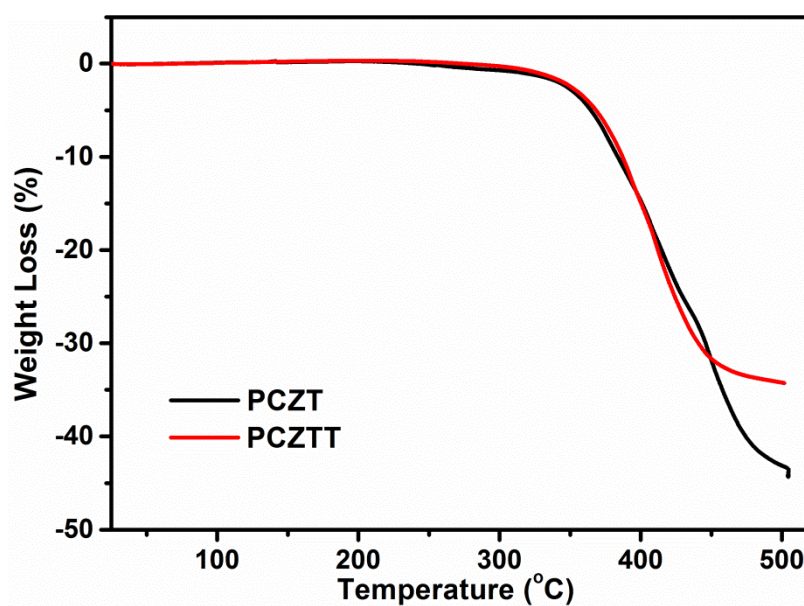
**Fig. S1** The  $^1\text{H}$  NMR resonance multiplicity of angular-type and linear-type carbazodioxazine derivatives.



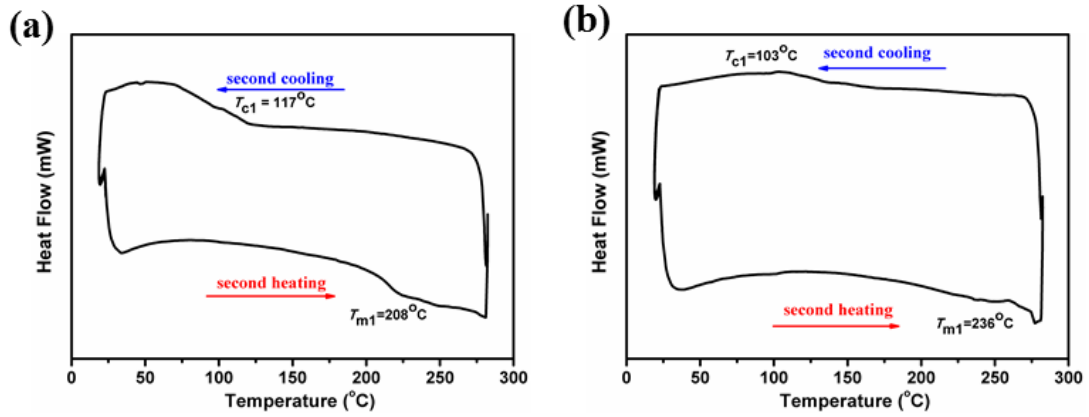
**Fig. S2** FT-IR spectra of **4** (left) and the linear carbazodioxazine monomer **CZ** (right).



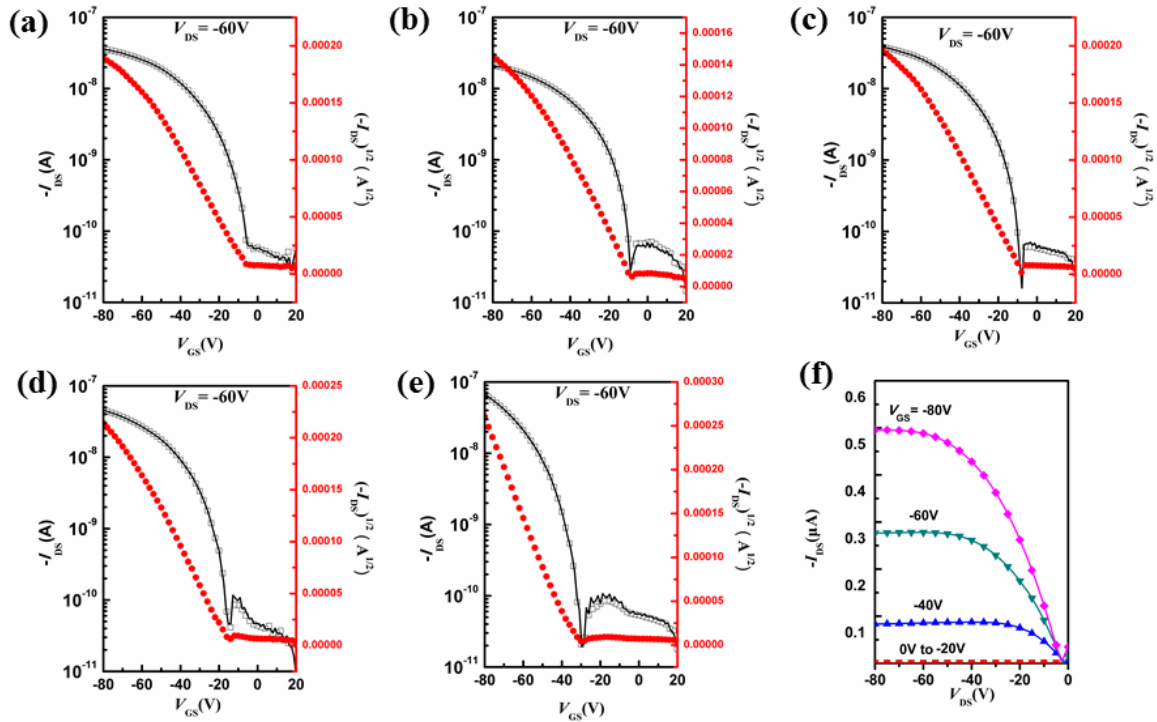
**Fig. S3** GPC curves of (a) PCZT and (b) PCZTT using 1,2-dichlorobenzene as the eluent at 40 °C. Polystyrene standards were used for determining the molecular weights.



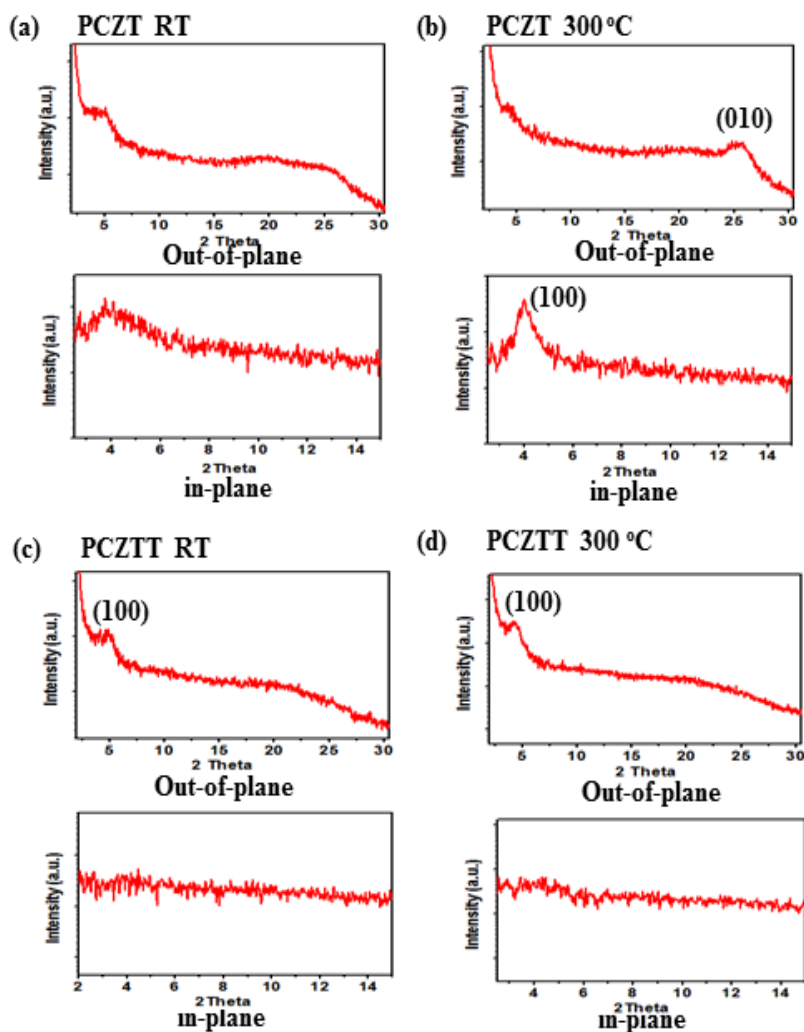
**Fig. S4** Thermogravimetric analysis (TGA) under a nitrogen atmosphere at the heating rate of 10 °C min<sup>-1</sup>.



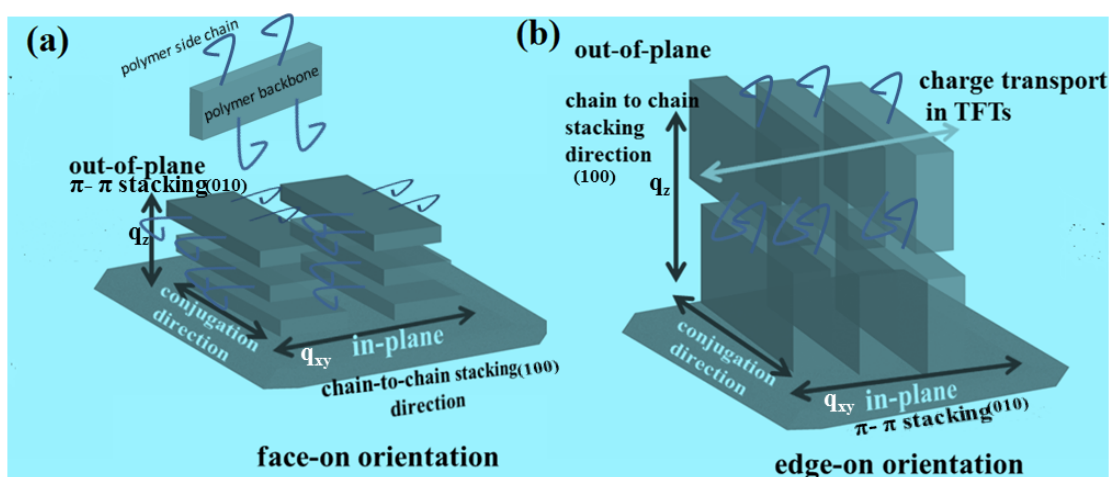
**Fig. S5** Differential scanning calorimetry (DSC) curves of (a) PCZT and (b) PCZTT under a nitrogen atmosphere at the heating or cooling rate of  $10\text{ }^{\circ}\text{C min}^{-1}$ .



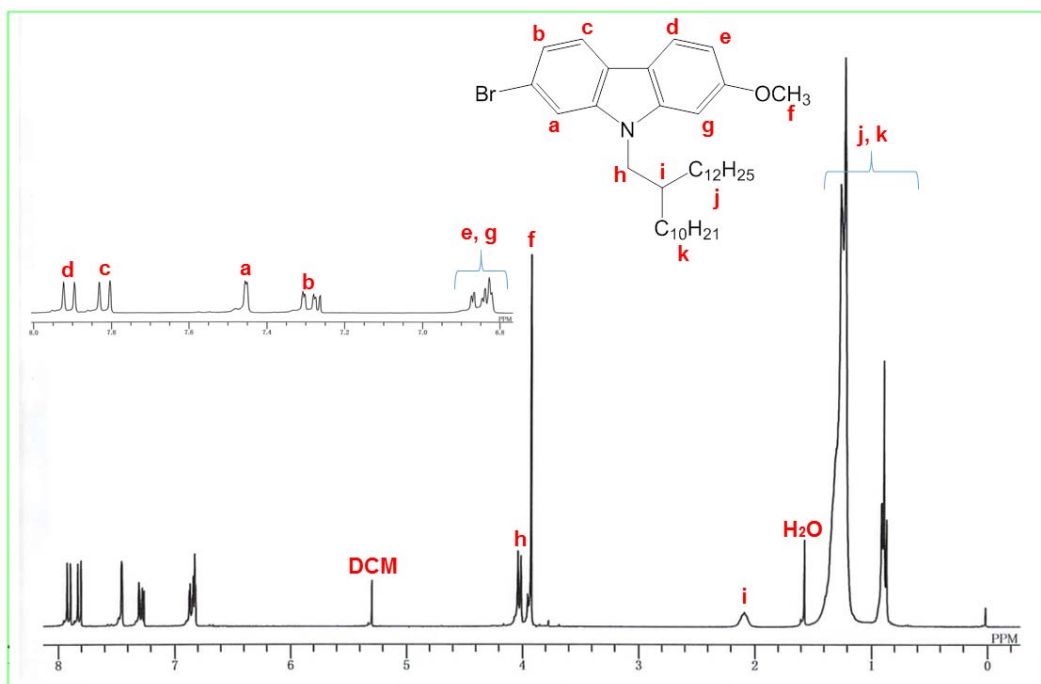
**Fig. S6** Current-voltage (I-V) characteristics of TFTs at different thermal annealing temperatures. Transfer characteristics for PCZT films annealed at (a)  $100\text{ }^{\circ}\text{C}$ , (b)  $150\text{ }^{\circ}\text{C}$ , and (c)  $250\text{ }^{\circ}\text{C}$ . Transfer characteristics for PCZTT films annealed at (d)  $100\text{ }^{\circ}\text{C}$  and (e)  $150\text{ }^{\circ}\text{C}$ . (f) Output characteristics for PCZTT films after annealing at  $250\text{ }^{\circ}\text{C}$  ( $L = 100\text{ }\mu\text{m}$  and  $W = 1\text{ mm}$ ). All the measurements were done in air).



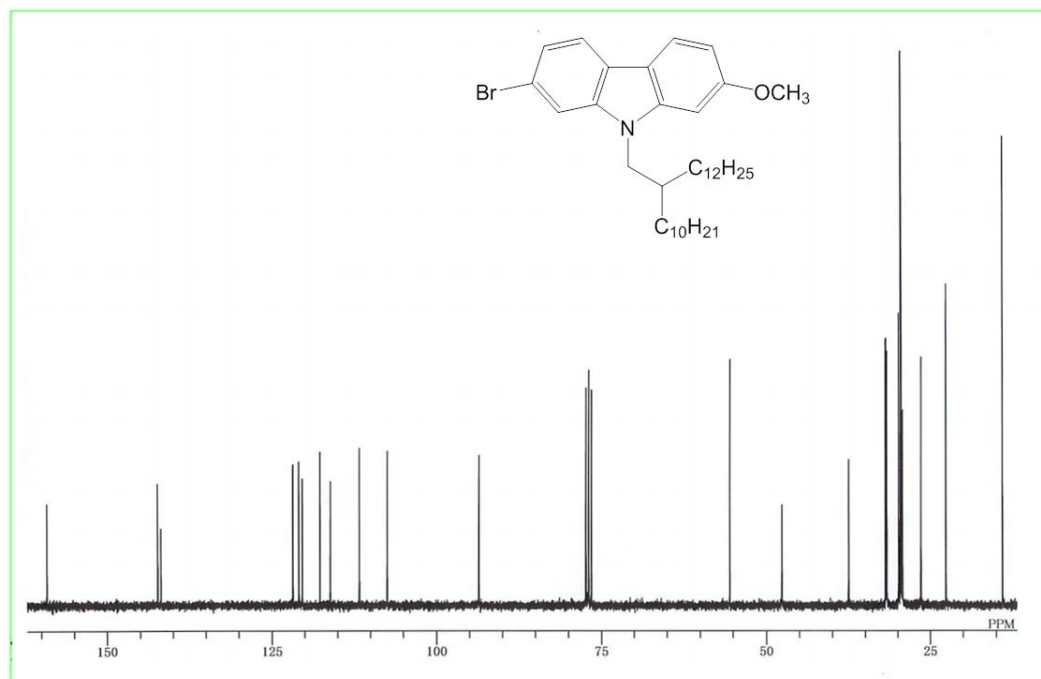
**Fig. S7** The corresponding 1D profiles of the 2D-GIWAXS patterns.



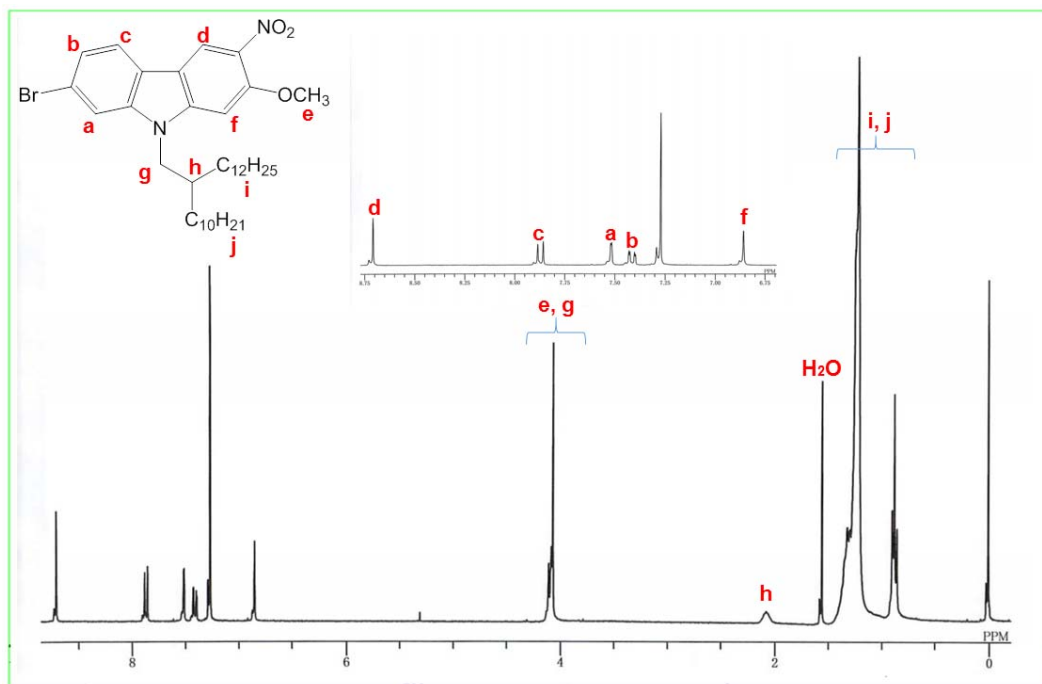
**Fig. S8** Schematic illustration of the charge transport models in lamellar stacking conjugated polymers. (a) Face-on texture of polymeric crystallites; (b) edge-on texture of polymeric crystallites.



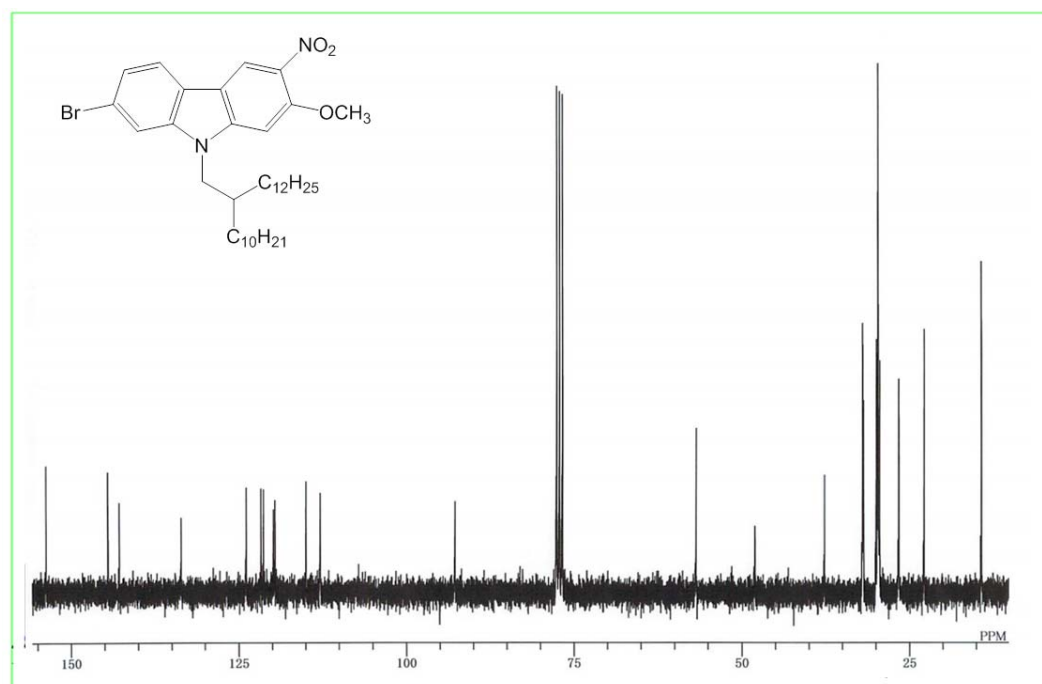
**Fig. S9**  $^1\text{H}$  NMR of compound **2** in  $\text{CDCl}_3$ .



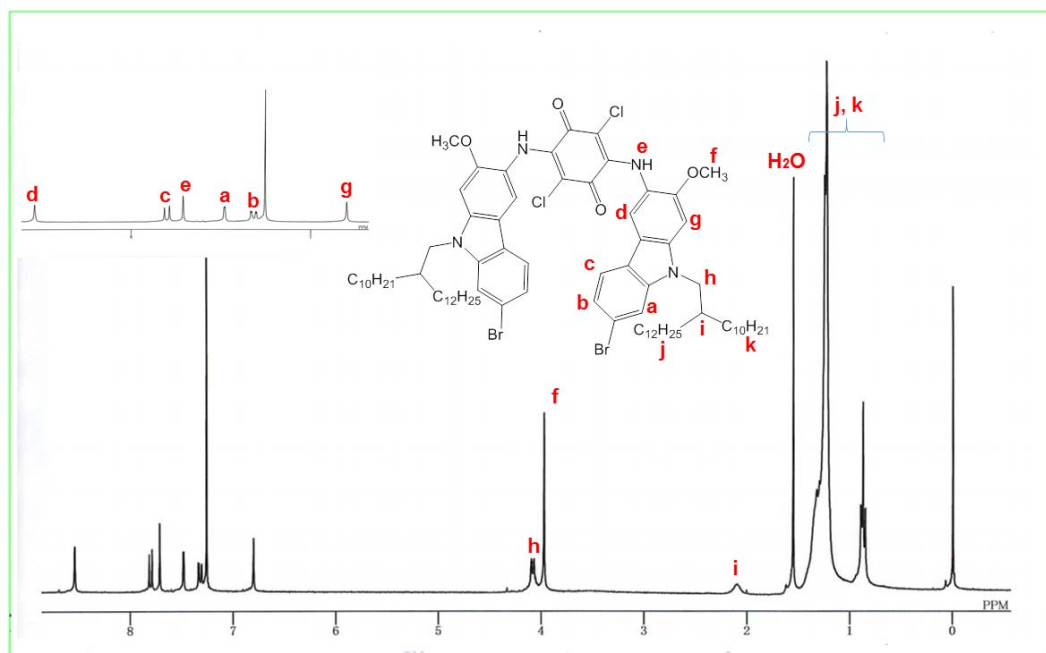
**Fig. S10**  $^{13}\text{C}$  NMR of compound **2** in  $\text{CDCl}_3$ .



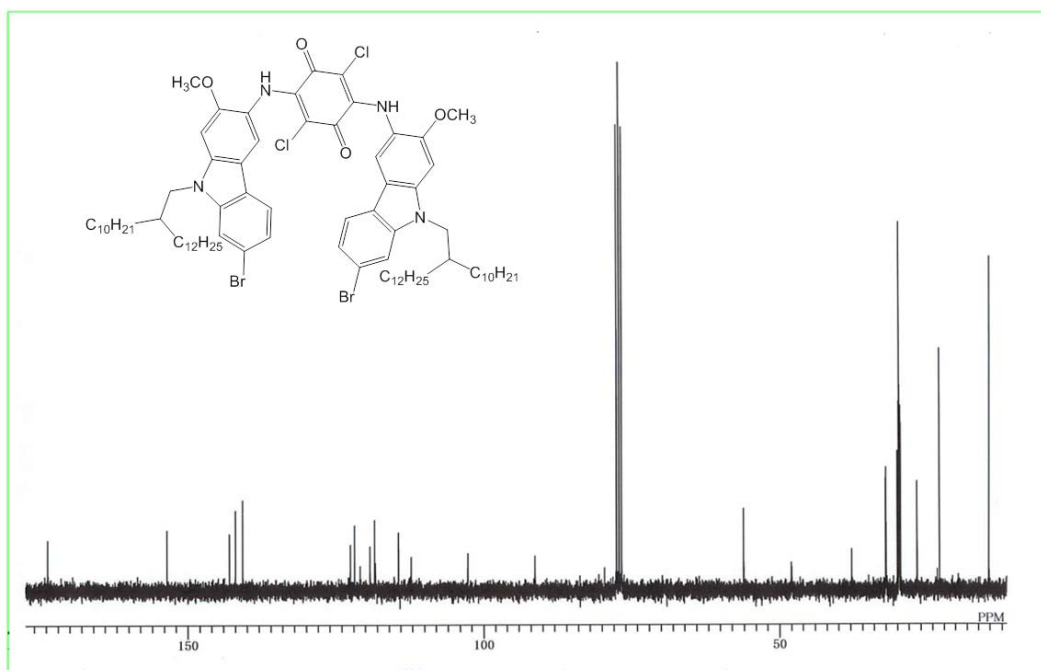
**Fig. S11** <sup>1</sup>H NMR of compound **3** in CDCl<sub>3</sub>.



**Fig. S12** <sup>13</sup>C NMR of compound **3** in CDCl<sub>3</sub>.

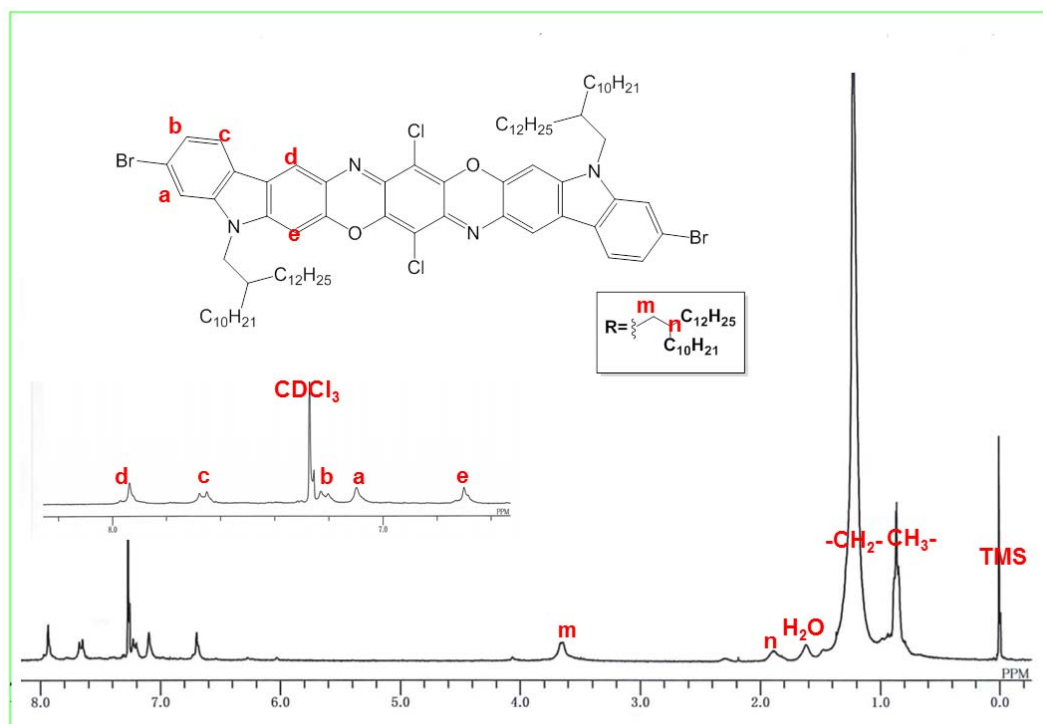


**Fig. S13**  $^1\text{H}$  NMR of compound **4** in  $\text{CDCl}_3$ .

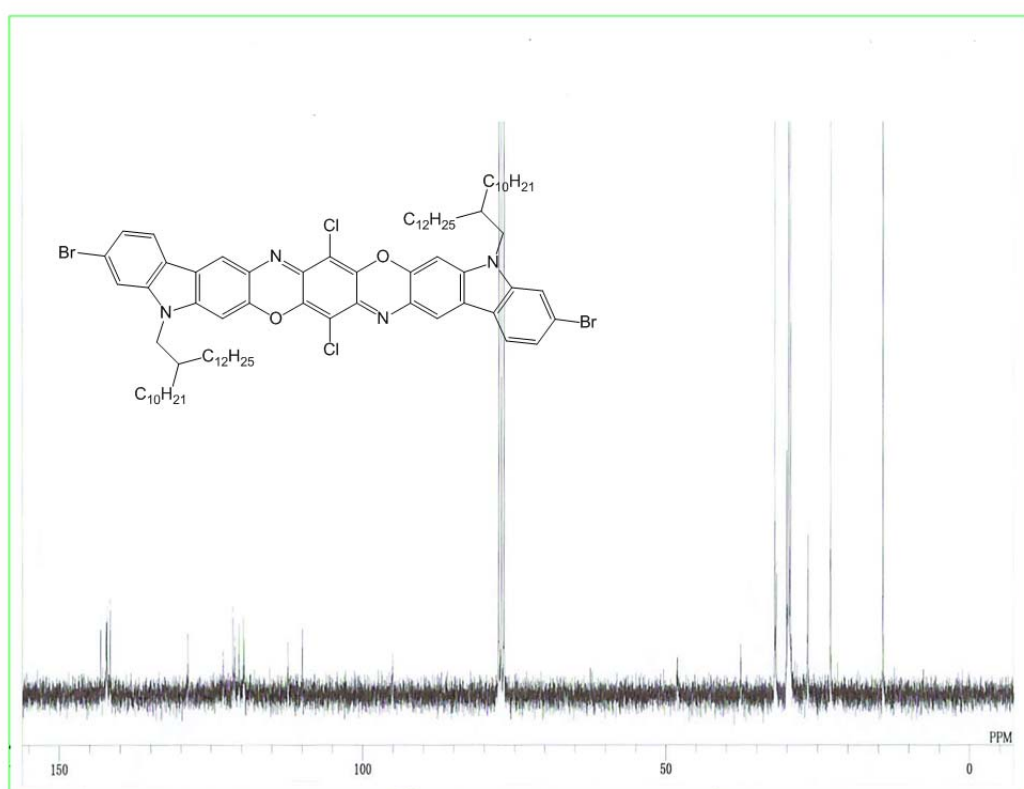


**Fig. S14**  $^{13}\text{C}$  NMR of compound **4** in  $\text{CDCl}_3$ .

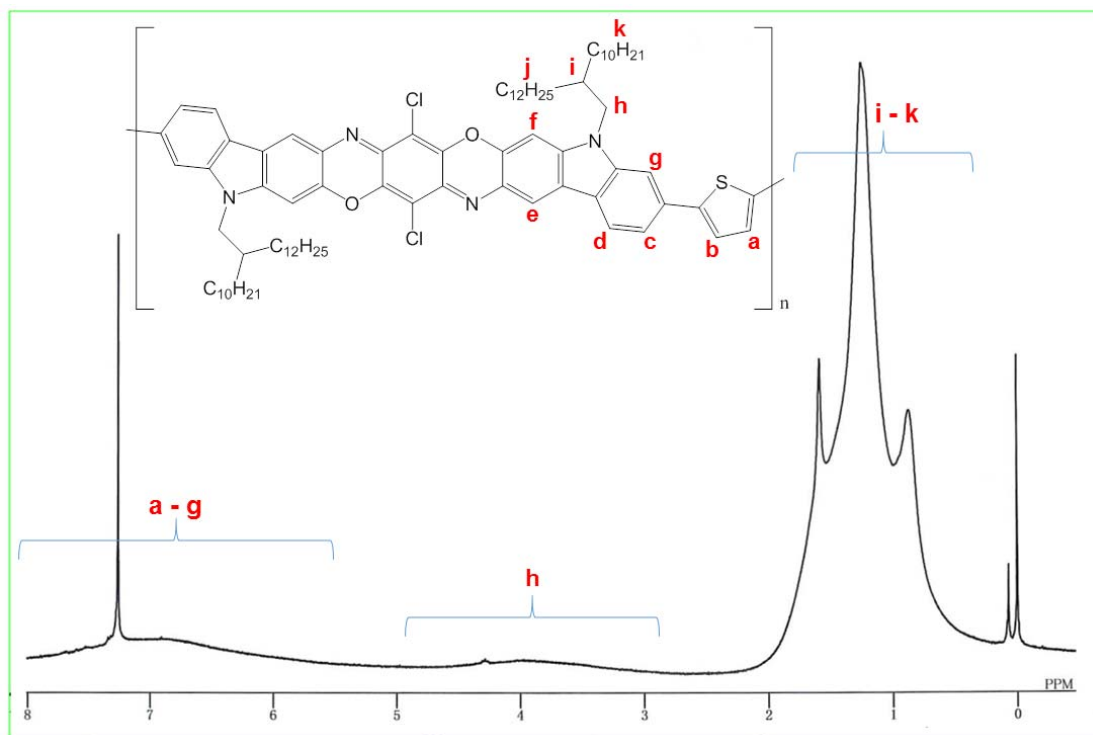




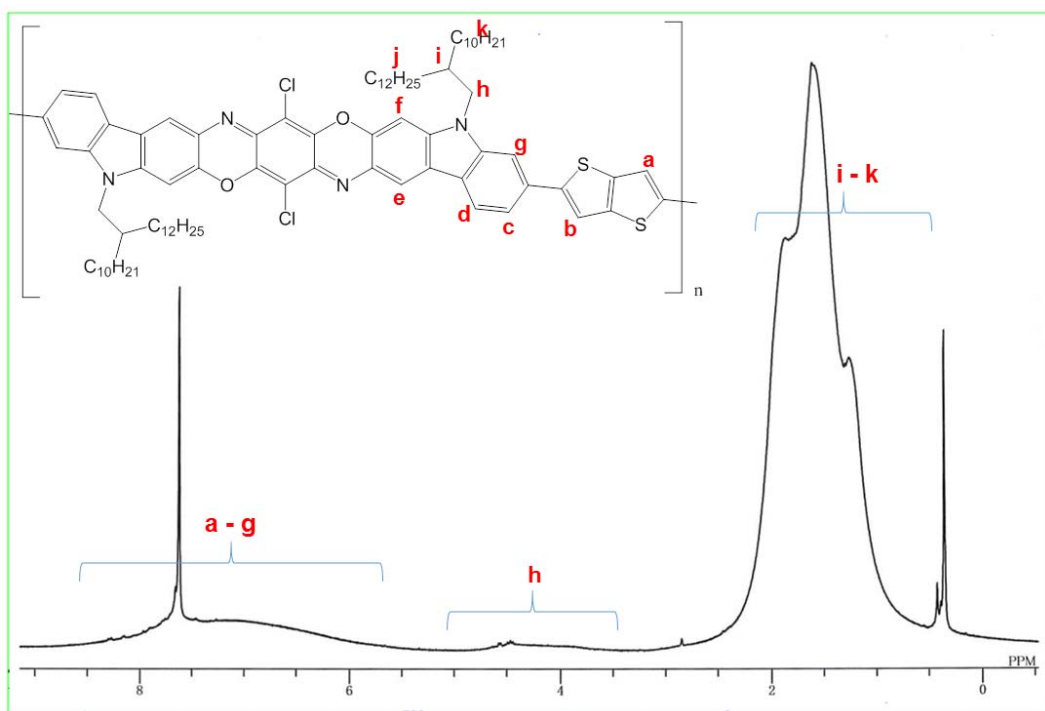
**Fig. S15**  $^1\text{H}$  NMR of compound **CZ** in  $\text{CDCl}_3$ .



**Fig. S16**  $^{13}\text{C}$  NMR of compound **CZ** in  $\text{CDCl}_3$ .



**Fig. S17** <sup>1</sup>H NMR of PCZT in CDCl<sub>3</sub>.



**Fig. S18** <sup>1</sup>H NMR of PCZTT in CDCl<sub>3</sub>.