

Supporting Information

Prato Reaction Derived Polythiophene/C₆₀ Donor-Acceptor Double Cable Polymer, Fabrication of Photodetectors and Evaluation of Photocurrent Generation

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1. Synthetic Procedures

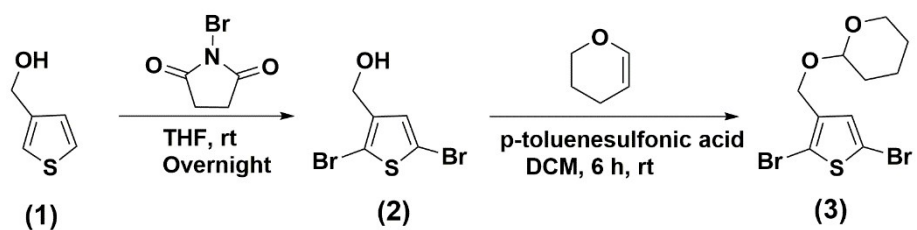
Synthesis of 2-((2,5-dibromothiophen-3-yl)methoxy)tetrahydro-2H-pyran **3**:

2,5-dibromo-3-tetrahydropyranoxyethylthiophene **3** was synthesized by literature reported method (Scheme S1).¹

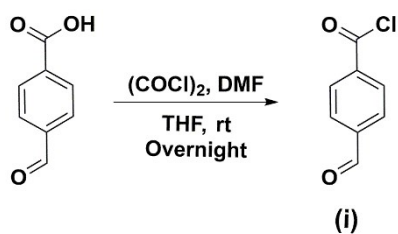
Synthesis of 4-formylbenzoyl chloride (i)

0.25 g (1.7 mmol) of 4-formylbenzoic acid was dissolved in 10 mL of anhydrous THF under inert conditions. The catalytic amount (2-3 drops) of anhydrous DMF was added in the mixture. The reaction mixture was placed on the ice bath and then dropwise added 419 μ L (4.2 mmol) of oxalyl chloride under inert and ice-cold conditions. The ice bath was removed after 30 minutes and the reaction mixture was stirred overnight at room temperature. The solvent was removed via a rotary evaporator to get concentrated product which was dried under vacuum at room temperature (Scheme S2).²

2. Schemes



Scheme S1. Synthetic route of 2,5-dibromo-3-(tetrahydropyran-2-ylmethoxy)methylthiophene **3**



Scheme S2. Synthesis of 4-formylbenzoyl chloride (**i**) from 4-formylbenzoic acid

3. Figures

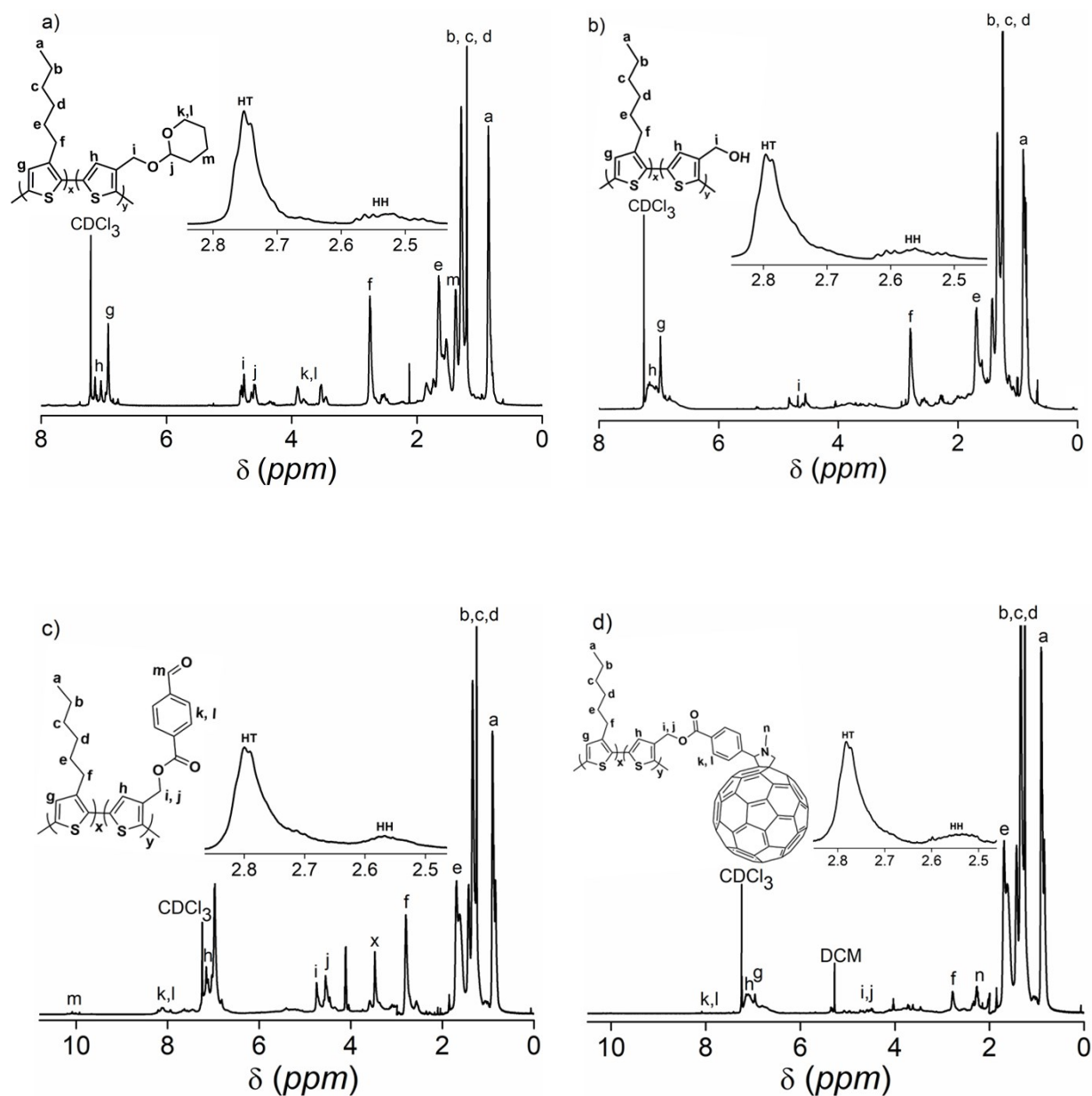


Figure S1. $^1\text{H-NMR}$ spectra and regioregularity analysis (a) copolymer **4** with pendant THP ether groups, (b) copolymer **5** with pendant hydroxyl groups, (c) copolymer **6** with pendant aldehyde groups and (d) copolymer **7** covalent hybrid with C_{60}

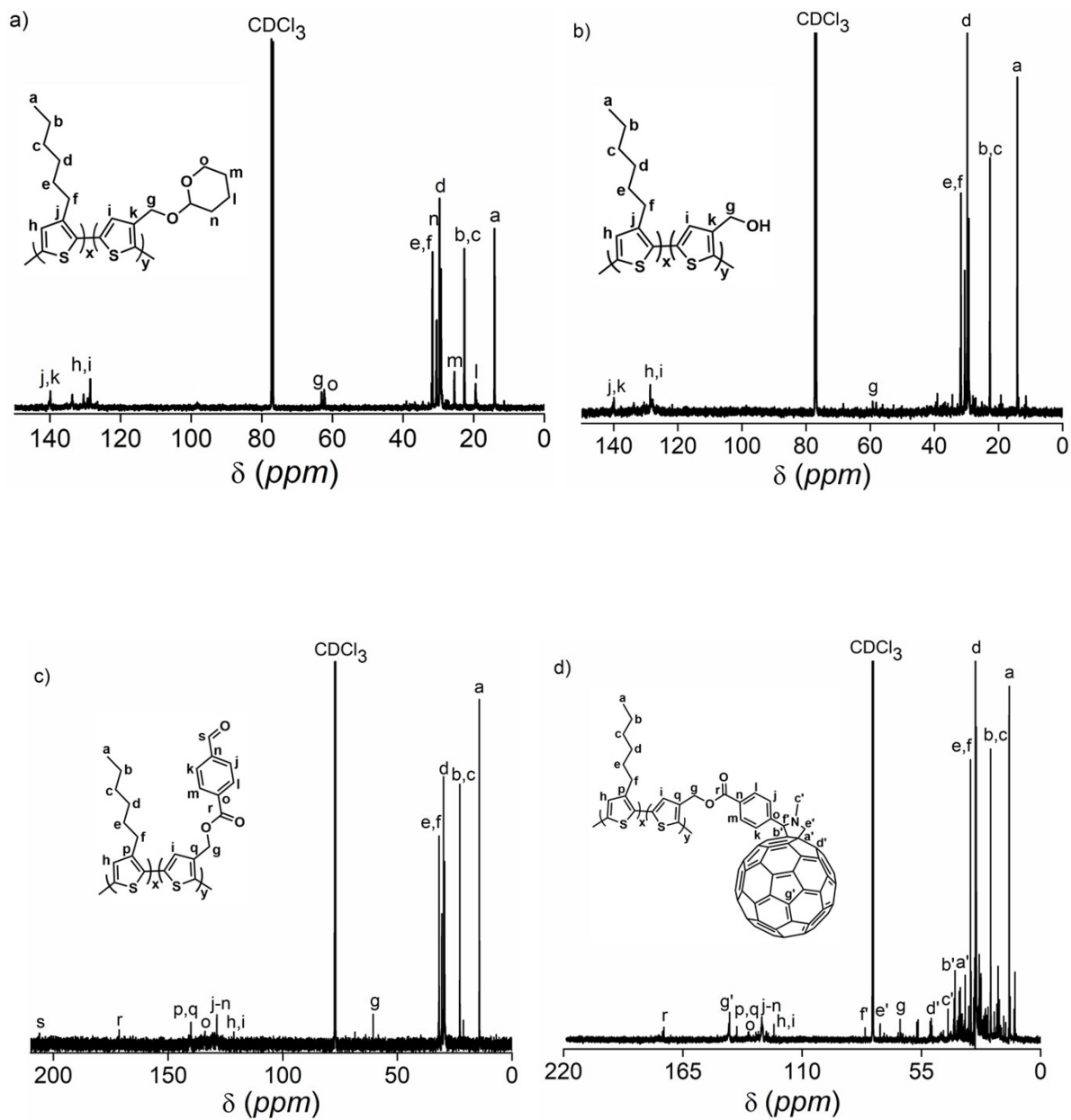


Figure S2. ^{13}C -NMR spectra of (a) copolymer **4** with pendant THP ether groups, (b) copolymer **5** with pendant hydroxyl groups, (c) copolymer **6** with pendant aldehyde groups and (d) copolymer **7**, which is a covalent hybrid of copolymer **6** and C_{60}

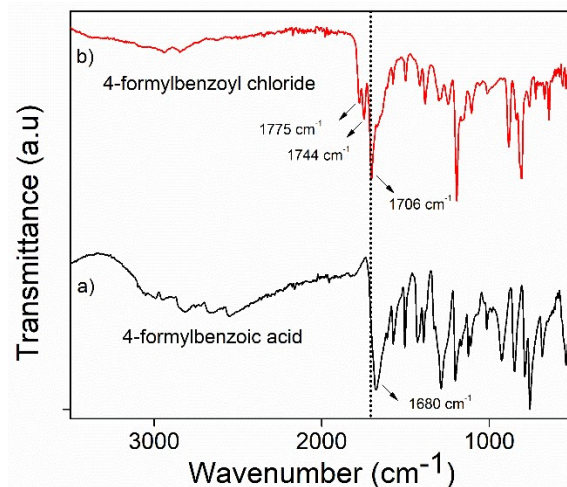


Figure S3. FTIR spectra (a) 4-formylbenzoic acid (b) 4-formylbenzoyl chloride (i)

Gel Permeation Chromatography (GPC)

Gel permeation chromatography (GPC) measurements were carried out by using THF as an eluent with flow rate of 1 mL /min at 35 °C. The GPC profile of statistical random copolymer **4** and copolymer **5** is shown in Figure S4 which clearly depicted the synthesis of copolymer **4** (M_n 12300 Da and \bar{D} : 1.1) by Grignard metathesis (GRIM) polymerization.

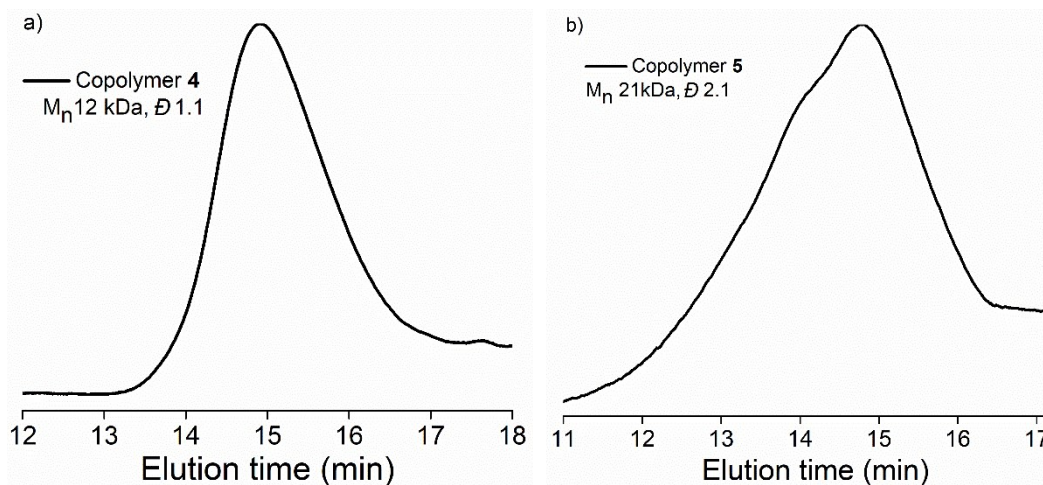


Figure S4. GPC profile of copolymer synthesized by Grignard metathesis (GRIM) polymerization (a) copolymer **4** (b) copolymer **5**

References

1. B. A. Hammer, F. A. Bokel, R. C. Hayward, T. Emrick, *Chem. Mater.*, 2011, **23**, 4250-4256.
2. T. Uchida, Y. Kagoshima, T. Konosu, *Bioorg. Med. Chem. Lett.*, 2009, **19**, 2013-2017.