Electronic Supplementary Material (ESI) for Polymer Chemistry.

Electronic Supplementary Information

Effects of Replacing Thiophene with 5,5-Dimethylcyclopentadiene in Alternating Poly(phenylene), Poly(3-hexylthiophene), and Poly(fluorene) Copolymer Derivatives

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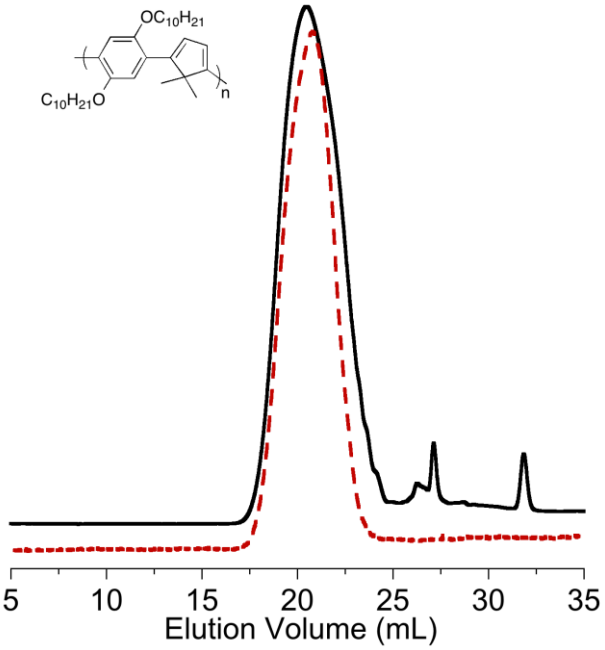

Figure S 1. GPC traces of **PPCp** with UV detector (red dash) and refractive index detector (black solid).

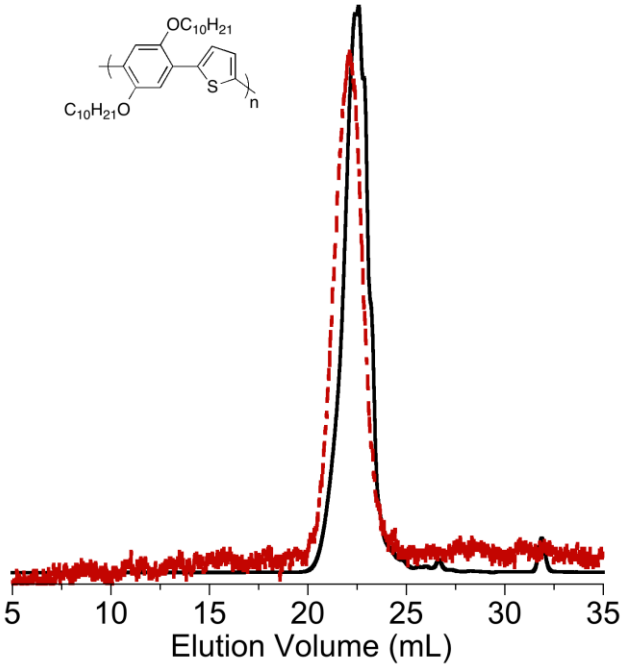

Figure S 2. GPC traces of **PPT** with UV detector (red dash) and refractive index detector (black solid).

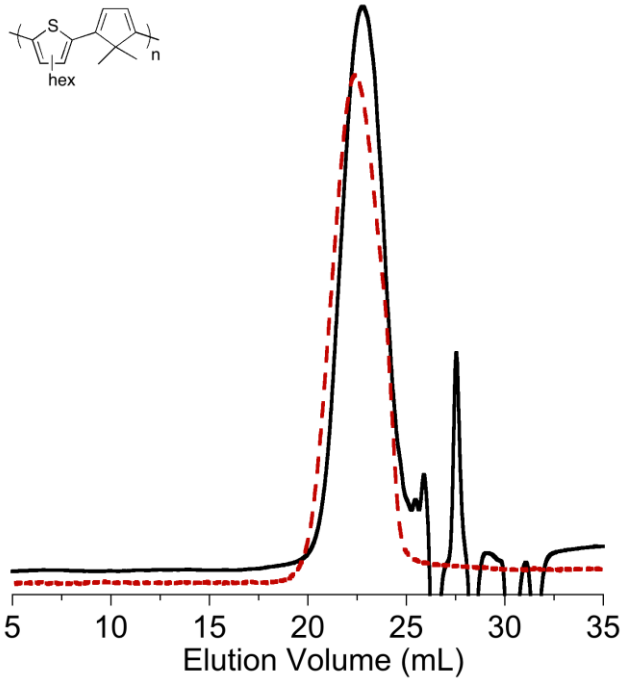

Figure S 3. GPC traces of **P3HTCp** with UV detector (red dash) and refractive index detector (black solid).

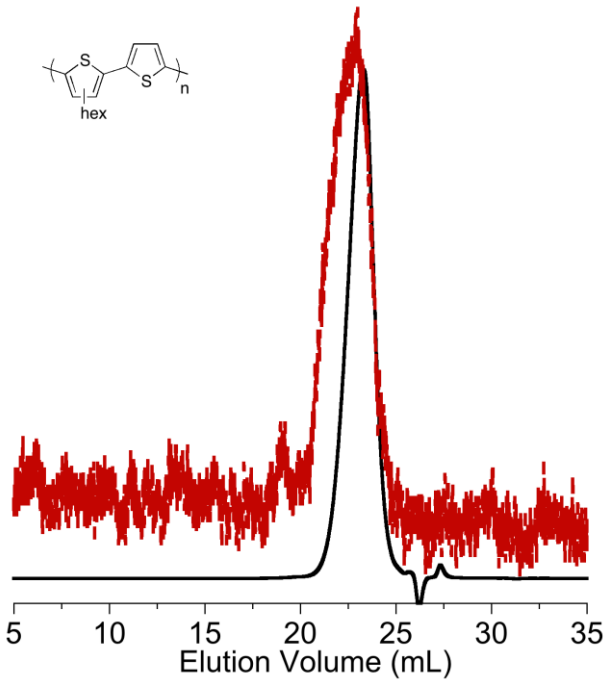

Figure S 4. GPC traces of **P3HTT** with UV detector (red dash) and refractive index detector (black solid).

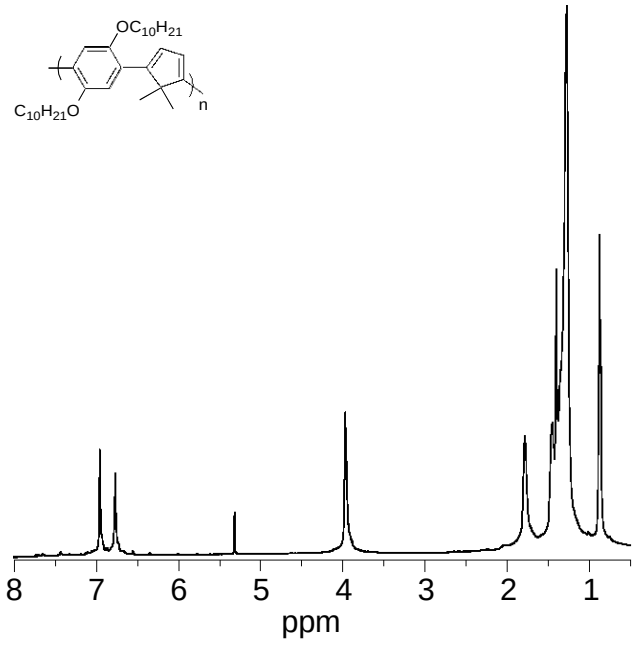

Figure S 5. ^{1}H NMR spectrum of **PPCp** (500 MHz, CD_2Cl_2).

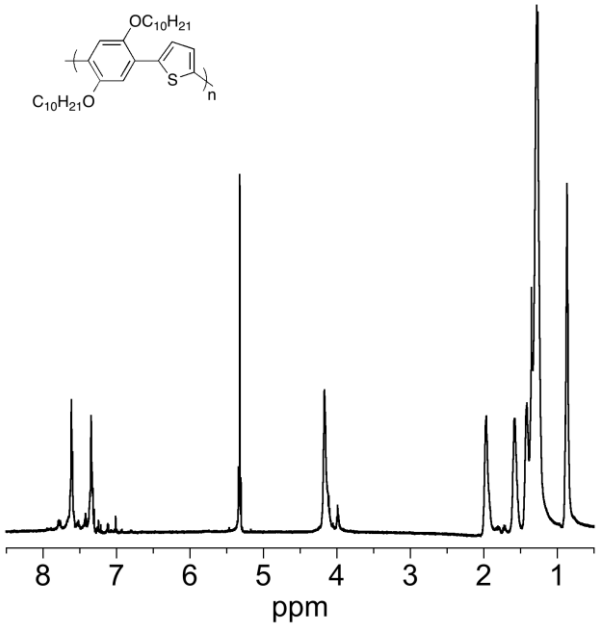

Figure S 6. ^{1}H NMR spectrum of **PPT** (500 MHz, CD_2Cl_2).

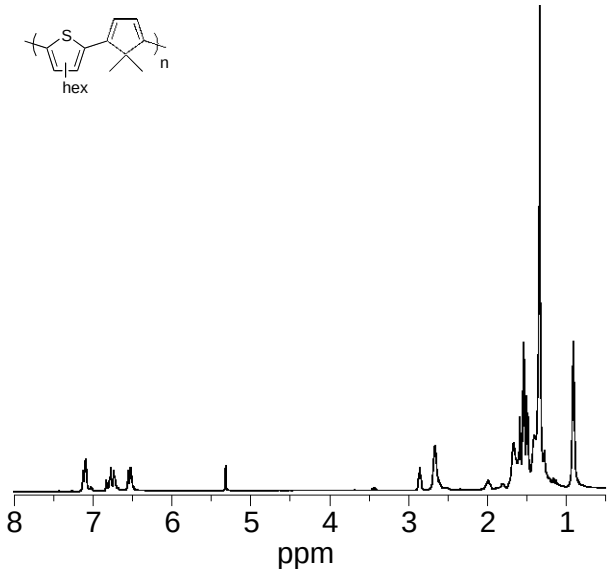

Figure S 7. ^{1}H NMR spectrum of **P3HTCp** (500 MHz, CD_2Cl_2).

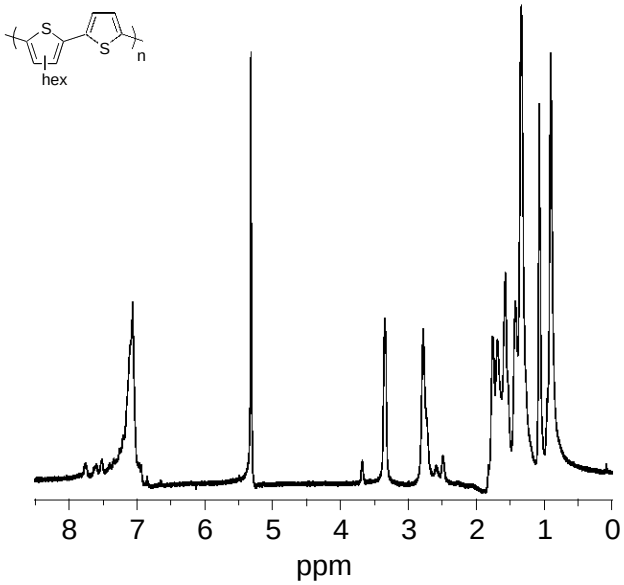

Figure S 8. ^{1}H NMR spectrum of **P3HTT** (500 MHz, CD_2Cl_2).

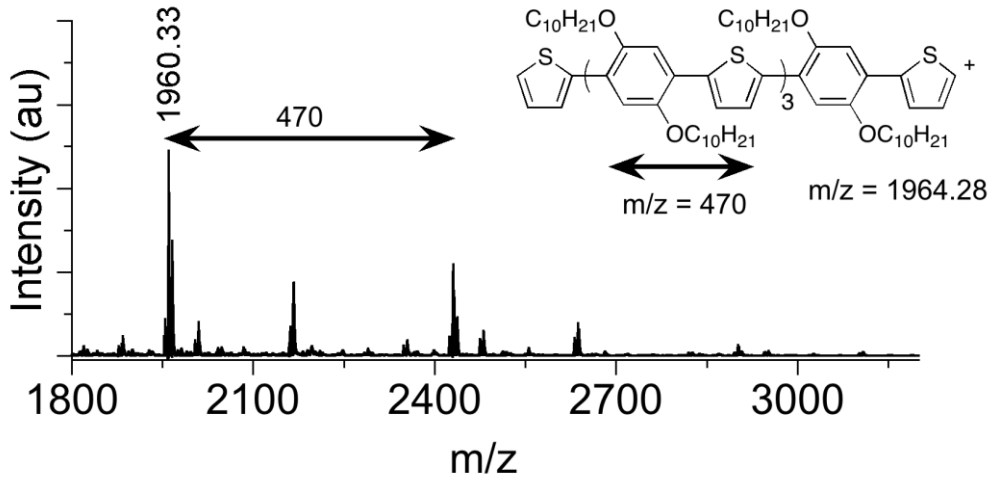

Figure S 9. MALDI-TOF mass spectrum of **PPT**.

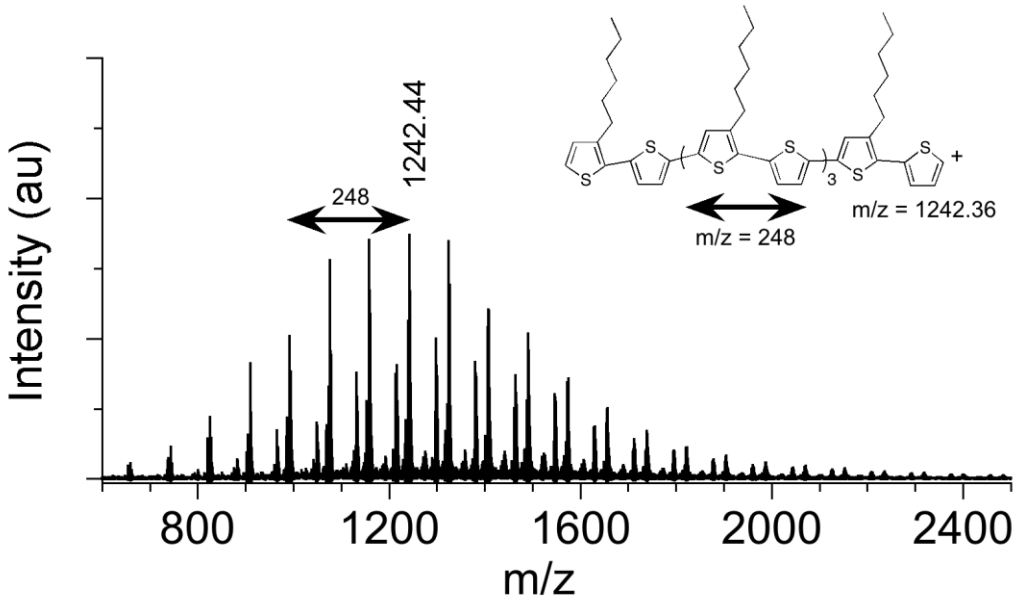

Figure S 10. MALDI-TOF mass spectrum of **P3HTT**.

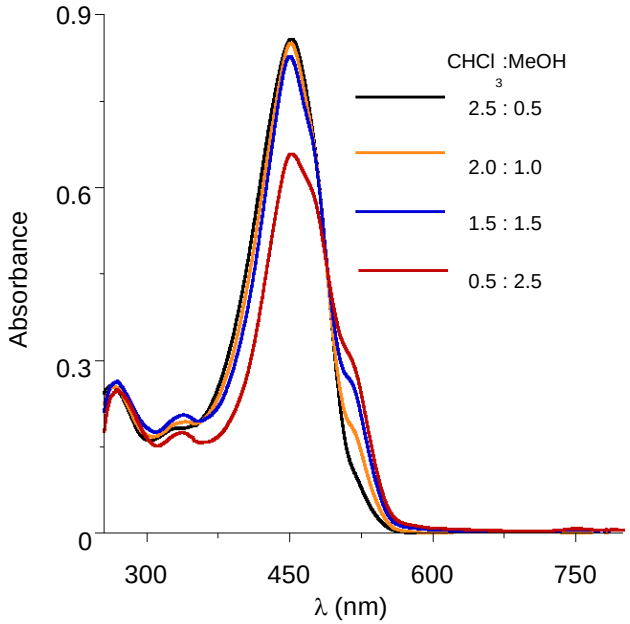

Figure S 11. UV/vis absorption spectra of **PPT** in $CHCl_3$/MeOH solvent mixtures.

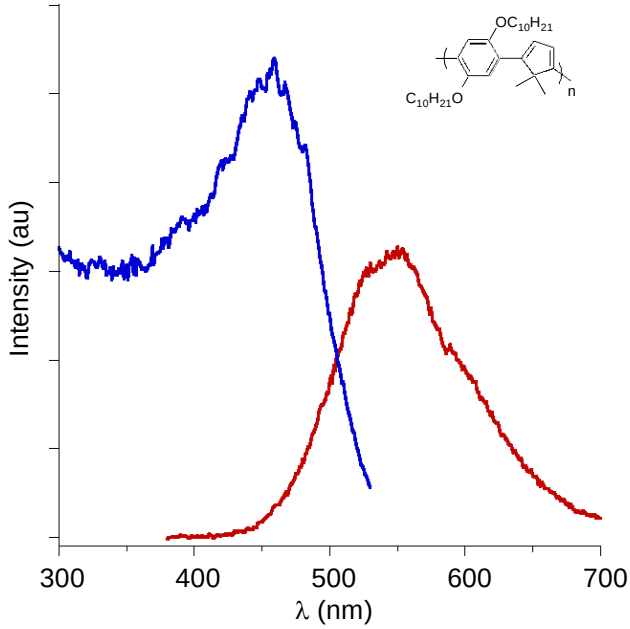

Figure S 12. Excitation (blue, em. @ 550 nm) and emission (red, exc. @ 365 nm) spectra of **PPCp**.

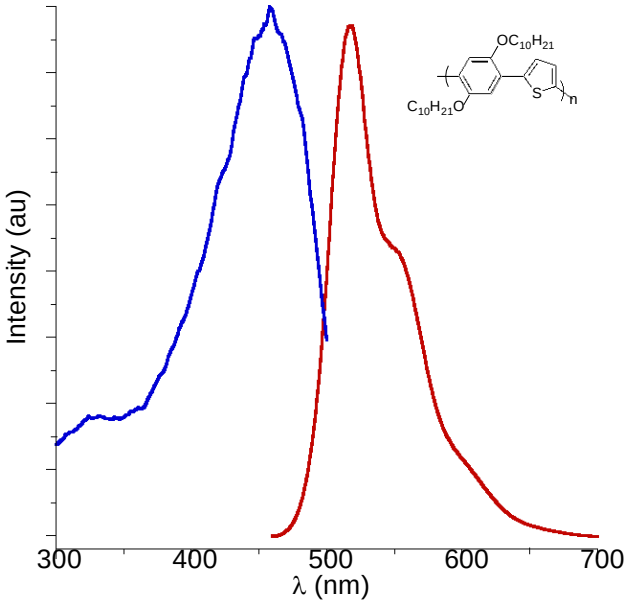

Figure S 13. Excitation (blue, em. @ 517 nm) and emission (red, exc. @ 454 nm) spectra of **PPCp**.

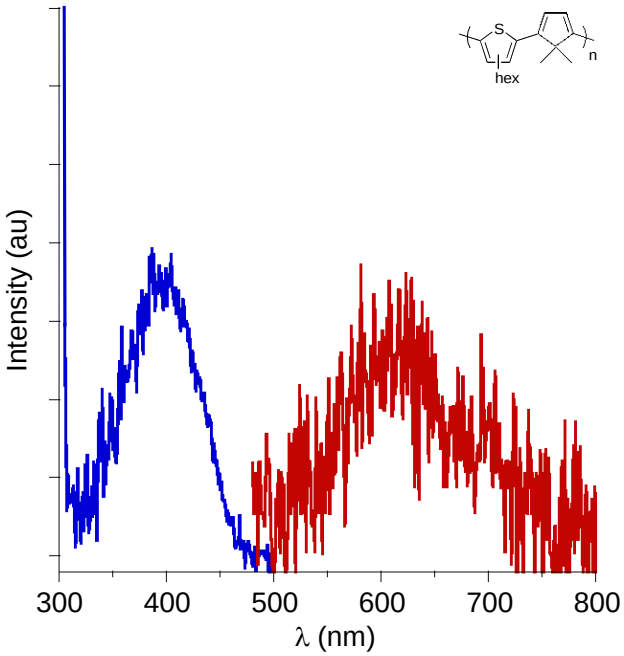

Figure S 14. Excitation (blue, em. @ *ca*. 600 nm) and emission (red, exc. @ *ca*. 476 nm) spectra of **P3HTCp**.

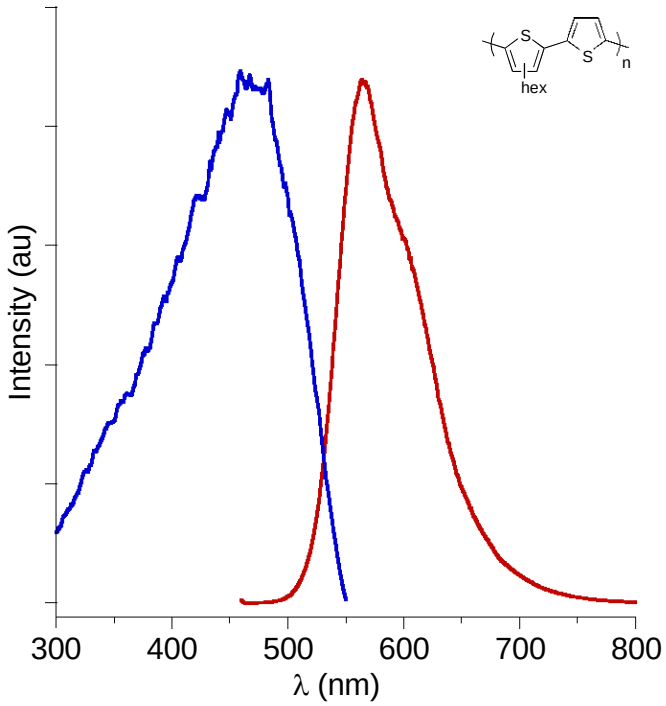

Figure S 15. Excitation (blue, em. @ *ca*. 564 nm) and emission (red, exc. @ *ca*. 457 nm) spectra of **P3HTCp**.

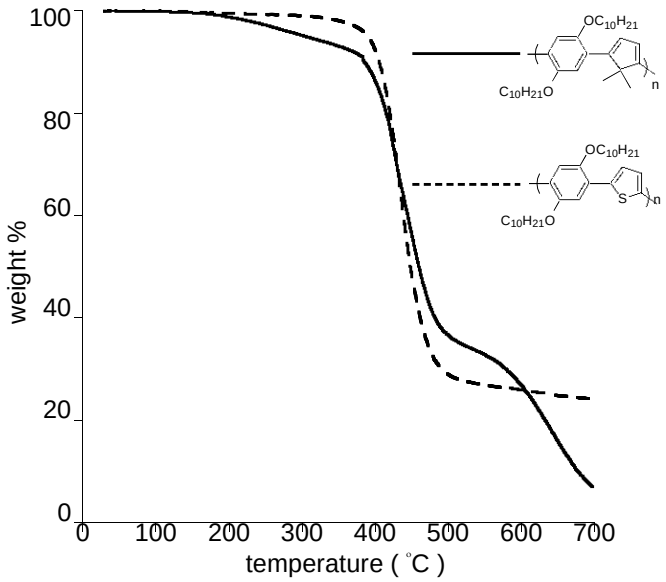

Figure S 16. TGA thermograms of **PPT** and **PPCp**.

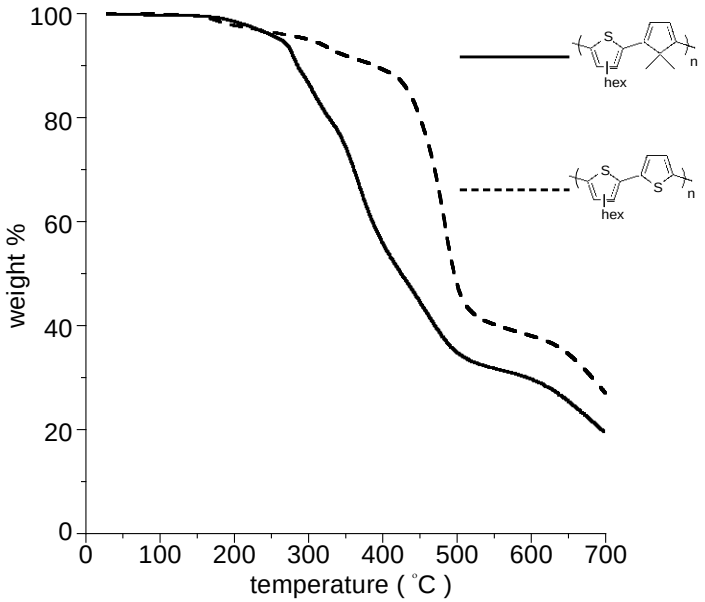

Figure S 17. TGA thermograms of **P3HTT** and **P3HTCp**.

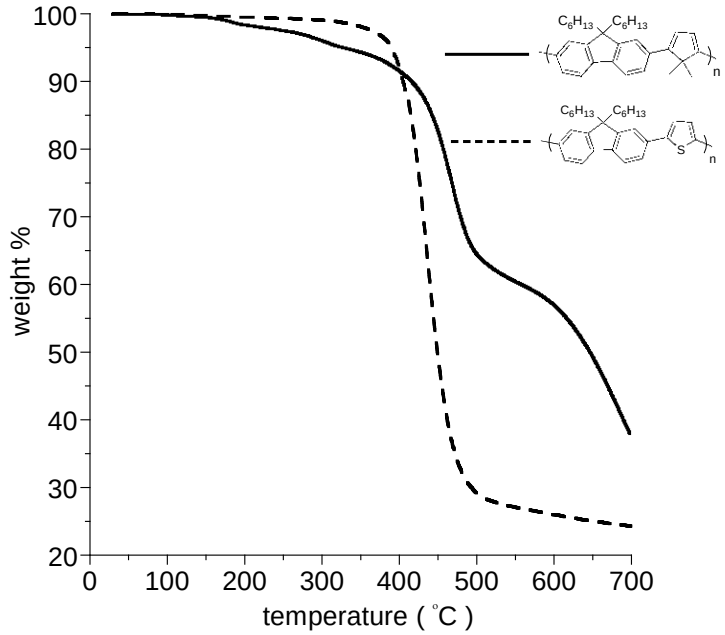

Figure S 18. TGA thermograms of **PFT** and **PFCp**.

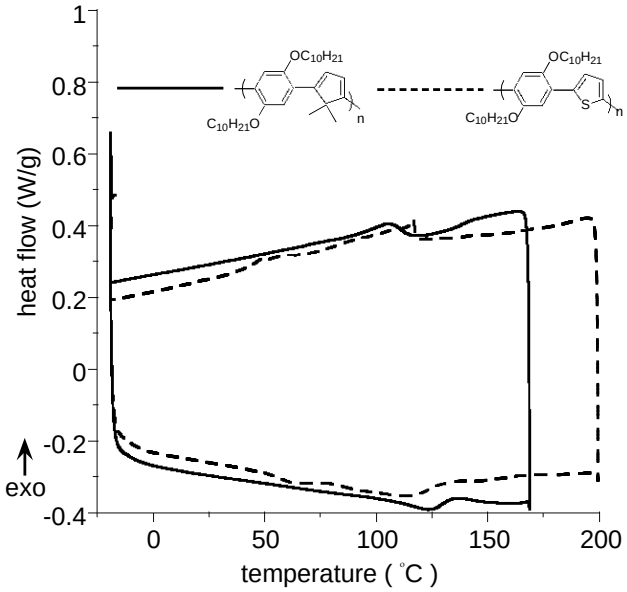

Figure S 19. DSC thermograms of **PPT** and **PPCp** (Scan rate 10°C/min, second heating and cooling curves).

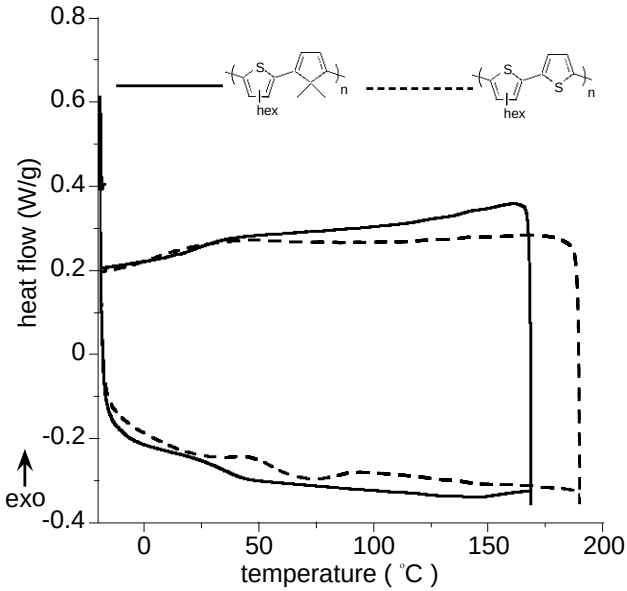

Figure S 20. DSC thermograms of **P3HTT** and **P3HTCp** (Scan rate 10°C/min, second heating and cooling curves).

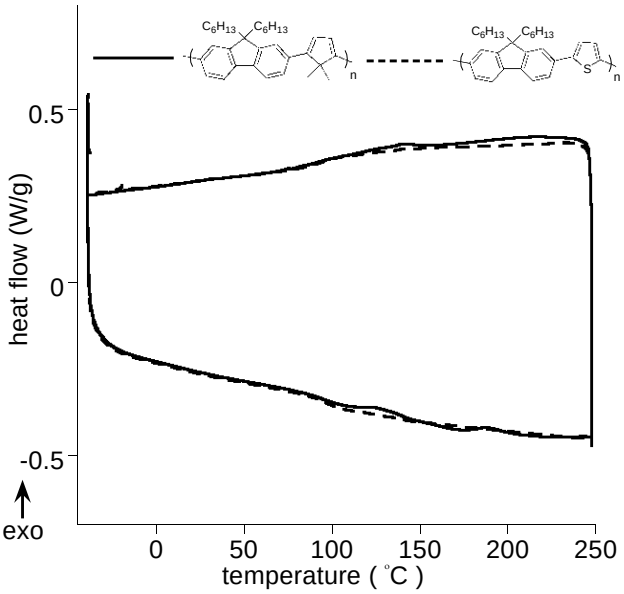

Figure S 21. DSC thermograms of **PFT** and **PFCp**. (Scan rate 10°C/min, second heating and cooling curves).

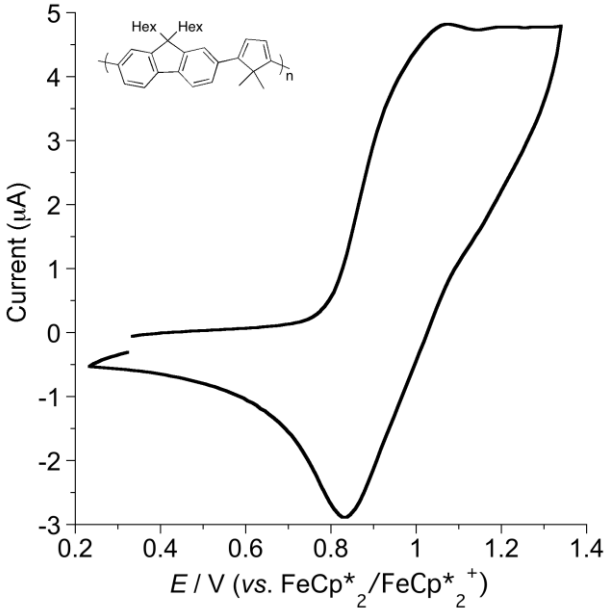

Figure S 22. Cyclic voltammogram of **PFCp** [5.6 mM (based on repeat unit Mw)]. Conditions: 0.1 M [*n*-Bu_4N]PF_6 in DCM; scan rate, 100 mV/s, Pt disc working electrode, *E vs.* FeCp*/ $FeCp^{*+}$.

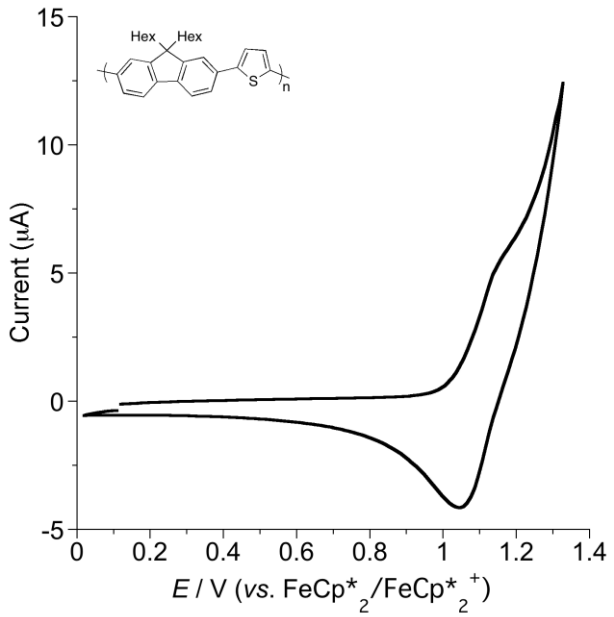

Figure S 23. Cyclic voltammogram of **PFT** [5.6 mM (based on repeat unit Mw)]. Conditions: 0.1 M [*n*-Bu_4N]PF_6 in DCM; scan rate, 100 mV/s, Pt disc working electrode, *E vs.* FeCp*/ $FeCp^{*+}$.

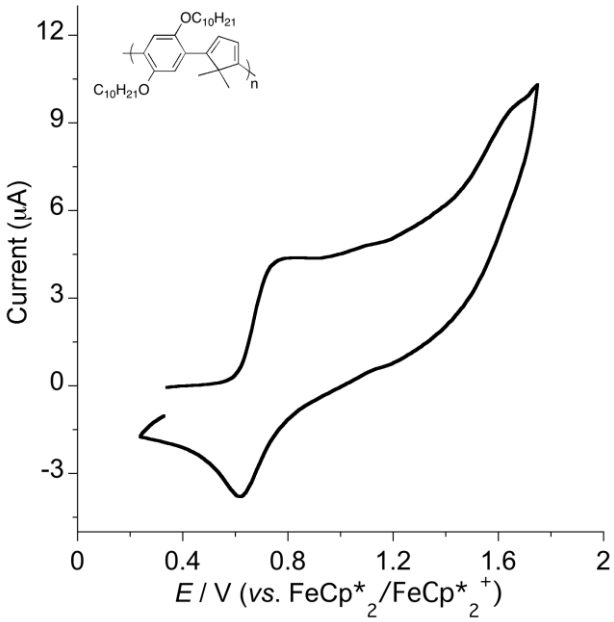

Figure S 24. Cyclic voltammogram of **PPCp** [5.6 mM (based on repeat unit Mw)]. Conditions: 0.1 M [*n*-Bu_4N]PF_6 in DCM; scan rate, 100 mV/s, Pt disc working electrode, *E vs.* FeCp*/ $FeCp^{*+}$.

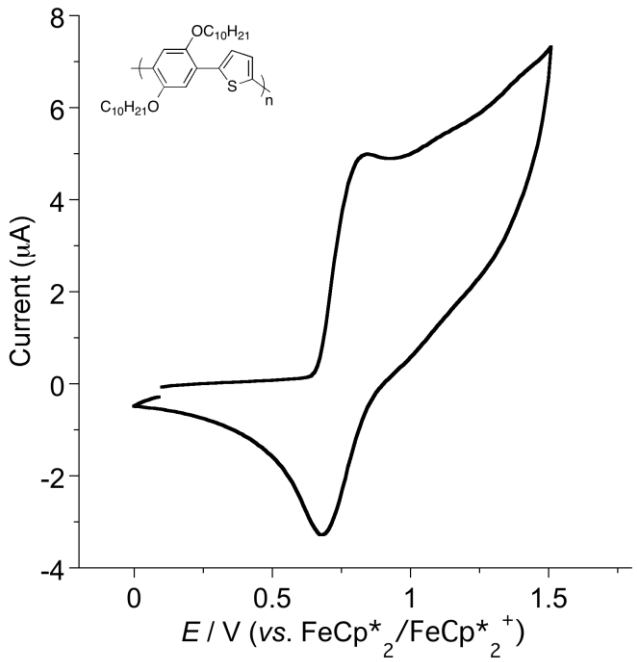

Figure S 25. Cyclic voltammogram of **PPT** [5.6 mM (based on repeat unit Mw)]. Conditions: 0.1 M [*n*-Bu_4N]PF_6 in DCM; scan rate, 100 mV/s, Pt disc working electrode, *E vs.* FeCp*/ $FeCp^{*+}$.

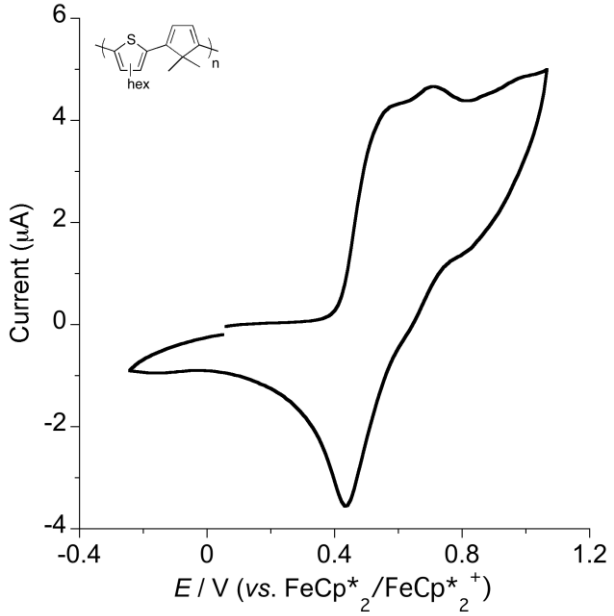

Figure S 26. Cyclic voltammogram of **P3HTCp** [5.6 mM (based on repeat unit Mw)]. Conditions: 0.1 M [*n*-Bu_4N]PF_6 in DCM; scan rate, 100 mV/s, Pt disc working electrode, *E vs.* FeCp*/ $FeCp^{*+}$.

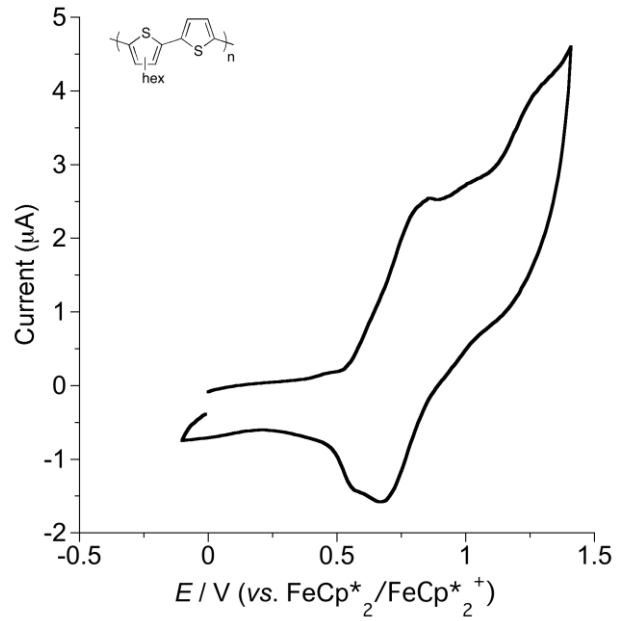

Figure S 27. Cyclic voltammogram of **P3HTT** [5.6 mM (based on repeat unit Mw)]. Conditions: 0.1 M [*n*-Bu_4N]PF_6 in DCM; scan rate, 100 mV/s, Pt disc working electrode, *E vs.* FeCp*/ $FeCp^{*+}$.

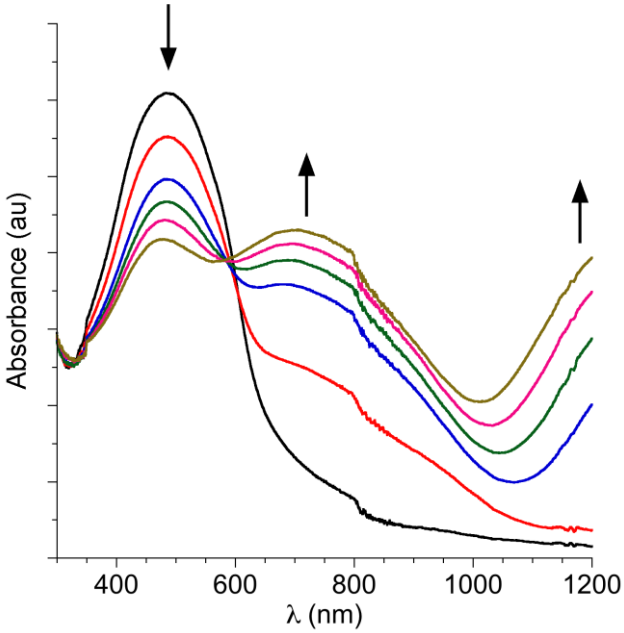

Figure S 28. Spectroelectrochemical profile **of P3HTT** between 0.80 and 1.00 V (vs Ag/Ag^+). The black spectrum was obtained from a film in the neutral state. All subsequent spectra (*i.e.*, red, blue, green, pink, and brown) were taken at progressively higher potentials at 50 mV intervals.

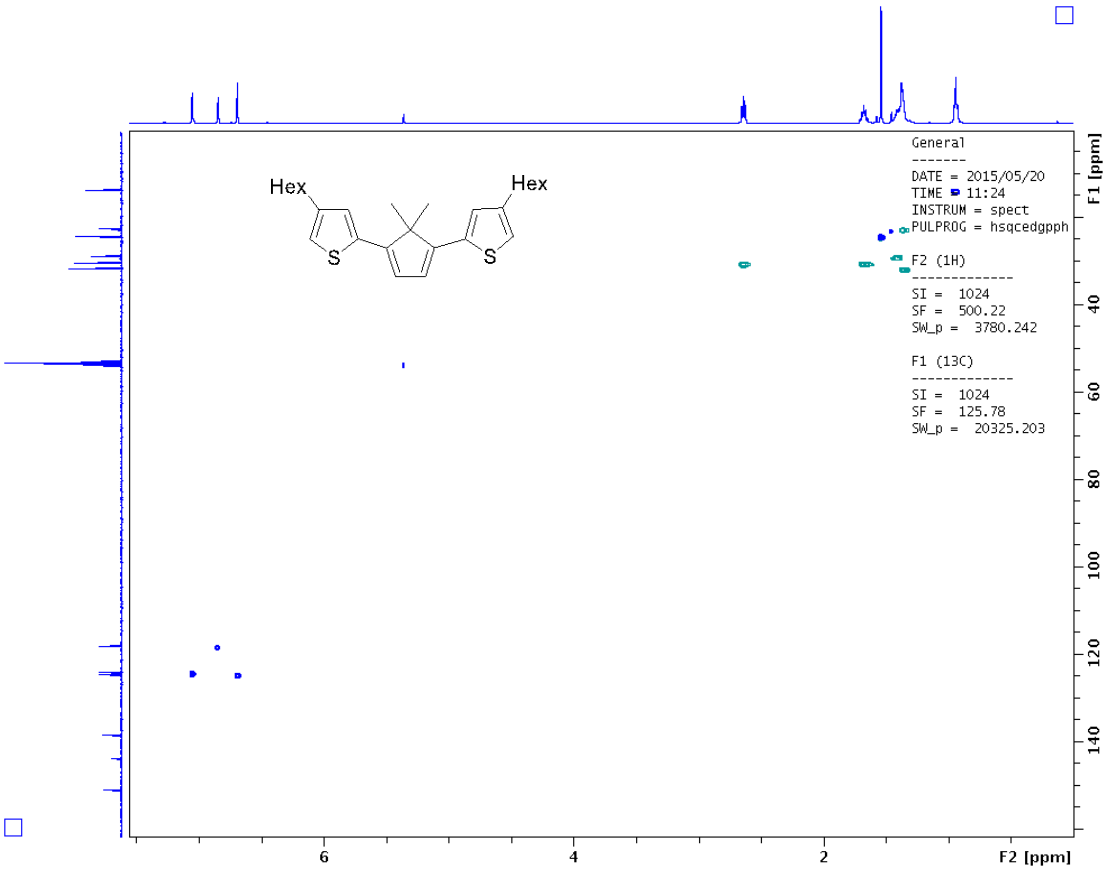

Figure S 29. HSQC spectrum of **3** (500 MHz, CD_2Cl_2).

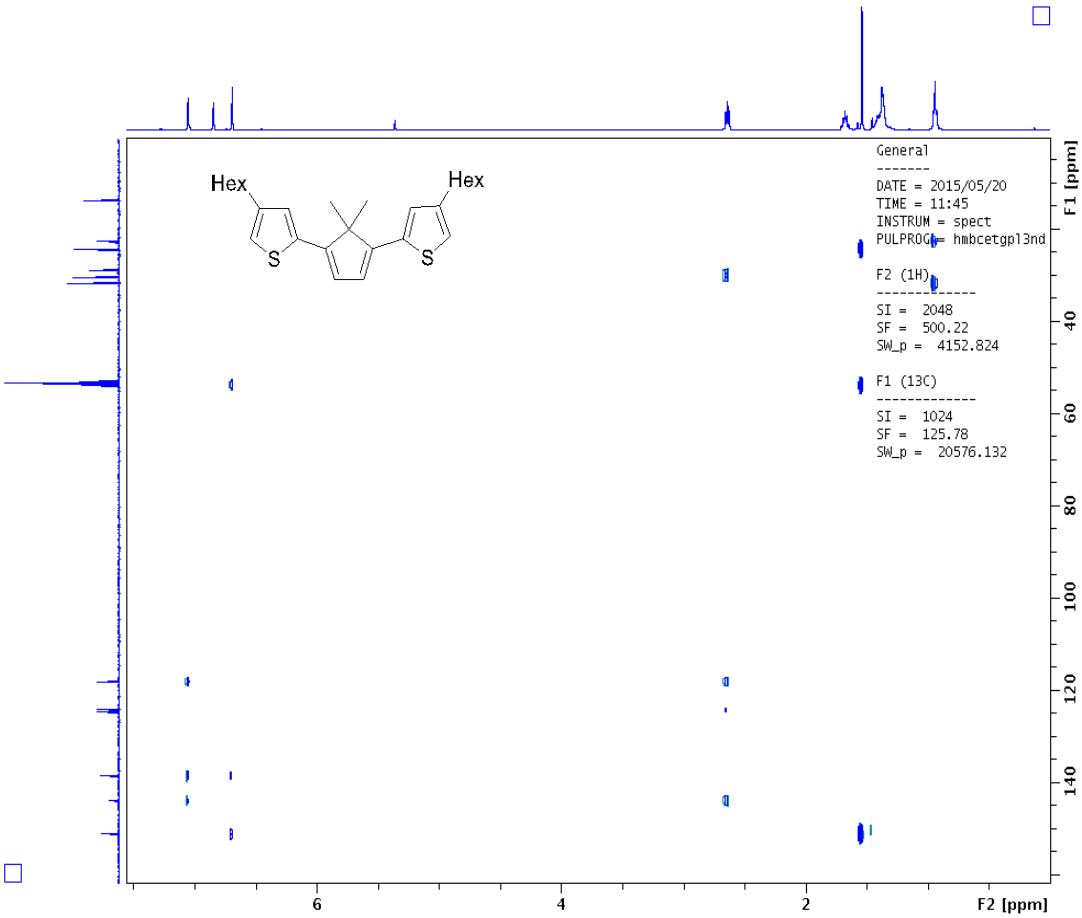

Figure S 30. HMBC spectrum of **3** (500 MHz, CD_2Cl_2).

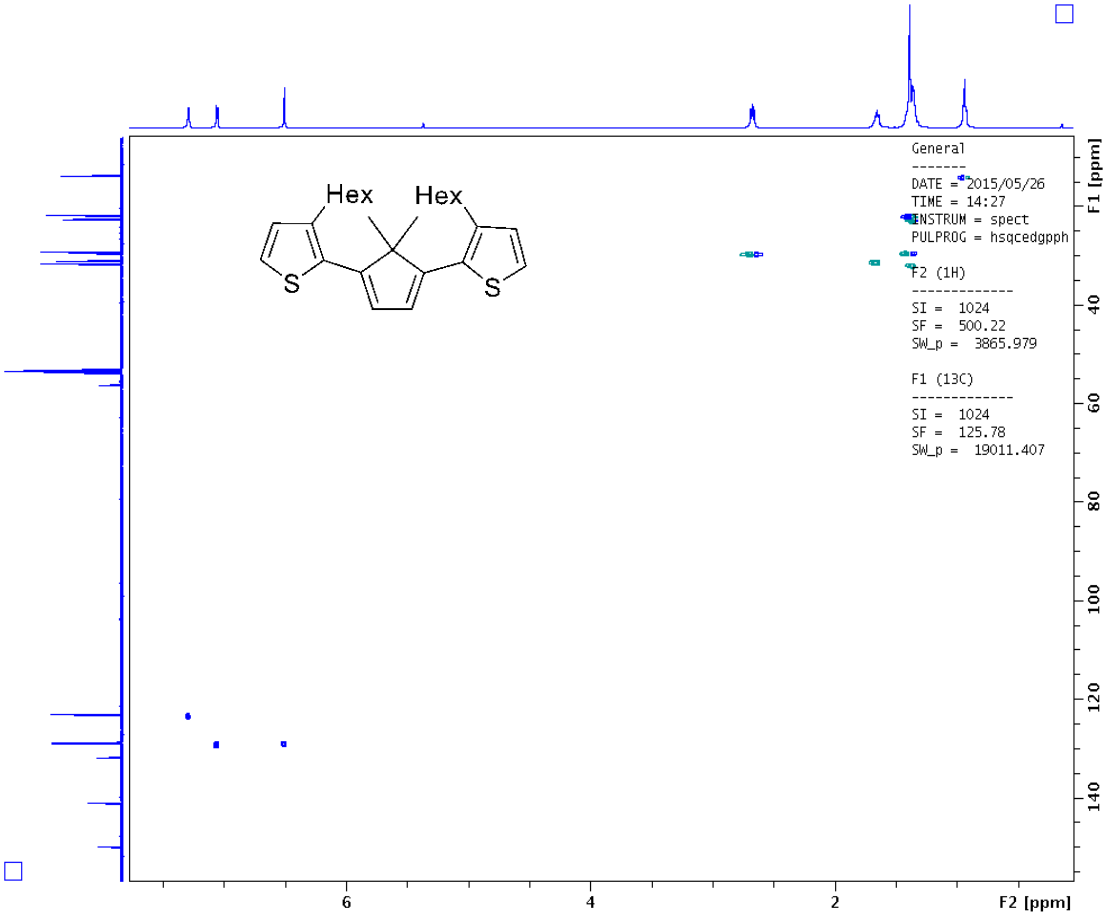

Figure S 31. HSQC spectrum of **4** (500 MHz, CD_2Cl_2).

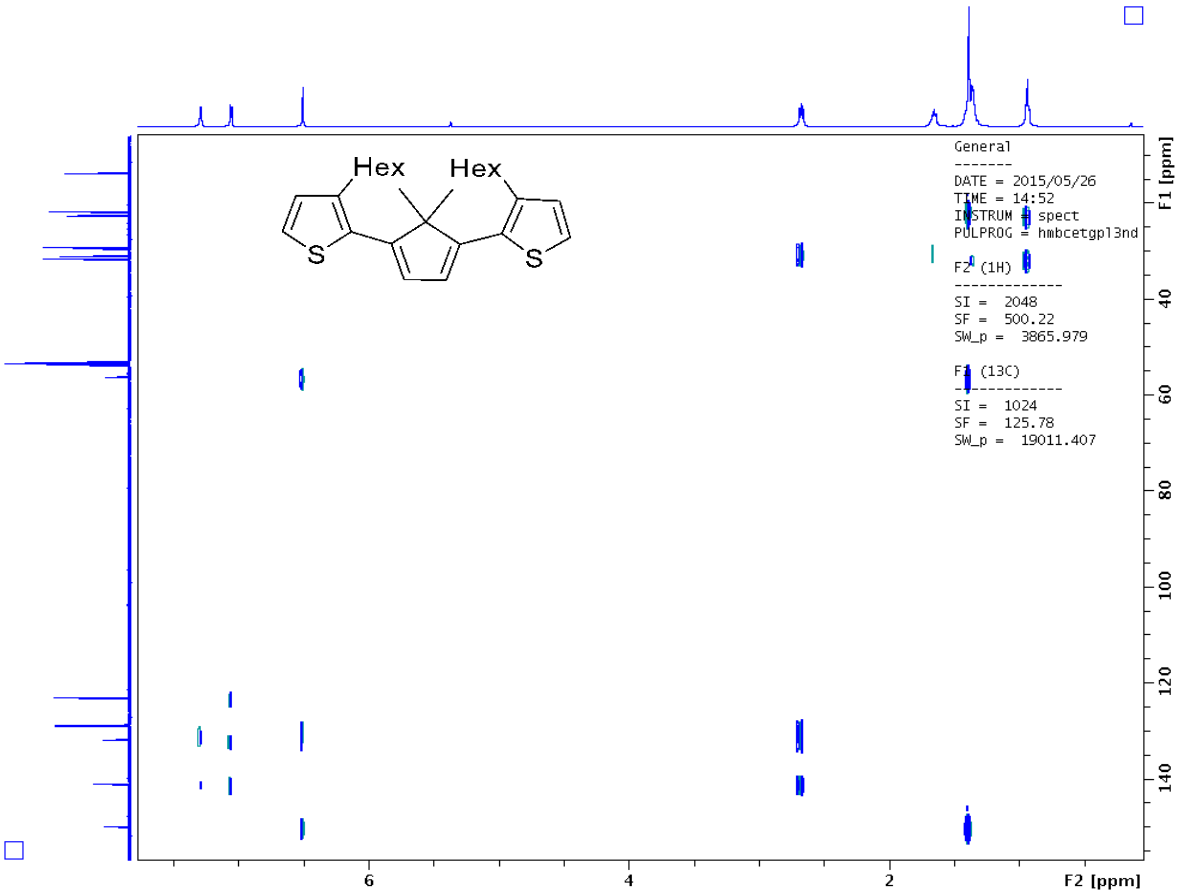

Figure S 32. HMBC spectrum of **4** (500 MHz, CD_2Cl_2).

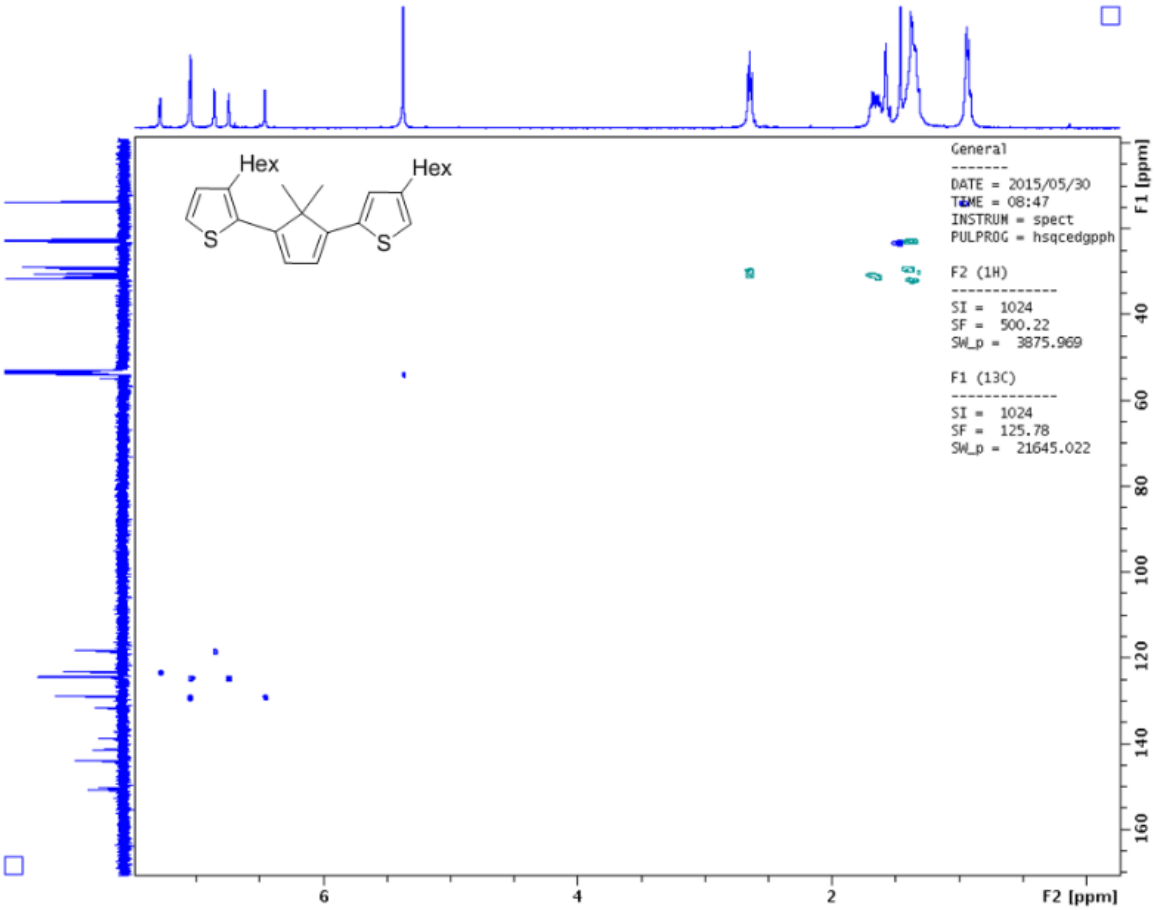

Figure S 33. HSQC spectrum of **5** (500 MHz, CD_2Cl_2).

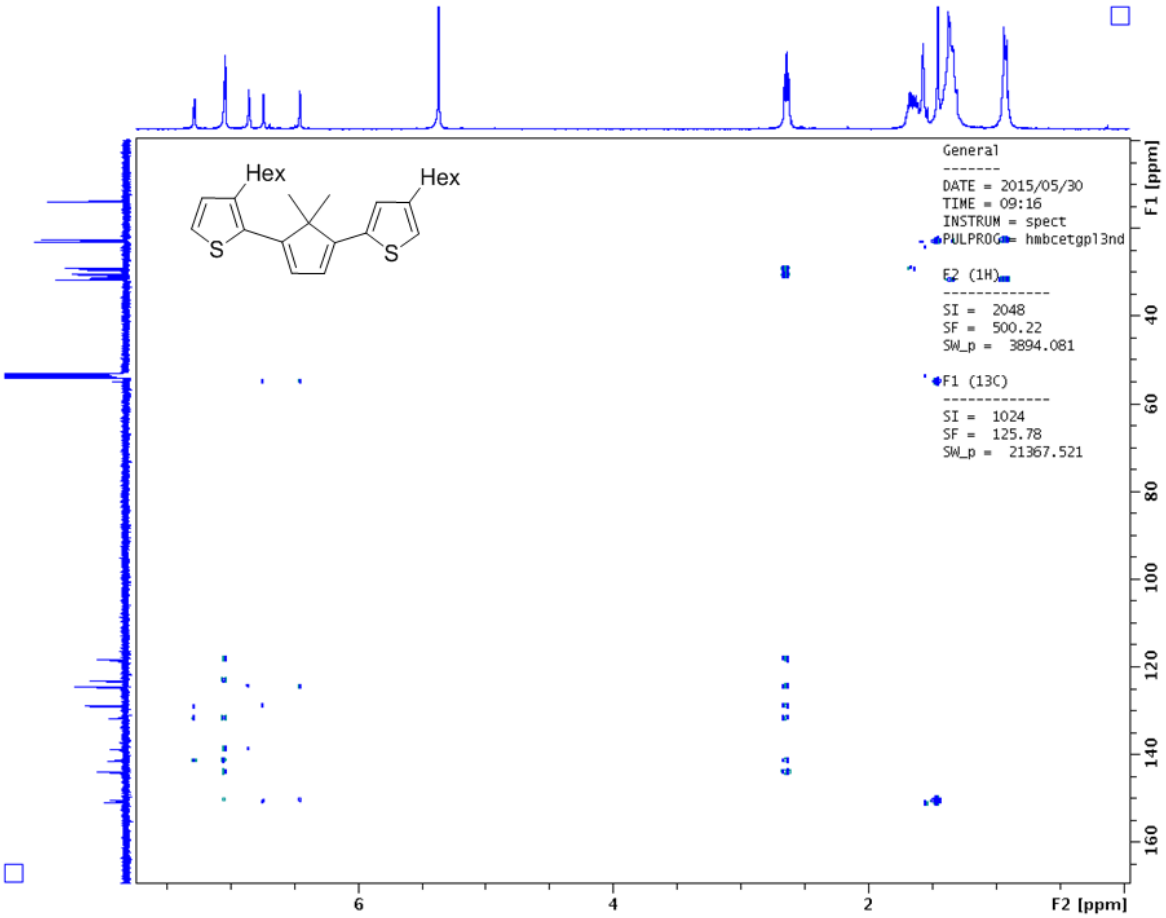

Figure S 34. HMBC spectrum of **4** (500 MHz, CD_2Cl_2).

Device Fabrication and Characterization. Electroluminescence spectra were collected from an ILT950 spectroradiometer (International Light Technologies) and luminance recorded with an ILT 1400-A photometer (International Light Technologies). Luminous intensity for **PFCp** was tested using a device architecture of Glass/ITO/PEDOT/**PFCp**/Alq3/LiF/Al. ITO was cleaned by sonication in water, acetone, and finally isopropyl alcohol before drying in a vacuum oven at 100°C for 30 minutes. Poly(3,4-ethylenedioxythiophene)-poly(styrenesulfonate) (PEDOT:PSS, Clevios^{TM} P) was the spin-coated at 4000 RPM and dried at 100°C for 30 minutes. **PFCp** was then spun from a DCM solution (10 mg/mL) at 2000 RPM. After drying, the device fabrication was completed by thermal evaporation of Alq^{3}, LiF (*ca*. 1 nm) and Al (*ca*. 100 nm) through a shadow mask under vacuum at a base pressure of *ca*. 5x10^{-6} Torr at a rate of 0.05 nm/s. The overlap between ITO and Al electrodes was 3 mm x 3 mm as the active emissive area of the device. The Current-Voltage (IV) characteristics were measured using a Keithley 236 source-measurement unit.