Supplementary Material (ESI) for Polymer Chemistry

Supporting Information for:

Synthesis and Characterization of Polythiophenes with Alkenyl Substituents

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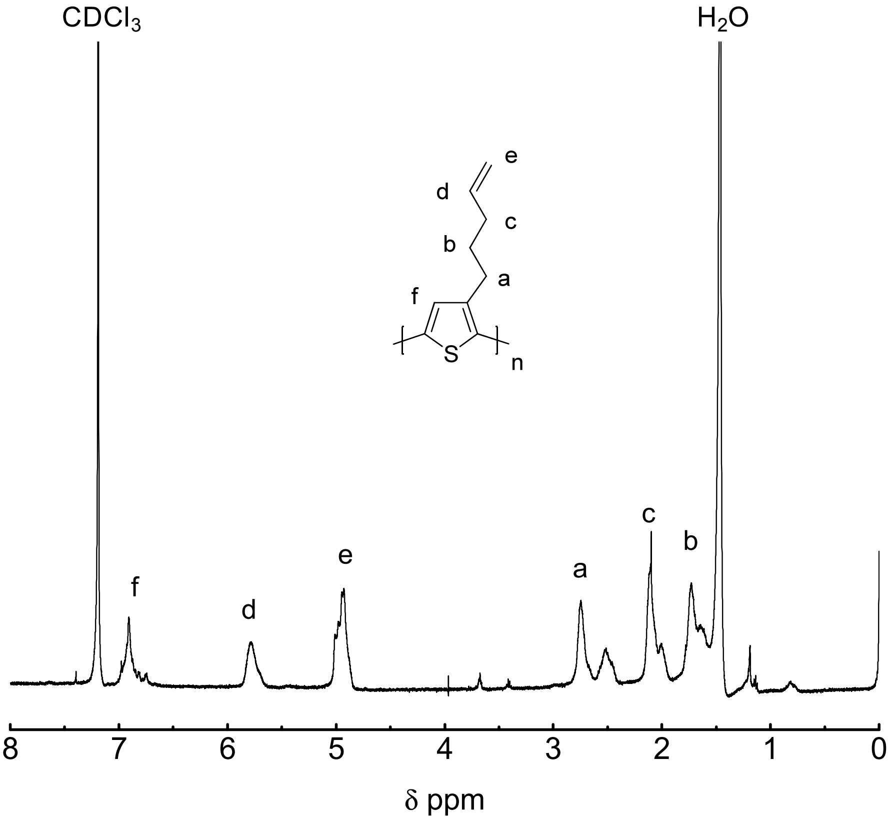

Figure S1. ^{1}H NMR spectrum of poly(3-pentenylthiophene)

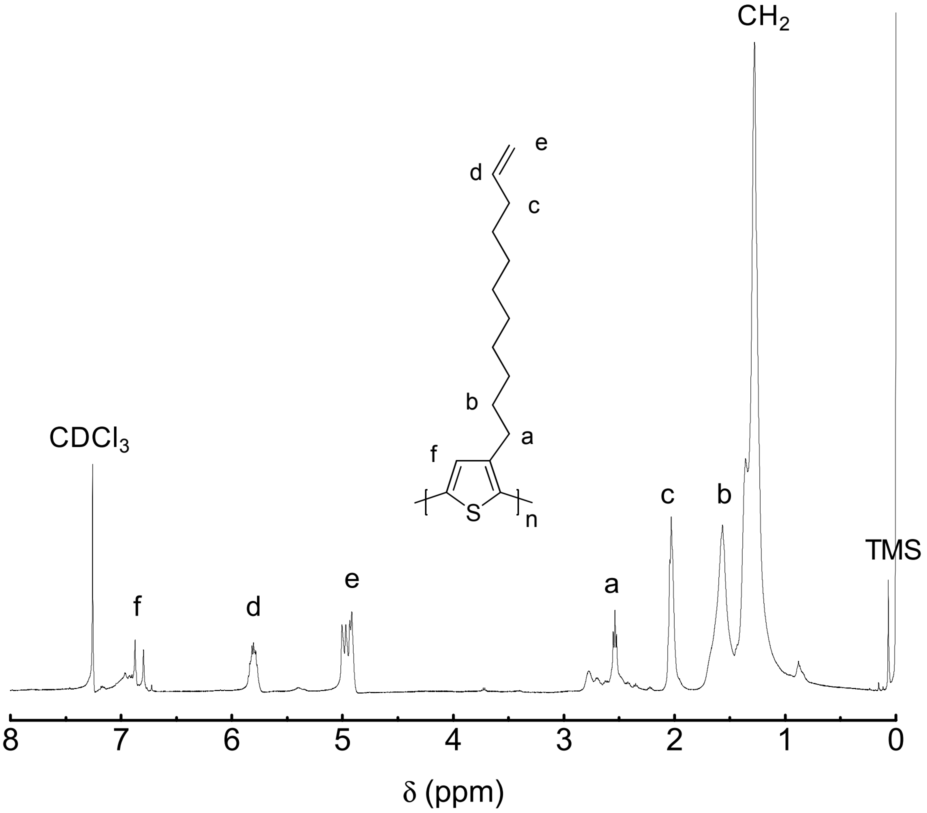

Figure S2. ^{1}H NMR spectrum of poly(3-undecenylthiophene)

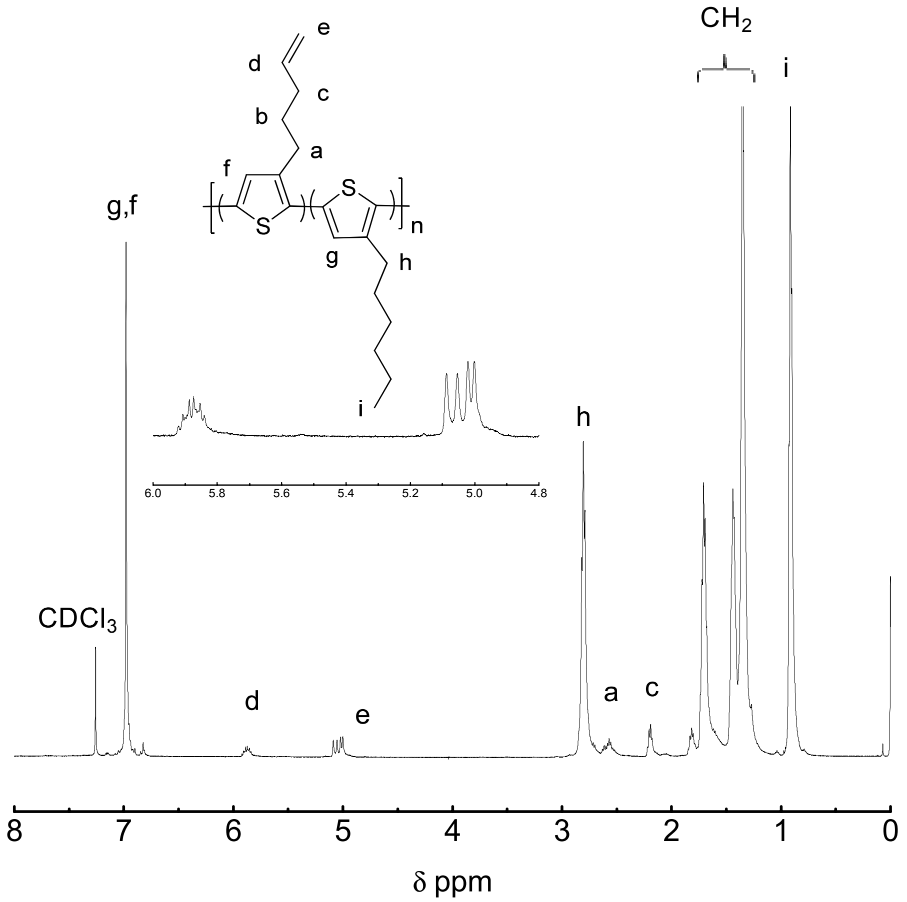

Figure S3. ^{1}H NMR spectrum of poly(3-hexylthiophene-*ran*-3-pentenylthiophene)

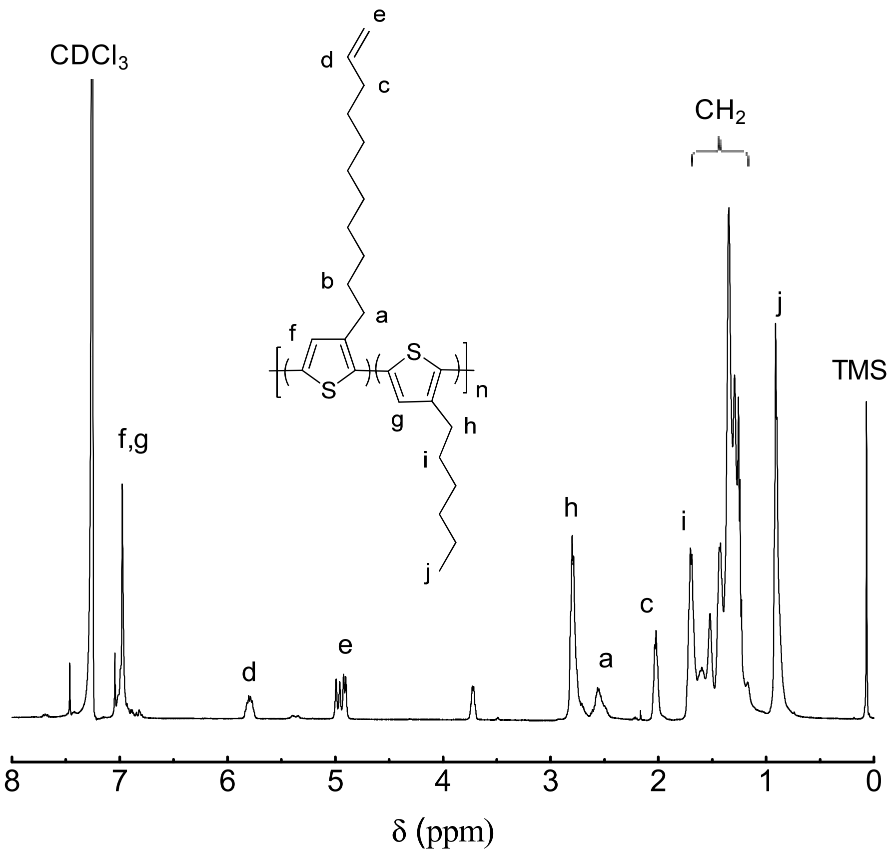

Figure S4. ^{1}H NMR spectrum of poly(3-hexylthiophene-*ran*-3-undecenylthiophene)

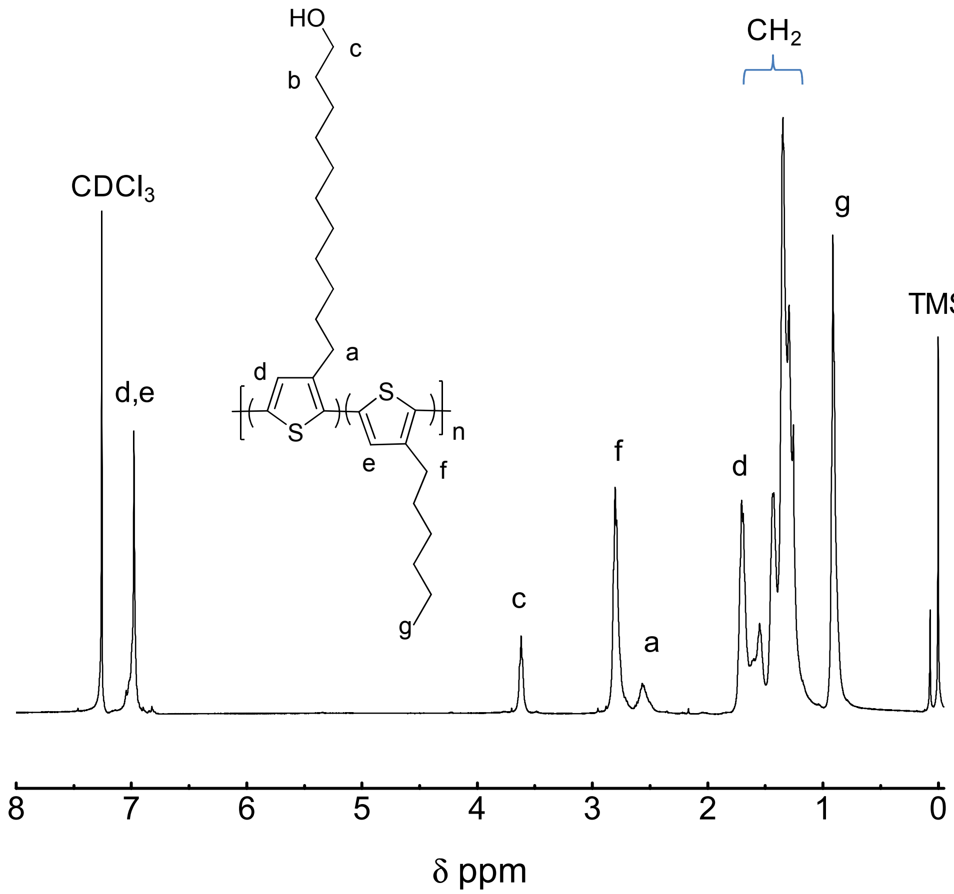

Figure S5. ^{1}H NMR spectrum of poly{3-hexylthiophene-*ran*-3-(11-hydroxyundecylthiophene)}

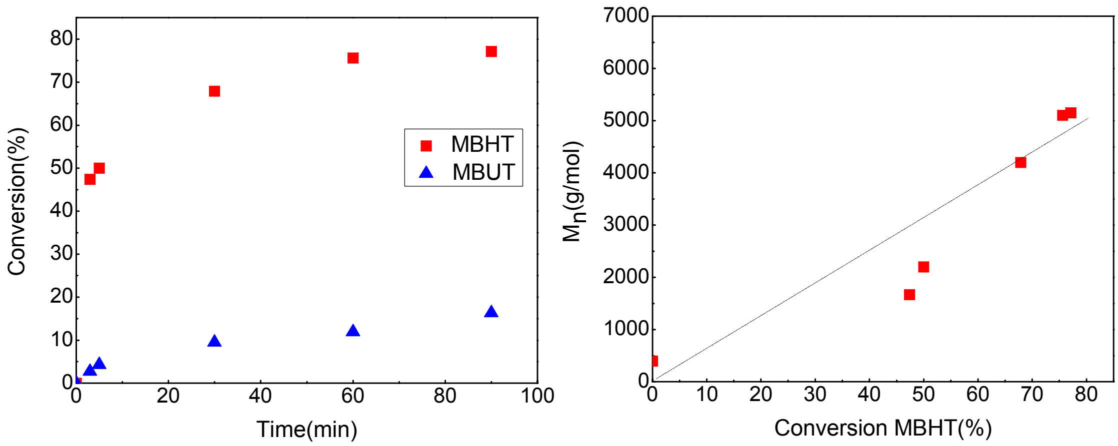

Figure S6. Conversion vs. time plot (left) and molecular weight vs. conversion plot (right) for copolymerization of 3-hexylthiophene and 3-undecenylthiophene. Reaction conditions: [MBHT] : [MBUT] = 2 : 1; [M]0 = 0.2 mol/L; [Ni]0 = 0.002 mol/L

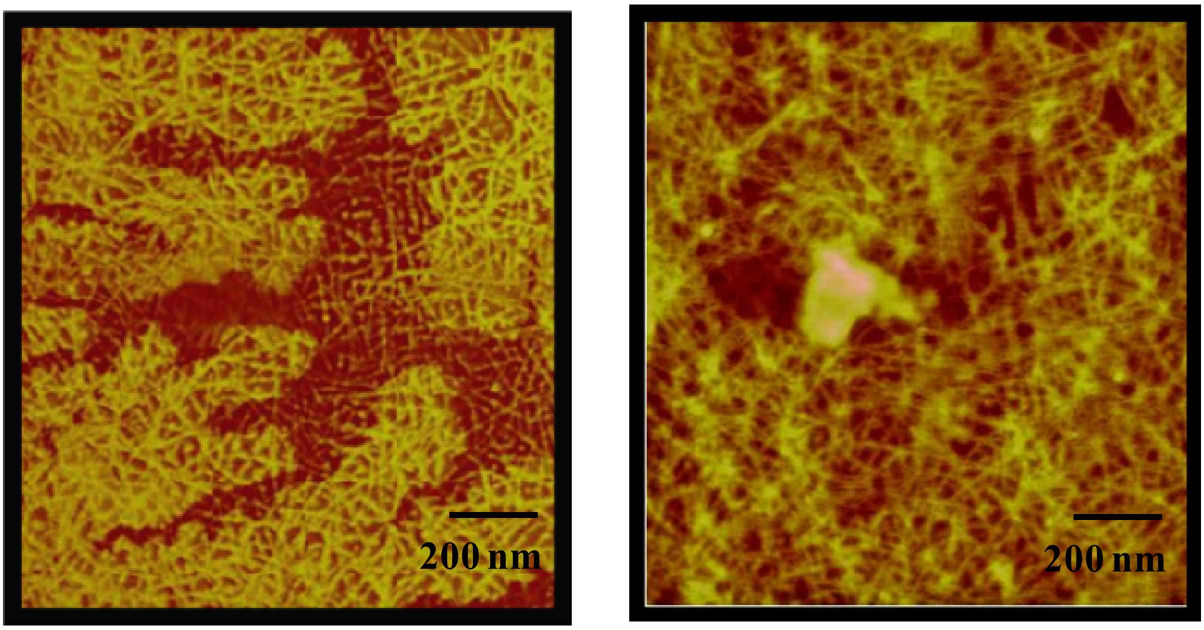

Figure S7. TMAFM phase (left) and height (right) images of poly(3-pentenylthiophene-*ran*-3-hexylthiophene); scan size: 5 x 5 µm.

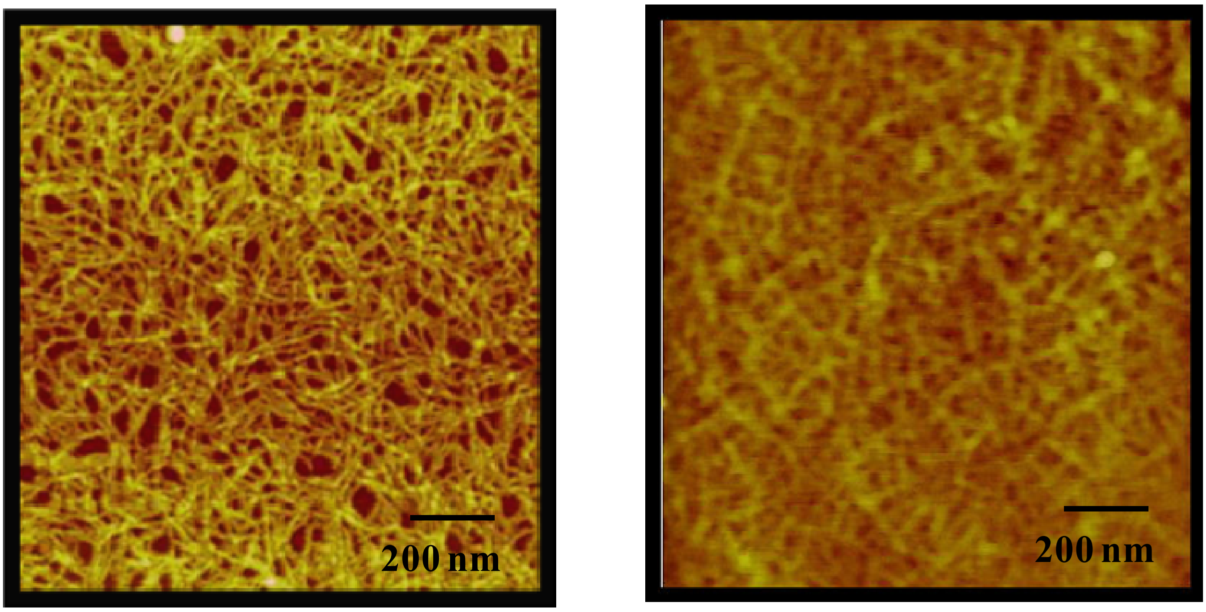

Figure S8. TMAFM phase (left) and height (right) images of poly(3-undecenylthiophene-*ran*-3-hexylthiophene); scan size: 5 x 5 μm.

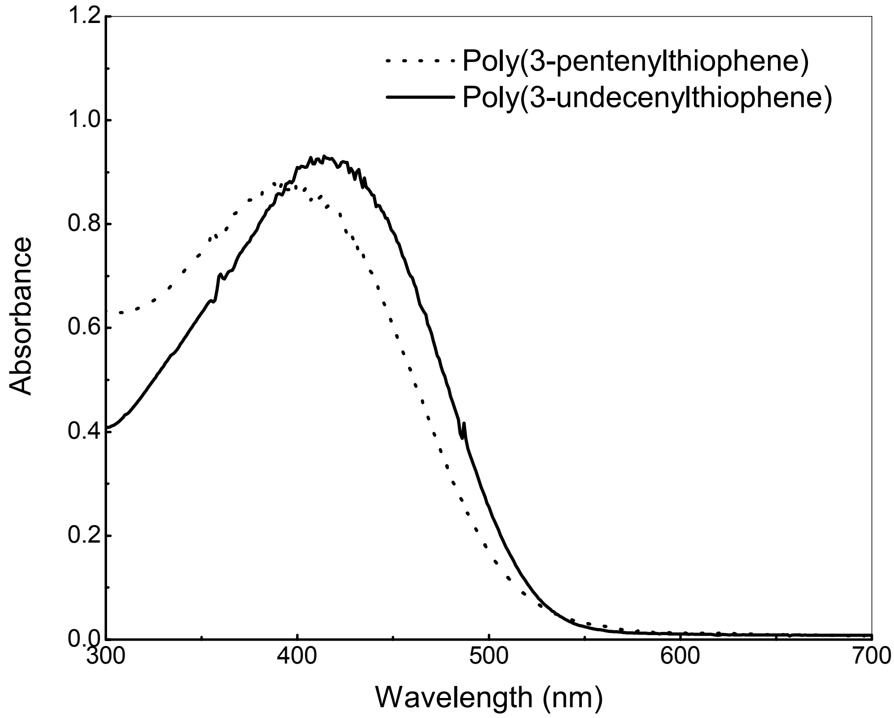

Figure S9. UV-vis spectra of poly(3-pentenylthiophene) and poly(3-undecenylthiophene) in chloroform solution.

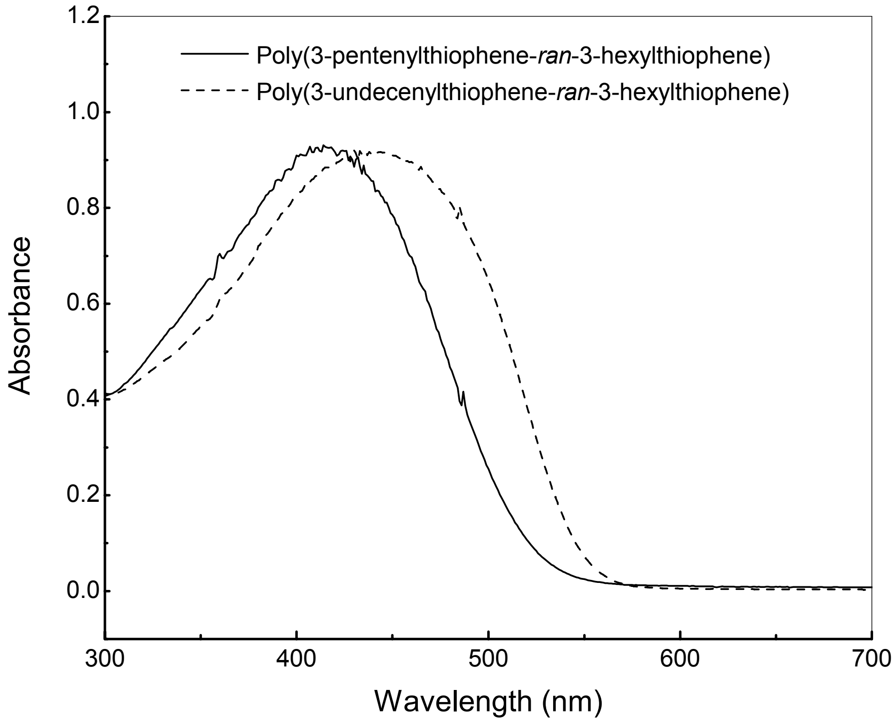

Figure S10. UV-vis spectra of poly(3-pentenylthiophene-*ran*-3-hexylthiophene) and poly(3-undecenylthiophene-*ran*-3-hexylthiophene) in chloroform solution.

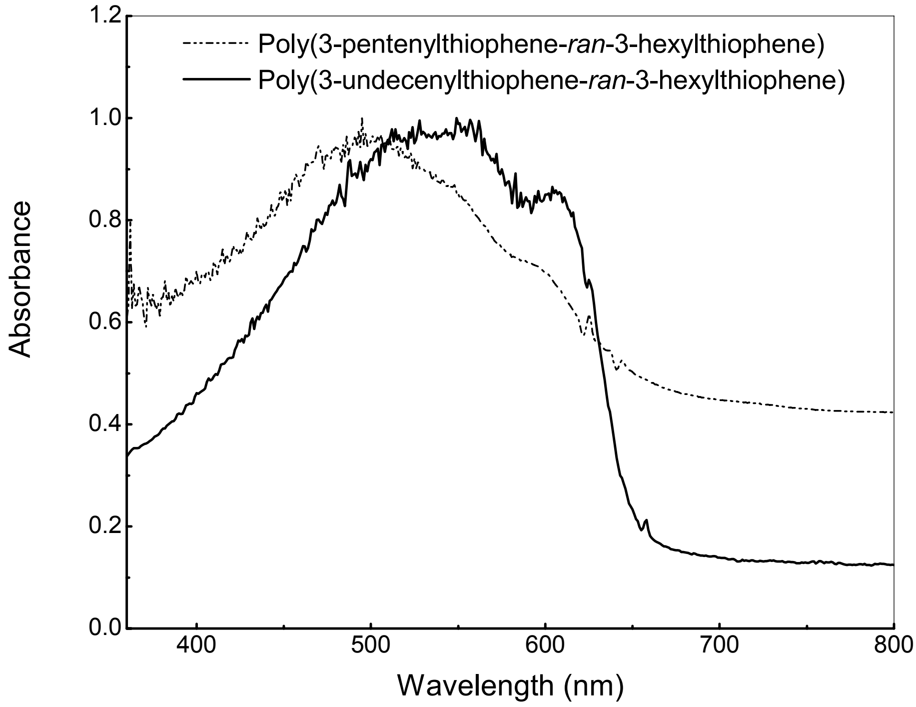

Figure S11. UV-vis spectra of poly(3-undecenylthiophene-*ran*-3-hexylthiophene) and poly(3-undecenylthiophene-*ran*-3-hexylthiophene) in thin films.

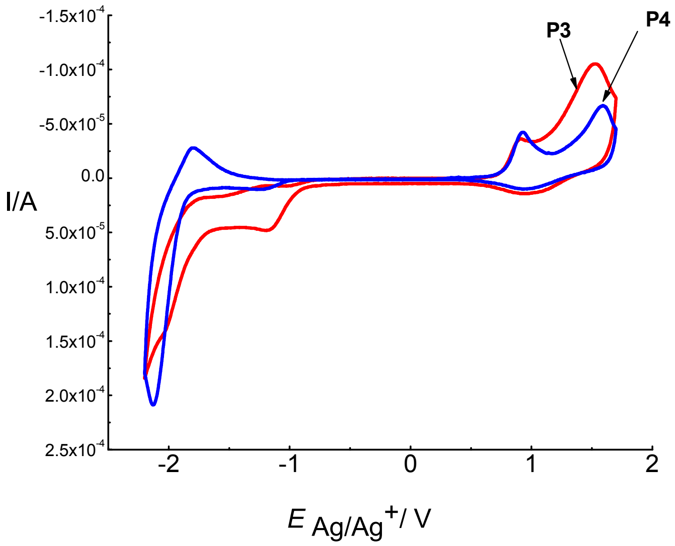

Figure S12. Cyclic voltammograms of poly(3-pentenylthiophene-*ran*-3-hexylthiophene) (blue) and poly(3-undecenylthiophene-*ran*-3-hexylthiophene) (red)

Evaluation of HOMO and LUMO energy levels was obtained by using the following equations:

$$\text{HOMO (eV)} = -e\,(E_{ox} + 4.71)\ \text{(eV)}$$

$$\text{LUMO (eV)} = -e\,(E_{red} + 4.71)\ \text{(eV)}$$

Where Eox and Ered are the measured potentials relative to $Ag/AgCl^{+}$.

Power conversion efficiency (η_p) was calculated from the equation shown below, where η_p is the ratio of maximum electrical power delivered to the incident light power (P_0), J_{SC} is the short circuit current density, V_{OC} is the open circuit voltage and FF is the fill factor of the diode properties of the solar cell respectively.

$$\eta_p = \frac{J_{SC} V_{OC} FF}{P_0}$$

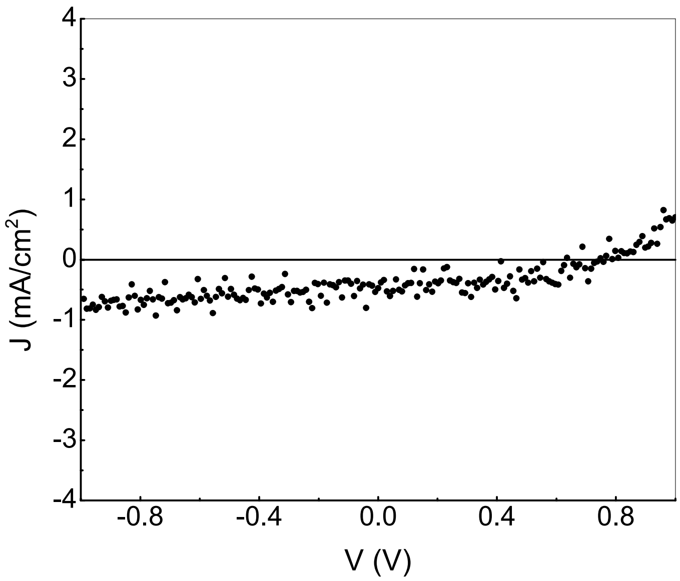

Figure S13. *I-V* plot of the polymer solar cell with poly(3-hexylthiophene-*ran*-3-pentenylthiophene) donor and CdSe acceptor (weight ratio [P3] : [CdSe] = 1 :5)

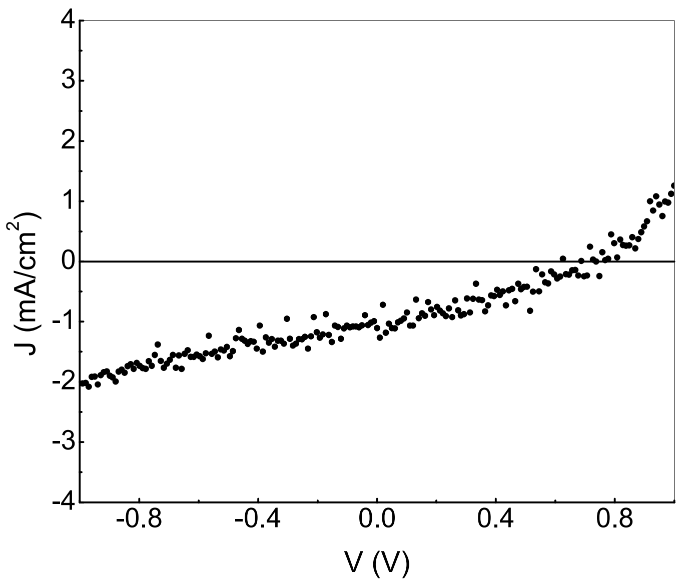

Figure S14. *I-V* plot of the polymer solar cell with poly(3-hexylthiophene-*ran*-3-undecenylthiophene) donor and CdSe acceptor (weight ratio [P4] : [CdSe] = 1 :5)