

Radical ion pair mediated triplet formation in polymer–fullerene blend films

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Experimental

Materials

The synthetic details for both polymers have been previously published.¹ Polymer films were fabricated under N₂ atmosphere by spin-coating a chlorobenzene solution (~ 10 mg mL⁻¹) on glass substrates, which were preliminarily cleaned by sonication for 15 min in toluene, acetone, and ethanol, respectively. The weight concentration of PCBM in the polymer blend films was fixed at 5 wt%, thereby minimising any effect of PCBM addition upon film morphology.

Measurements

Absorption and photoluminescence spectra were measured with a spectrophotometer (Shimadzu, UV-1601) and a spectrofluorimeter (Horiba Jobin Yvon, Spex Fluoromax 1), respectively. Transient absorption data were collected with a microsecond transient absorption system under Ar atmosphere as details previously.² Thermal properties of the polymers were obtained with a differential scanning calorimeter (TA Instruments, Q1000). Heating and cooling rates were 10 °C min⁻¹, where heating data for the second scan were used. Ionisation potentials of the polymer films were determined by an ambient photoelectron spectroscopy with a spectrometer (Riken-Keiki, AC-2).³

Thermal Properties

As shown in Figure S1, no distinct peak was observed for P(T₈T₈T₀) samples over the wide temperature range from 0 to 250 °C, indicating that P(T₈T₈T₀) is amorphous. On the other hand, a small endothermic peak was observed around 130 °C for P(T₁₂NpT₁₂) samples with increasing temperature, which is assigned to the melting temperature of the polymer. The crystallisation enthalpy of P(T₁₂NpT₁₂) was evaluated to be 5 J g⁻¹ from the exothermic DSC curve. This value was much smaller than that of regioregular P3HT (20 J g⁻¹).¹ These DSC data are well consistent with spectroscopic characteristics showing that two polythiophenes used in this study form a more amorphous film compared with P3HT.

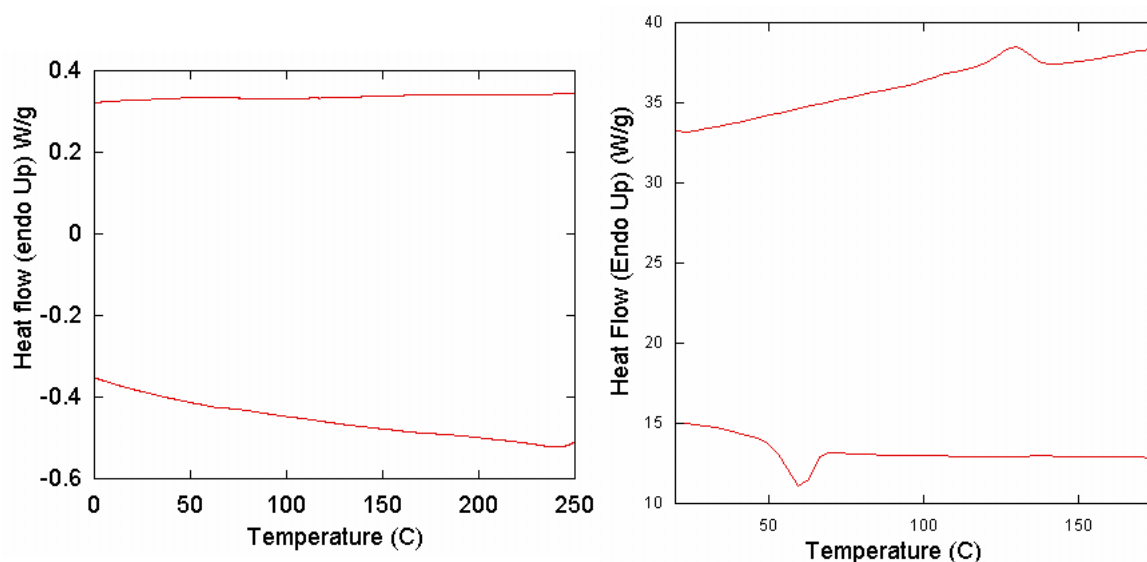


Figure S1. DSC curves (the second run) at a heating and cooling rate of 10 °C min⁻¹: Left) P(T₈T₈T₀), right) P(T₁₂NpT₁₂).

References

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