Supporting Information

Study of Chains Condensed Process from Dilute to Concentrated Solution and Chains Conformation's Transformation from Solution to Film for the Conjugated Polymer PFO

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APPENDIX:

1.1 *Calculation of the Kuhn length* (*b*) *and Kuhn segments* (*N*)

Firstly, $R_{\max}$ is the contour length of the PFO chain, R is the Kuhn chain length. According to the previous report, the length of the monomer unit was $l = 0.838$ nm to the PFO chain, molar mass of the monomer was M_0 = 390 g mol^{-1}**.** Therefore, $R_{\max}$ can be calculated as follow: $R_{\max} = \frac{M}{M_0} \times \mathrm{l} = \frac{127192\ \mathrm{g\ mol}^{-1}}{390\ \mathrm{g\ mol}^{-1}} \times 0.838\ \mathrm{nm} = 273\ \mathrm{nm}.$

Then, according to the equation (9) in the main text, the Kuhn segments (*N*) can be calculated as follow: $N = \frac{{R_{\max}}^2}{R^2} = \frac{273^2}{41.4^2} = 44.$

Finally, according to the equation (10) in the main text, the Kuhn length (*b*) can be calculated as follow: $\mathrm{b} = \frac{R^2}{R_{\max}} = \frac{41.4^2}{273} = 6.28\ \mathrm{nm}$

1.2 *Calculation of the Kuhn unit relaxation time* (τ_0) *and Polymer chain relaxation time* ($\tau_Z(\tau_R)$)

Firstly, $\tau_0 \approx \eta_s b^3 / kT$ is Kuhn unit relaxation time, $k = 1.38 \times 10^{-23}$ J K^{-1} is the Boltzmann constant，T =298.15 K is the temperature. In addition, $\eta_s = 4.31 \times 10^{-4}$ (pa·s) is obtained from Figure 1 and b = 6.14 nm is obtained from equation (10) in the main text. Based on the above information, the Kuhn unit relaxation time (τ_0) is calculated as follows:

$$\tau_0 = \frac{(4.31 \times 10^{-4}\ \mathrm{pa \cdot s}) \times (6.28\ \mathrm{nm})^3}{(1.38 \times 10^{-23}\ \mathrm{J \cdot K^{-1}}) \times (298.15\ \mathrm{K})} = \frac{(4.31 \times 10^{-4}\ \mathrm{kg \cdot m^{-1} \cdot s^{-1}}) \times (6.28 \times 10^{-9}\ \mathrm{m})^3}{(1.38 \times 10^{-23}\ \mathrm{kg \cdot m^2 \cdot s^{-2} \cdot K^{-1}}) \times (298.15\ \mathrm{K})}$$

$$= \frac{(4.31 \times 10^{-4}) \times (6.28 \times 10^{-9})^3}{(1.38 \times 10^{-23}) \times (298.15)}\ \mathrm{s} = 2.59 \times 10^{-8}\ \mathrm{s}$$

Secondly, according to the equation (1):

$$\tau_Z \approx \frac{R^2}{D_z} \approx \frac{\eta_s}{kT} R^3 = \frac{\eta_s b^3}{kT} N^{3\nu} \approx \tau_0 N^{3\nu} \qquad (1)$$

Here, τ_0 = 2.43×10^{-8} s, toluene is the θ solvent of PFO at 25 °C, so, $\nu = 0.5$ can be obtained, and N = 45 is obtained from equation (9) in the main text. Thus, the polymer chain relaxation time (τ_Z) in the Dilute solution is calculated as follows:

$$\tau_Z = (2.59 \times 10^{-8}\ \mathrm{s}) \times (44)^{3 \times 0.5} = 7.56 \times 10^{-6}\ \mathrm{s}$$

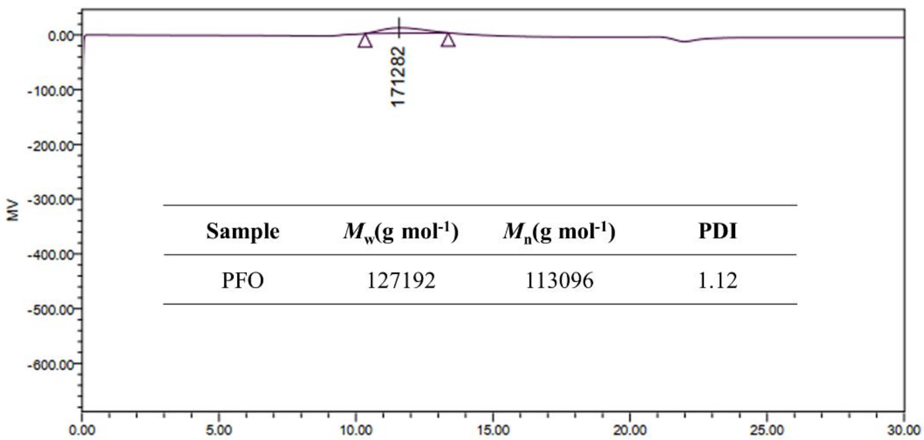
Finally, according to the equation (2):

$$\tau_R \approx \frac{R^2}{D_{\mathrm{R}}} \approx \frac{\zeta}{kT} N R^2 \approx \frac{\eta_s b^3}{kT} N^{1+2\nu} \approx \tau_0 N^{1+2\nu} \qquad (2)$$

Thus, the polymer chain relaxation time (τ_Z) in the Dilute solution is calculated as follows:

$$\tau_R = (2.59 \times 10^{-8}\ \mathrm{s}) \times (44)^{1 + 2 \times 0.5} = 5.01 \times 10^{-5}\ \mathrm{s}$$

1.3 *GPC experiments*



Sample	M_w(g mol^{-1})	M_n(g mol^{-1})	PDI
PFO	127192	113096	1.12

Figure S1. Gel permeation chromatography (GPC) curve, the weight-average molecular weight (M_w), number-average molecular weight (M_n) and the polydispersity index (PDI) of PFO were shown.

1.4 *LS experiments*

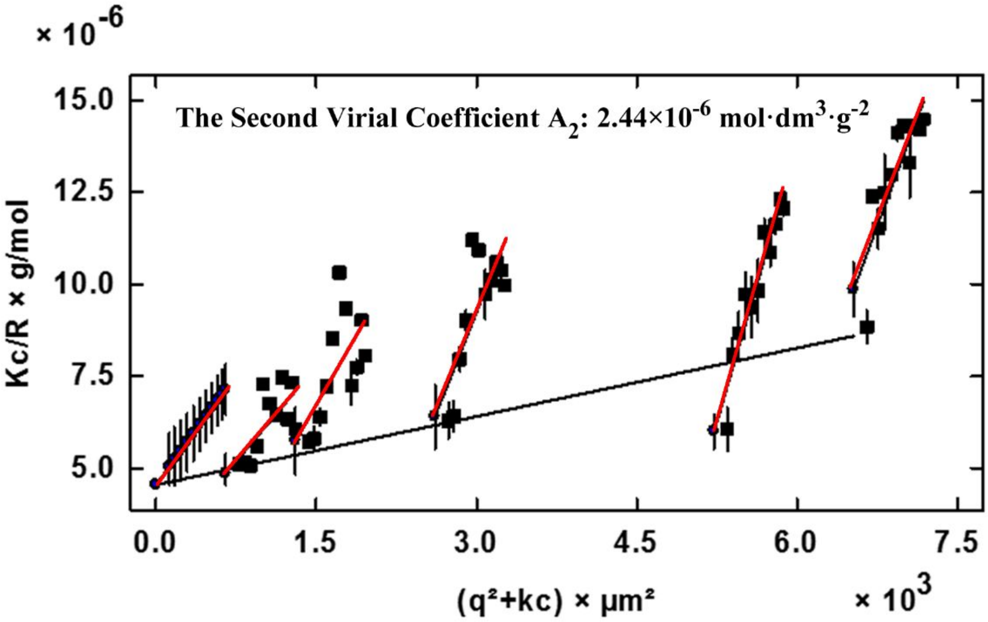


Figure S2 Zimm plots of PFO/toluene dilute solutions at 25 °C.