Supplementary Information

Novel thermally self-crosslinkable diarylfluorene-based copolymers for efficient and stable blue light-emitting diodes

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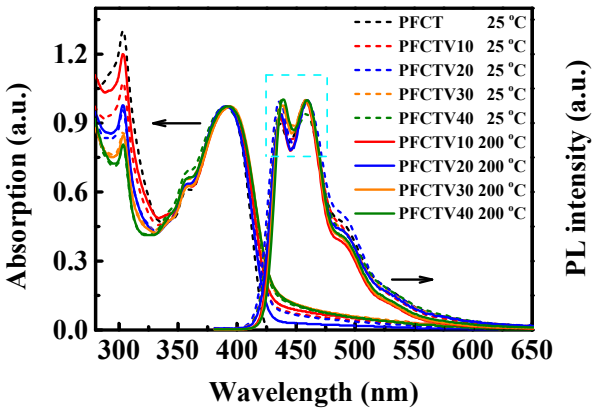

Fig. S1 UV-vis absorption and PL spectra of PFCT and PFCTV10−40 films.

Table S1. Optical properties and energy levels of PFCT and PFCTV10−40 with and without thermal crosslinking.

Polymers	$\lambda^{a}_{Abs,\ max}$ (nm)	$\lambda^{b}_{Abs,\ max}$ (nm)	$\lambda^{a}_{PL,\ max}$ (nm)	$\lambda^{b}_{PL,\ max}$ (nm)	E^{a}_{g}/E^{b}_{g} (eV)	E_{ox} (eV)	$E^{a}_{HOMO}/E^{b}_{HOMO}/E^{c}_{HOMO}$	$E^{a}_{LUMO}/E^{b}_{LUMO}/E^{c}_{LUMO}$
PFCT	303.5 391.0	303.5 391.0	435 457	435 457	2.98/2.98	0.99	-5.39/-5.81/-	-2.41/-2.83/-
PFCTV10	303.5 391.5	303.5 391.5	436 458	436 457	2.96/2.96	0.97	-5.37/-5.77/-5.75	-2.41/-2.81/-2.79
PFCTV20	303.5 391.5	303.5 390.5	436 459	436 457	2.95/2.96	0.95	-5.35/-5.78/-5.69	-2.40/-2.83/-2.73
PFCTV30	303.5 391.5	303.5 391.0	436 459	436 457	2.93/2.94	0.94	-5.34/-5.79/-5.77	-2.41/-2.86/-2.83
PFCTV40	303.5 391.5	303.5 390.0	439 459	438 458	2.93/2.94	0.96	-5.36/-5.83/-5.81	-2.43/-2.90/-2.87

$\lambda^{a}_{Abs,\ max}$, $\lambda^{a}_{PL,\ max}$, $\lambda^{b}_{Abs,\ max}$ and $\lambda^{b}_{PL,\ max}$ are the main absorption and *PL* peaks of the films without/with annealing at 200 °C, respectively;

E^{a}_{g} and E^{b}_{g} are the optical band gaps determined by the cut off of absorption spectra of the films without/with annealing at 200 °C, respectively;

E_{HOMO}^{a} is calculated from the oxidation potentials E_{ox} from the *CV* curves with the equation of $E_{HOMO}^{a} = -(E_{ox} + 4.4)$ eV and $E_{LUMO}^{a} = E_{HOMO}^{a} + E_{g}^{a}$;

E_{HOMO}^{b} and E_{HOMO}^{c} are calculated from secondary electrons cut-off edge and valence-band maximum of UPS of the un-crosslinked and crosslinked films, respectively; $E_{LUMO}^{b} = E_{HOMO}^{b} + E_{g}^{b}$ and $E_{LUMO}^{c} = E_{HOMO}^{c} + E_{g}^{b}$.

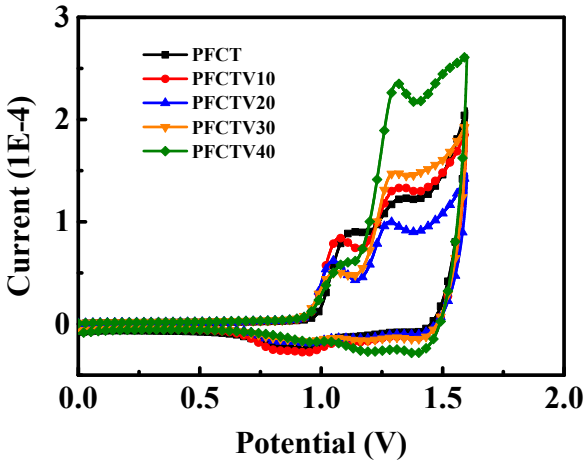

Fig. S2 *CV* characteristics of PFCT and PFCTV10−40 polymers.

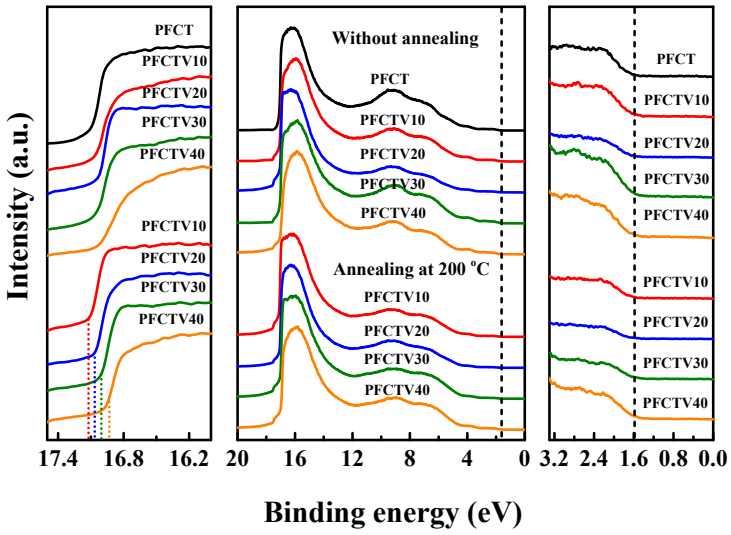

Fig. S3 UPS spectra of PFCT and PFCTV10−40 films.

Table S2. Detailed parameters of PFCT and PFCTV20 devices at the current density of around 35 mA/cm^2.

Device	Condition	Voltage (V)	*J* (mA/cm^2)	*L* (cd/m^2)	*LE* (cd/A)	*EQE* (%)
PFCT	25 °C	6	38.11	959.61	2.52	3.15
PFCTV20	25 °C	7.2	30.64	292.51	0.95	1.19
PFCTV20	200 °C-10min	5.2	38.15	1309.95	3.43	4.29

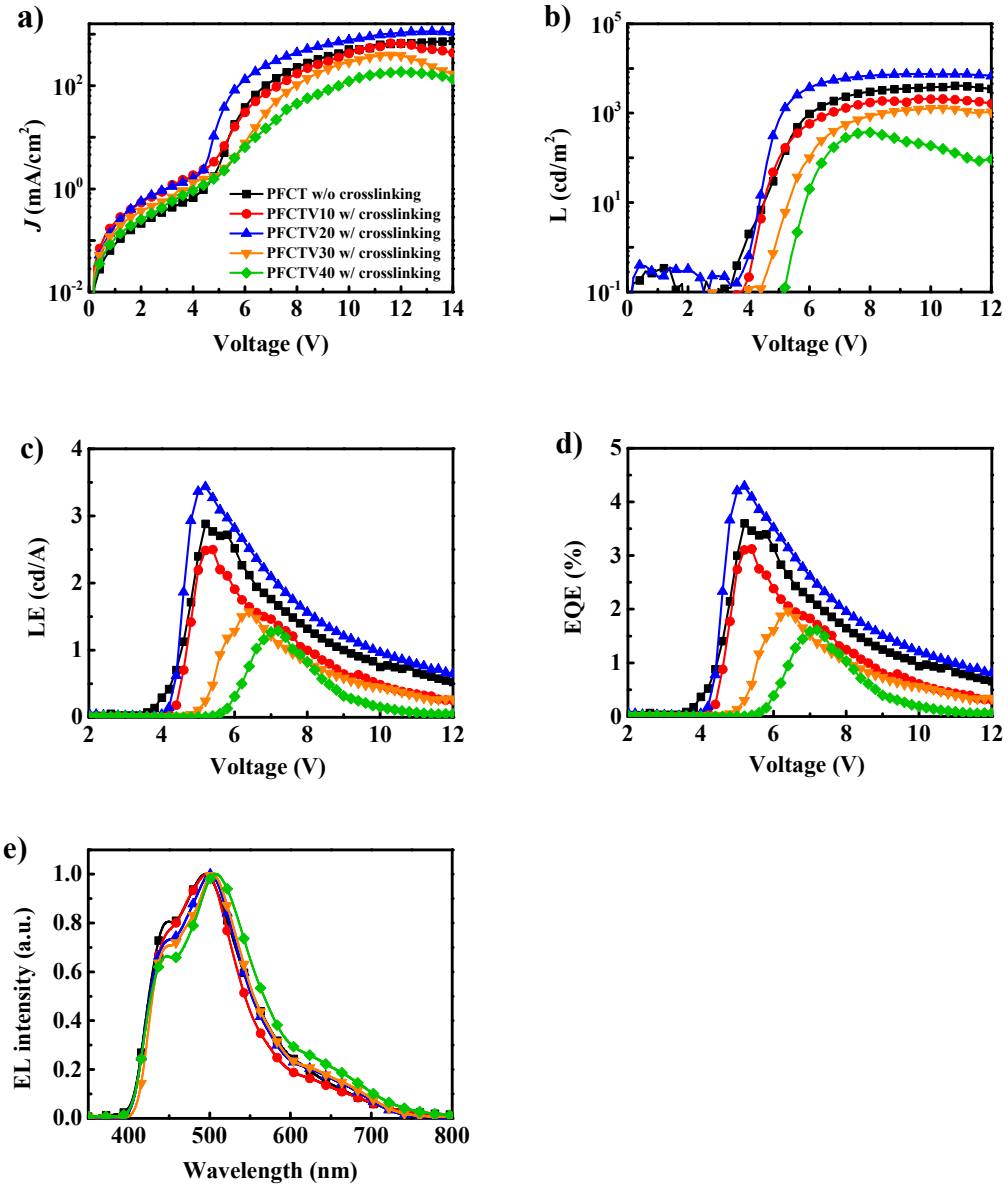

Fig. S4 *J*−*V*, *L*−*V*, *LE*−*V*, *EQE*−*V* characteristics and *EL* spectra of PFCT and PFCTV10−40 devices with thermal crosslinking at 200 °C.

Table S3. Detailed parameters of the PFCTV10−40 devices at the maximum *LE* and *EQE* under different crosslinking temperatures.

Device	T (°C)	V_{on} (V)	*Voltage* (V)	*J* (mA/cm^2)	*L* (cd/m^2)	*LE* (cd/A)	*EQE* (%)
PFCT	25	3.9	5.2	5.05	145.7	2.88	3.60
PFCTV10	25	4.9	6.8	6.76	86.5	1.28	1.60
	150	4.8	6.4	22.20	369.2	1.66	2.08
	200	4.3	5.4	10.31	257.7	2.50	3.12
	230	4.8	6	34.02	606.1	1.78	2.23
PFCTV20	25	5.4	6.2	2.58	56.2	2.17	2.72
	150	5.0	6.2	8.03	187.5	2.33	2.92
	200	4.3	5.2	38.15	1309.9	3.43	4.29
	230	4.6	6.8	144.55	2321.8	1.61	2.01
PFCTV30	25	5.6	8	31.70	324.4	1.02	1.28
	150	5.3	7.2	10.23	139.1	1.36	1.70
	200	4.9	6.4	15.45	243.1	1.57	1.97
	230	5.1	7	19.62	204.8	1.04	1.30
PFCTV40	25	5.7	9.4	879.31	3514.1	0.93	1.17
	150	5.5	7.2	21.93	282.9	1.29	1.61
	200	5.6	8	89.33	1010.8	1.13	1.41

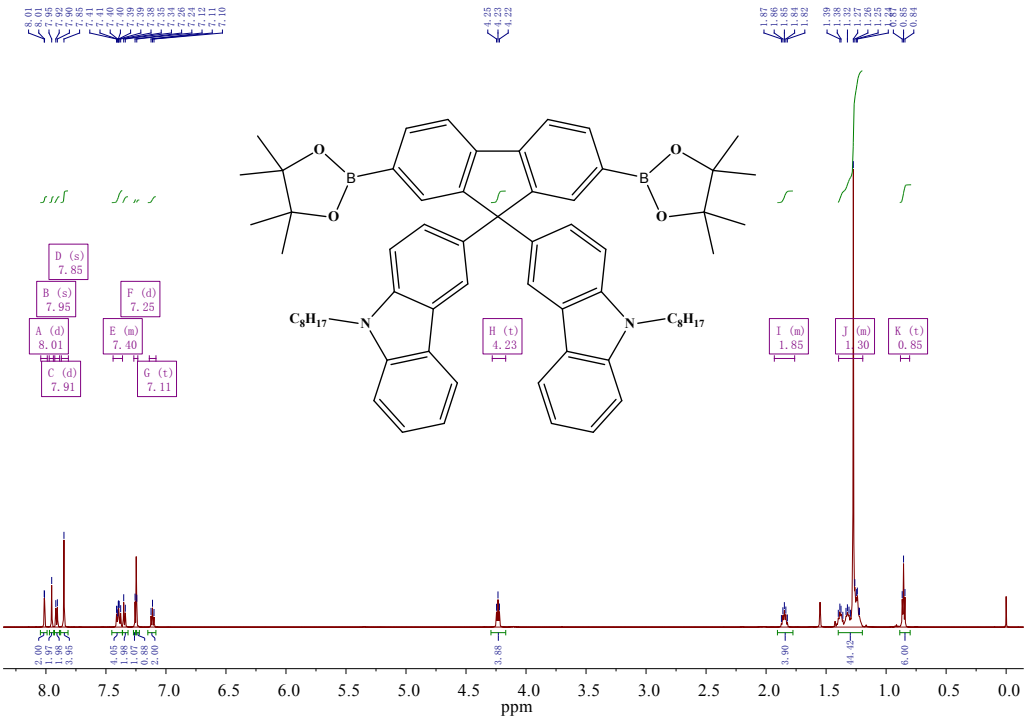

Fig. S5 ^{1}H-NMR of M1.

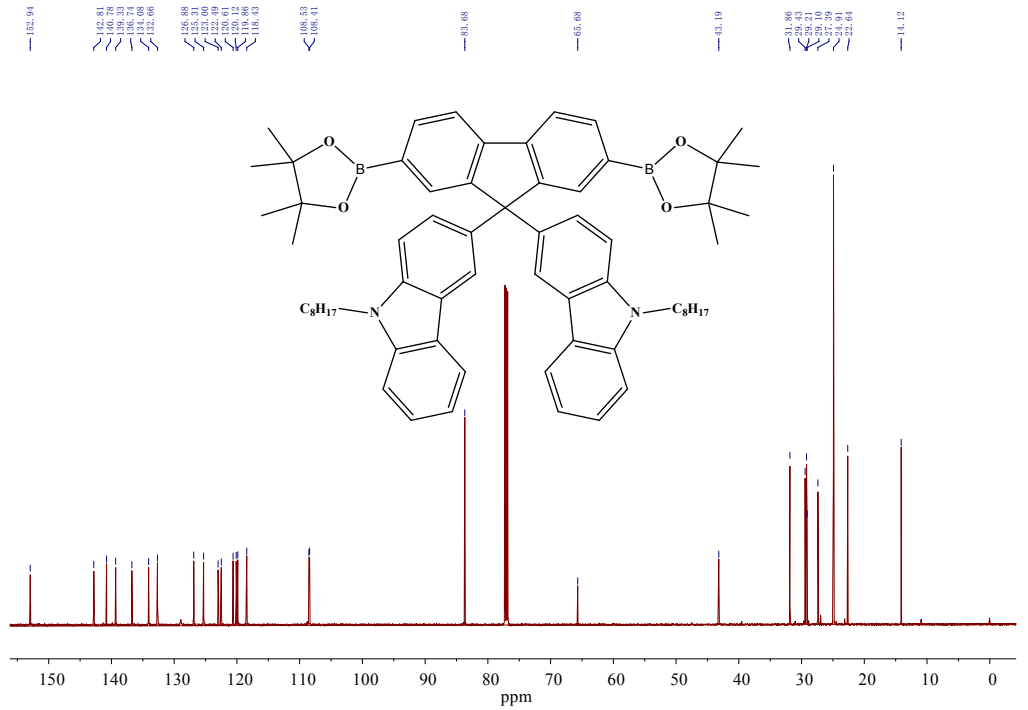

Fig. S6 ^{13}C-NMR of M1.

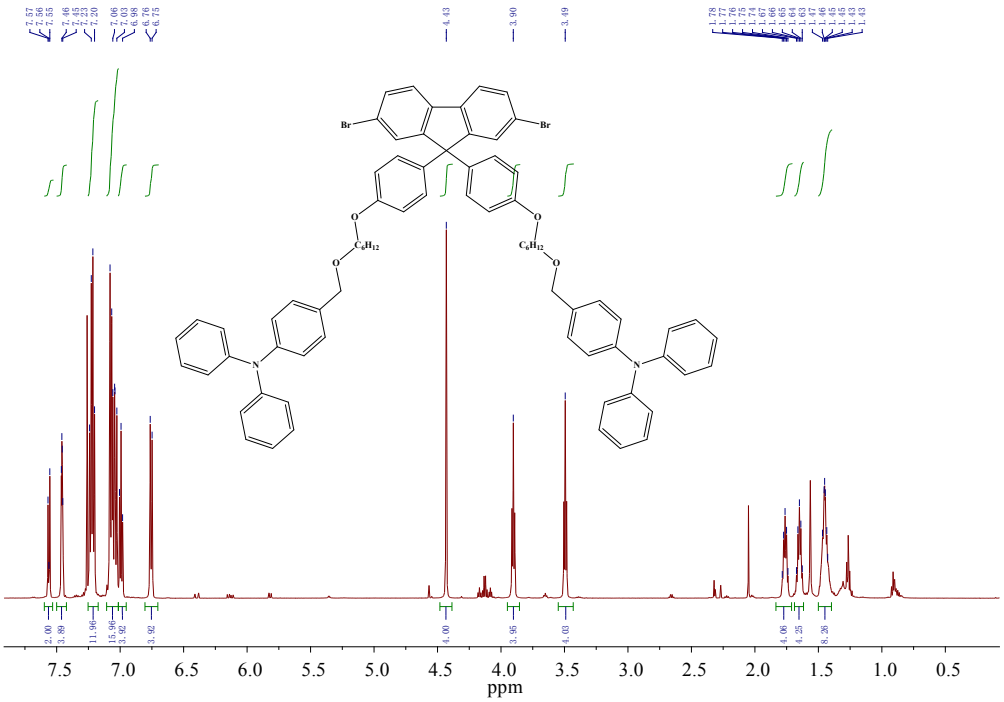

Fig. S7 ^{1}H-NMR of M2.

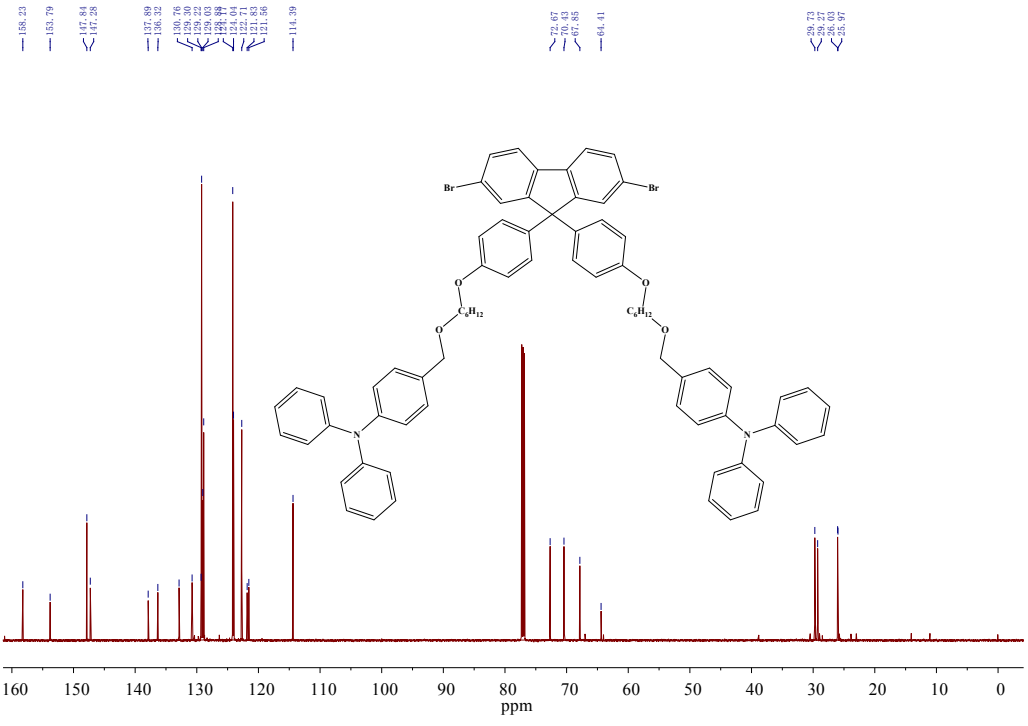

Fig. S8 ^{13}C-NMR of M2.

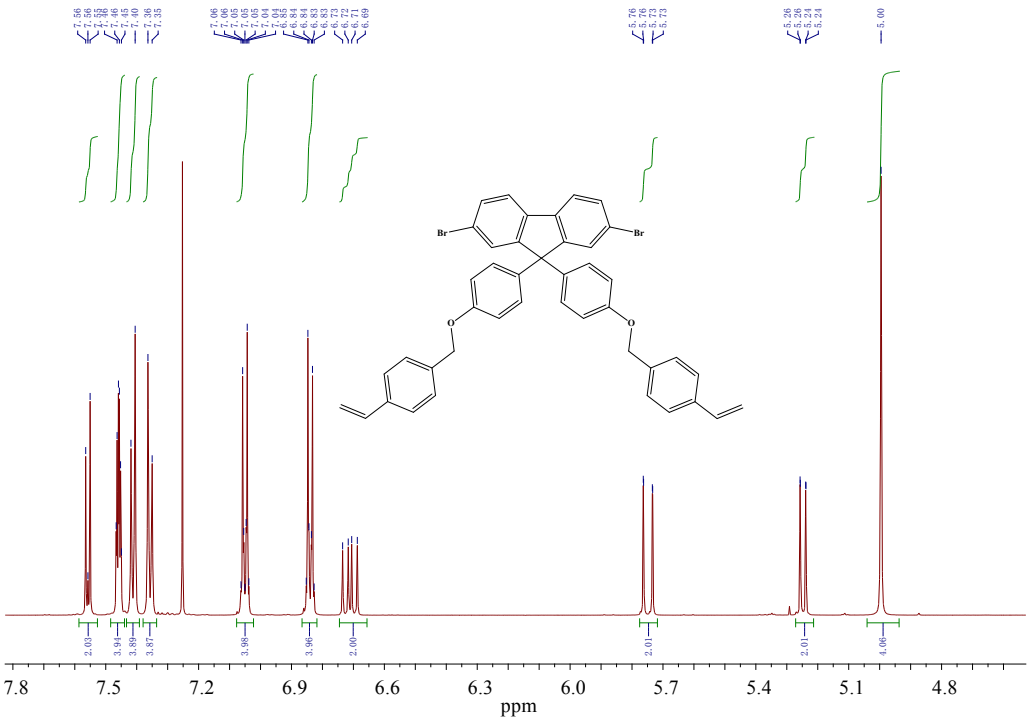

Fig. S9 ^{1}H-NMR of M3.

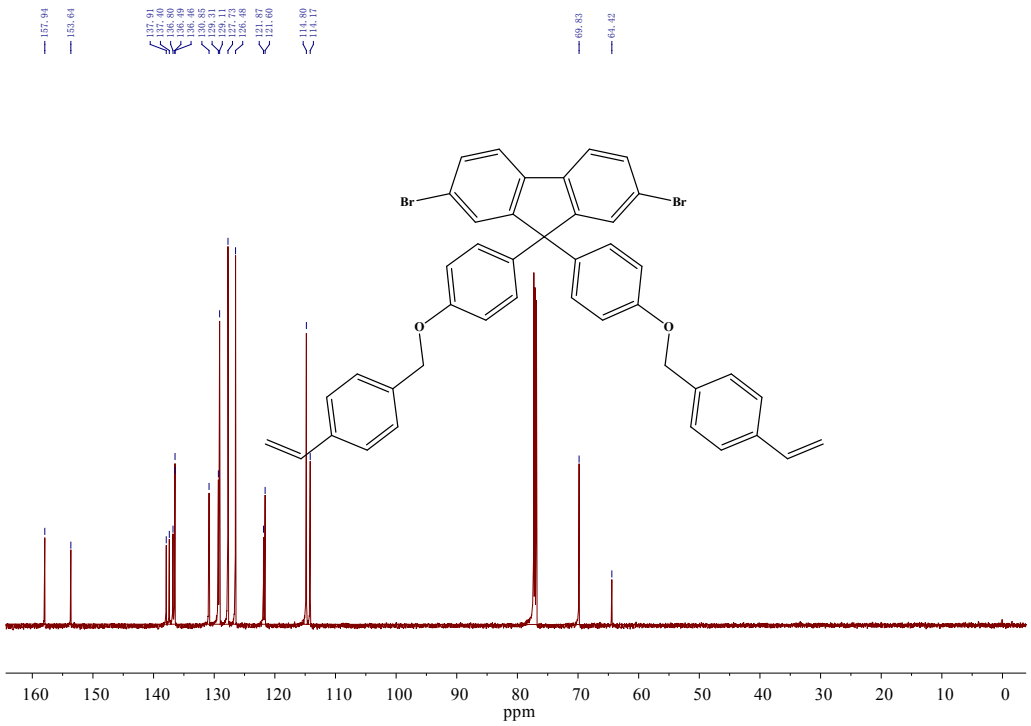

Fig. S10 ^{13}C-NMR of M3.

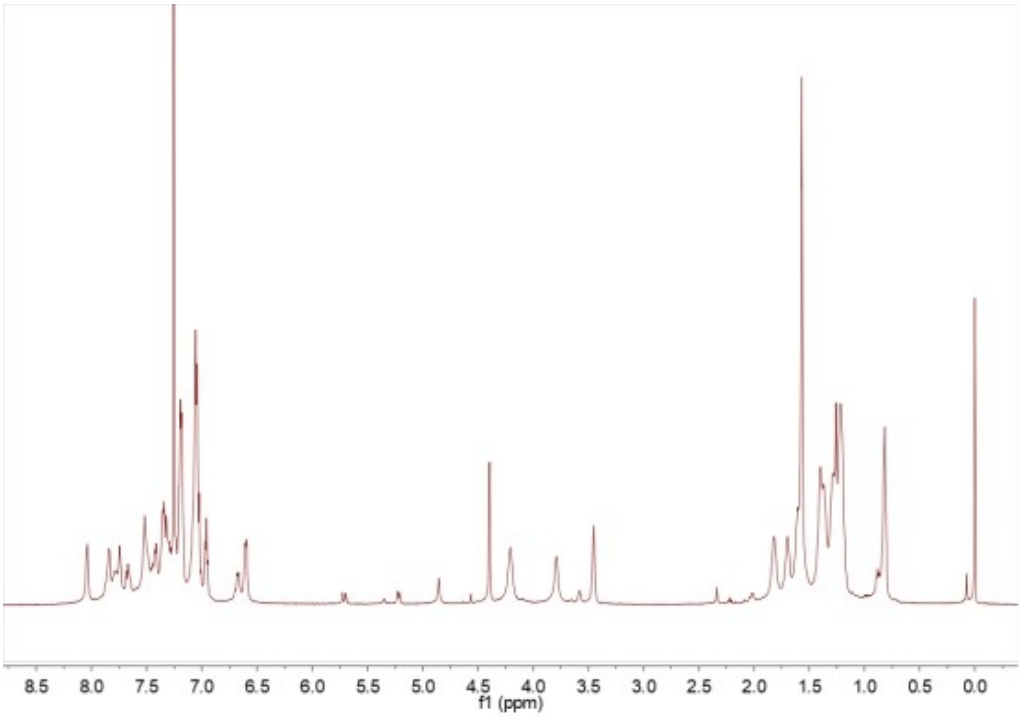

Fig. S11 ^{1}H-NMR of PFCTV10.

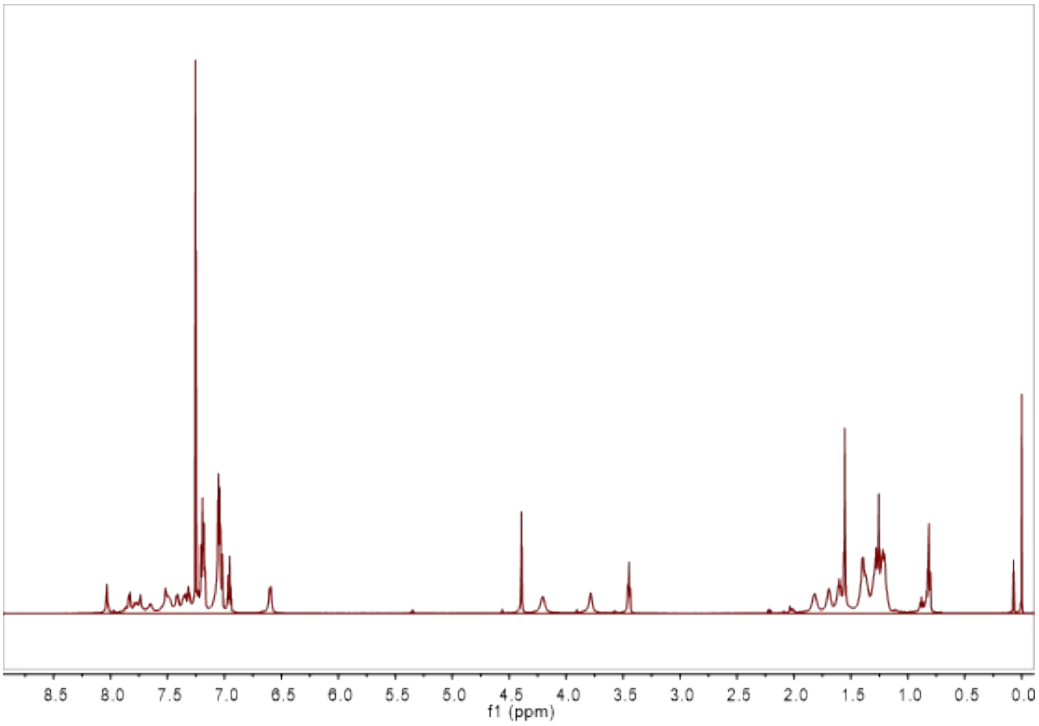

Fig. S12 ^{1}H-NMR of PFCT.

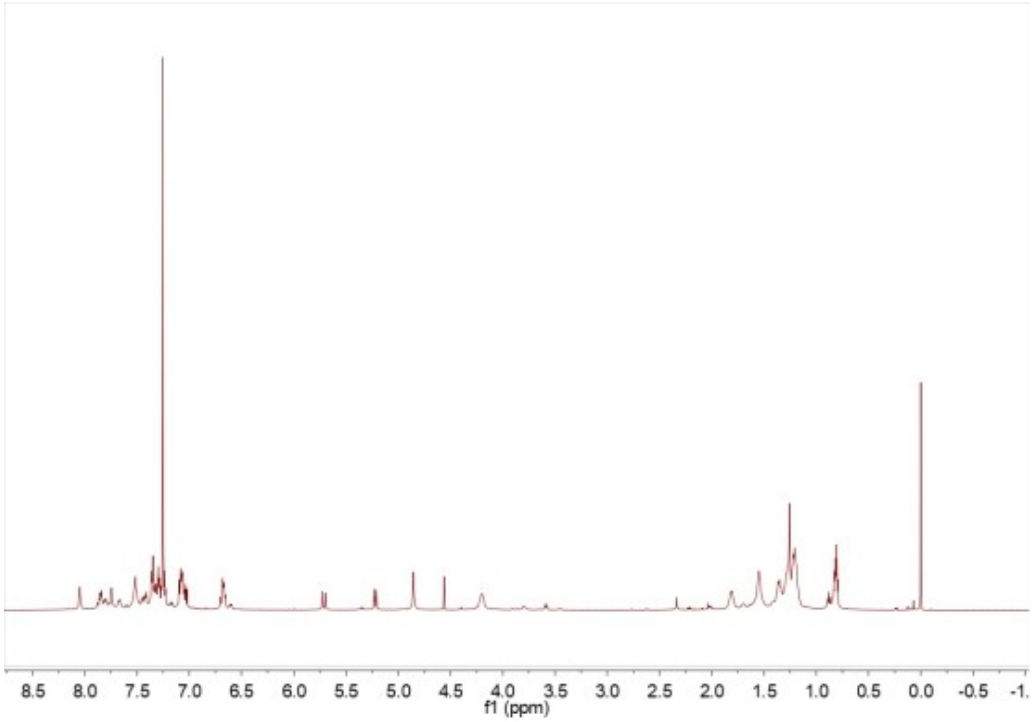

Fig. S13 ^{1}H-NMR of PFCTV20.

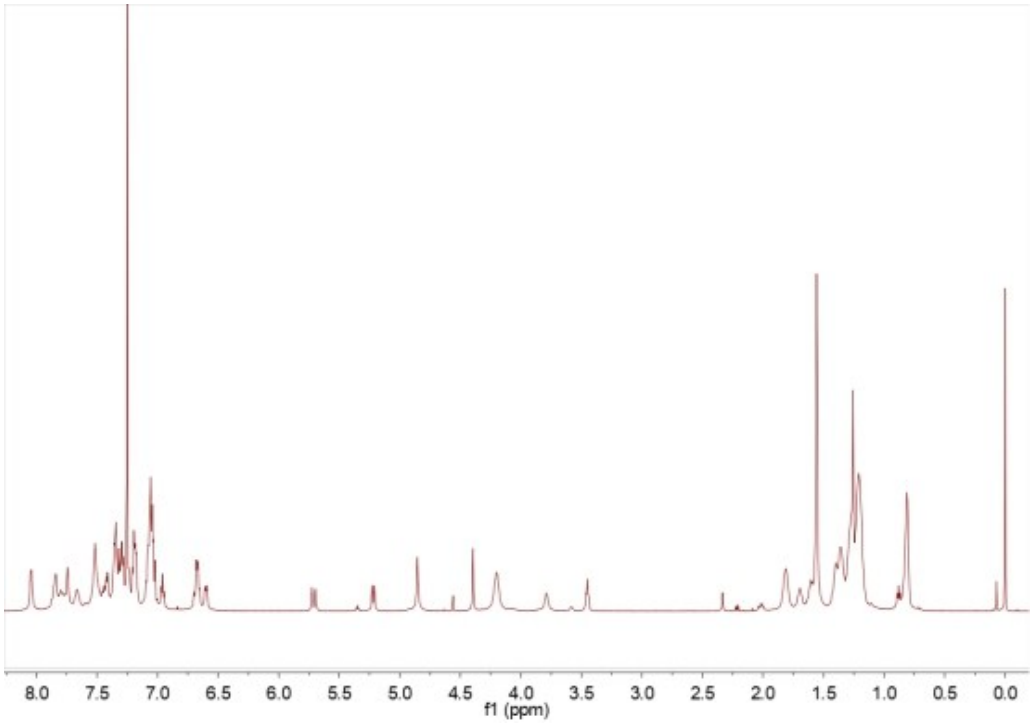

Fig.S14 ^{1}H-NMR of PFCTV30.

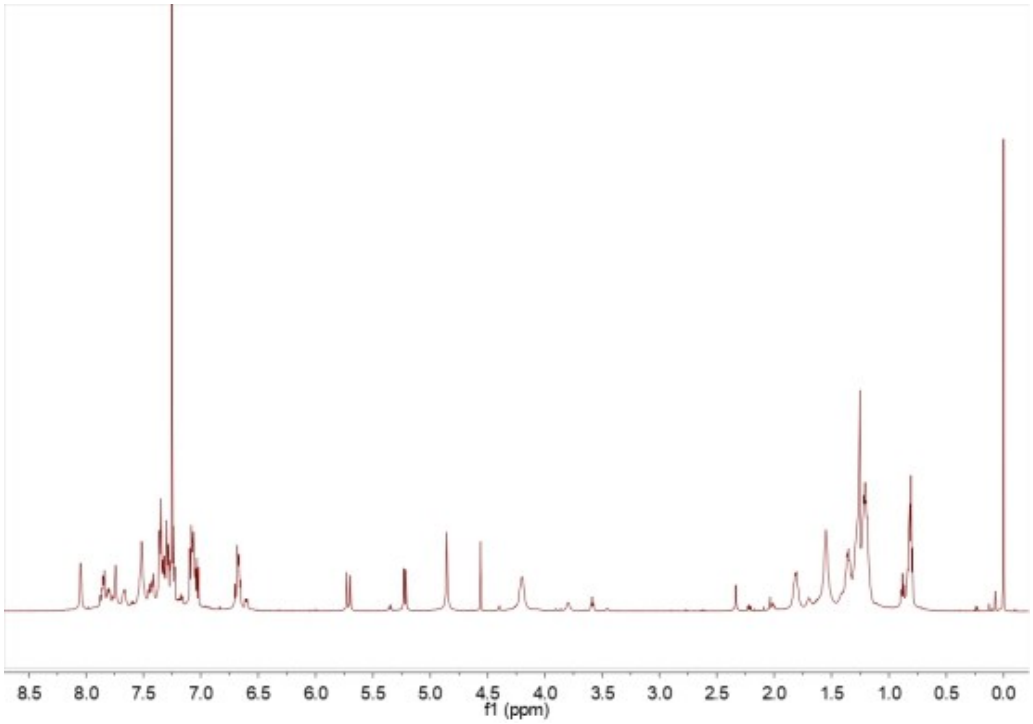

Fig. S15 ^{1}H-NMR of PFCTV40.