Supporting Information

Enable Discrimination Capability to Achiral F6BT based Organic Semiconductor Transistor via Circularly Polarized Light Induction

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Estimation of Electrical Properties:

The field-effect mobility (μ) and threshold voltage (V_T) were extracted from the saturation regime transfer characteristics (V_D = -60 V) with following equation:

$$I_D = \frac{W}{2L}\mu C_i (V_G - V_T)^2$$

where V_D, V_G and I_D are the drain voltage, gate voltage and drain current, respectively. While W, L, μ are the channel width, channel length and insulator capacitance per unit area of the gate dielectric, respectively.

The photocurrent/dark-current ratio (P), photoresponsivity (R) and detectivity (D^*) could be typically defined by the following equations:

$$P = \frac{I_{ph}}{I_{dark}} = \frac{I_{light} - I_{dark}}{I_{dark}}$$

$$R = \frac{I_{ph}}{SP_{inc}} = \frac{I_{light} - I_{dark}}{SP_{inc}}$$

$$D^* = \frac{\sqrt{S}R}{\sqrt{2qI_{dark}}}$$

where I_{ph}, I_{light} and I_{dark} are the generated photocurrent, the drain current under illumination and the drain current in the dark, respectively. P_{inc}, S and q are the incident illumination power upon the channel, the area of the channel exposed to illumination, and the electron charge, respectively.

The external quantum efficiency (EQE, η), which could be defined as the ratio of the number of photogenerated carriers to the number of photons incident onto the OFET channel area, was measured using the following equation:

$$\eta = \frac{Rhc}{q\lambda}$$

where h, c and λ are the Planck constant, the speed of light and the incident light wavelength, respectively.

In addition, the anisotropy factor of responsivity (g_{res}) was defined by the following equation:

$$g_{res} = \frac{2(R_L - R_R)}{R_L + R_R}$$

where R_L and R_R are the responsivity under LCP and RCP illumination, respectively.

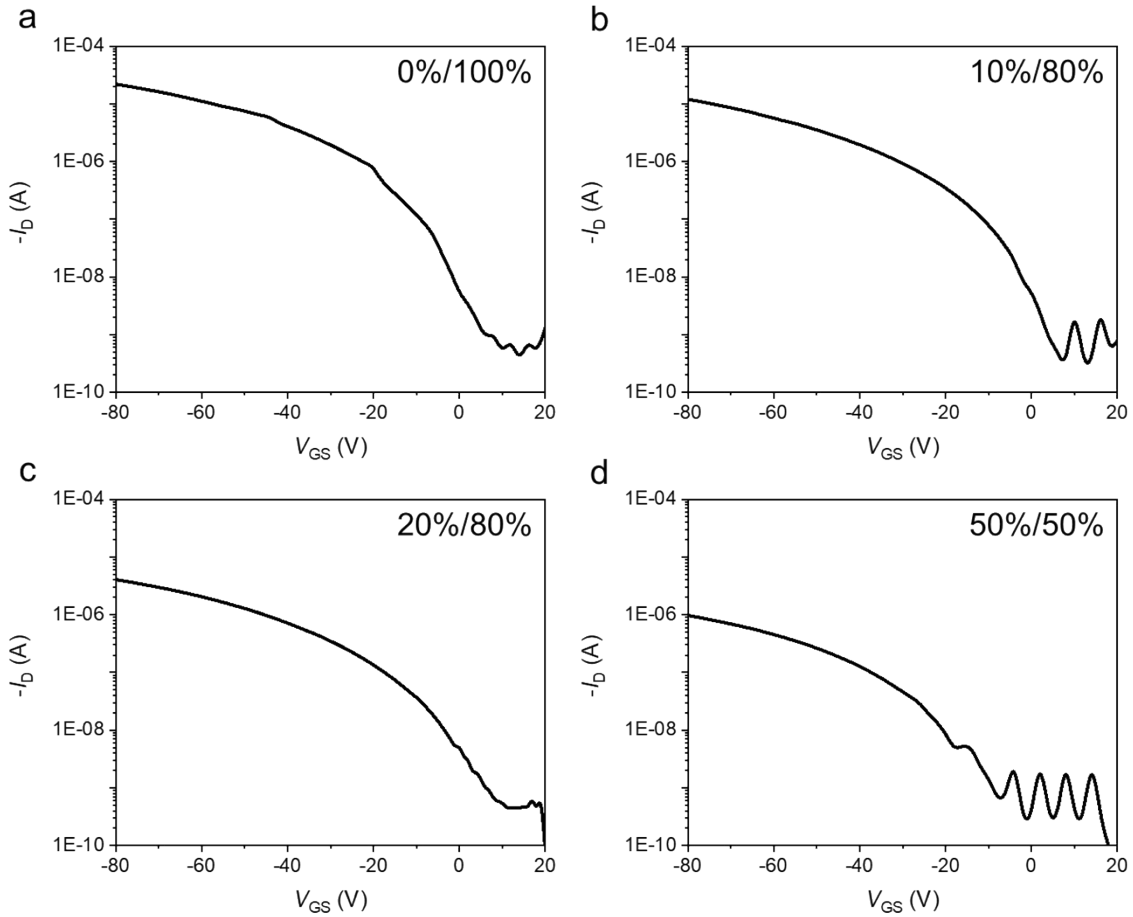

Fig. S1 Transfer characteristics of the F6BT/P3HT OFETs with various F6BT contents. (a) 0%/100%. (b) 10%/90%. (c) 20%/80%. (d) 50%/50%. w/w.

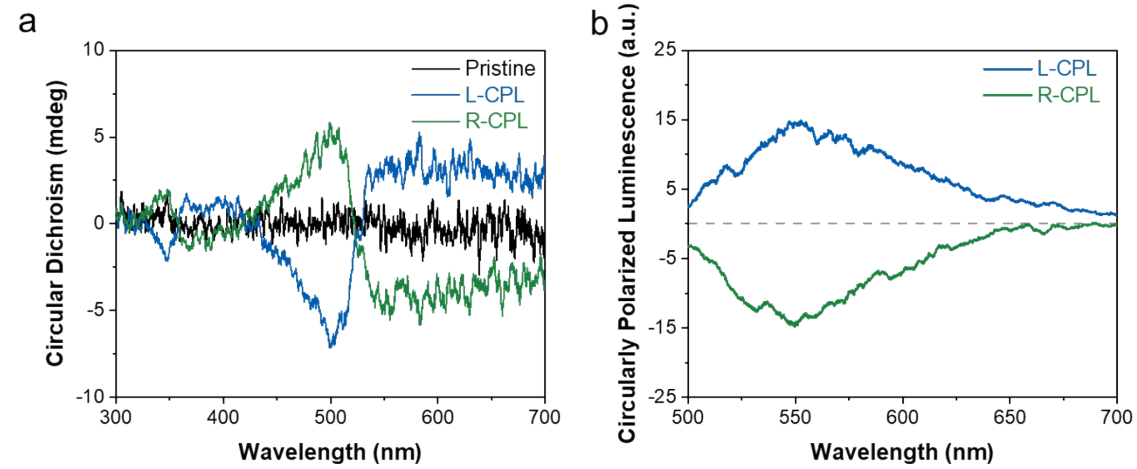

Fig. S2 (a) Circular dichroism and (b) circularly polarized luminescence spectra of pristine samples (Pristine, black), pristine samples irradiated with circularly polarized light in the handedness of left (L-CPL, blue) and right (R-CPL, green), respectively.

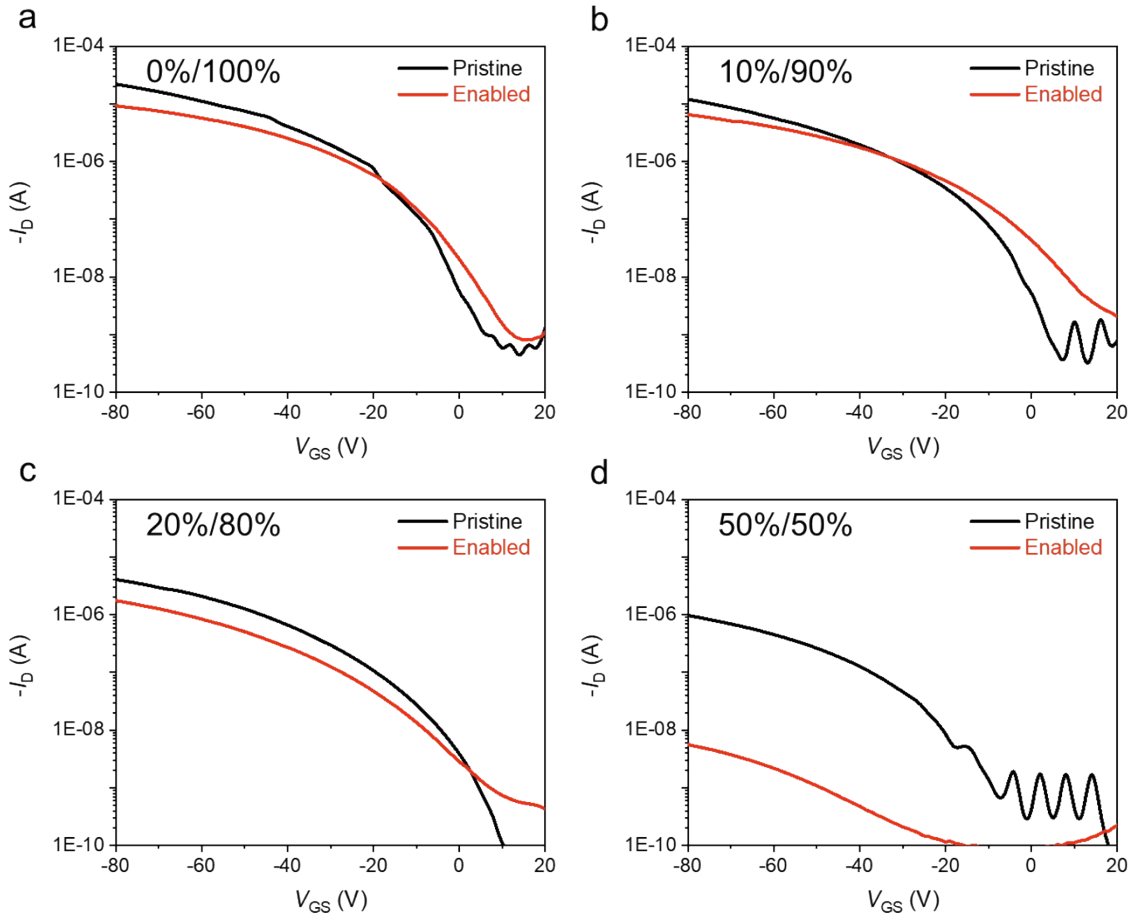

Fig. S3 The performance degradation of the enabled F6BT/P3HT OFETs with various F6BT contents. (a) 0%/100%. (b) 10%/90%. (c) 20%/80%. (d) 50%/50%. w/w.

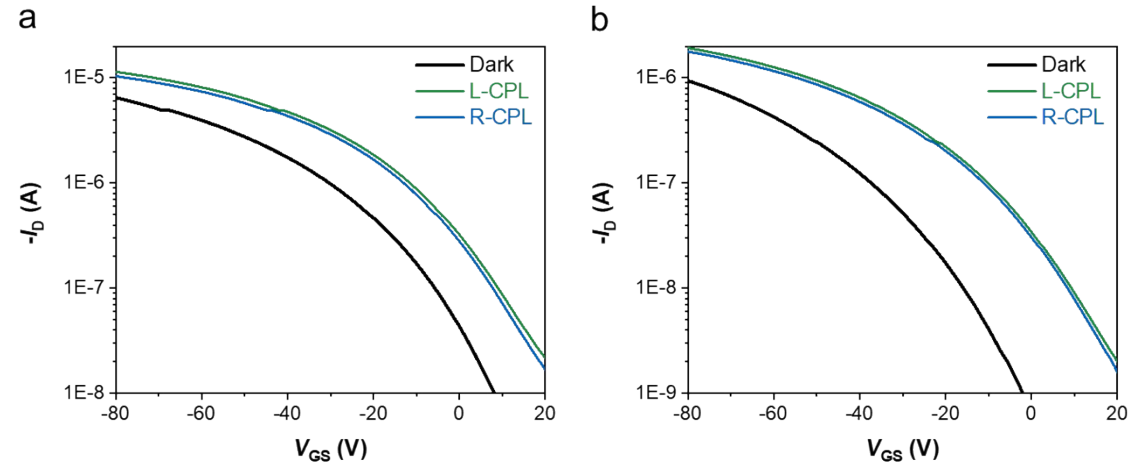

Fig. S4 Photo-responses of the enabled F6BT/P3HT OFETs to left-/right-handed CPL. (a) 10%/90%. (a) 20%/80%. Enabled by L-CPL for 20 min.

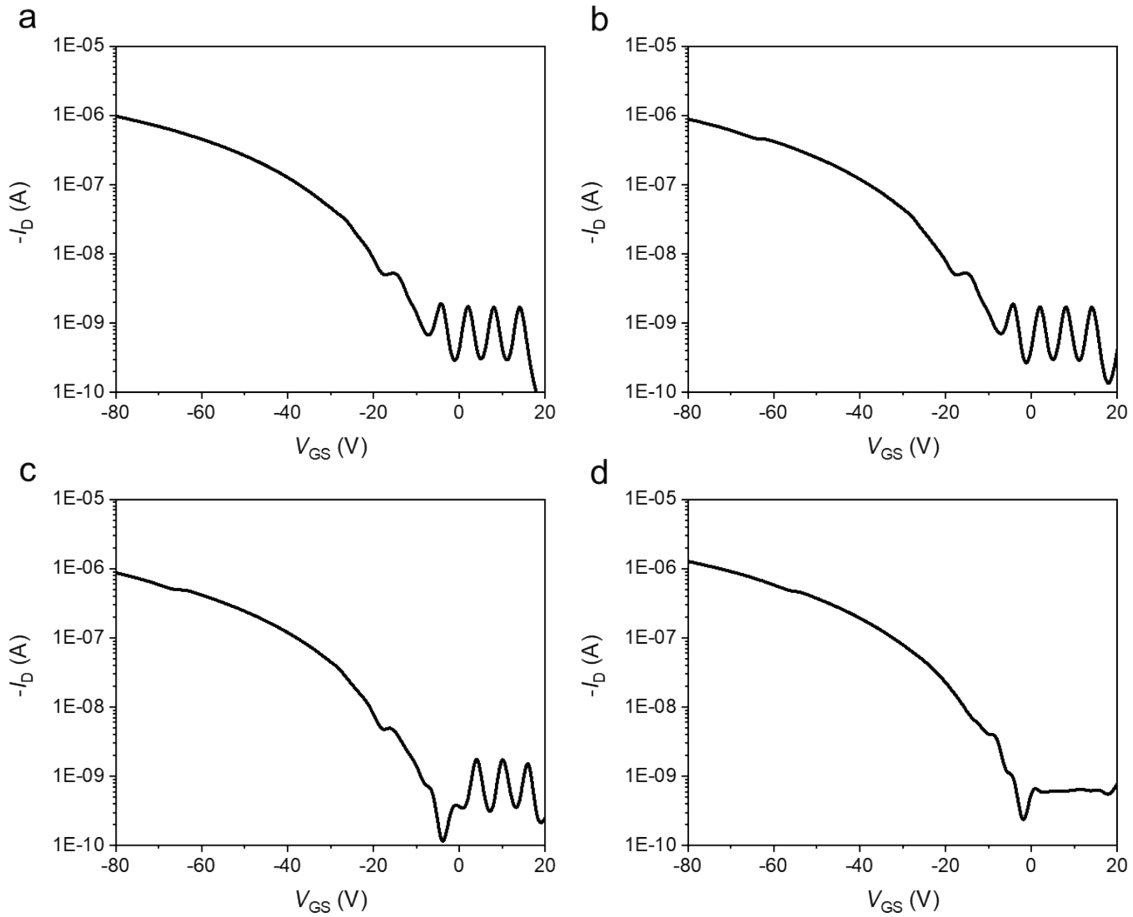

Fig. S5 Transfer characteristics from the same batch of the pristine F6BT/P3HT (50/50, w%/w%.) OFETs.

Table S1 Summary of the pristine F6BT/P3HT OFETs electrical properties

F6BT/P3HT w/w (%/%)	field-effect mobility μ ($cm^2 V^{-1} s^{-1}$)	threshold voltage V_T (V)	on/off current ratio
0/100	8.39×10^{-2}	-10.6	6.88×10^{4}
90/10	4.46×10^{-2}	-11.8	3.70×10^{4}
80/20	1.63×10^{-2}	-12.0	9.14×10^{3}
50/50	4.73×10^{-3}	-18.0	3.47×10^{3}

Table S2 Summary of the enabled F6BT/P3HT OFETs electrical properties

devices	condition	field-effect mobility μ ($cm^2 V^{-1} s^{-1}$)	threshold voltage V_T (V)	on/off current ratio
L-CPL enabled	Dark	3.83×10^{-5}	-27.6	65.0
	L-CPL	1.76×10^{-5}	49.4	8.2
	R-CPL	8.92×10^{-6}	55.4	5.3
R-CPL enabled	Dark	8.95×10^{-6}	-17.2	44.4
	L-CPL	2.10×10^{-6}	54.5	5.3
	R-CPL	3.53×10^{-6}	47.0	7.7

Table S3 Summary of the enabled F6BT/P3HT OFETs photosensitivity properties

Devices	Condition	P	R A W^{-1}	D^* Jones	EQE %
L-CPL enabled	L-CPL	40.34	1.86×10^{-5}	7.44×10^{7}	1.62×10^{-3}
	R-CPL	23.38	9.42×10^{-6}	4.21×10^{7}	8.16×10^{-4}
R-CPL enabled	L-CPL	12.48	3.46×10^{-6}	1.80×10^{7}	1.87×10^{-4}
	R-CPL	9.08	2.15×10^{-6}	1.27×10^{7}	3.02×10^{-4}