

Electronic Supplementary Information (ESI)

Polymer Bilayer Films with Semi-interpenetrating Semiconducting/Insulating Microstructure for Field-Effect Transistor Applications

Fu-Chiao Wu,^a Horng-Long Cheng,^{a,b*} Yu-Ta Chen,^a Ming-Feng Jang,^a and Wei-Yang Chou^{a,b}

^a *Institute of Electro-Optical Science and Engineering,*

^b *Advanced Optoelectronic Technology Center,*

National Cheng Kung University, Tainan 701, Taiwan

E-mail: shlcheng@mail.ncku.edu.tw; Fax: +886 6 2095040 ;

Tel: +886 6 2757575 65286

Table S1. Saturated field-effect mobility (μ_{sat}), subthreshold swing (ss), and threshold voltage (V_{th}) for the P3HT-based FETs. The P3HT active layers were made by various solvents without (*w/o*) and with (*w*) PMMA covering.

Solvents	PMMA	μ_{sat} ($\times 10^{-3} \text{ cm}^2/\text{Vs}$)	ss (V/dec.)	V_{th} (V)
Chloroform	<i>w/o</i>	0.47	23.7	-7.5
	<i>w</i>	1.11	20.4	-16.7
Toluene	<i>w/o</i>	1.55	40.8	7.0
	<i>w</i>	0.04	15.3	-25.9
<i>p</i> -Xylene	<i>w/o</i>	1.22	34.9	0.1
	<i>w</i>	0.02	3.2	-28.2
TCB	<i>w/o</i>	8.72	36.2	20.8
	<i>w</i>	1.06	53.0	1.1

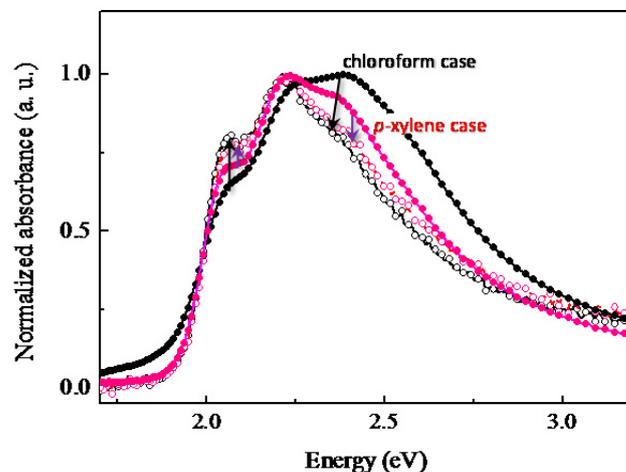


Figure S1. Comparison of normalized absorption spectra of the P3HT films made by chloroform and *p*-xylene, respectively, before (closed circles) and after (open circles) spin-coating with the pure *p*-xylene and then baked at 150 °C for 2 h in vacuum.

Note: It should be noted that after spin-coating process the absorbance of the P3HT films were very low (ca. 10% of the initial films).

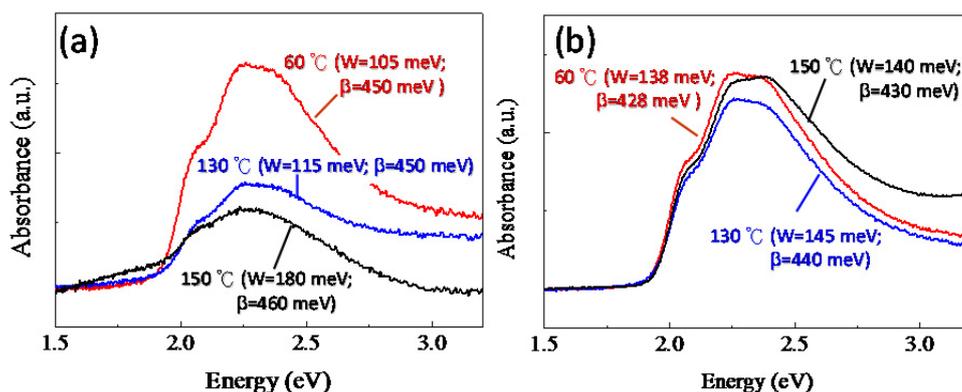


Figure S2. Absorption spectra of the P3HT/PMMA bilayer films made at different tempering temperatures of the PMMA layer. The underlying P3HT layers were made by (a) *p*-xylene and (b) chloroform, respectively. After running theoretical modeling by Equation (2), the observed values of the exciton bandwidth (W) and the full width at half maximum (β) of crystalline absorption bands are also shown.

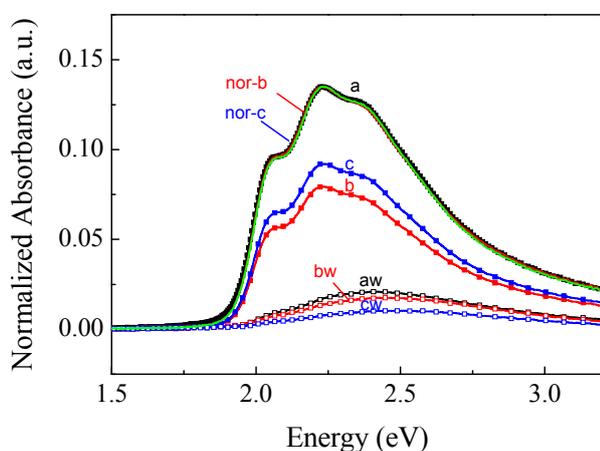


Figure S3. Absorption spectra of the P3HT films from different concentrations and spinning rate: (a) 0.34wt% in *p*-xylene, 500 rpm; (b) 0.34wt% in *p*-xylene, 2000 rpm; (c) 0.085wt% in chloroform, 2000 rpm. Spectra (aw), (bw), and (cw) are the corresponding films after being covered with PMMA, respectively. For comparisons, spectra (b) and (c) are normalized to the strong absorbance of spectra (a), and referred to traces (nor-b) and (nor-c), respectively.

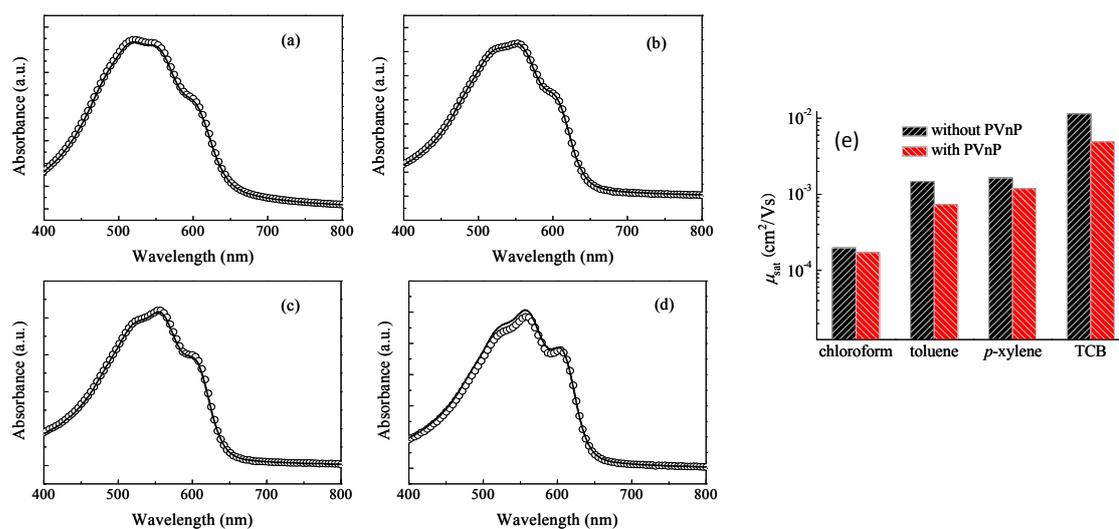


Figure S4. Absorption spectra of P3HT thin films deposited from (a) chloroform, (b) toluene, (c) *p*-xylene, and (d) TCB before (open circles) and after (solid lines) being covered with poly(vinyl pyrrolidone) (PVnP) layer. (e) The saturated field-effect mobility (μ_{sat}) of the corresponding FETs with and without PVnP layer. The channel width/length ratio of 833.

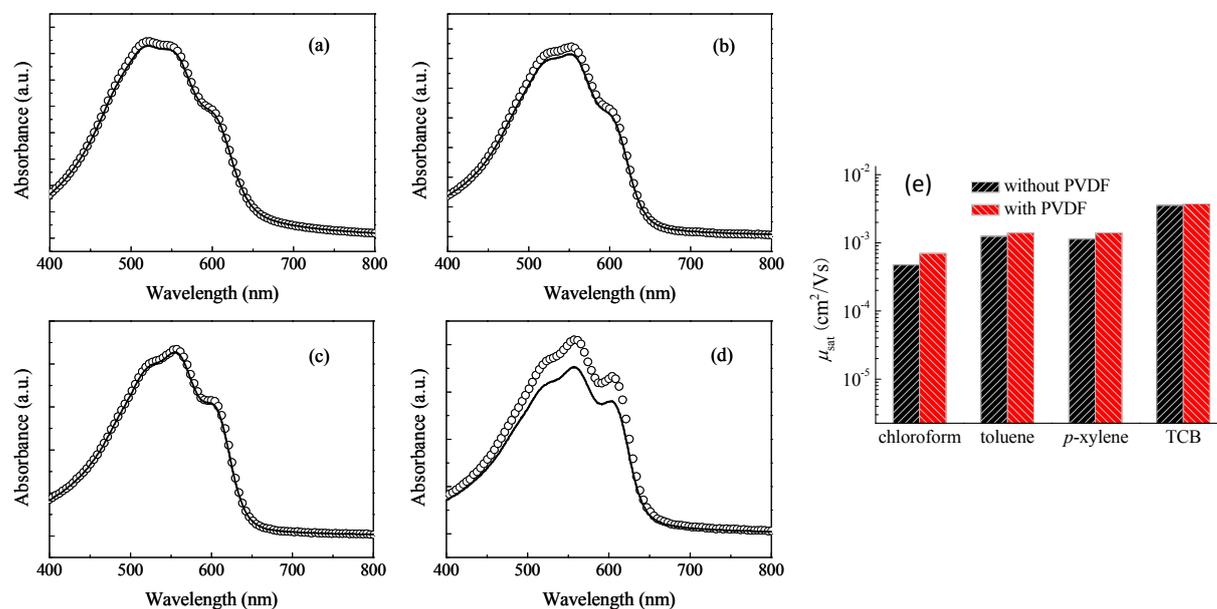


Figure S5. Absorption spectra of P3HT thin films deposited from (a) chloroform, (b) toluene, (c) *p*-xylene, and (d) TCB before (open circles) and after (solid lines) being covered with poly(vinylidene fluoride) (PVDF) layer. (e) The saturated field-effect mobility (μ_{sat}) of the corresponding FETs with and without PVDF layer. The channel width/length ratio of 370.