Electronic Supplementary Information

Vacuum-Deposited Organic Photodetector Utilizing Non-Fullerene Acceptor for Enhanced Detectivity in Green Visible Light Spectrum

M Rivaldi Ali Septian,‡[a,b] Richie Estrada,‡[b,c,e] Chih-Chien Lee,[c] Chih-Hsin Chen,[d] Johan Iskandar,[b,c] Nurul Ridho Al Amin,[b,c] Abdul Khalik Akbar,[b] Kasimayan Uma,[b] Shun-Wei Liu[a,b,*]

[a] Department of Electronic Engineering, Ming Chi University of Technology, New Taipei City 24301, Taiwan.

[b] Organic Electronics Research Center, Ming Chi University of Technology, New Taipei City 24301, Taiwan.

[c] Department of Electronic Engineering, National Taiwan University of Science and Technology, Taipei 10617, Taiwan.

[d] Department of Chemistry, Tamkang University, New Taipei 251, Taiwan.

[e] Department of Electrical Engineering, Krida Wacana Christian University, Jakarta 11470, Indonesia.

[†]M. R. A. S and R. E contributed equally to this study
*S.-W. L. is the corresponding author (E-mail: swliu@mail.mcut.edu.tw)

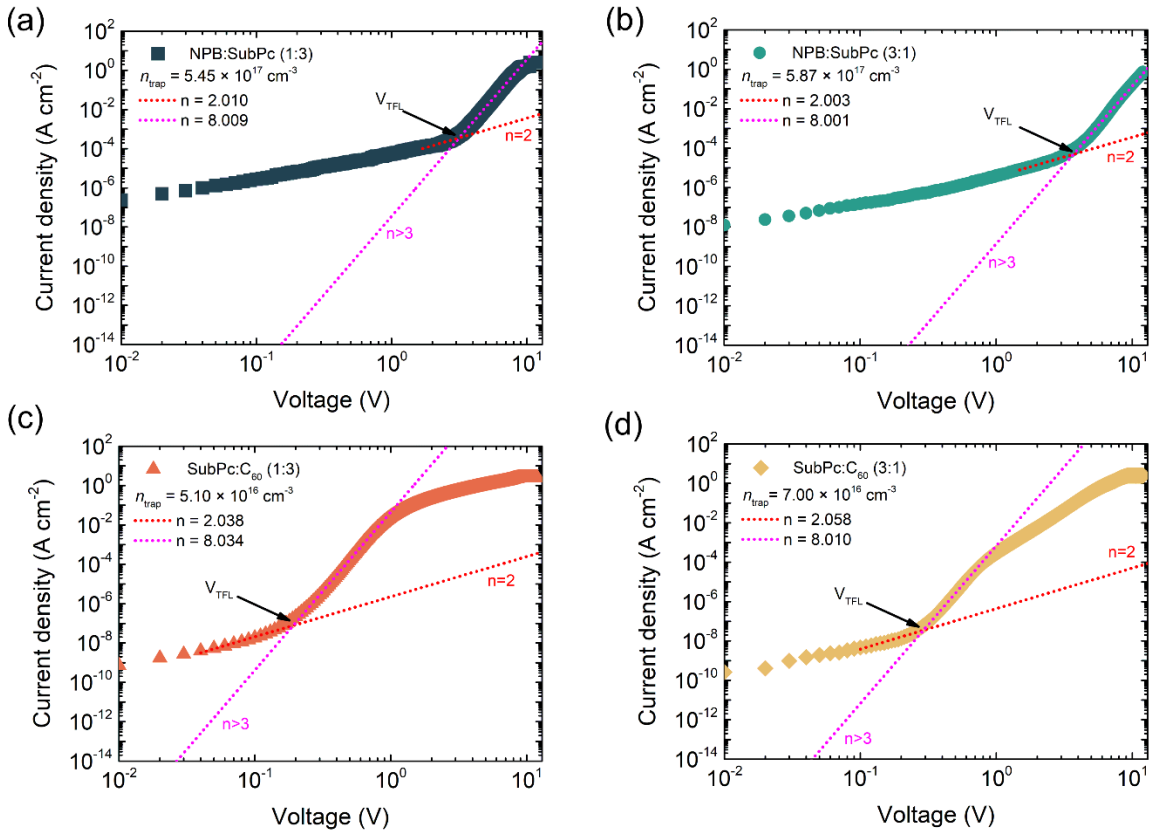

Figure S1 J-V characteristics of the different active layers of OPD devices indicate different regions to obtain trap state density from electron only device.

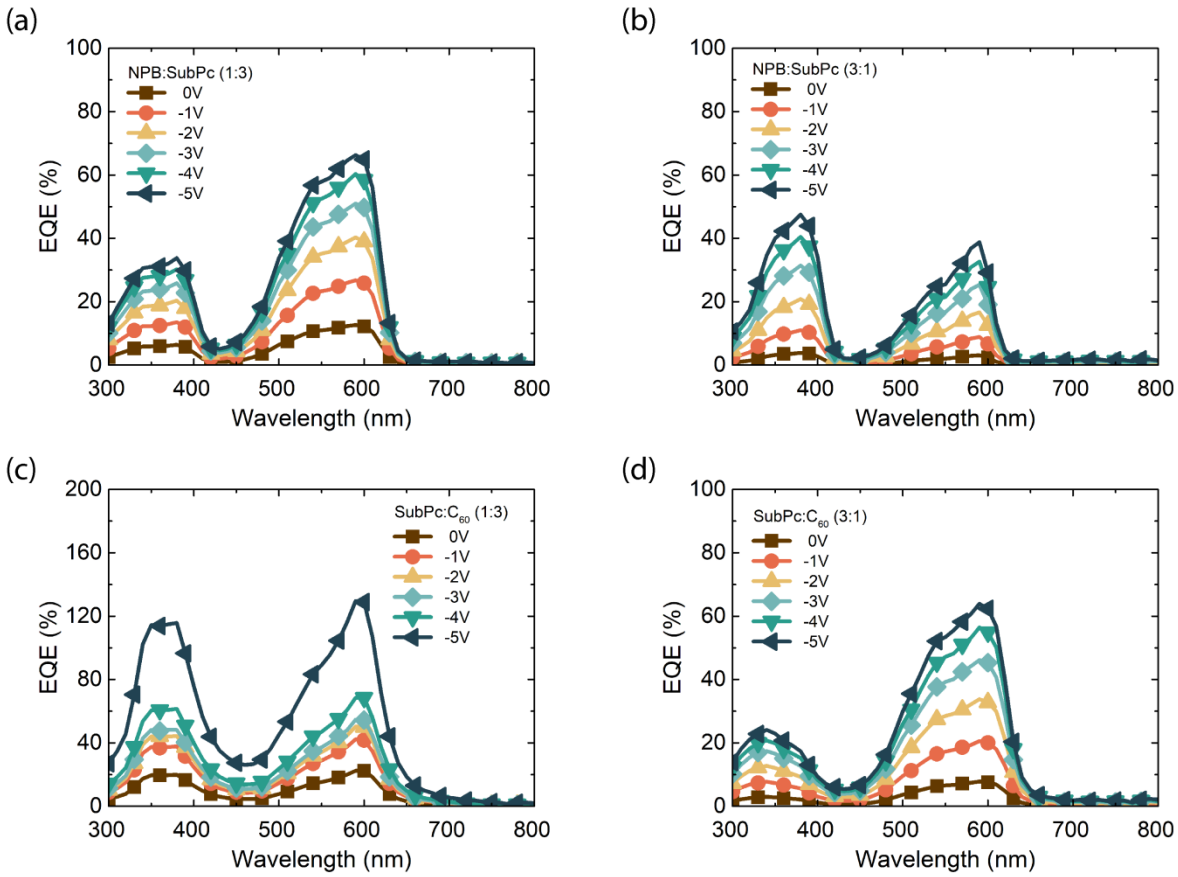

Figure S2 The external quantum efficiency of different active layers of the OPD devices that consist of (a) NPB:SubPc (1:3), (b) NPB:SubPc (3:1), (c) SubPc:C_{60} (1:3), and (d) SubPc:C_{60} (3:1).

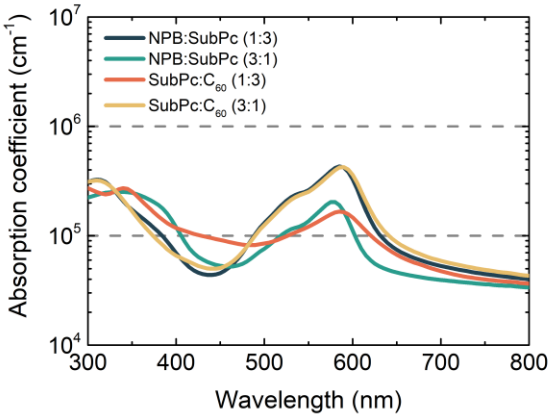

Figure S3 The absorption coefficient spectra from blending of donor and acceptor with different active layers.

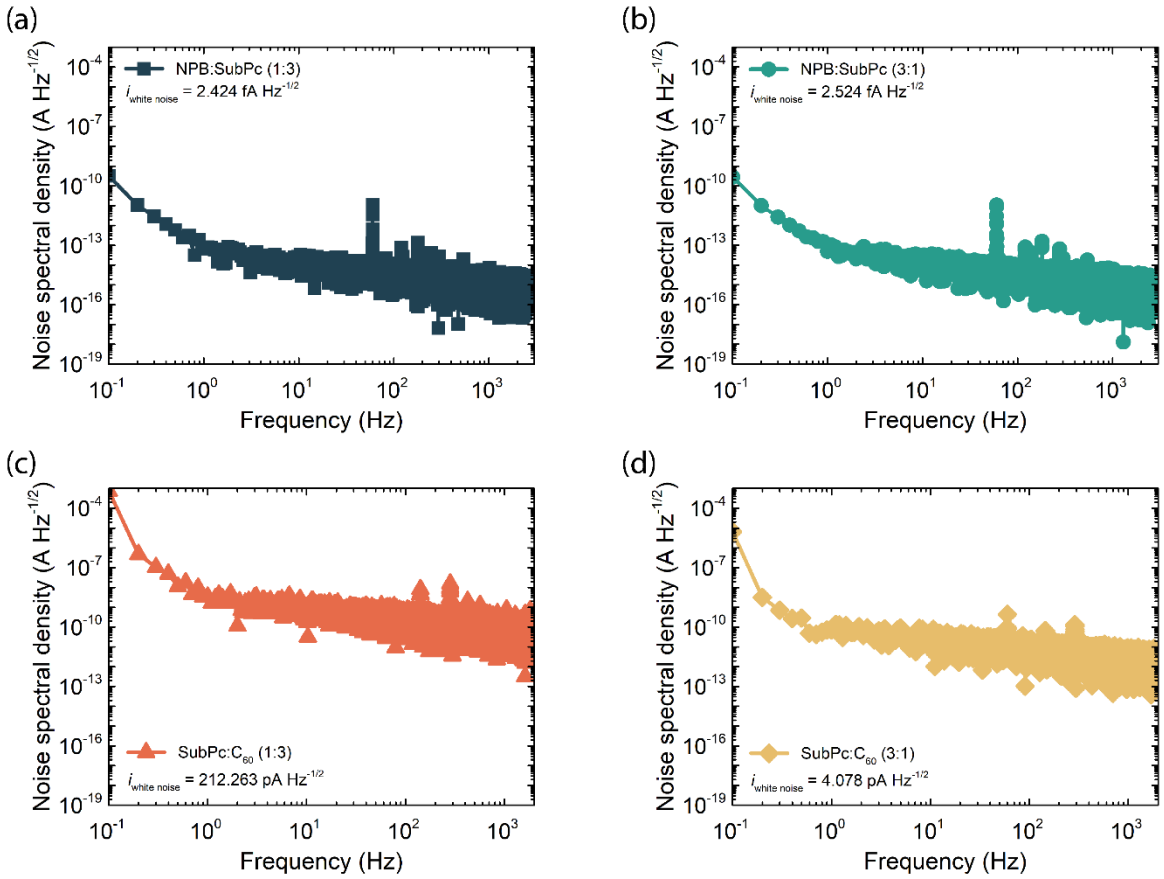

Figure S4 Noise spectral density of different active layers of the OPD devices using bias voltage of -5 V that consist of (a) NPB:SubPc (1:3), (b) NPB:SubPc (3:1), (c) SubPc:C_{60} (1:3), and (d) SubPc:C_{60} (3:1).

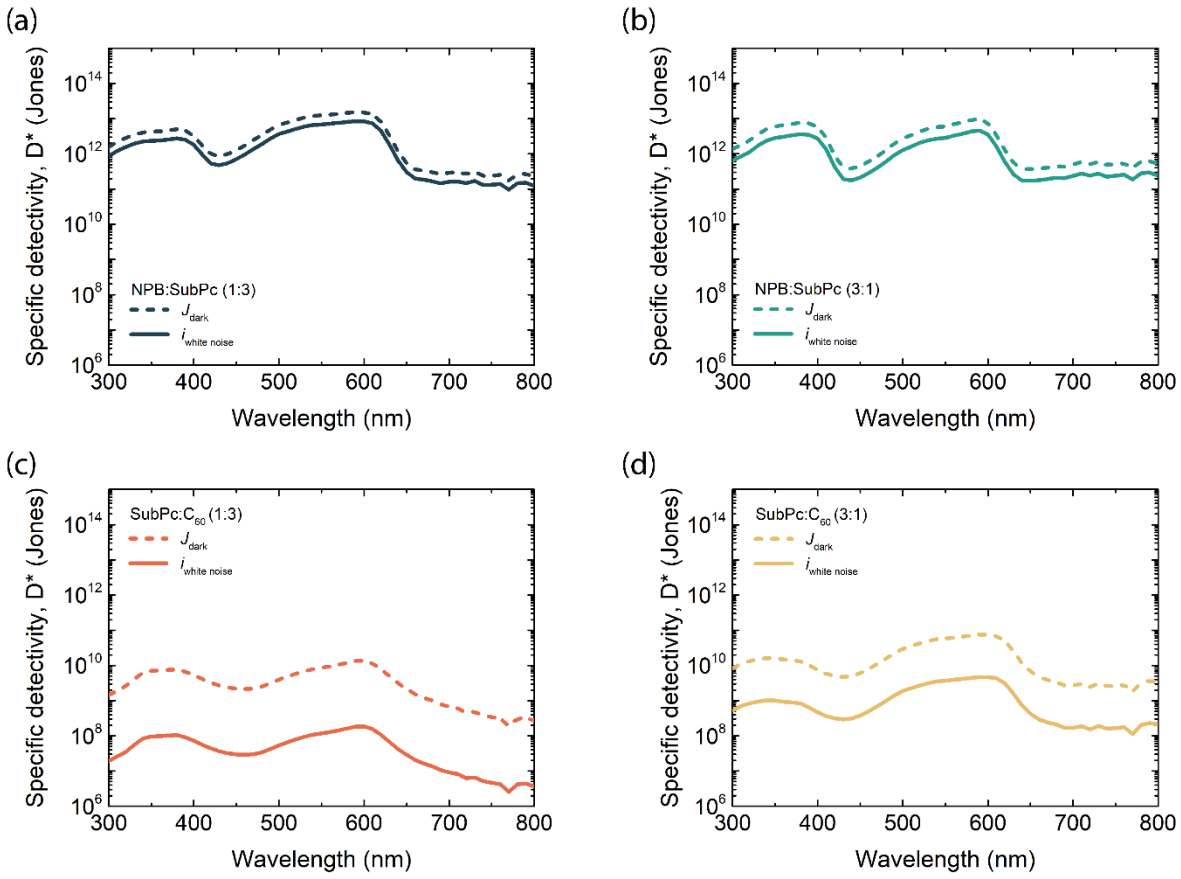

Figure S5 Specific detectivity based on the dark current density and white noise of different active layers of the OPD devices under a bias voltage of -5 V that consist of (a) NPB:SubPc (1:3), (b) NPB:SubPc (3:1), (c) SubPc:C_{60} (1:3), and (d) SubPc:C_{60} (3:1).

Table S1 The summary of noise parameters of OPD devices with various active layers.

Device	Active Layer	$I_{shot\ noise}$ [A Hz$^{-1/2}$]^a	$I_{white\ noise}$ [A Hz$^{-1/2}$]^b	$D^*_{white\ noise}$ [Jones]^c	Min. Irradiance [W cm^{-2}]^d
A	NPB:SubPc (1:3)	4.12×10^{-15}	2.42×10^{-15}	5.78×10^{12}	4.47×10^{-9}
B	NPB:SubPc (3:1)	3.75×10^{-15}	2.52×10^{-15}	2.43×10^{12}	7.47×10^{-9}
C	SubPc:C_{60} (1:3)	9.12×10^{-12}	2.12×10^{-10}	9.38×10^{7}	1.55×10^{-4}
D	SubPc:C_{60} (3:1)	8.07×10^{-13}	4.07×10^{-12}	3.14×10^{9}	7.29×10^{-6}

[a] $I_{shot\ noise}$ is calculated by Equation (5), [b] The $i_{white\ noise}$ is calculated by using Equation (6), [c] Detectivity is calculated using Equation (7), where A = 0.04 cm^2, $\Delta\delta$ = 0.1, along to a wavelength of 530 nm. [d] The minimum irradiance is obtained from Equation (9), which is multiplied and divided by f_{-3dB} and A, respectively.