# Supporting Information

# Narrow-band Organic Photodiodes for High-resolution Imaging

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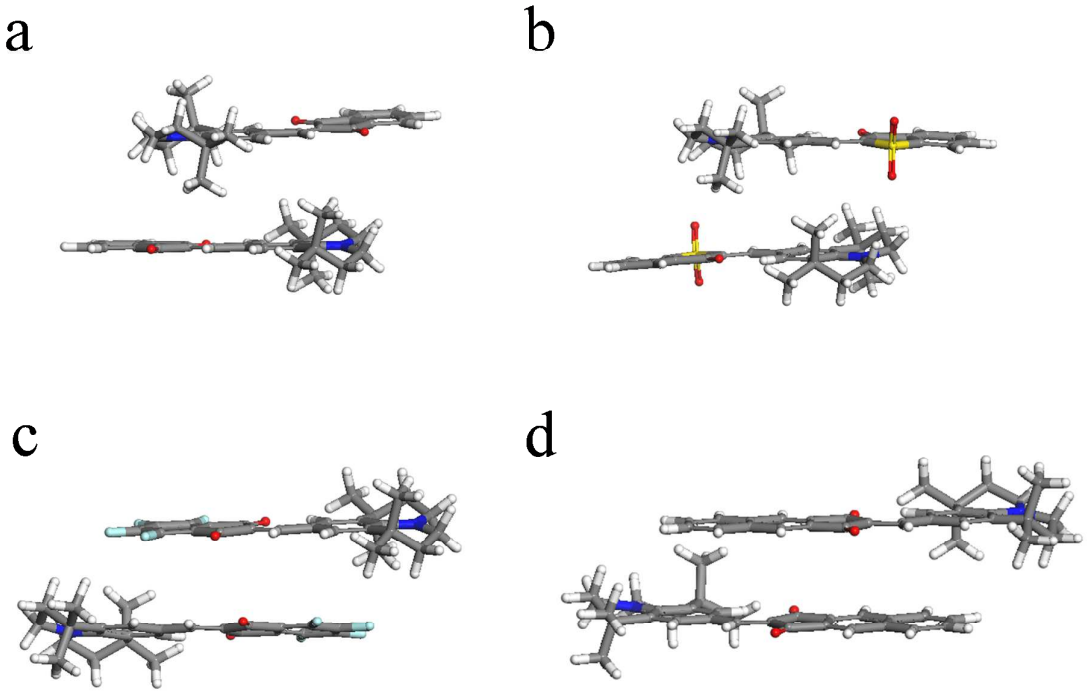


**Figure S1.** Optimized dimer configurations of (a) M1, (b) M2, (c) M3, and (d) M4.

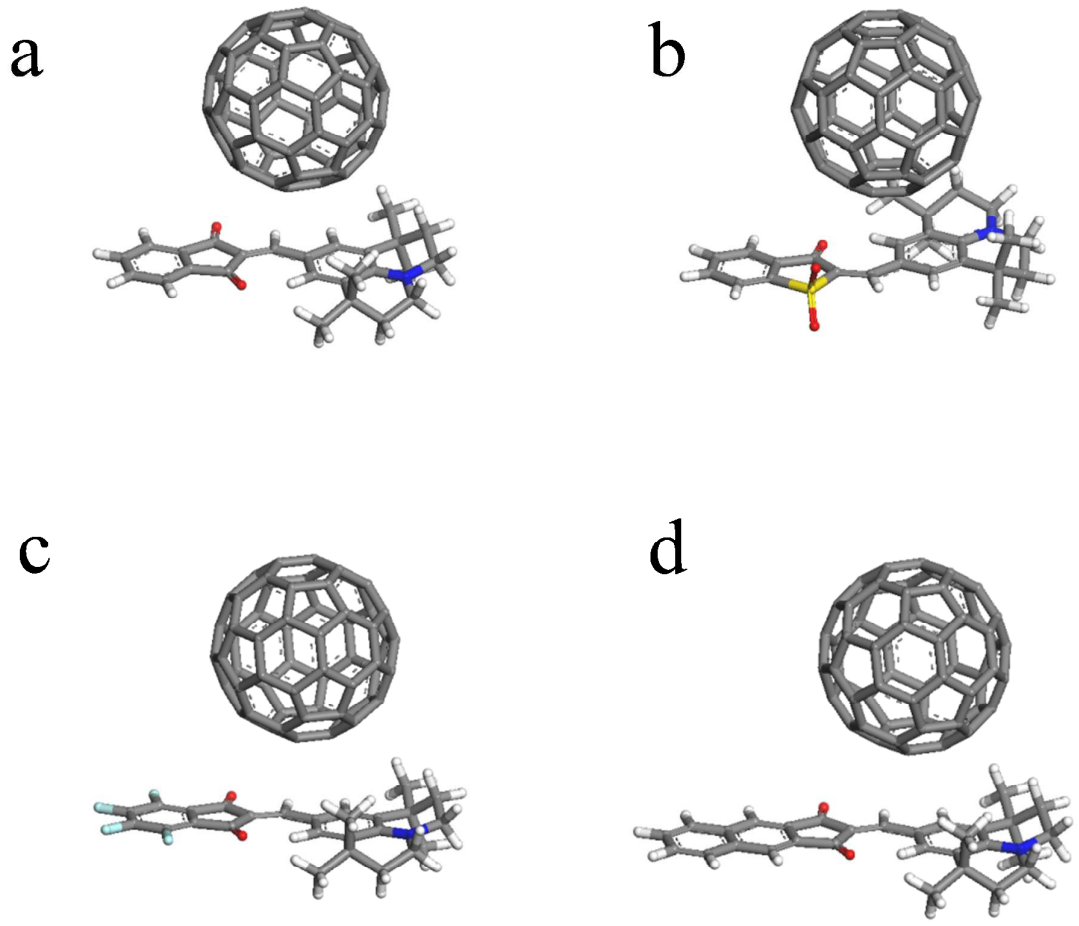


**Figure S2**. Optimized dimer configuration between M molecules and C60: (a) M1:C60, (b) M2:C60, (c) M3:C60, and (d) M4:60.

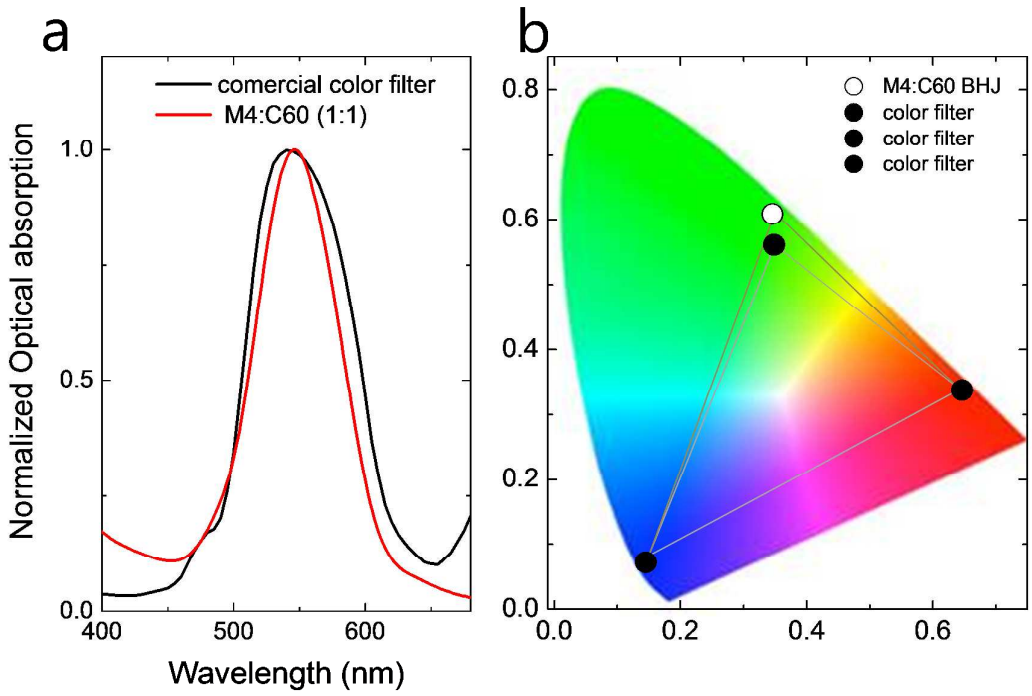


**Figure S3**. (a) Normalized optical absorption spectra for commercial color filter and M4:C60 BHJ for comparison. (b) Chromaticity coordinates of M4:C60 BHJ (empty circle) and commercial color filter (filled circles).

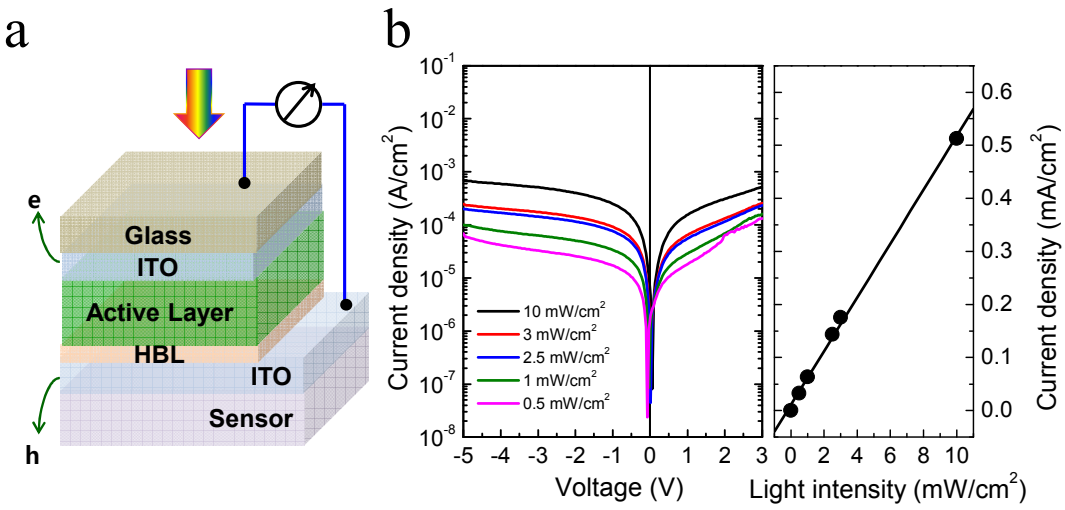


**Figure S4**. (a) Simplified device structure of conventional architecture. (b) Current density-voltage (J-V) curves of the device with normal structure under the following illumination conditions: $\lambda_{max}$ = 553 nm, 0.5–10 mW/cm$^2$. The right figure shows photocurrent density ($J_{ph}$) versus the light intensity (I).

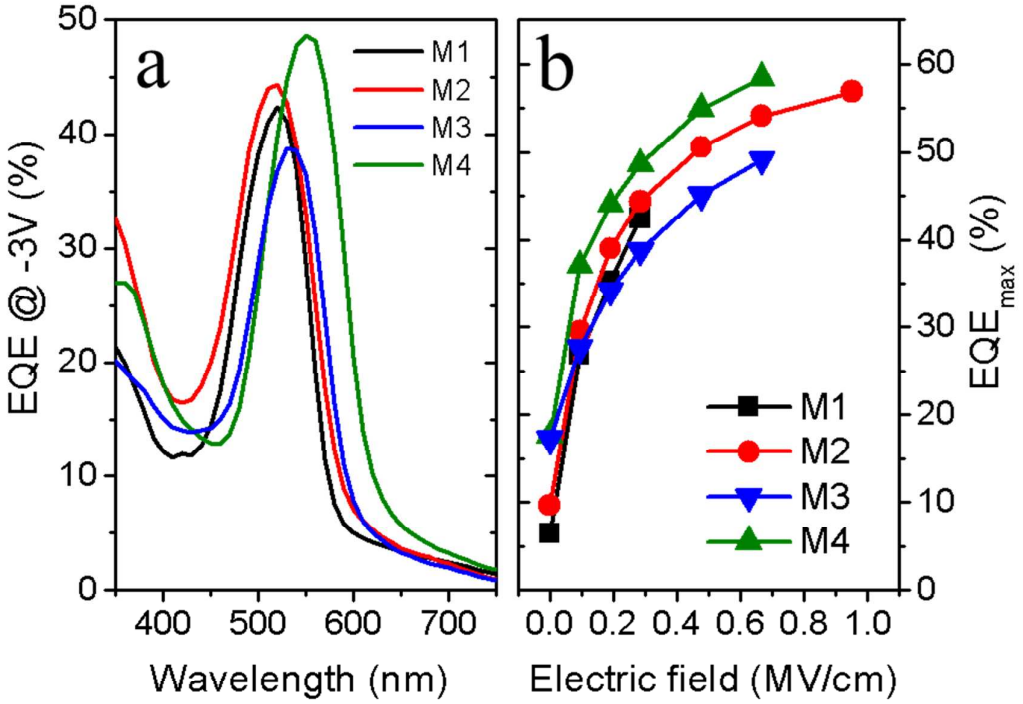


**Figure S5**. (a) EQE curves of all the OPDs with different active layers. 85 nm of M molecules:C60 (1:1) BHJ layers were used as active layers and the device configuration is same with Figure S4. (b) Maximum EQE value at 550 nm as a function of electric field.

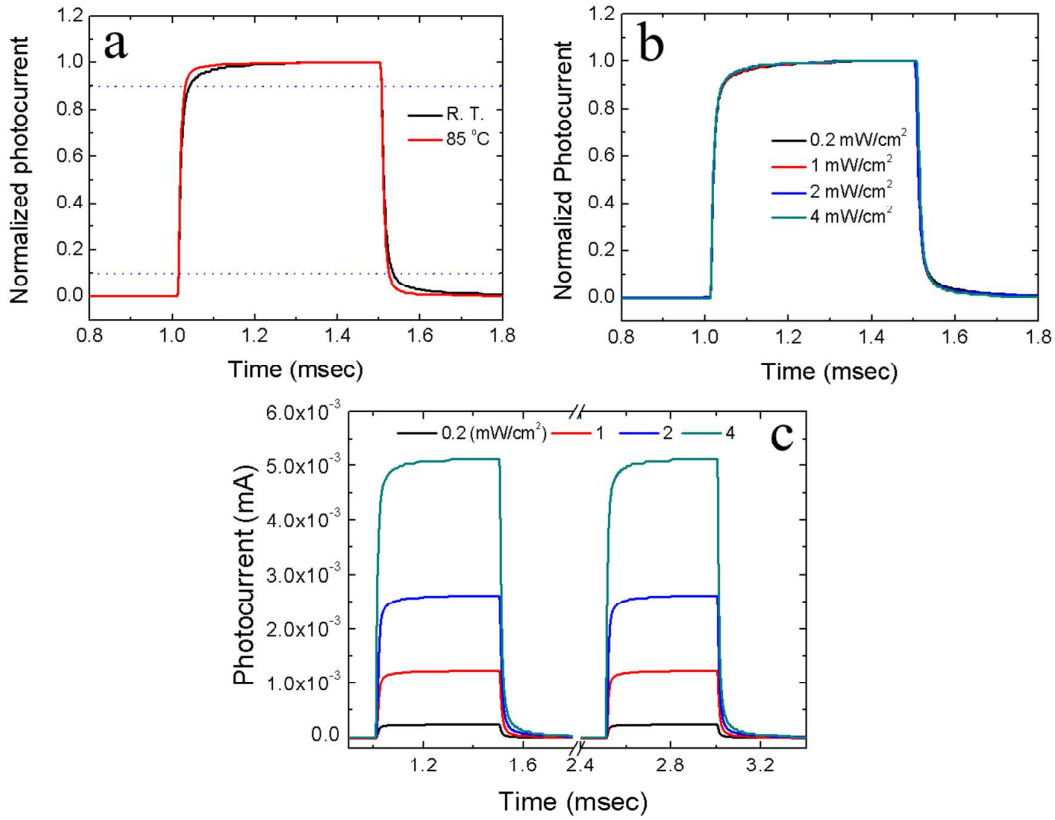


**Figure S6**. (a) Normalized photocurrent at 2 mW/cm$^2$ illumination as a function of time obtained at different temperature. (b) Normalized photocurrent obtained at different light intensity. (c) photo-response behavior obtained at different light intensity.

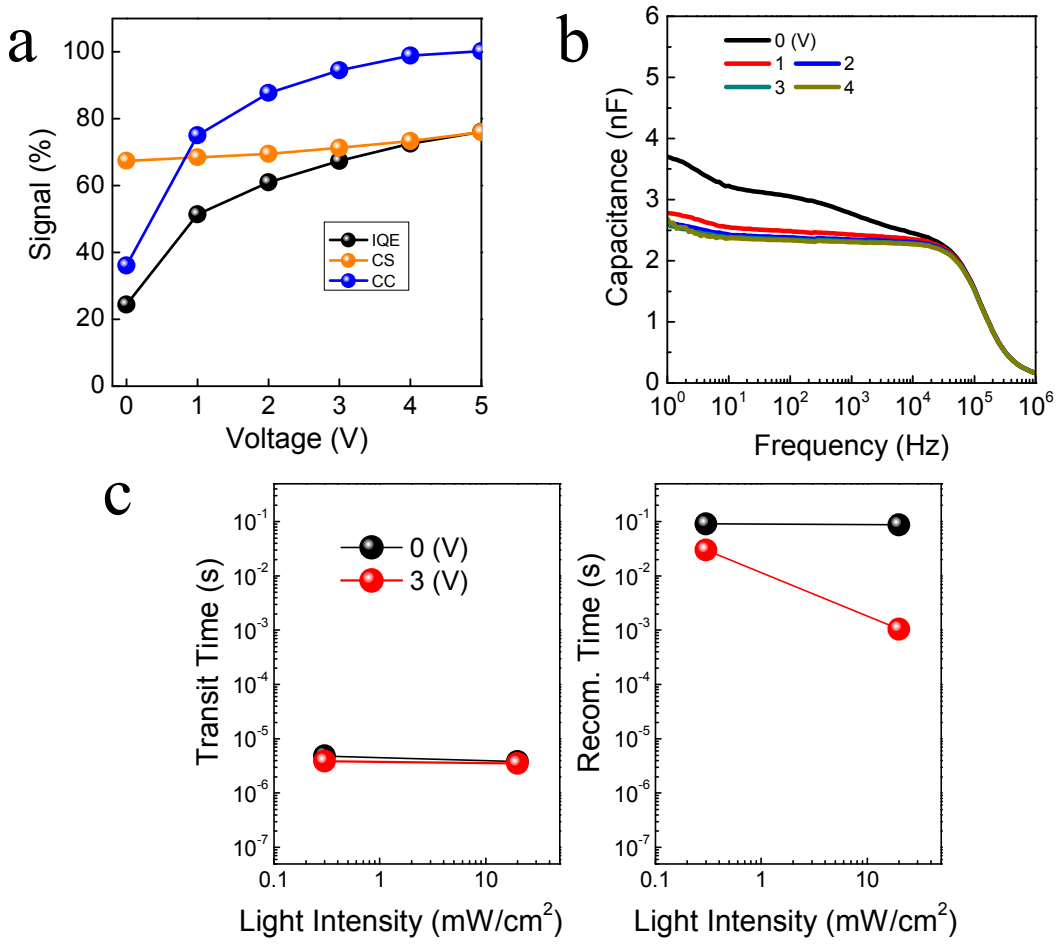


**Figure S7.** (a) The internal quantum efficiency (IQE), charge separation efficiency (CSE) measured from conventional photoluminescence quenching efficiency (PLQE), and estimated charge collection efficiency (CCE) as a function of the electric field. (b) Capacitance as a function of frequency. (c) Measured transit (left) and recombination time (right) versus illumination light intensity.

**Table S1**. Summary of the device data obtained from OPD with standard structure. Same device configuration as shown in Fig. S4(a) was used for all the devices. 85 nm of M molecules:C60 (1:1) BHJ layers were used as active layers..

| Active layers | $\lambda_{max}$ (nm)[a] | EQE at -3V (%) | IQE at -3V (%) | Dark Current ($A/cm^2$) | Cross Talk (CT, %) |
|---|---|---|---|---|---|
| M1:C60 | 520 | 42.4 | 74.4 | $2.13 \times 10^{-7}$ | 14.4 |
| M2:C60 | 520 | 44.3 | 76.4 | $2.24 \times 10^{-6}$ | 16.7 |
| M3:C60 | 530 | 38.8 | 68.1 | $6.97 \times 10^{-8}$ | 11.4 |
| M4:C60 | 550 | 48.6 | 77.5 | $2.71 \times 10^{-7}$ | 12.4 |

[a] Data obtained from EQE spectra.

**Table S2**. Device parameters of the hybrid CMOS image sensor

| Parameters | Values |
|---|---|
| Process | 5Mp 90nm FSI CIS |
| Chip size | 7060 x 5570 μm |
| Pixel array | 2592 (H) x 1944 (V) |
| Pixel pitch | 1.4 μm |
| Readout | 4-transistor type |
| Linear full well capacity (green pixel) | 9400 e |
| Frame rate | 30 fps |
| Source Voltage ($V_{dd}$) | 2.8 V |