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Supporting Information

Prospects of Colour Selective Organic Photodiode

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Table 1. A summary of wavelength selective OPDs with figures of merit

Mechanism	Donor Material Used	Acceptor Material Used	Donor Peak (FWHM)	Acceptor Peak (FWHM)	Junction Structure	Photoactive Layer Thickness	Peak Wavelength of D* or EQE (FWHM)	$D^*_{Inferred}$ (Voltage, Wavelength)	D^*_{Noise} (Voltage, Wavelength)	EQE (Voltage, Wavelength)	J_{Dark} (Voltage)	−3 dB Frequency (Voltage)	Linear Dynamic Range (Voltage)	Ref.
			nm	nm		nm	nm	$cm \cdot Hz^{0.5}/W$	$cm \cdot Hz^{0.5}/W$	% (nm)	A/cm^2	kHz	orders of magnitude	
UTIL*	F8T2	–	448 (85)	–	Single	160	469	–	–	0.12 (3.52, 469)	–	–	–	S1
UTIL	R6G doped PFO	–	560 (94)	–	Single	270	530	–	–	0.009 (4.05, 530)	–	–	–	S1
UTIL	Ni(t-Bu)4Pc doped PFO	–	609 (68)	–	Single	210	619	–	–	0.001 (3.57, 619)	–	–	–	S1
UTIL	ISQ	–	690 (~150)	–	Single	55	680 (80)	3.2×10^{12} (−2, 680)	–	15 (−2, 680)	2.11×10^{-9} (−2)	190 (−2)	11.4 (−2)	S2
UTIL	MoO_3 doped Rubrene	–	–	–	Single	38	~430	–	–	55 (−1)	1.54×10^{-9} (−1)	950	–	S3
UTIL	ISQ	–	645 (~80)	–	Single	–	680 (~100)	–	–	55 (−4, 680)	$\sim1\times10^{-7}$ (−4)	680	–	S3
UTIL	PSQ	–	600 (~140)	–	Single	55	660 (~110)	7.7×10^{12} (−2.5, 600)	–	66 (−2.5,660)	5.4×10^{-9} (−2.5)	–	4.8 (−2.5)	S4
UTIL	DMQA	DCV3T	538 (92)	534 (161)	BHJ	70	540 (150)	–	–	67 (−5)	3×10^{-7} (−3)	–	–	S5
UTIL	DMQA	DCV3T	540 (~90)	530 (~160)	BHJ	70	540 (142)	3.05×10^{12} (−3, 540	–	55.2 (−3)	6.4×10^{-9} (−3)	–	4.38 (−3)	S6
UTIL	SubPc	F5-SubPc	586 (80)	581 (49)	BHJ	90	550 (137)	1.48×10^{12} (−5, 550)	–	49.2 (−5)	6.79×10^{-8} (−5)	–	–	S7
UTIL	SubPc	DCV3T	586 (80)	534 (161)	BHJ	90	540 (211)	2.12×10^{12} (−5, 540)	–	62.6 (−5)	5.31×10^{-8} (−5)	–	–	S7
UTIL	DMQA	SubPc	538 (92)	586 (80)	BHJ	90	560 (131)	2.34×10^{12} (−5, 560)	–	60.1 (−5)	4.01×10^{-8} (−5)	–	–	S7
UTIL	DMQA	F5-SubPc	538 (92)	581 (49)	BHJ	90	580 (126)	1.28×10^{12} (−5, 580)	–	52.2 (−5)	8.99×10^{-9} (−5)	–	–	S7
UTIL	DMQA	DCV3T	–	–	BHJ	90	540 (~200)	–	–	60.7 (−5)	3.7×10^{-8} (−5)	92.9 (−5)	–	S8
UTIL	DMQA	SubPc	–	–	BHJ	90	540 (~150)	–	–	60.1 (−5)	1.2×10^{-8} (−5)	148.3 (−5)	–	S8
UTIL	DMQA	DCV3T	538 (~90)	530 (~160)	BHJ	110	530	2.1×10^{12} (−1, 530)	–	5 (−1)	3.8×10^{-10} (−1)	–	–	S9
UTIL	DM-2,9-DMQA	SubPc	546 (60)	586 (79)	BHJ	70	580 (85)	2.03×10^{12} (−3, 580)	–	56.5 (−3)	5.3×10^{-8} (−3)	76.7 (−3)	–	S10
UTIL	1a	C_{60}	515 (83)	–	BHJ	85	530 (98)	–	–	47.48 (−3)	$\sim3\times10^{-9}$ (−3)	–	–	S11
UTIL	1b	C_{60}	547 (83)	–	BHJ	150	550 (101)	1.19×10^{13} (−3, 550)	–	60.95 (−3)	1.6×10^{-9} (−3)	–	~1 (−3)	S11
UTIL	M1	C_{60}	525 (90)	–	BHJ	–	512 (~80)	–	–	42 (−3)	–	–	–	S12

UTIL	M2	C_{60}	526 (98)	–	BHJ	–	517 (~80)	–	–	44 (−3)	–	–	–	S12
UTIL	M3	C_{60}	548 (97)	–	BHJ	–	534 (~90)	–	–	38 (−3)	–	–	–	S12
UTIL	M4	C_{60}	552 (100)	–	BHJ	85	553 (~80)	3.73×10^{13} (−3, 552)	–	48 (−3)	1.0×10^{-10} (−3)	–	~1 (−3)	S12
UTIL	ketocyanine-cored dendrimers-1	$PC_{60}BM$	527 (117)	–	BHJ	~150	520 (175)	–	–	2.8 (0,520)	8.5×10^{-5} (0)	–	–	S13
UTIL	ketocyanine-cored dendrimers-2	$PC_{60}BM$	529 (89)	–	BHJ	~150	530 (141)	–	–	2 (0)	7.8×10^{-6} (0)	–	–	S13
UTIL	ketocyanine-cored dendrimers-3	$PC_{60}BM$	522 (101)	–	BHJ	~150	510 (130)	–	–	2.1 (0)	7.6×10^{-6} (0)	–	–	S13
UTIL	ketocyanine-cored dendrimers-4	$PC_{60}BM$	526 (95)	–	BHJ	~150	530 (~100)	–	–	1 (0)	5.0×10^{-6} (0)	–	–	S13
UTIL	dendronised quinquethiophene-1	$PC_{60}BM$	~450	–	BHJ	130	~450 (~150)	–	–	22.5 (−2)	3×10^{-9} (0)	–	~5 (−2)	S14
UTIL	dendronised quinquethiophene-2	$PC_{60}BM$	~450 (100)	–	BHJ	130	–	–	–	–	1.2×10^{-8} (0)	–	–	S14
UTIL	1	$PC_{60}BM$	527 (117)	–	BHJ	130	525 (90)	$\sim1\times10^{11}$ (−1, 525)	$\sim4\times10^{9}$ (−1, 525)	~17 (−1)	$\sim2\times10^{-5}$ (−1)	20 (−1)	3.5 (−1)	S15
UTIL	2	$PC_{60}BM$	524 (108)	–	BHJ	90	525 (80)	9×10^{10} (−1, 525)	1×10^{8} (−1, 525)	~14 (−1)	$\sim9\times10^{-6}$ (0)	25 (−1)	4 (−1)	S15
UTIL	NPD	DFPP	–	~480 (~150)	PHJ	80	~550 (~100)	–	–	~2.1 (0)	–	–	–	S16
UTIL	CuPc	MPP	~610 (~200)	~410 (~150)	PHJ	550	~610 (~110)	–	–	2 (0)	–	–	–	S16
UTIL	F8T2	ZnO	~450 (~80)	–	PHJ	460	450 (110)	–	1.2×10^{12} (−5, 450)	~4.5 (−5)	1.3×10^{-9} (−5)	10.6 (−3)	6.25 (−3)	S17
UTIL	PP-TPD	ZnO	538 (138)	–	PHJ	557.5	550 (148)	–	1.04×10^{12} (−5, 550)	24 (−5)	6.8×10^{-10} (−5)	11.9 (−5)	5.05 (−5)	S18
UTIL	PP-Th	ZnO	510 (98)	–	PHJ	365	510 (118)	–	1.42×10^{12}	13	2×10^{-9}	3.1	4.245	S19
UTIL	PNa6-Th	ZnO	426 (100)	–	PHJ	360	~425 (103)	–	2.31×10^{12} (−1, 425)	37.8 (−1)	4×10^{-9} (−5)	9.1 (−1)	7.1 (−1)	S20
UTIL	PPDT2FBT	ZnO	650 (~150)	–	PHJ	460	650 (~180)	–	3.04×10^{12} (−1, 650)	~28 (−1)	5.9×10^{-9} (−1)	30.6 (−1)	5.8 (−1)	S21
UTIL	P3HT	ZnO	–	–	PHJ	885	550 (~120)	–	1.02×10^{12} (−9, 550)	–	2.4×10^{-8} (−9)	3.98 (−9)	5 (−9)	S22
UTIL	F8T2	–	–	–	Shottky	350	450 (~120)	–	2.4×10^{13} (−3, 450)	27.2 (−3)	2.6×10^{-10} (−3)	17.6 (−3)	6.1 (−3)	S23
ICT**	P3HT	PC60BM	–	–	BHJ	14000	750 (~180)	–	–	60 (200)	–	–	–	S24
ICT	ZnPc	C60	–	–	BHJ	50	950 (36)	–	–	18	–	–	–	S25
ICT	ZnPc	C60	–	–	BHJ	50	880 (21)	–	–	17	–	–	–	S26
ICT	pBTTT	PC60BM	–	–	BHJ	440	907 (15)	–	8.6×1012 (0, 907)	26	–	~1000 (0)	6.5 (0)	S27
CCN***	PCDTBT	$PC_{70}BM$	–	–	BHJ	2000	650	–	$\sim4.7\times10^{12}$	~35	$\sim1\times10^{-10}$	100	8	S28

							(100)		(−1, 650)	(−1)	(−1)	(−1)	(−1)	
CCN	DPP-DTT	$PC_{70}BM$	–	–	BHJ	2000	950 (~80)	–	$\sim2.0\times10^{12}$ (−1, 950)	~7 (−1)	$\sim1\times10^{-10}$ (−1)	–	–	S28
CCN	P3HT	$PC_{60}BM$	–	–	PIN	~780	635 (~80)	–	1.8×10^{12} (−0.5, 635)	~25 (−0.5)	8.5×10^{-10} (−0.5)	15 (−0.5)	4.5 (−0.5)	S29
CCN	F8T2	$PC_{60}BM$	–	–	PIN	~530	510 (~120)	–	1.7×10^{12} (−0.5, 510)	–	–	–	–	S29
UTIL	F8T2	$PC_{60}BM$	–	–	PIN	230	480 (~200)	–	1.7×10^{12} (−0.5, 480)	–	–	–	–	S29
CCN	PbS doped DFBT	$PC_{70}BM$	–	–	BHJ	4000	890 (~50)	–	7.98×10^{11} (−7,890)	~180 (−7)	–	1.1 (−7)	5.5 (−7)	S30
CCN	P3HT	$PC_{70}BM$	–	–	BHJ	2500	695 (28)	–	1.5×10^{11} (−10,695)	53500 (−60)	1.94×10^{-8} (−10)	–	8 (−60)	S31
CCN	F8T2	hPDI2	–	–	BHJ	1140	575 (22)	2.6×10^{10} (−3,575)	–	1.8 (−3)	–	–	–	S32
CCN	F8T2	hPDI3	–	–	BHJ	1260	600 (19)	2.6×10^{11} (−3,600)	–	1.5 (−3)	–	–	–	S32
CCN	F8T2	hPDI4	–	–	BHJ	1300	615 (16)	2.6×10^{11} (−3,615)–	–	0.7 (−3)	–	–	–	S32
CCN	F8T2	hPDI3–PyrhPDI3	–	–	BHJ	1400	645 (20)	2.6×10^{11} (−3,645)	–	0.2 (−3)	–	–	–	S32
CCN	P3HT	$PC_{60}BM$	–	–	BHJ	4000	665 (~30)	4.75×10^{10} (−10,665)	–	~1800 (−60)	3.95×10^{-10} (−10)	–	–	S33
CCN	P3HT	$PC_{70}BM$	–	–	BHJ	2500	~650 (~50)	–	–	~900 (−20)	–	–	–	S34
CCN	P3HT:PTB7-Th	$PC_{70}BM$	–	–	BHJ	–	~800 (~50)	–	5.7×10^{11} (−50, ~800)	~2000 (−50)	$\sim1\times10^{-4}$ (−50)	8.5 (−50)	–	S34
CCN	PTAA	ZnO	–	–	BHJ	1900	~425 (12)	–	2.8×10^{11} (−1, ~425)	0.66 (−1)	6.7×10^{-7} (−1)	–	–	S35
CCN	F8T2	ZnO	–	–	BHJ		360 (19)	–	8.8×10^{11} (−15, 360)	2170 (−15)	1.3×10^{-8} (−15)	–	0.11 (−15)	S36

*UTIL: utilization of colour selective semiconductors
**ICT: Intermolecular charge transfer method
***CCN: charge collection narrowing method

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