Supporting Information

Enhanced-performance of self-powered flexible quantum dot photodetectors by double hole transport layer structure

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(a)

Elt.	Line	Intensity (c/s)	Conc	Units	Error 2-sig	MDL 3-sig	
C	Ka	297.63	46.499	wt.%	4.655	0.000	
Al	Ka	165.59	6.672	wt.%	1.134	0.000	
Ge	La	27.55	2.456	wt.%	0.932	0.000	
Se	La	196.77	14.348	wt.%	1.699	0.000	
Cd	La	425.89	21.418	wt.%	1.441	0.000	
Te	La	118.42	8.608	wt.%	1.288	0.000	
			100.000	wt.%			Total

(b)

Elt.	Line	Intensity (c/s)	Conc	Units	Error 2-sig	MDL 3-sig	
C	Ka	294.40	45.692	wt.%	4.581	0.000	
Ge	La	26.10	2.612	wt.%	1.052	0.000	
Se	La	232.02	18.972	wt.%	1.870	0.000	
Cd	La	424.93	23.270	wt.%	1.567	0.000	
Te	La	118.69	9.454	wt.%	1.411	0.000	
			100.000	wt.%			Total

(c)

Elt.	Line	Intensity (c/s)	Conc	Units	Error 2-sig	MDL 3-sig	
C	Ka	294.59	45.938	wt.%	4.604	0.000	
Se	La	238.22	19.836	wt.%	1.891	0.000	
Cd	La	425.07	24.300	wt.%	1.636	0.000	
Te	La	118.57	9.926	wt.%	1.484	0.000	
			100.000	wt.%			Total

(d)

Elt.	Line	Intensity (c/s)	Conc	Units	Error 2-sig	MDL 3-sig	
C	Ka	403.16	47.340	wt.%	4.649	0.000	
Se	La	320.59	19.859	wt.%	1.700	0.000	
Cd	La	537.17	23.047	wt.%	1.453	0.000	
Te	La	156.05	9.755	wt.%	1.420	0.000	
			100.000	wt.%			Total

Figure S1. Amount of elements in the $CdSe_xTe_{1-x}$ alloyed quantum dots determined from EDS.

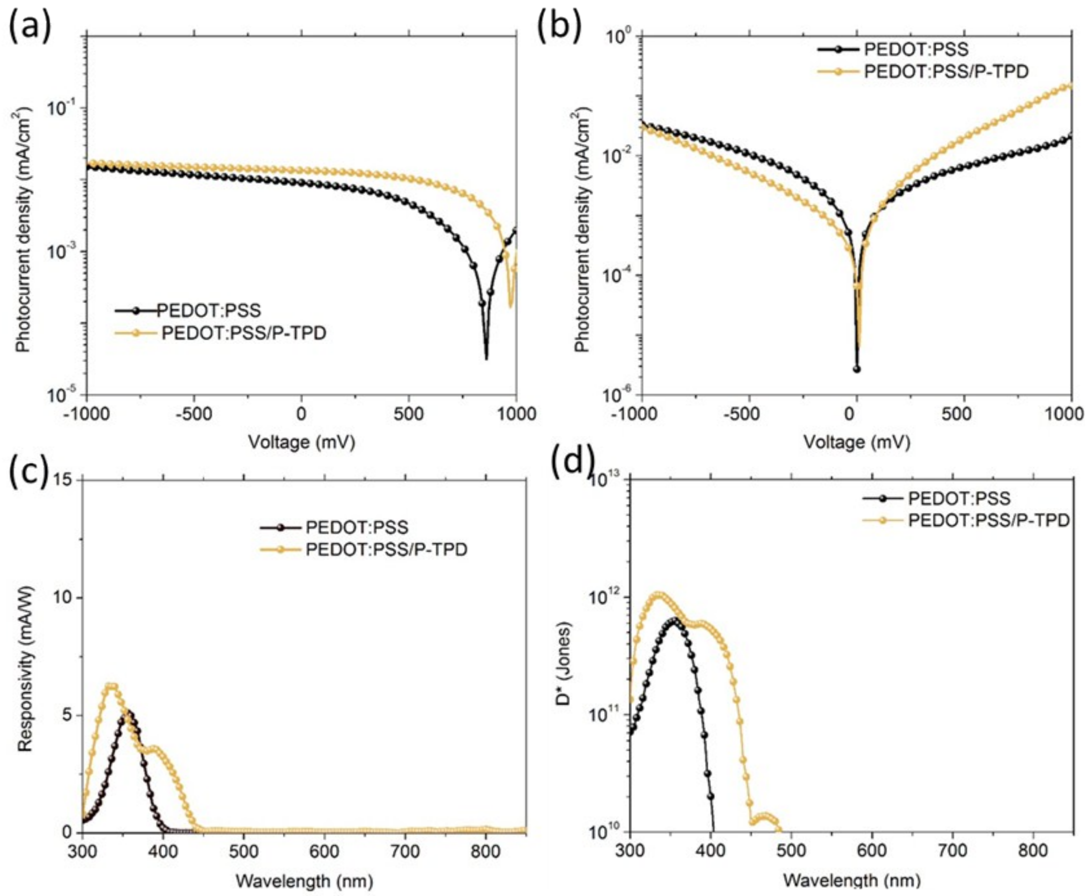

Figure S2. Current-voltage characteristic under light (a) and dark, (b) Responsivity and (c) normalized detectivity (d) of the two kinds of devices without QDs upon 100 mW/cm^2 sun light intensity.

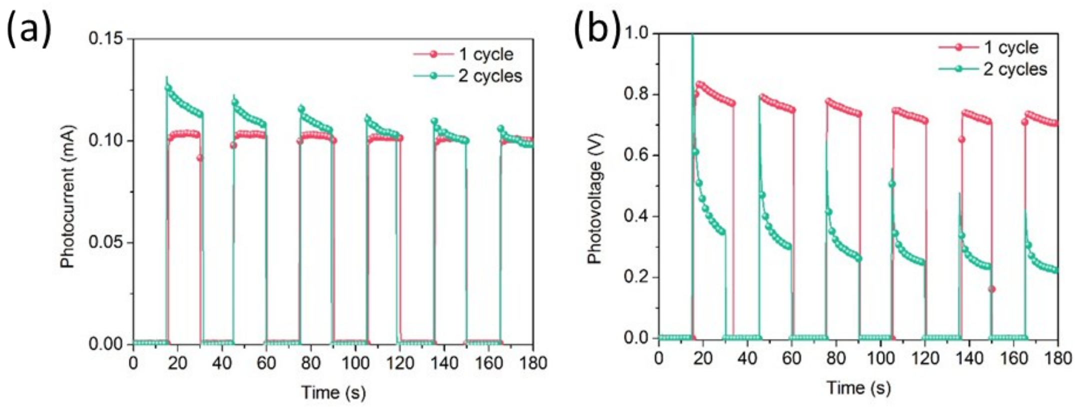

Figure S3. The temporal response and recovery of (a) current density and photovoltage of the devices based on different thickness of P-TPD layer and QDs layer.

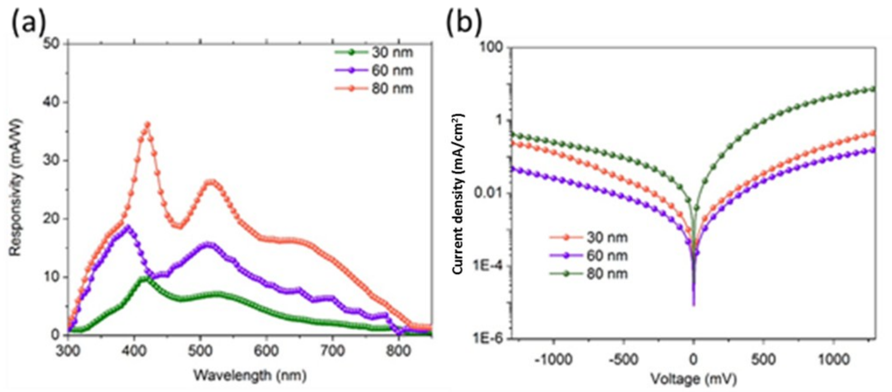

Figure S4. (a) Responsivity and (b) IV curves of the devices under the dark condition based on different thickness of P-TPD layer.

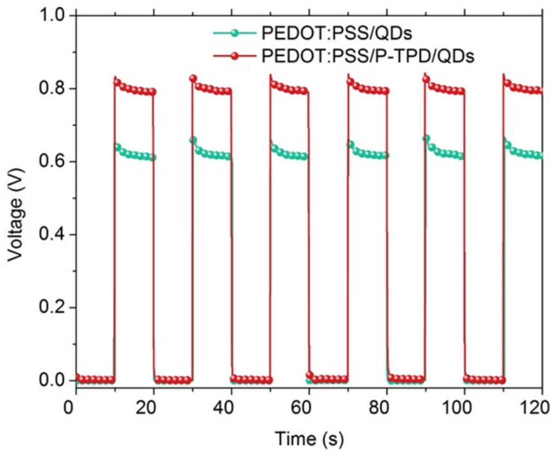

Figure S5. The temporal response and recovery of voltage of the devices upon 100 mW/cm^2 sun light intensity.

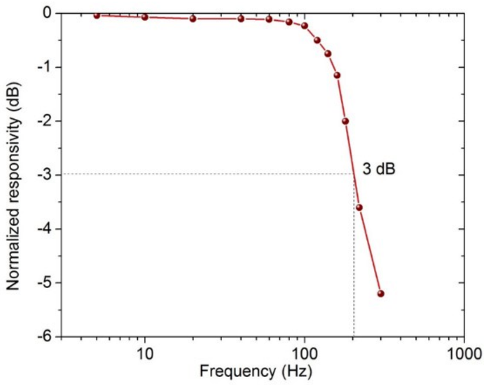

Figure S6. The 3 dB bandwidth of the double HTL-based device.

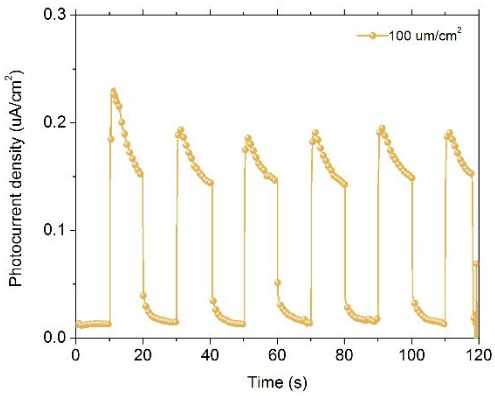

Figure S7. Weak light conditions in conventional current detection mode for the PEDOT:PSS device.

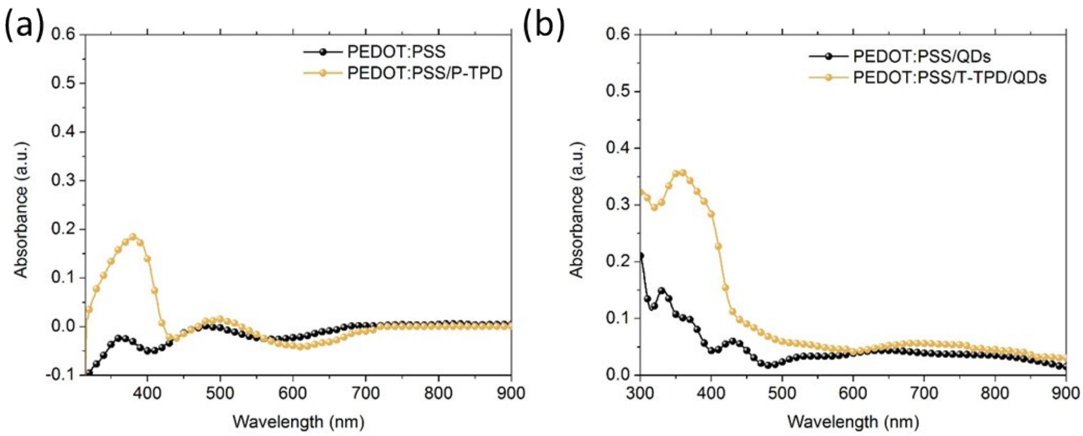

Figure S8. The absorption of the PEDOT:PSS films, PEDOT:PSS/P-TPD films (a), PEDOT:PSS/QDs films and PEDOT:PSS/P-TPD/QDs films (b).

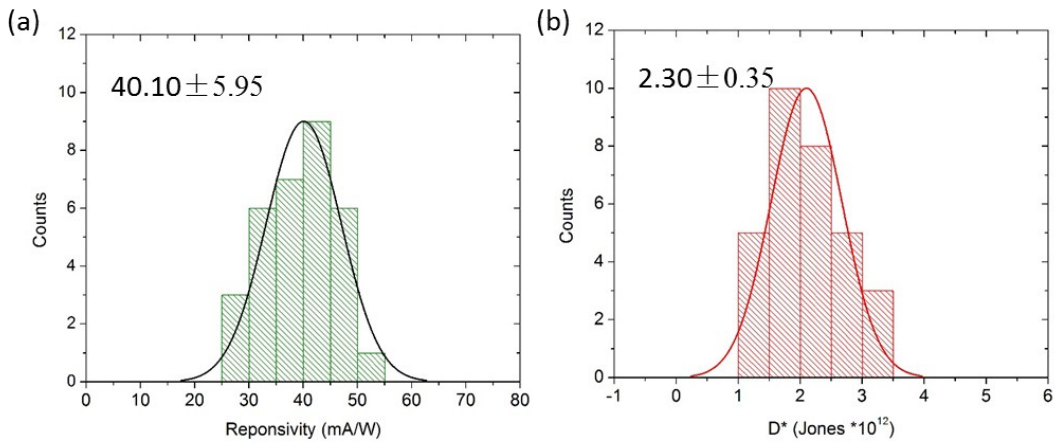

Figure S9. Statistical histogram of the responsivity (a) and detectivity (b) of 31 individual P-TPD based photodetectors.

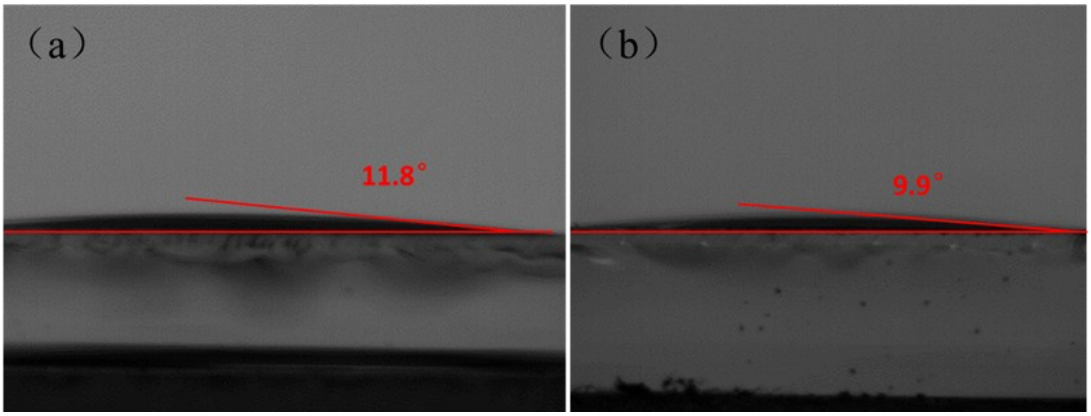

Figure S10. Contact angles of octane droplets on PEDOT:PSS films (a) and PEDOT:PSS/P-TPD films (b).

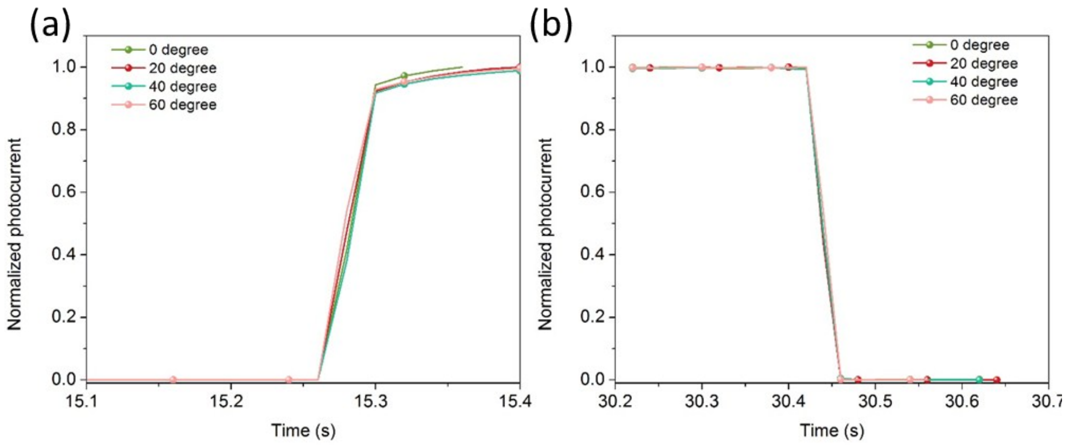

Figure S11. Photocurrent rise (a) and decay (b) of the device at various angles of curvature measured at a light intensity of 100 mW/cm^2.

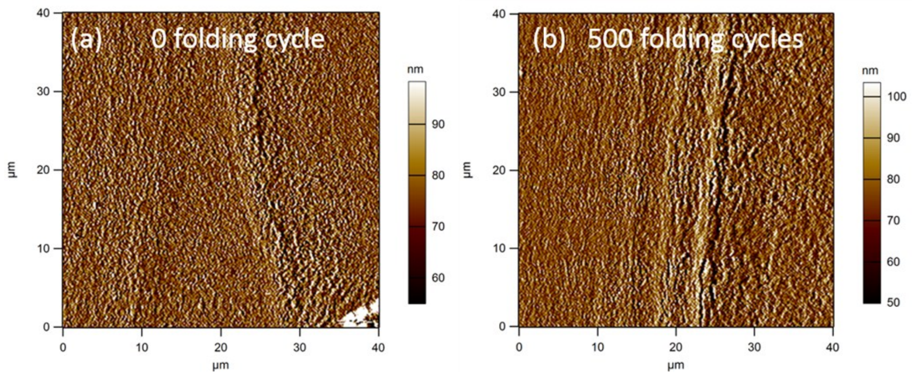

Figure S12. Atomic force microscopy (AFM) of PEDOT:PSS/P-TPD/QDs/ZnO films after being subjected to (a) 0 folding cycle and (b) 500 folding cycles.

Table S1. Figures of merit and progress of flexible quantum dots photodetectors.

Year	Spectral region	D* (Jones $*10^{12}$)	Rise/decay Time (s)	Quantum efficiency(%)	Materials	Refs
2013	Vis	--	0.0007/0.0013	20 (1Wcm^{-2}, 665nm)	CdSe nanobelt /graphene QDs	1
2014	UV	--	0.1/0.2	--	ZnO/Au	2
2016	UV-NIR	(500nm) 3.0	0.25/5.3	--	Perovskite/graphene QDs	3
2017	Vis-NIR	(400nm)4.3 (980nm)0.76	0.052/0.063	36(0.4 Wcm^{-2}, 560nm)	Perovskite/nanoparticles	4
2017	Vis-NIR	(580nm) 1.44	--	--	PbS QDs	5
2017	UV-NIR	(700nm) 0.38 (350nm) 2.5	7/4	--	TiO_2/perovskite QDs	6
2018	UV-NIR	(450nm)4.23 (830nm)2.6	0.098/0.051	163(450nm)/ 54(830nm）	Au/perovskite	7
2018	UV-NIR	(375nm) 3.98 (532nm) 2.39 (808) 0.37	1.01/1.35	--	PbS QDs/ZnO	8
2018	UV	--	0.25	--	ZnO QDs	9
2018	UV-NIR	(350 nm)2.1 (420nm) 2.6 (800nm) 0.6	0.04/0.04	13(350nm) 14(420nm) 3(800nm)	$CdSe_xTe_{1-x}$ QDs	This work

Table S2. Parameters of the flexible P-TPD-based double device and the rigid glass-based double device.

Samples	I_{light}(mA)	I_{dark}(mA)	t_r/t_d (ms)	R(mA/W)	D*(Jones)
Flexible device	0.10	$1.03*10^{-7}$	40	45	$2.6*10^{12}$
Rigid device	0.12	$0.91*10^{-7}$	40	47	$2.9*10^{12}$

Table S3. Weak-light response and progress of self-powered photodetectors.

Year	Light wavelength (nm)	Light intensity (um/cm^2)	I_{light}(nA/cm^2)	Materials	Refs
2005	514	10	18	CdSe QDs	10
2017	850	10	10	Perovskite/Polymer	11
2018	white	10	300	Perovskite	12
2018	white	10	5	Organic/PbS QDs	13
2018	white	20	600	$CdSe_xTe_{1-x}$ QDs	This work

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