

Supplementary Information

Metal Oxide-Free Flexible Organic Solar Cells with 0.1 M Perchloric Acid Sprayed Polymeric Anodes

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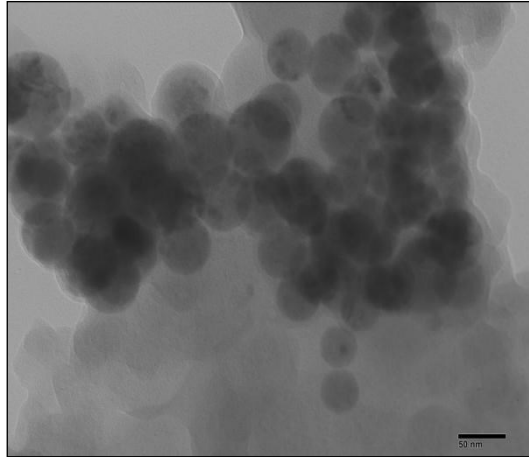


Fig. S1 Aggregate morphology of the PEDOT:PSS anodes with >99.5 wt% CH₃SO₃H soaking treatment.

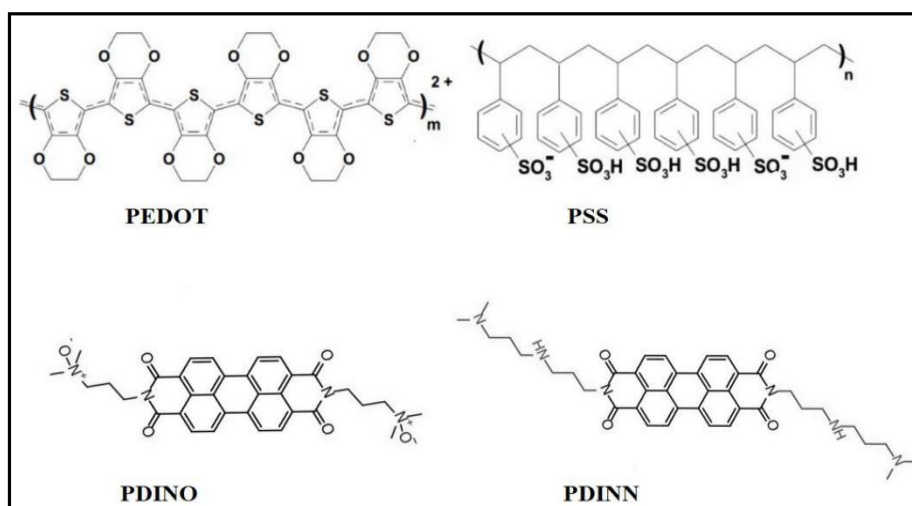


Fig. S2 Molecular structures of PEDOT:PSS, PDINO and PDINN.

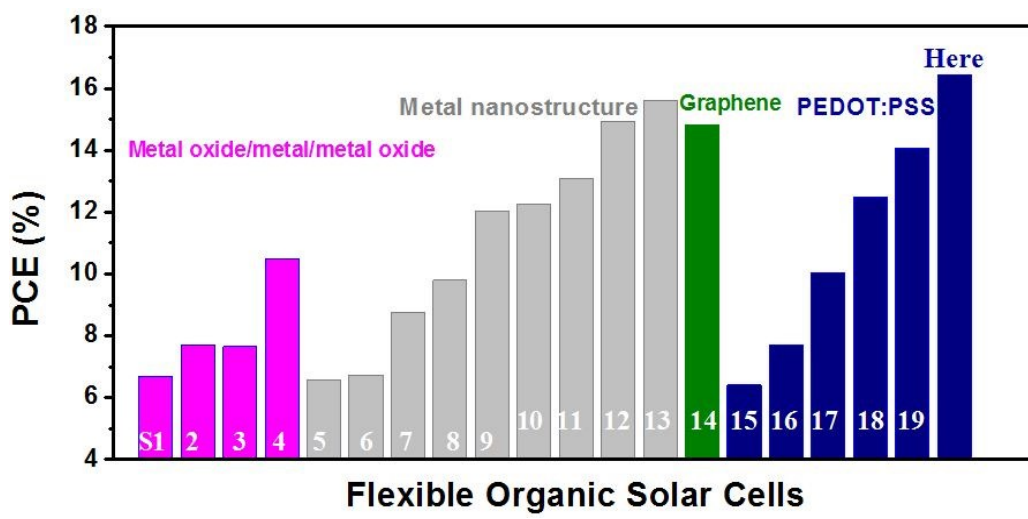


Fig. S3 Plotted PCE values of single-junction flexible OSCs reported in literatures and in this work.

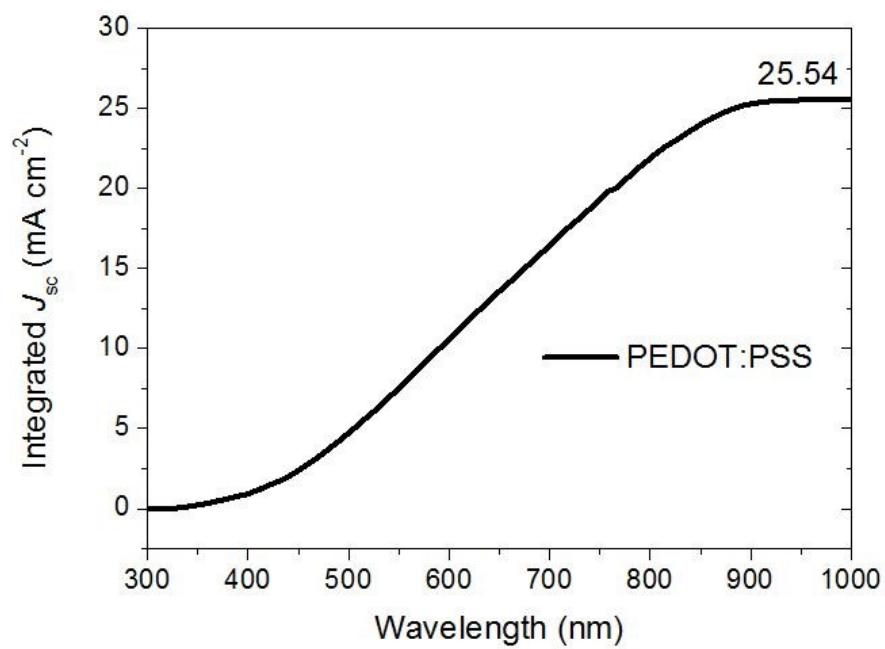


Fig. S4 The integrated current density of the flexible OSCs based on the PEDOT:PSS electrodes with the HClO_4 treatments.

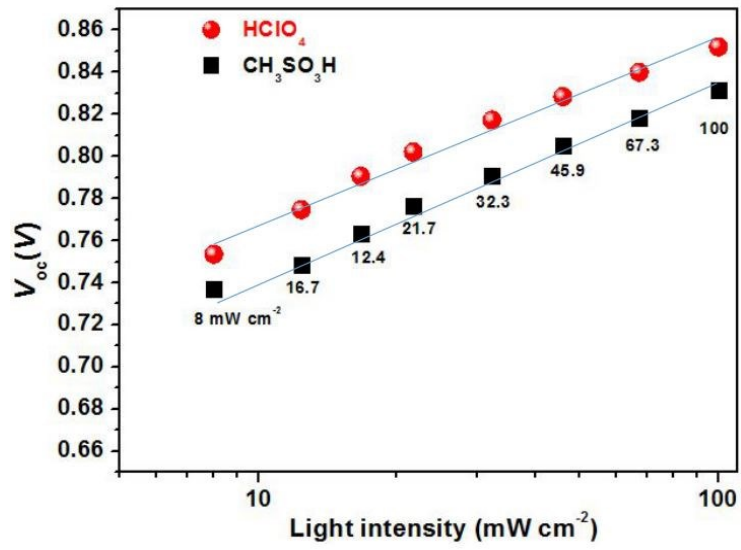


Fig. S5 V_{oc} versus light intensity of the flexible OSCs based on the PEDOT:PSS electrodes with the HClO_4 treatments ($n=1.45$) and the $\text{CH}_3\text{SO}_3\text{H}$ treatments ($n=1.58$), respectively.

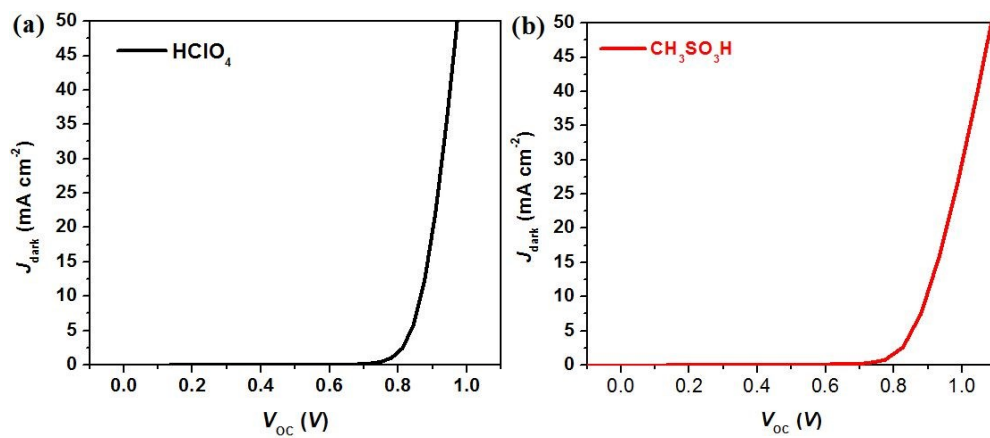


Fig. S6 The dark current density of the flexible OSCs based on the PEDOT:PSS electrodes with the HClO_4 treatments (a) and the $\text{CH}_3\text{SO}_3\text{H}$ treatments (b).

Tab. S1 Summaries of photovoltaic characteristics of single-junction flexible organic solar cells with flexible transparent electrodes

Flexible electrode	Preparation method	Active layer	PCE (%)	Refer.
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ZnO/Cu(8.0 nm) on Cu(O)/ZnO	Magnetron sputtering/Thermal evaporation	PTB7:PC ₇₁ BM	6.70	S1
ZnO/Cu(9.5 nm) on Cu(O)/ZnO		PTB7:PC ₇₁ BM	7.7	S2
ZnO/Cu (0:5%)(7 nm)/ZnO		PTB7-Th:PC ₇₁ BM	7.65	S3
TiO ₂ /ZnO/Ag(8.0 nm)/ZnO	Vacuum sputtering	PBDB-T:IT-M:PC ₇₁ BM	10.48%	S4
			Best: 10.62	
Ag grid/PEDOT:PSS	Thermal evaporation/Solution preparation	PTB7-Th:PC ₇₁ BM	6.58	S5
Ag mesh/PEDOT:PSS	Printing/Solution preparation	PTB7:PC ₇₁ BM	6.73	S6
Ag NW	Solution preparation	PTB7-Th:PC ₇₁ BM	8.75	S7
Ag island/PEDOT:PSS	Thermal evaporation/Solution preparation	PTB7-Th:PC ₇₁ BM	9.8	S8
			Best: 9.9	
Ag NW/Al-ZnO	Solution preparation	PM6:IT-4F	12.02	S9
Ag/Cu grid	Nanoimprinting and electrodeposition	NF3000-P:NF3000-N	12.26	S10
Ag NW/PSSNa	Solution preparation		13.1	S11
Ag NW/Al-ZnO	Solution preparation	PBDB-T-2F:Y6	14.93	S12
			Best:15.21	
Transferred Ag NW/ZnO	Solution preparation	PM6:N3:PC71BM	15.6	S13
			Best: 16.1	
Graphene	Chemical vapor deposition	PM6:Y6	14.8	S14
			Best: 15.2	
PEDOT:PSS	Aqueous solution preparation	PBDTT-S-TT:PC ₇₁ BMP	6.42	S15

PEDOT:PSS	Aqueous solution preparation	TB7-Th:PC ₇₁ BM	7.7	S16
PEDOT:PSS	Aqueous solution preparation	PBDB-T:IT-M	10.03	S17
			Best: 10.12	
PEDOT:PSS	Aqueous solution preparation	PCE-10:IEICO-4F	12.5	S18
PEDOT:PSS	Aqueous solution preparation	PM6:Y6:PC ₇₁ BM	14.06	S19
PEDOT:PSS	Aqueous solution preparation	PM6:Y6	16.44	Here
			Best:16.71	

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Tab. S2 Physical Properties of PEDOT:PSS (Clevios PH1000) and PEDOT:PSS (Clevios P VP A14083) Used to make transparent electrodes and hole transport layers, respectively

Product	Solids content	PEDOT:PSS ratio (by weight)	Particle size (nm) d50	Viscosity (cP)	Film resistance (Ω .cm)	Work function
P VP A14083	1.3–1.7%	1:6	Max:35 distribution50	5–12	500–5000	5.0–5.2
PH1000	1.0–1.3%	1:1.25	Major:120	15–50	<0.0012 (with doping)	4.8–5.2 eV

