

Supporting Information

Flexible Nonfullerene Organic Solar Cells on Embedded Silver Nanowires with Efficiency up to 11.6%

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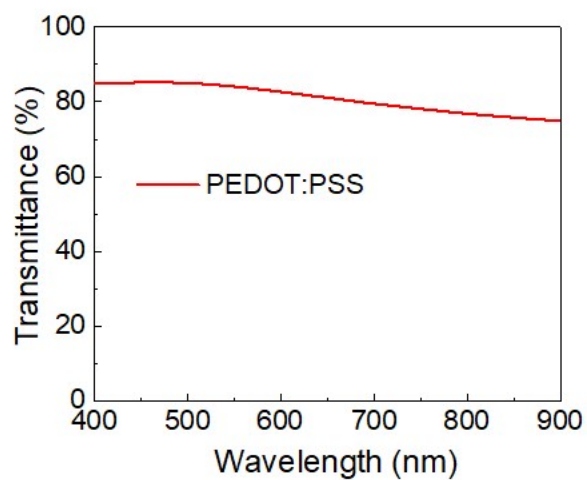


Figure S1. Transmittance spectrum of PEDOT:PSS film.

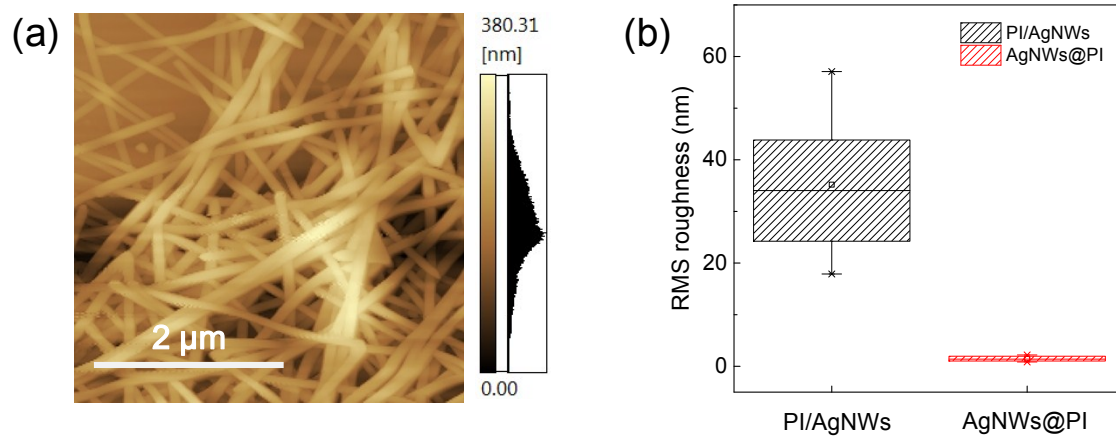


Figure S2. a) AFM image of the AgNWs spin-coated on PI substrates. b) RMS surface roughness of AgNWs on the top of PI and embedded in PI.

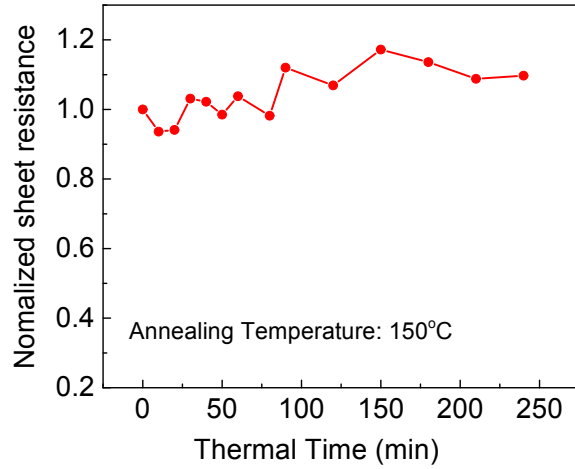


Figure S3. Normalized sheet resistance of AgNWs@PI after annealing for different time at a temperature of 150 °C.

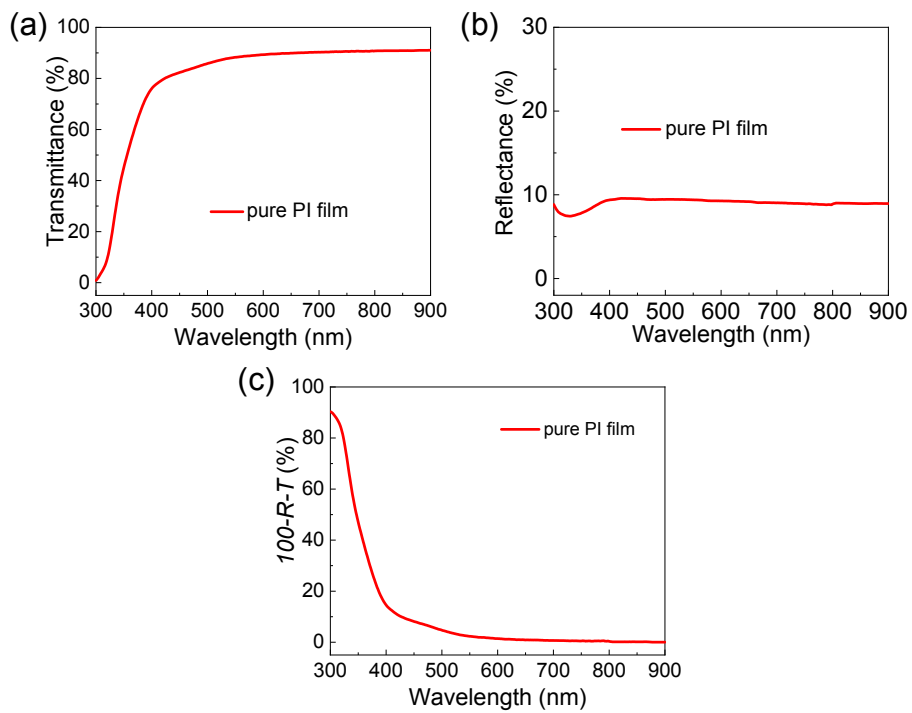


Figure S4. a) Transmittance, b) reflectance and c) absorption spectra of a PI substrate (200 μm).

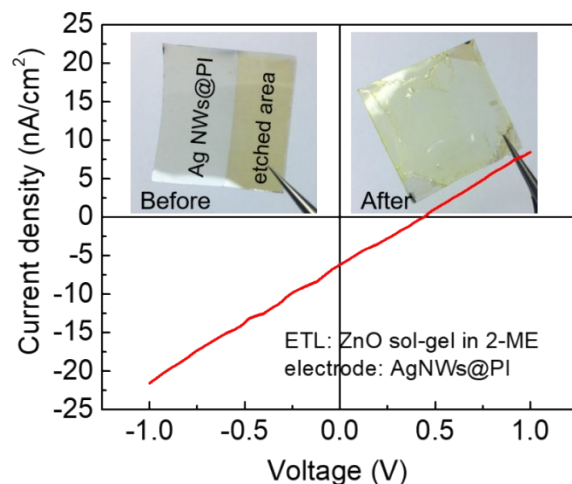


Figure S5. Current density–voltage (J – V) curves of flexible OSCs based on ZnO sol-gel in 2-ME (AgNWs@PI/ZnO sol-gel in 2-ME/PBDB-T-2F:IT-4F/MoO₃/Ag). The insets are images of AgNWs@PI after ZnO coating from 2-ME solvent.

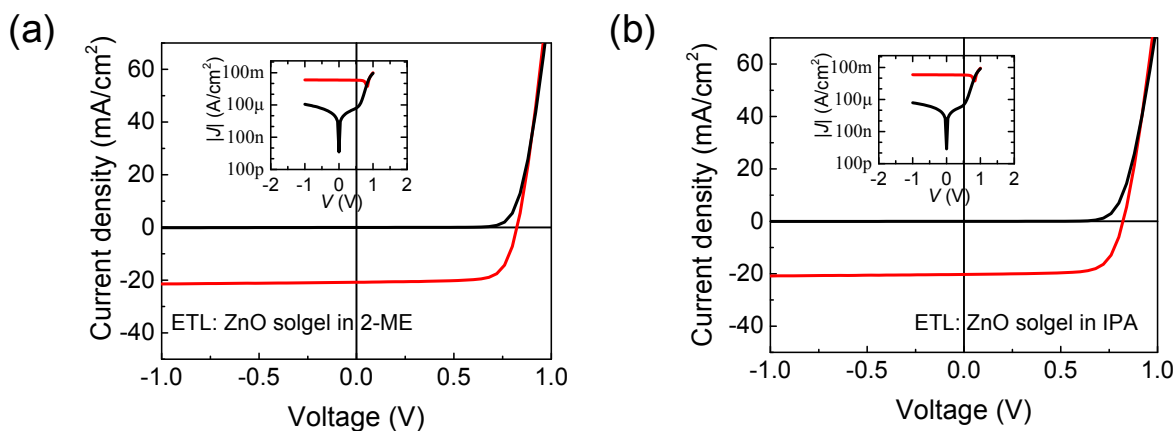


Figure S6. J – V curves of OSCs based on PBDB-T-2F:IT-4F with ZnO sol-gel different solvents processed from different solvents: (a) from 2-ME; (b) from IPA. Device structure is glass/ITO/ZnO in IPA/Active Layer/MoO₃/Ag.

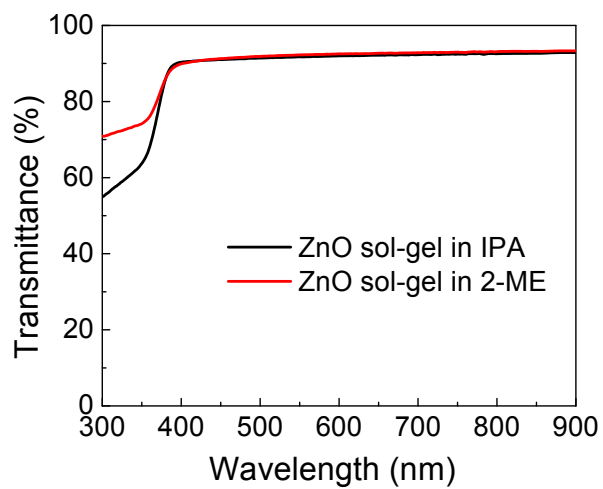


Figure S7. Transmittance spectra for ZnO sol-gel processed from different solvents.

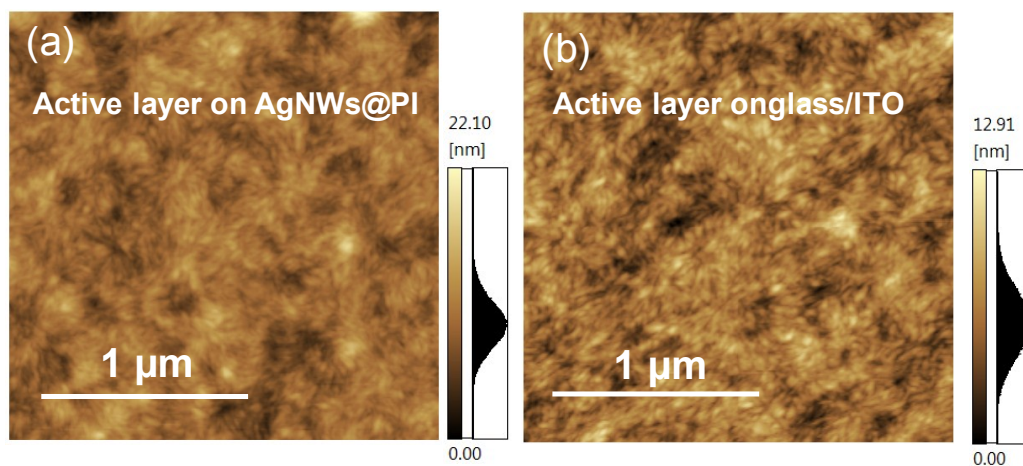


Figure S8. AFM height images of the PBDB-T-2F:IT-4F films on different substrates: a) AgNWs@PI; b) glass/ITO.

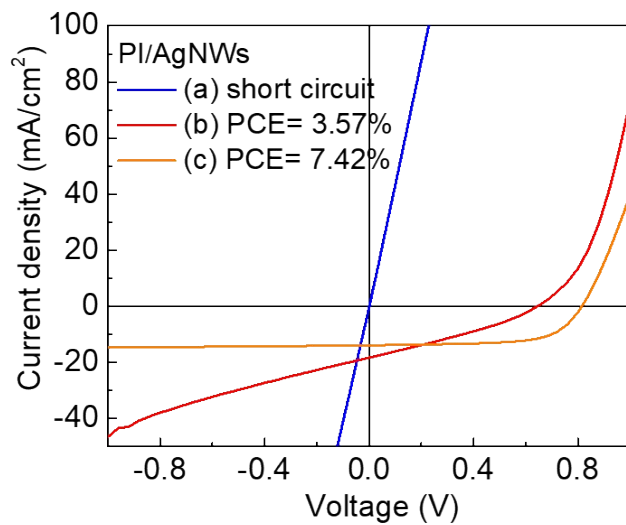


Figure S9. Typical J - V curves of flexible OSCs with PBDB-T-2F:IT-4F on PI/AgNWs (AgNWs spin-coated on top of PI substrates).

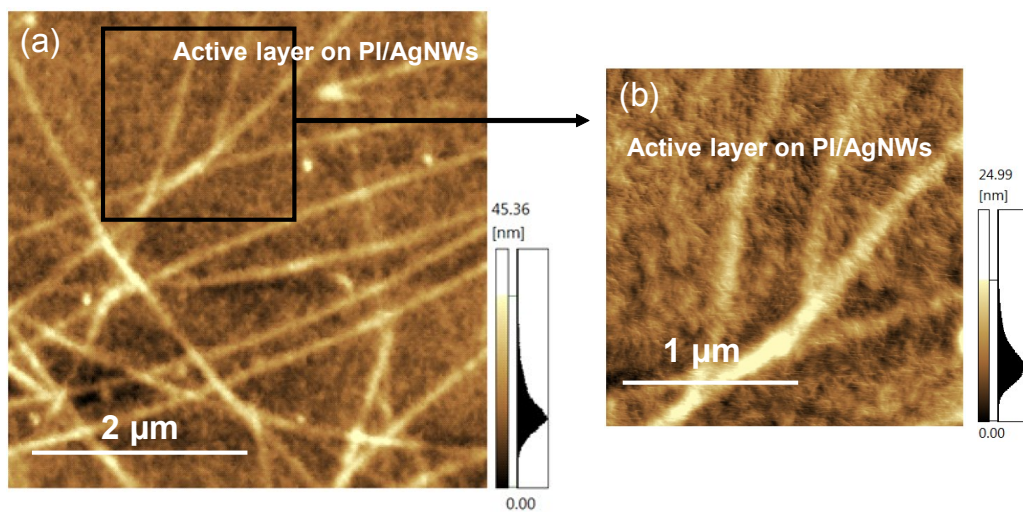


Figure S10. AFM height images of the PBDB-T-2F:IT-4F films on PI/AgNWs.

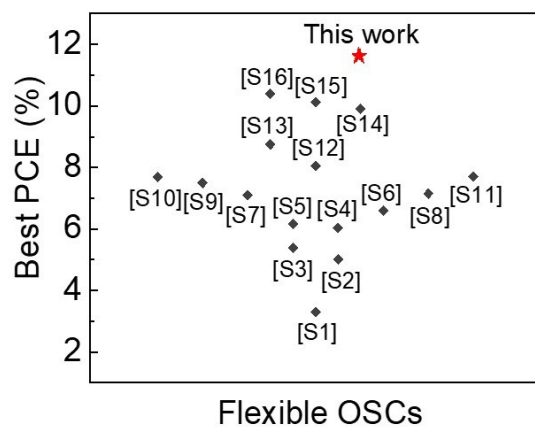


Figure S11. Comparison of PCE values of this work and the recently reported flexible OSCs (the references are given in **Table S3** of this supporting information).

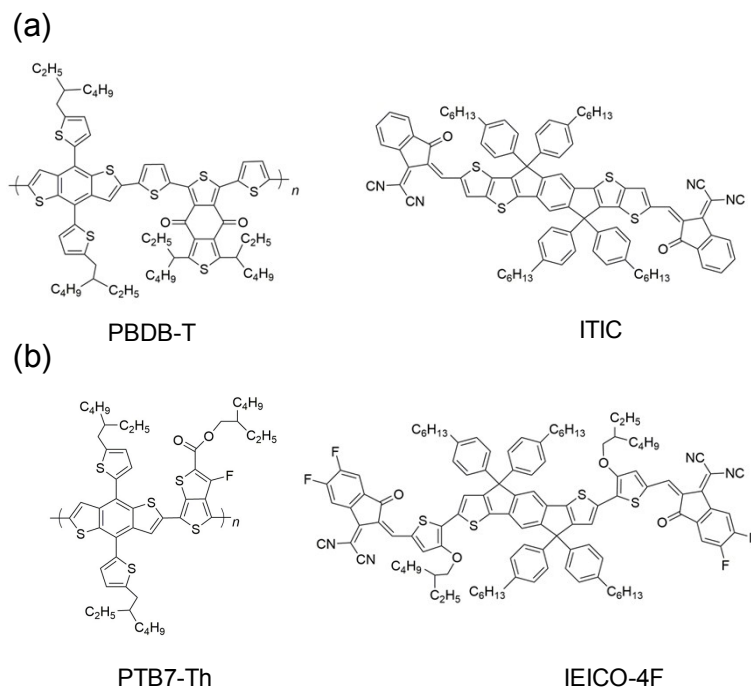


Figure S12. Molecular structures of (a) PBDB-T, ITIC and (b) PTB7-Th, IEICO-4F.

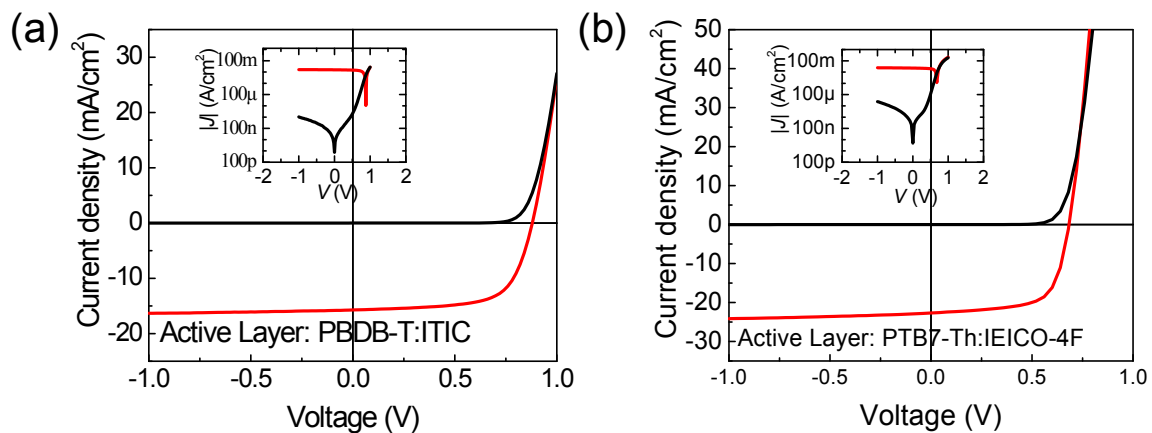


Figure S13. J - V curves of flexible OSCs on AgNWs@PI with different active layers: (a) PBDB-T:ITIC; (b) PTB7-Th:IEICO-4F.

Table S1. Photovoltaic parameters of OSCs with different solvents of ZnO sol-gel; Device structure glass/ITO/ZnO sol gel/PBDB-T-2F:IT-4F/MoO₃/Ag.

Solvent of ZnO	V_{oc} (V)	J_{sc} (mA/cm²)	FF	PCE (%)
2-ME	0.82	20.78	0.75	12.78
IPA	0.82	20.26	0.74	12.29

Table S2. Typical photovoltaic parameters of OSCs on PI/AgNWs (AgNws spin-coated on top of PI substrates); Device structure is PI/AgNWs/ZnO/PBDB-T-2F:IT-4F/MoO₃/Ag.

Cell	V_{oc} (V)	J_{sc} (mA/cm²)	FF	PCE (%)
(a)	Short circuit			
(b)	0.64	18.32	0.31	3.57
(c)	0.81	13.88	0.66	7.42

Table S3. Summaries of structures and PCEs of various flexible OSCs reported previously.

Device Structure	Best PCE	Year	Ref.
PET/H ₃ PO ₄ -PEDOT:PSS/PEI/P3HT:ICBA/PEDOT:PSS	3.30%	2015	[S1]
PET/ AgNWs/PEDOT/PTB7-F20:PC71BM/LiF/Al	5.02%	2013	[S2]
PDMS/mild acid-PEDOT:PSS/4083/PBDTT-STT:PC ₇₁ BM/Ca/Al	5.38%	2016	[S3]
PEN/ ZnO/Ag/ ZnO /PIDT-PhanQ:PC ₇₁ BM/MoO ₃ /Ag	6.04%	2015	[S4]
PET/ AgNWs/PFN /PTB7:PC ₇₁ BM/MoO ₃ /Ag	6.17%	2015	[S5]
PEN/AgNWs-exfoliated graphene/PEDOT:PSS/PTB7:PC ₇₁ BM/Ba/Ag	6.60%	2018	[S6]
PEN/ CVD-graphene /ZnO/PTB7:PC ₇₁ BM/MoO ₃ /Ag	7.10%	2014	[S7]
PET/Ag/PEN/PTB7-Th:PCBM/ITO/MoO ₃ /gradient Ag	7.15%	2015	[S8]
PET/ZnO/Cu/ ZnO /PTB7-Th:PC ₇₁ BM/PEDOT:PSS/Ag	7.50%	2015	[S9]
PEN/H ₂ SO ₄ -PEDOT:PSS/PTB7-Th:PC ₇₁ BM/Ca/Al	7.70%	2015	[S10]
PET/ZnO/Cu(N)/ ZnO /PTB7:PC ₇₁ BM/PEDOT:PSS/Ag	7.70%	2016	[S11]
Corning Willow Glass /TiO ₂ /Ag/ITO/ZnO/PTB7:PC ₇₁ BM/MoO ₃ /Ag	8.06%	2015	[S12]
PET/CIP-trated AgNWs /ZnO/PTB7-Th:PC ₇₁ BM/MoO ₃ /Ag	8.75%	2017	[S13]
PEN/PEI/Ag/PEDOT:PSS /PTB7:PC ₇₁ BM/MoO ₃ /Ag	9.90%	2015	[S14]
PET/ PEDOT:PSS /PEDOT:PSS(4083)/PBDB-T:IT-M/PDINO/Ag	10.12%	2018	[S15]
PET/thick Ag/PEIE/PBDTT-F-TT:PC ₇₁ BM/UTMF-Ag/TeO ₂	10.40%	2015	[S16]
AgNWs@PI/ZnO/PBDBT-2F:IT-4F/MoO₃/Ag	11.60%	2018	This work

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