Supplementary information

22.43%-efficiency flexible modification-free perovskite solar cells with a uniform and anti-reflective ITO/SiO_2/PET/SiO_2 substrate

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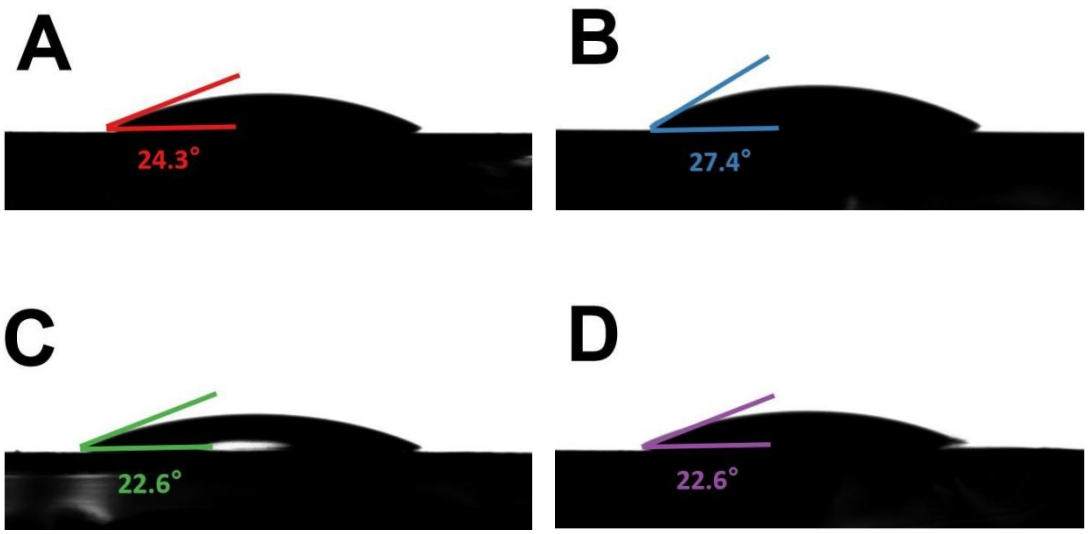

Figure 1. Wettability characteristics of the MeO-2PACz droplets on these ITO transparent electrodes. Obviously, the droplets of MeO-2PACz showed a good wettability with a contact angle of ~24.3° on the surfaces of the α-ITO/SiO_2/PET/SiO_2, which is smaller than that (~27.4°) of the droplets on the surface of the β-ITO/SiO_2/PET/SiO_2. The smaller contact angle suggests a higher hydrophilic property of the α-ITO and an intimate contact at interfaces. The enhanced wettability is favorable for a better deposition of the MeO-2PACz HTLs. When the MeO-2PACz droplets were dipped on both γ- and δ-ITO, the droplets showed a comparable wettability with a small contact angle of ~22.6°. The results demonstrate an intimate interface contact between the MeO-2PACz and the γ- and δ-ITO electrodes.

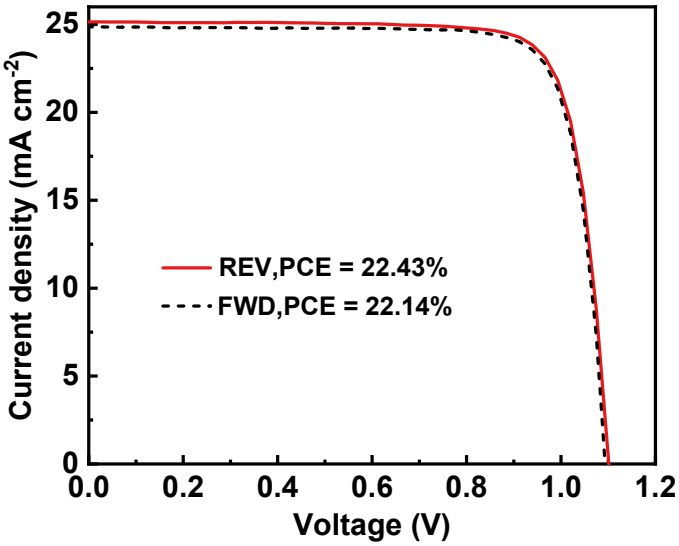

Figure S2. *J*−*V* curves of the best flexible unmodified PSCs *via* a forward (FWD) scanning and the reverse (REV) scanning.

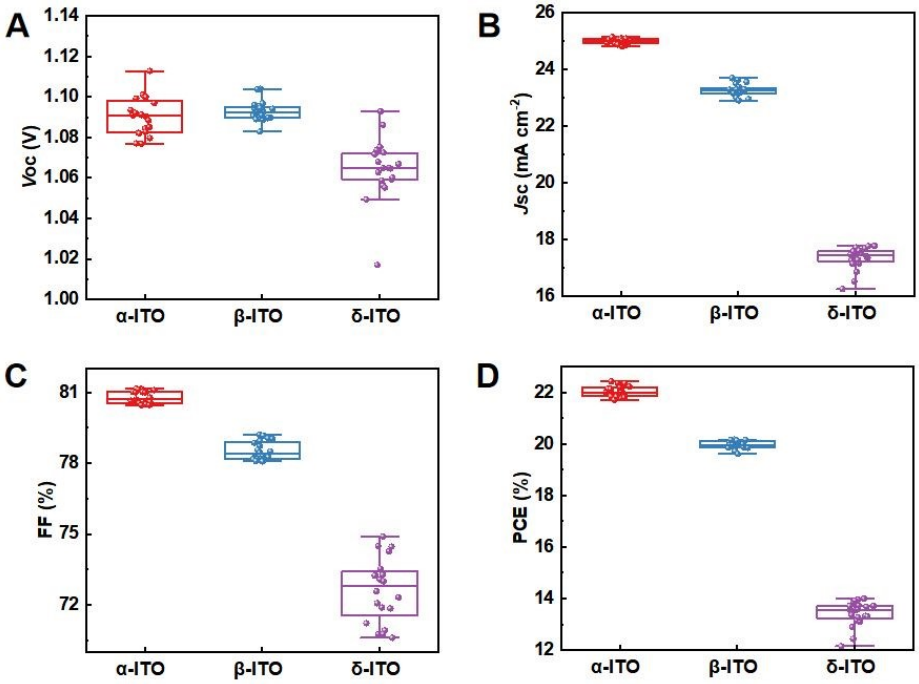

Figure S3. Performance distributions of the flexible PSCs with the different ITO-coated plastic substrates. A) V_{OC}, B) J_{SC}; C) FF, and D) PCE.

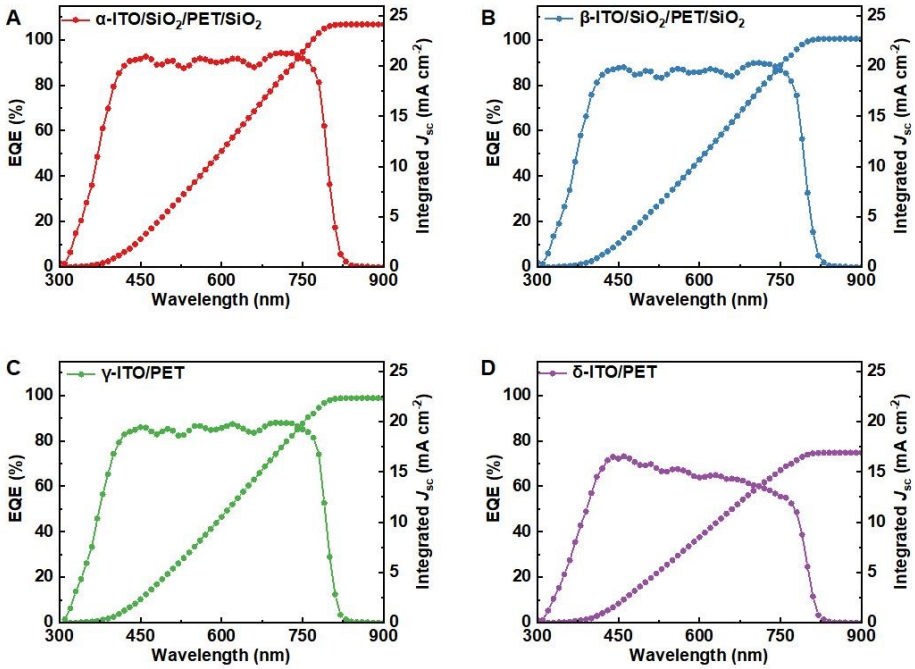

Figure S4. EQE spectra of the flexible PSCs with the different ITO-coated plastic substrates.

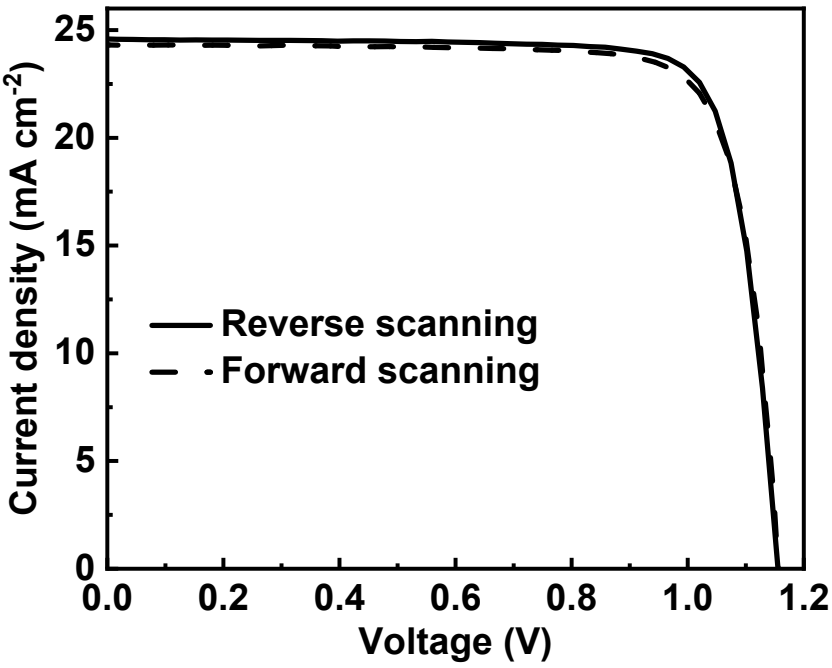

Figure S5. *J*−*V* curves of the best flexible GBAc doped PSCs *via* forward scanning and reverse scanning.

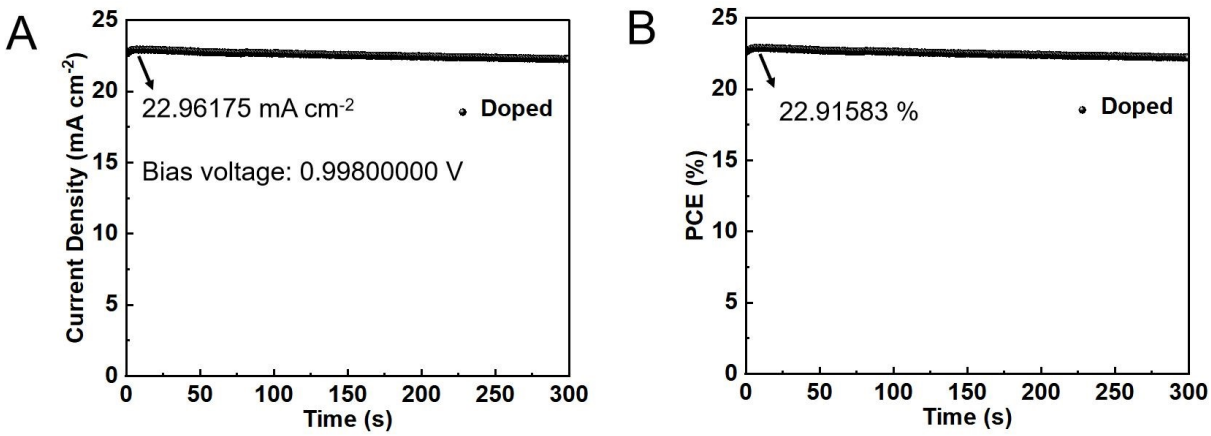

Figure S6. Steady-state photocurrent and power output of the GBAc doped flexible PSCs with the α-ITO/SiO_2/PET/SiO_2.

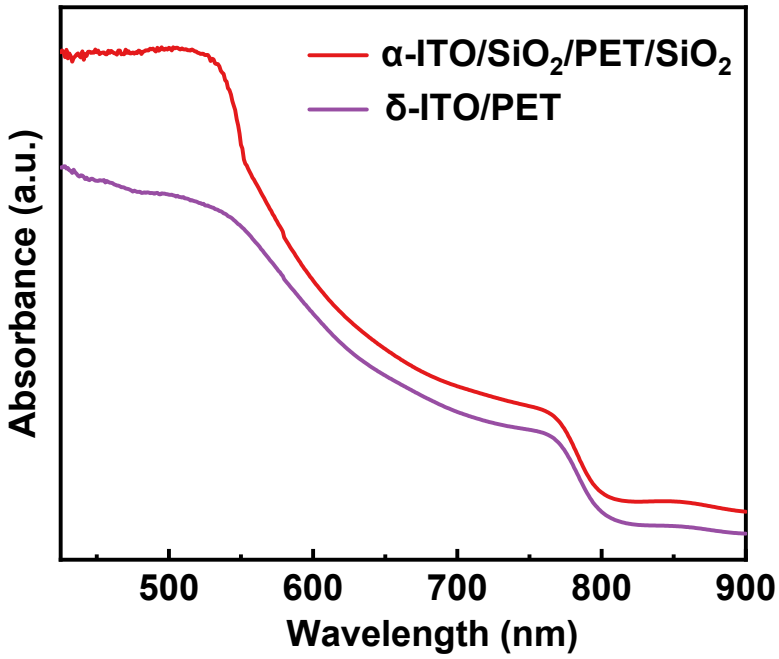

Figure S7. The absorption spectra of the α- and δ-ITO based flexible devices without Ag metals.

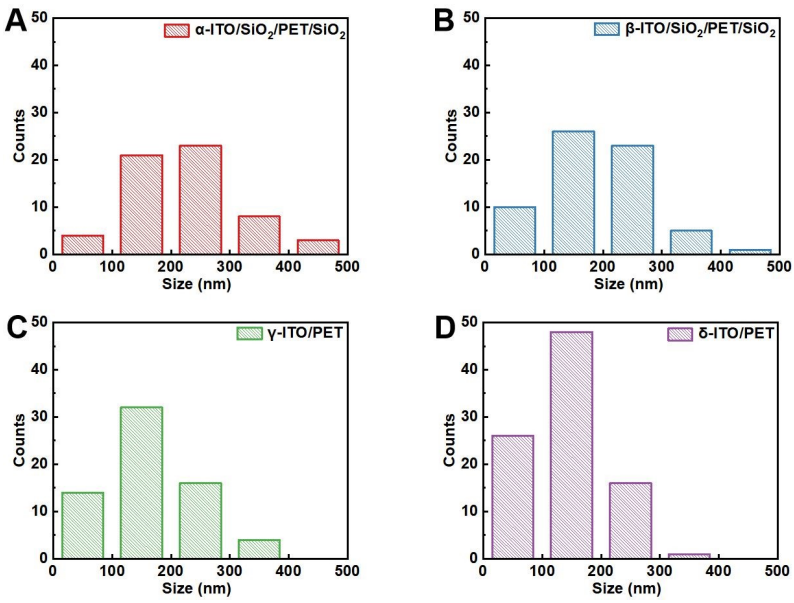

Figure S8. The grain size distribution data of the perovskites on the different ITO-coated plastic substrates.

Table S1. Comparison of the PCEs of the processing-simple flexible PSCs without surface modifications and dopant incorporation.

Device Structure	V_{OC} [V]	J_{SC} [mA cm^{-2}]	FF [%]	PCE [%]	Refer.
SiO_2/PET/SiO_2/ITO/MeO-2PACz/$Cs_{0.05}(FA_{0.98}MA_{0.02})_{0.95}Pb(I_{0.98}Br_{0.02})_3$/$C_{60}$/BCP/Ag	1.10	25.14	81.16	**22.43**	**Here**
PET/ITO/DCPA/$Cs_{0.05}(FA_{0.98}MA_{0.02})_{0.95}Pb(I_{0.98}Br_{0.02})_3$/$C_{60}$/BCP/Ag	1.10	24.24	79.45	**21.11**	1
PET/ITO/PTAA/$Cs_{0.05}(FA_{0.98}MA_{0.02})_{0.95}Pb(I_{0.98}Br_{0.02})_3$/$C_{60}$/BCP/Ag	1.10	24.95	76.38	**20.96**	2
PET/PEDOT:PSS/PTAA/$Cs_{0.05}(FA_{0.95}MA_{0.05})_{0.95}Pb(I_{0.95}Br_{0.05})_3$/PCBM/BCP/Ag	1.12	24.90	76.00	**21.13**	3
PEN/ITO/PTAA//$FA_yMA_{1-y}PbI_{3-x}Cl_x$/$C_{60}$/BCP/Cu	1.05	21.86	77.42	**17.77**	4
SUPA/PEN/ITO/PTAA/$MA_{0.6}FA_{0.4}PbI_{2.9}Br_{0.1}$/C60/BCP/Cu	1.07	21.92	80.20	**18.84**	5
PEN/ITO/UV-NiO_x/$Cs_{0.05}FA_{0.85}MA_{0.1}PbI_{2.91}Br_{0.09}$/$C_{60}$/BCP/Cu	1.11	22.26	79.57	**19.70**	6
PEN/ITO/PTAA/$Cs_{0.15}FA_{0.85}Pb(I_{0.95}Br_{0.05})_3$/PCBM/BCP/Ag	1.15	22.55	80.50	**20.90**	7
PET/ITO/PTAA/$MAPbI_3$/C_{60}/BCP/Cu	1.16	21.98	79.11	**20.17**	8
PEN/ITO/NiO_x/$Cs_{0.1}FA_{0.7}MA_{0.2}PbI_xBr_{3-x}$/PCBM/BCP/Ag	1.09	22.09	79.28	**19.01**	9
PEN/ITO/$Cs_{0.3}(MA_{0.05}FA_{0.95})_{0.97}Pb(I_{0.95}Br_{0.05})_3$/$C_{60}$/BCP/Cu	1.07	23.22	74.90	**18.59**	10
PET/ITO/PTAA/$MAPbI_3$/C_{60}/BCP/Ag	1.07	22.40	72.00	**17.27**	11
PEN/ITO/PTAA/$Cs_{0.05}FA_{0.7}MA_{0.25}Pb(I_{0.93}Br_{0.07})_3$/PCBM/BCP/Ag	1.04	23.89	74.50	**18.51**	12
PEN/ITO/Spiro-TTBb/$MAPbI_3$/PCBM/BCP/Ag	1.10	21.70	81.19	**19.34**	13
PEN/ITO/NiO_x/$(FA_{0.83}MA_{0.17})_{0.95}Cs_{0.05}Pb(I_{0.9}Br_{0.1})_3$/PCBM/BCP/Ag	1.07	21.60	77.80	**18.10**	14
PET/ITO/CuPC/$MAPbI_3$/C_{60}/BCP/Ag	1.10	22.65	75.00	**18.68**	15
PEN/ITO/PEDOT:PSS/PTAA/$MAPbI_3$/PCBM/BCP/Ag	1.09	21.98	81.00	**19.41**	16
PEN/ITO/NiO_x:PDA/$MAPbI_3$/PCBM/BCP/Ag	1.04	20.78	77.40	**16.76**	17
PET/ITO/NiO_x/$FA_yMA_{1-y}PbI_{3-x}Cl_x$/PCBM/BCP/Ag	1.06	22.23	73.00	**17.23**	18
PET/PEDOT:PSS(PH1000)/PTAA/$MAPbI_3$/C_{60}/BCP/Cu/parylene	0.96	22.45	79.00	**17.03**	19
PET/ITO/NiO_x/$Cs_{0.1}FA_{0.7}MA_{0.2}PbI_xBr_{3-x}$/PCBM/BCP/Ag	1.04	21.78	78.00	**17.69**	20

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