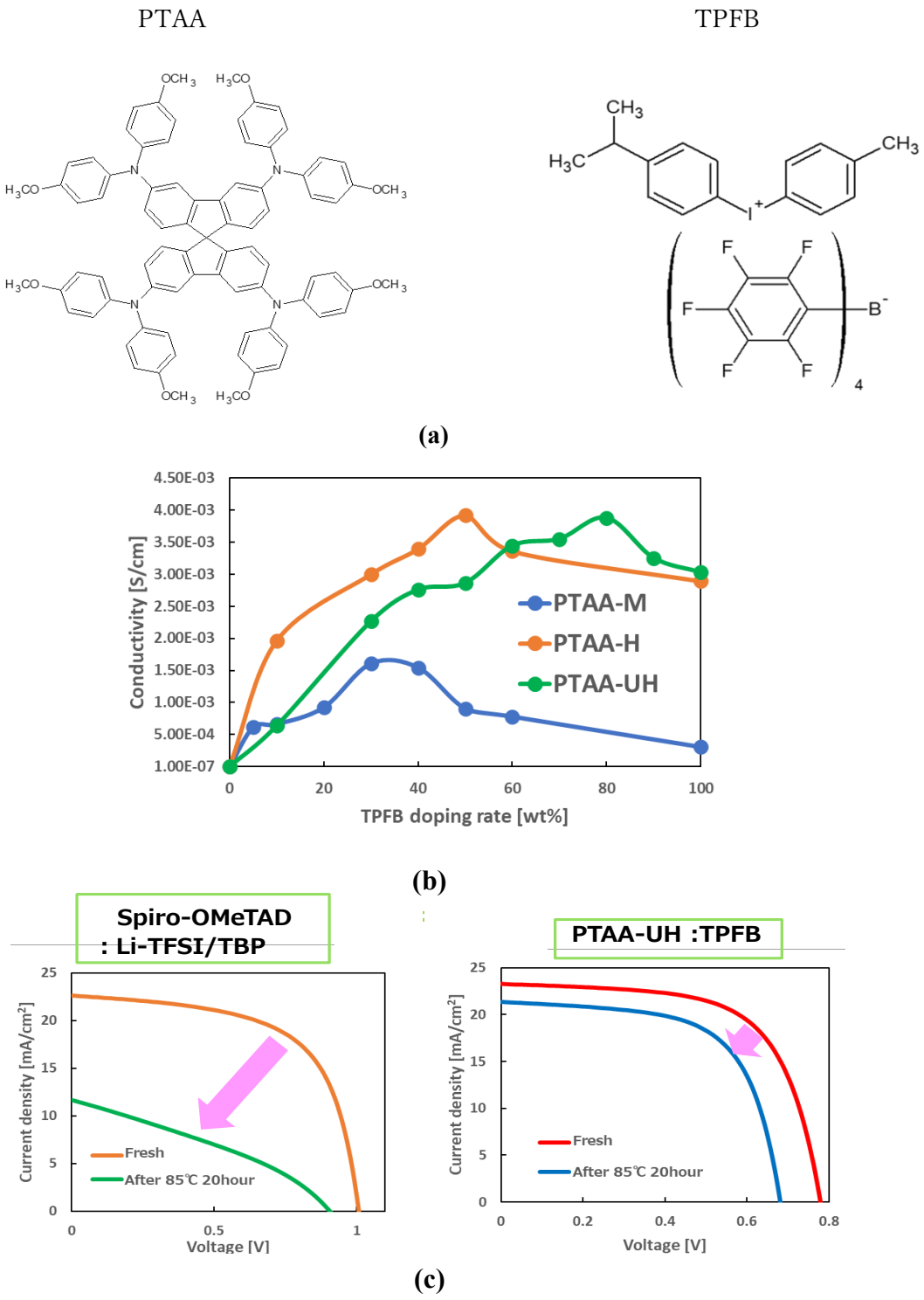
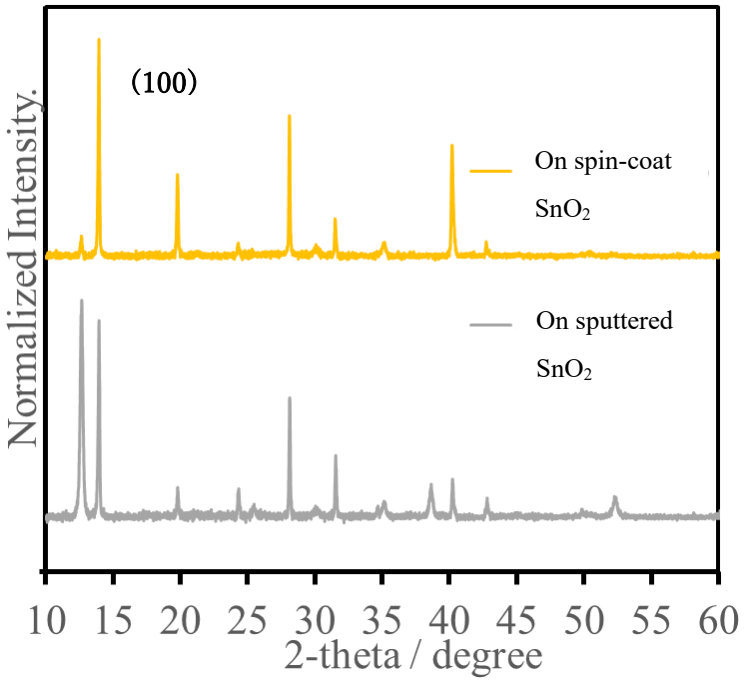


Figure S1. (a) Molecular structure of PTAA and TPFB (b) Conductivity of PTAA as a function of TPFB mixing concentration. -M, -U. and -UH present molecular weight, M: 1.1 kDa, H: 90 kDa,

and UH: 325 kDa in PTAA. (c) Stability test of I-V curve of single PSCs with spiro-OMeTAD and PTAA(TPFB) as HTL for 85℃ and 85%.



	(100) diffraction peak	fwhm [°]
On spin coat SnO_2	13.96	0.099
On sputtered SnO_2	13.97	0.108

Figure S2. XRD pattern of $FA_{0.9}Cs_{0.1}PbI_3$ thin films on spin coated and sputtered SnO_2 substrates.

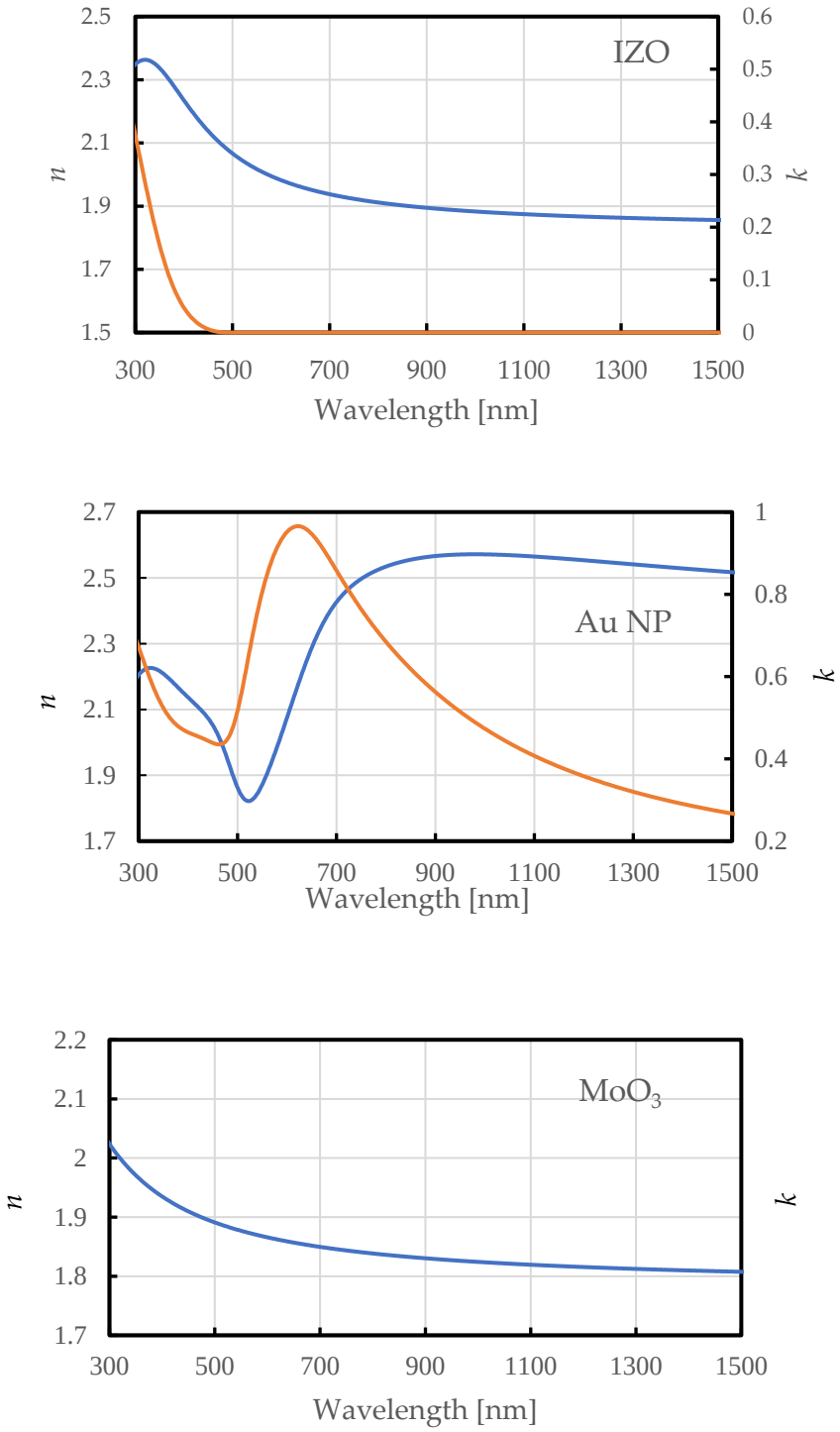


Figure S3. The *n* and *k* spectra of MoO_3, IZO, Au NPs components for the IZO/MoO_3 bilayer with and without Au NPs determined by the spectra fitting procedure. The *n* and *k* spectra of Au NP are given in the reference [48-50]. The measured spectra are analyzed using New-amorphous model for IZO and SnO_2.

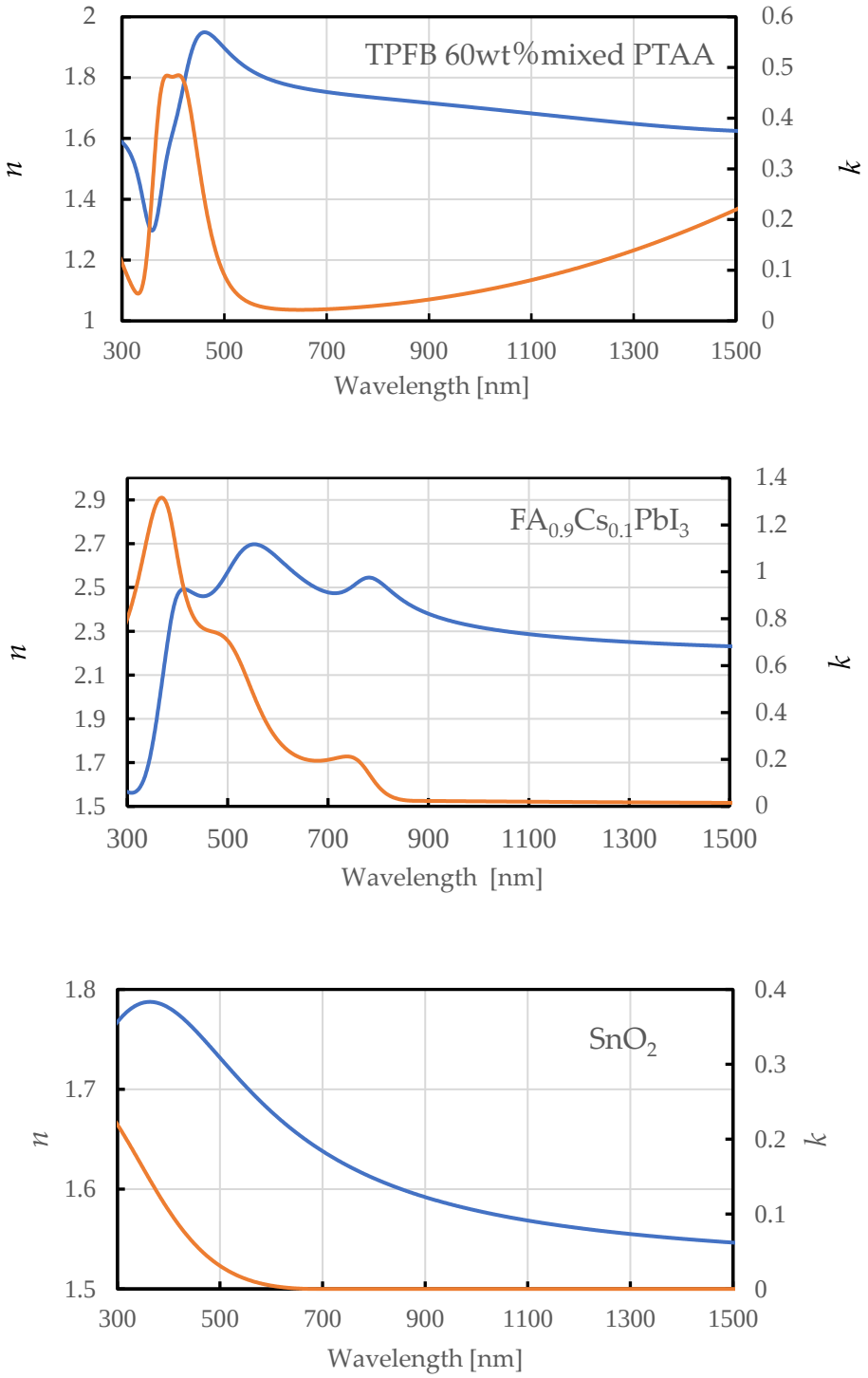


Figure S4. The *n* and *k* spectra of 60 wt% TPFB mixed PTAA, $FA_{0.9}Cs_{0.1}PbI_3$, and SnO_2 determined by the spectra fitting procedure. New amorphous + Drude model for 60% TPFB mixed PTAA, reference +I ZO for Au NPs, New-amorphous + Drude for PEDOT:PSS considering the uniaxial optical anisotropy.