Electronic Supplementary Information (ESI)

Perovskite-inspired Cu_2AgBiI_6 for mesoscopic indoor photovoltaics at realistic low-light intensity conditions

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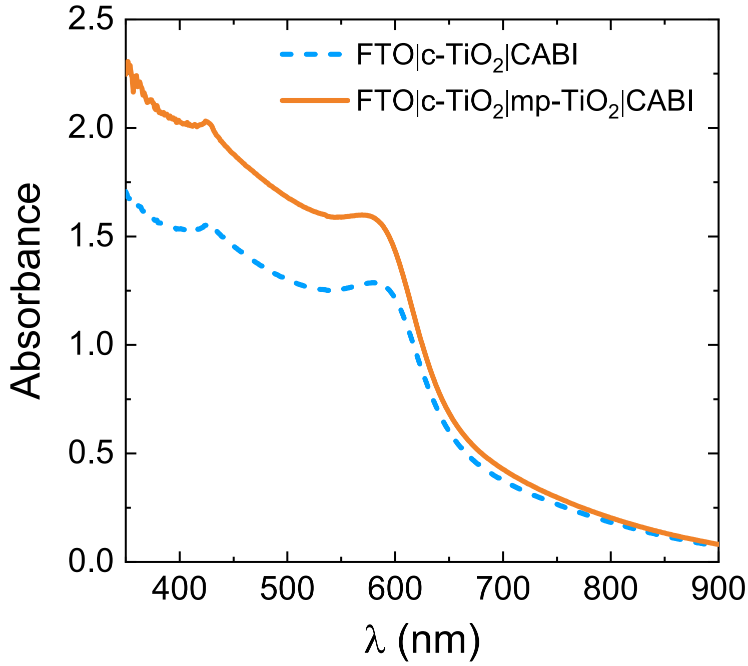

Figure S1. The optical absorption spectra of CABI films.

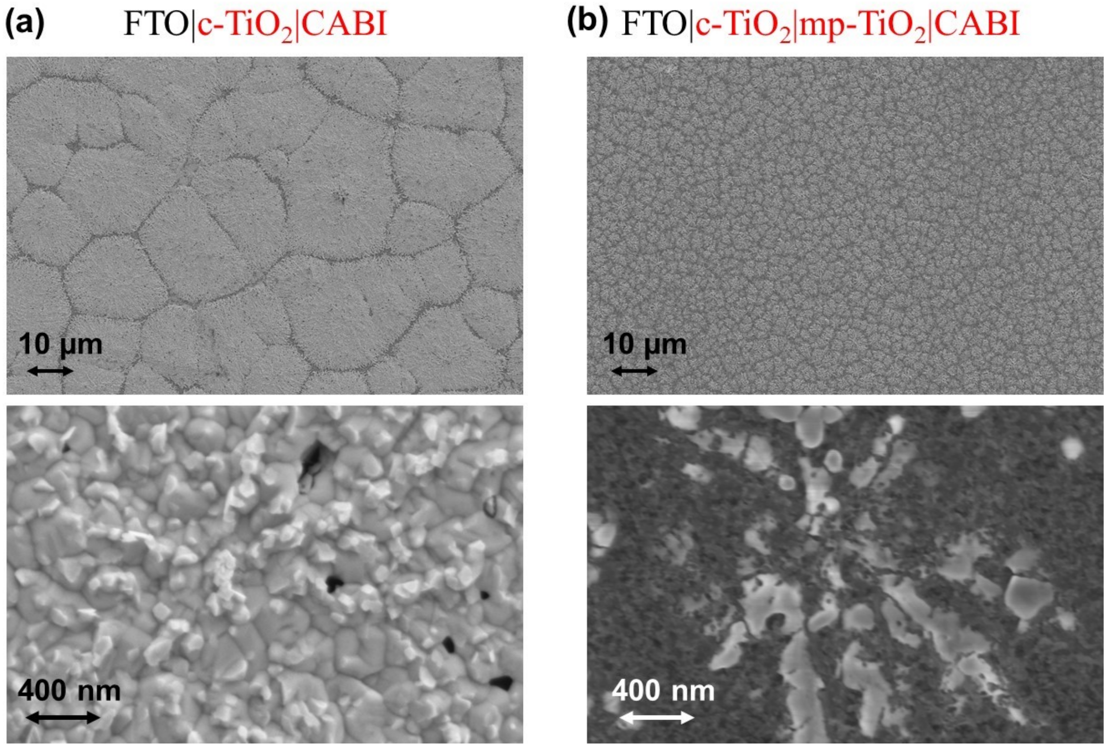

Figure S2. Low and high-resolution SEM top view images of CABI films on (a) c-TiO_2 and (b) mp-TiO_2.

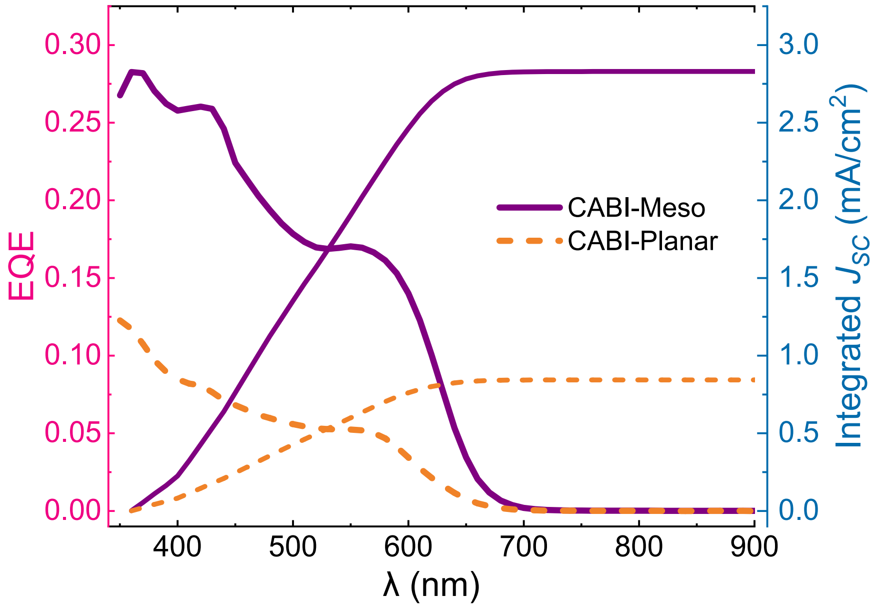

Figure S3. EQE spectra of the CABI solar cells and the corresponding integrated J_{SC} trend.

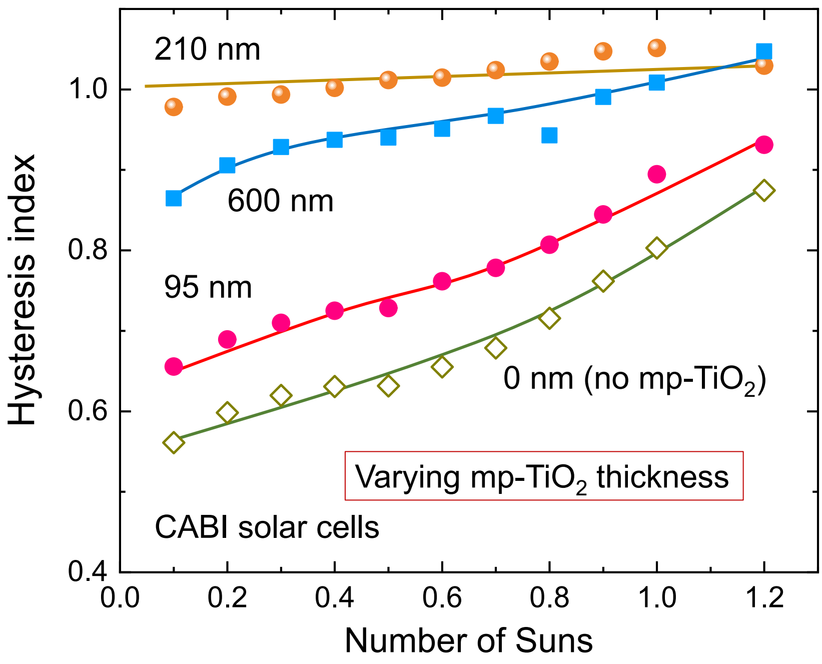

Figure S4. The variation of J-V hysteresis index of CABI-Planar and CABI-Meso (with varying mp-TiO2 thickness) solar cells as a function of 1-sun illumination. The hysteresis index is the ratio between the PCEs of reverse and forward bias *J-V* scans of the devices. Here we used the index to understand the change in the hysteresis with light intensity.

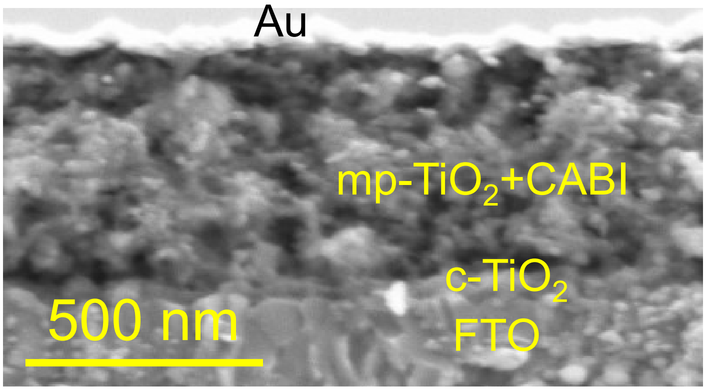

Figure S5. SEM cross-sectional view of a CABI-Meso device with a >210 nm mp-TiO_2 ETL layer. It should be note that the mp-TiO_2 layer is too thick so that both CABI (absorber) and SPIRO-OMeTAD (hole-transporting) layers are not visible in the image.

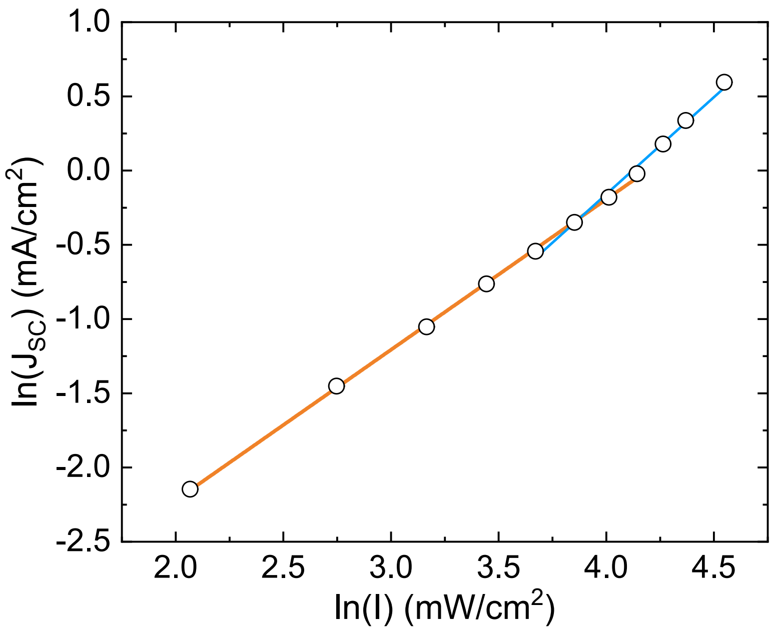

Figure S6. Log-log plot of J_{SC} versus 1-sun intensity (0.1-1.2 suns) for CABI-Meso device with mp-TiO_2 layer thickness of 400-600 nm.

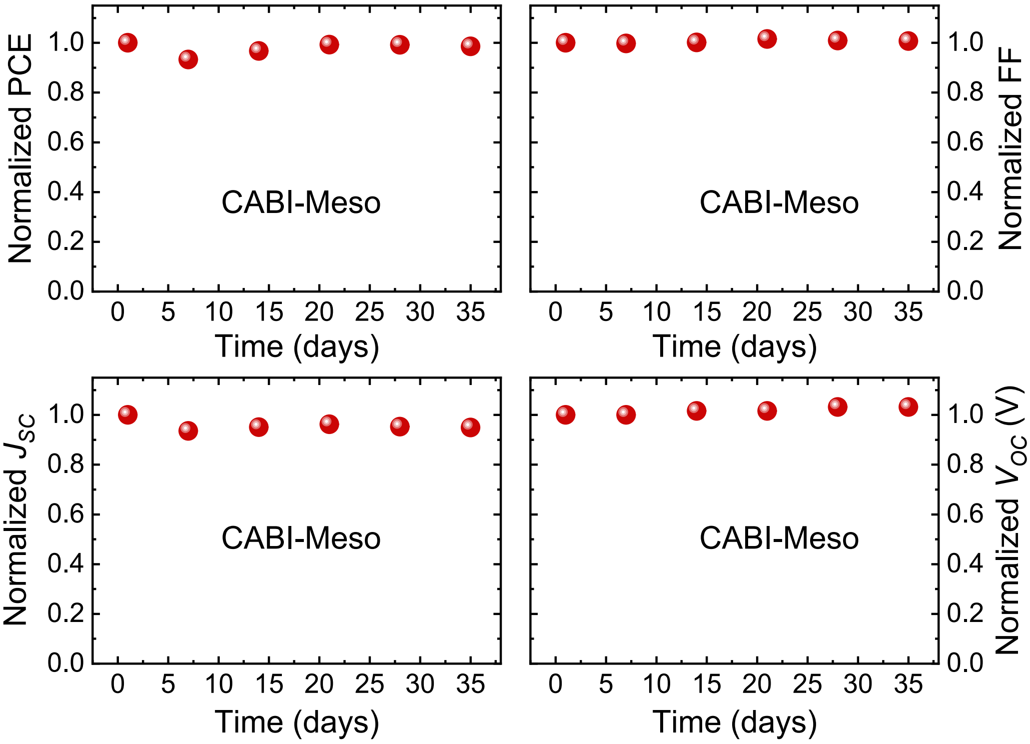

Figure S7. Normalized PV parameters, (a) PCE, (b) *FF*, (c) J_{SC}, and (d) V_{OC}, of a CABI-Meso device as a function of storage time. The device was stored in dry air (RH ~ 15%) but protected from light. T_{80} represents the time taken by the photovoltaic parameters to approach 80% of their initial values.

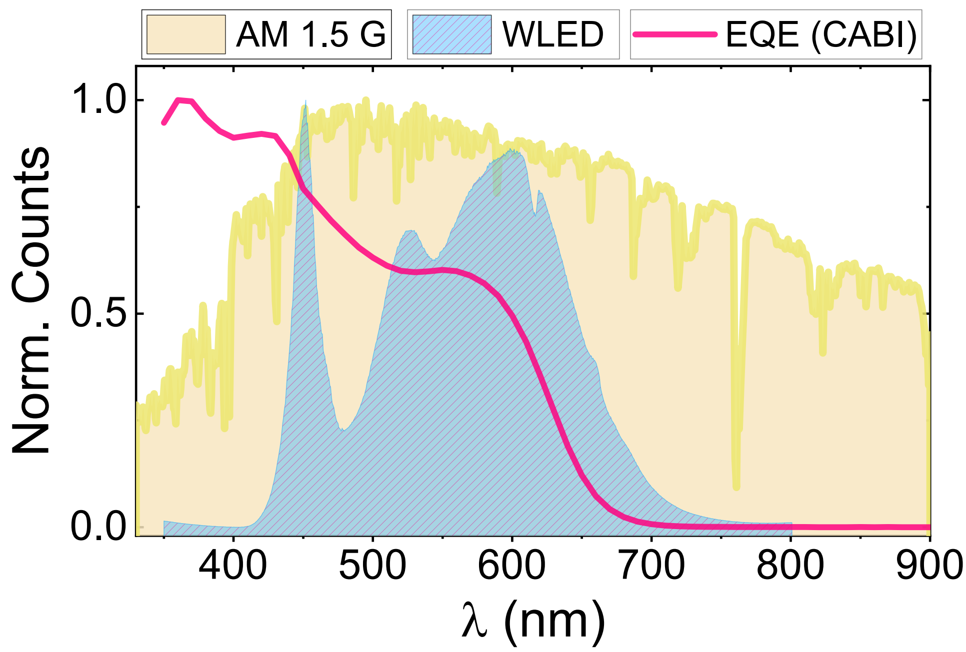

Figure S8. Comparison between the EQE spectrum of CABI-Meso solar cell, AM 1.5 G and WLED spectra.

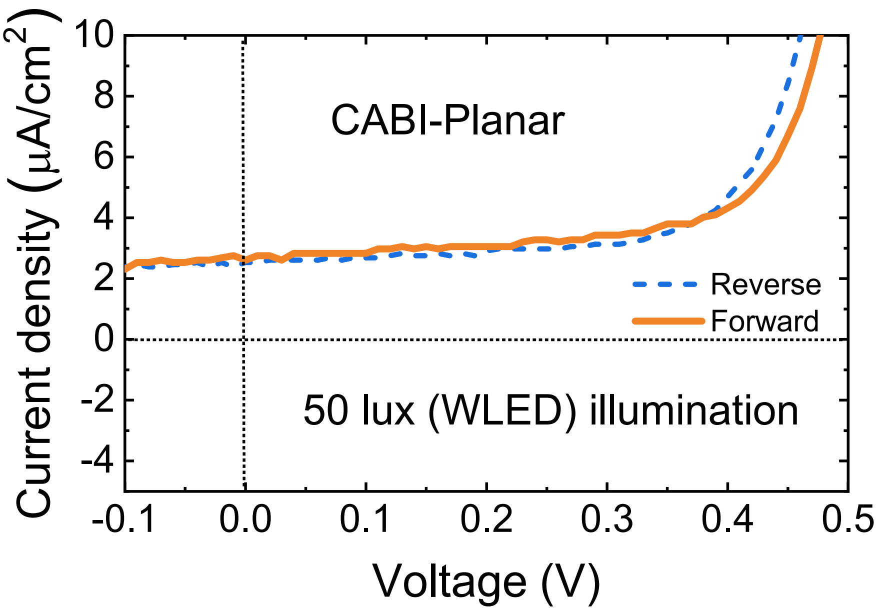

Figure S9. The *J-V* (reverse and forward bias) curves of a CABI-Meso device under 50 lux (WLED) illumination.

Table S1. The parameters obtained upon fitting the TRPL decay curves (Figure 1d) with bi-exponential, $I = A_{rad} \times \exp(-x/t_{rad}) + A_{non\text{-}rad} \times \exp(-x/t_{non\text{-}rad})$ + constant, and stretched exponential, $I = I_0 e^{-\left(\frac{t}{\tau_c}\right)^{\beta}}$, functions.

Here t_{rad} and $t_{non\text{-}rad}$ are radiative and non-radiative lifetimes, respectively. A_{rad}(%) and $A_{non\text{-}rad}$(%) are the percentage contributions of the radiative and non-radiative components of the TRPL decay curve, respectively. The I_0, τ_c, and β represent the initial PL intensity, time required for the PL intensity to reach a value of $1/e^{th}$ of its initial value, and the distribution coefficient, respectively. Note: β =1 leads to a mono-exponential behavior of the PL decay.

Sample	Bi-exponential fit				Stretched exponential fit	
	t_{rad} (ns)	$t_{non\text{-}rad}$ (ns)	A_{rad} (%)	$A_{non\text{-}rad}$ (%)	t_c (ns)	β
CABI on glass	70	12	39	61	29	0.49
CABI on c-TiO_2	58	8	46	54	25	0.46
CABI on mp-TiO_2	51	9	59	41	26	0.62

Table S2. Average solar cell parameters of CABI devices with varying mp-TiO2 layer thickness under 1-Sun illumination. The parameters of the champion devices are also given in brackets.

mp-TiO_2 (nm)	PCE (%)	FF (%)	J_{SC} (mA/cm^2)	V_{OC} (V)
0	0.37±0.02	62±1	1.0±0.1	0.59±0.01
	(0.41)	(64)	(1.1)	(0.61)
65	0.38±0.02	63±1	1.0±0.1	0.59±0.01
	(0.42)	(64)	(1.1)	(0.60)
95	0.46±0.004	64±1	1.2±0.1	0.59±0.01
	(0.47)	(65)	(1.3)	(0.61)
190	0.86±0.08	65±1	2.2±0.1	0.64±0.01
	(0.98)	(67)	(2.5)	(0.66)
210	1.04±0.12	70±2	2.7±0.2	0.62±0.01
	(1.26)	(71)	(3.0)	(0.64)
400	0.65±0.07	61±4	1.8±0.2	0.60±0.01
	(0.74)	(65)	(2.0)	(0.61)
600	0.57±0.11	62±7	1.6±0.1	0.59±0.02
	(0.72)	(70)	(1.8)	(0.61)