

Supporting Information

Mesoporous silica hybrids as antireflective coating to enhance light harvesting and achieve over 16% efficiency of organic solar cells

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Optical modeling

The software (TFCalc) was used to fit and analyze the transmittance and reflectance of glass coated with ARC. Optical parameters of ARC, including refractive index and extinction coefficient were measured using spectroscopy ellipsometry. Other parameters that were added in the single layer model of the optical modeling were shown in **Table S1**.

Table S1 The modeling factors and parameters.

Modeling Factors	Parameters
Reference wavelength (nm)	550.0
Illuminant	White
Incident angle (deg)	0.0
Incident medium	Air
Substrate	Glass
Thickness (mm)	1.0
Exit medium	Air
Detector	Ideal
First surface	Front

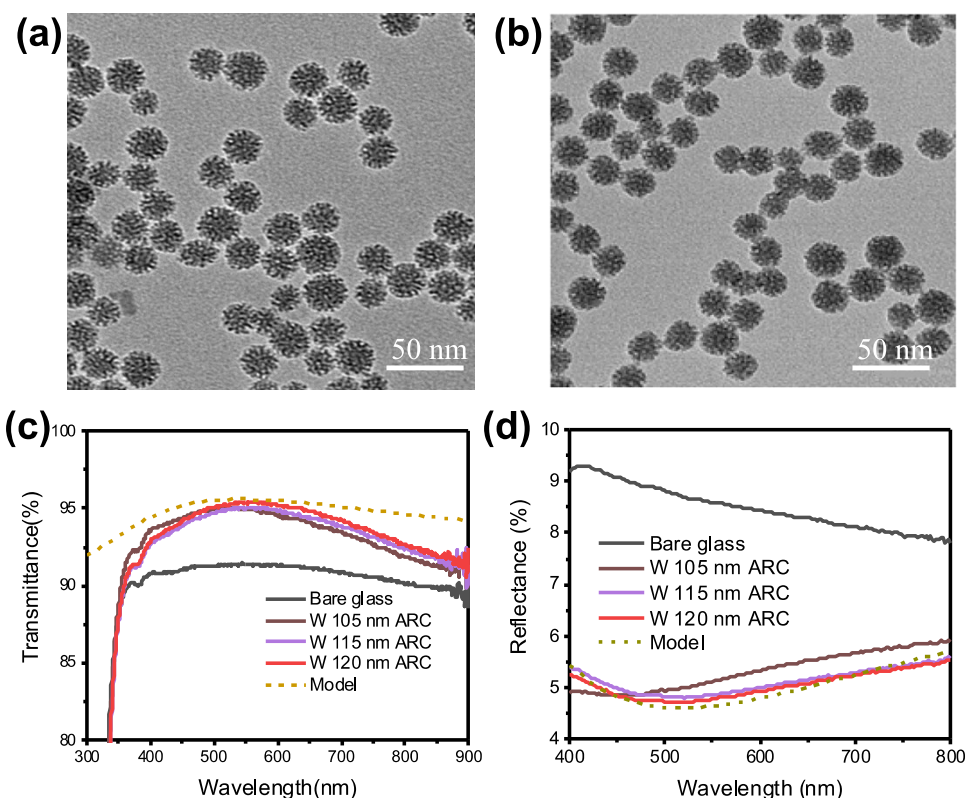


Fig. S1 TEM images of (a) MSNs, (b) HMDS-MSN hybrids, (c) transmittance and (d) reflectance of the bare glass, glass coated with ARC having different thickness, and optical modeling of transmittance and reflectance of glass coated with an 115 nm ARC.

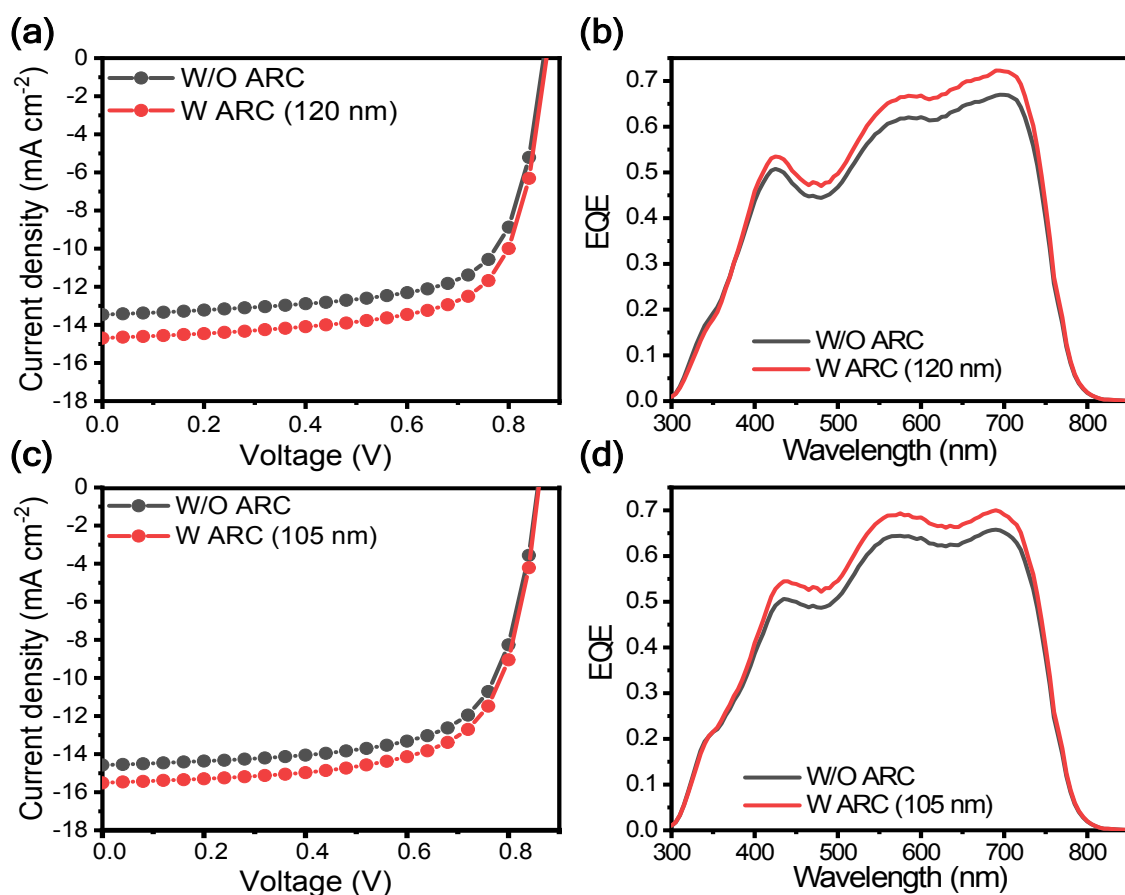


Fig. S2 (a), (c) J-V curves and (b), (d) EQE spectra of PBDB-T:ITIC devices with the presence of ARC having different thicknesses (120 nm, 105nm) and without ARC.

Table S2 Device performance of PBDB-T:ITIC OSCs coated with ARC having different thickness.

	J_{SC} (mA cm ⁻²)	Calculated J_{SC} (mA cm ⁻²)	FF (%)	V_{OC} (V)	PCE (%)
PBDB-T:ITIC (W/O ARC)	15.4 (15.5±0.1)	14.3	71.2 (71.4±0.5)	0.87 (0.88±0.01)	9.6 (9.7±0.1)
PBDB-T:ITIC (with 120 nm ARC)	16.1 (16.0±0.1)	15.2	72.0 (71.7±0.7)	0.88 (0.88±0.1)	10.2 (10.1±0.1)
PBDB-T:ITIC (W/O ARC)	15.2 (15.5±0.1)	14.1	70.9 (71.4±0.5)	0.88 (0.88±0.01)	9.5 (9.7±0.1)
PBDB-T:ITIC (with 115 nm ARC)	16.1 (16.0±0.1)	15.1	71.1 (71.8±0.5)	0.88 (0.88±0.01)	10.1 (10.1±0.1)

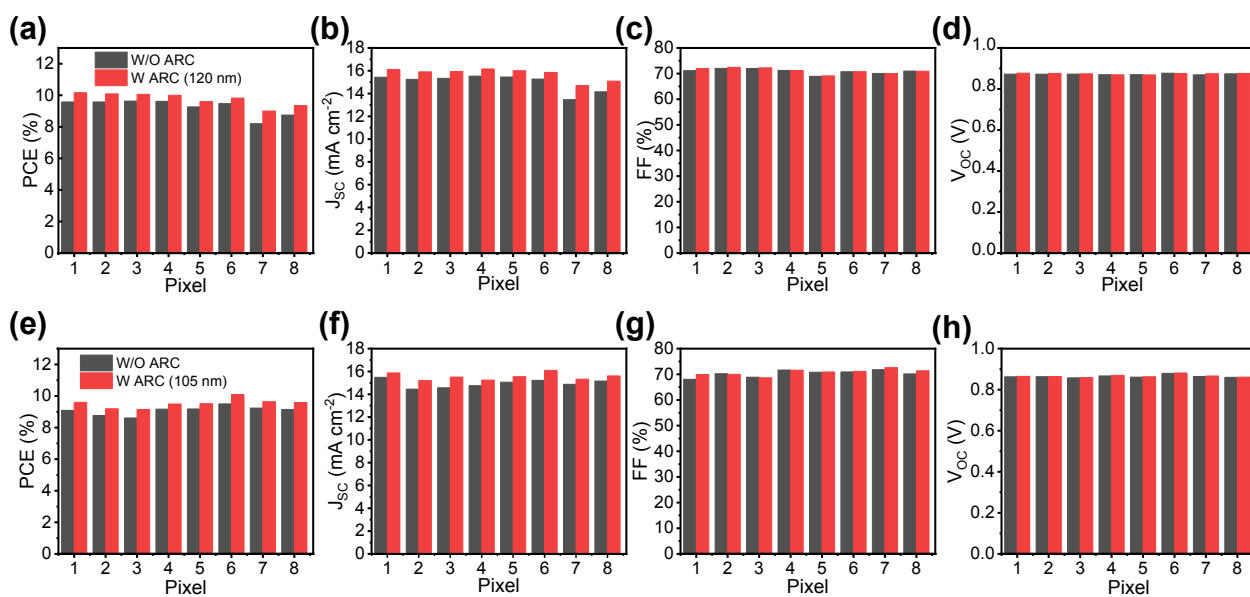


Fig. S3 (a), (e) PCE, (b), (f) J_{sc} , (c), (g) FF and (d), (h) V_{oc} of PBDB-T:ITIC solar cells with 120 nm or 105 nm- thick ARC and without ARC.

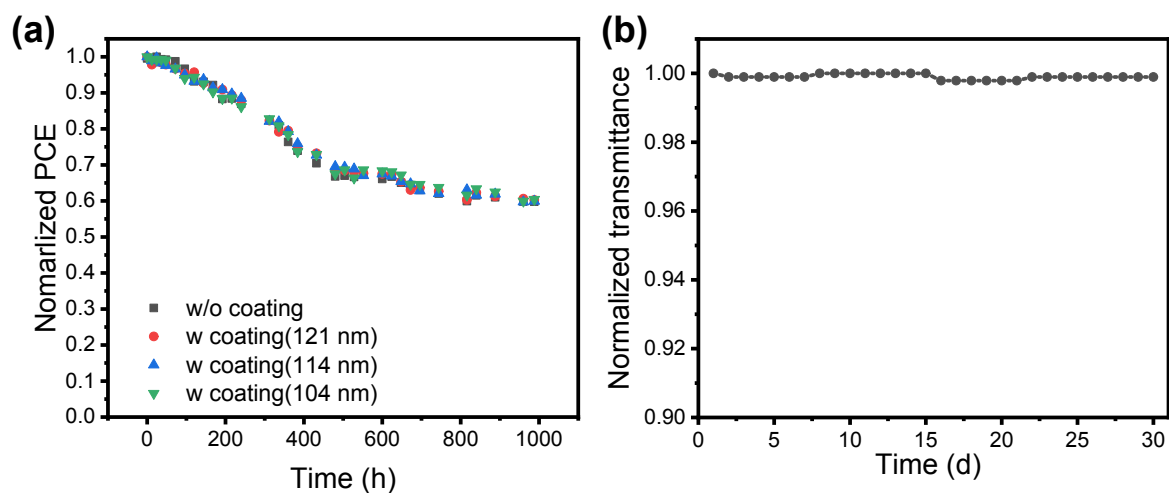


Fig. S4 (a) Stability of PBDB-T:ITIC devices with 120 nm or 105 nm- thick ARC and without ARC. (b) Normalized transmittance of a 115 nm thick ARC.