

Supporting information

High Performance Carbon-based Perovskite Solar Cells by the Dual Role of PC₆₁BM

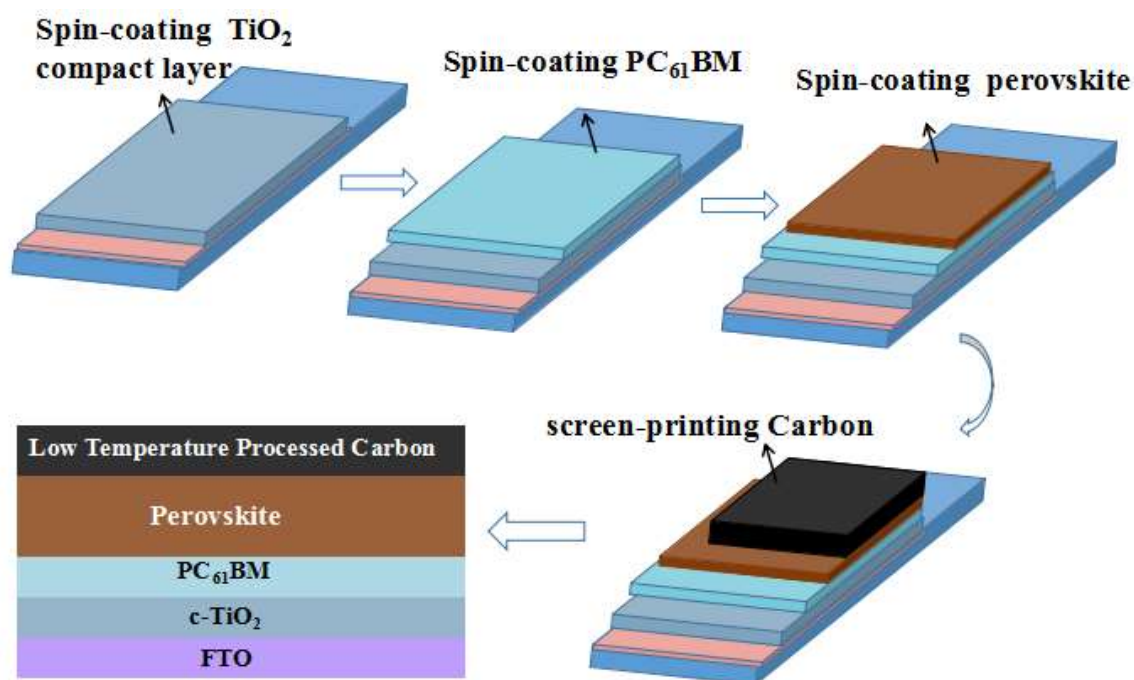


Figure S1. Production process of carbon-based HTM-free PSC using PC₆₁BM/c-TiO₂ as ETL.

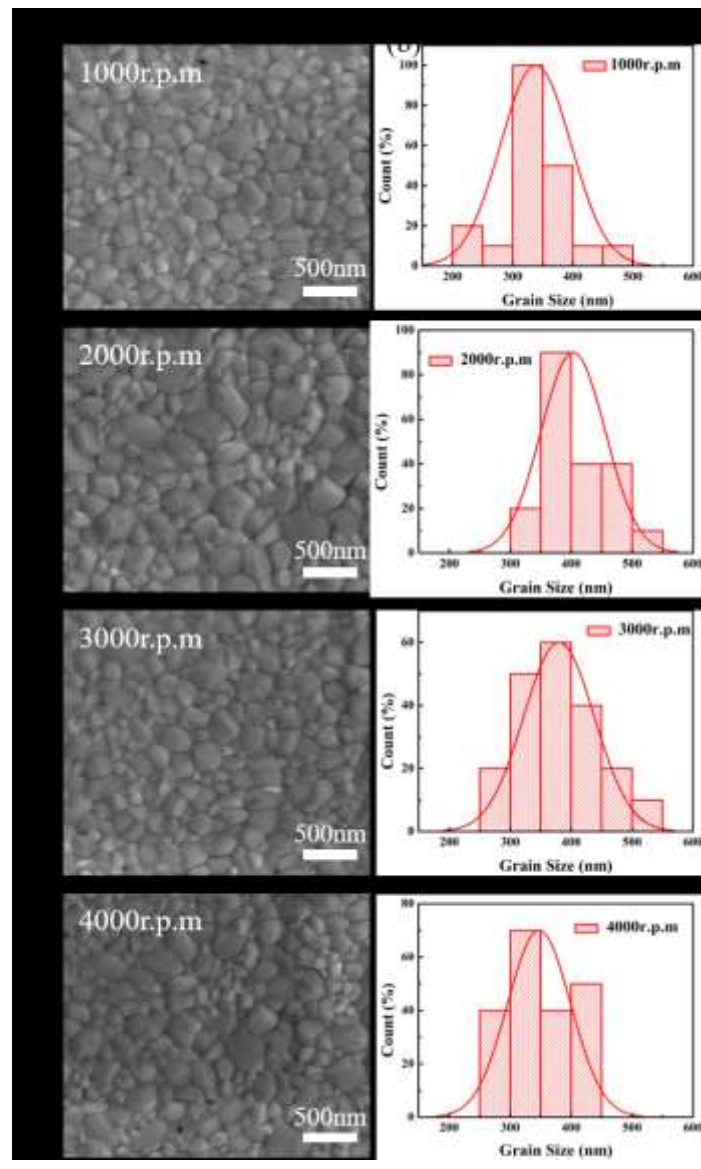


Figure S2. Top view SEM images of perovskite film corresponding to PC₆₁BM at 1000r.p.m,2000r.p.m,3000r.p.m,4000r.p.m.(a) and corresponding grain size distributions histogram(b).

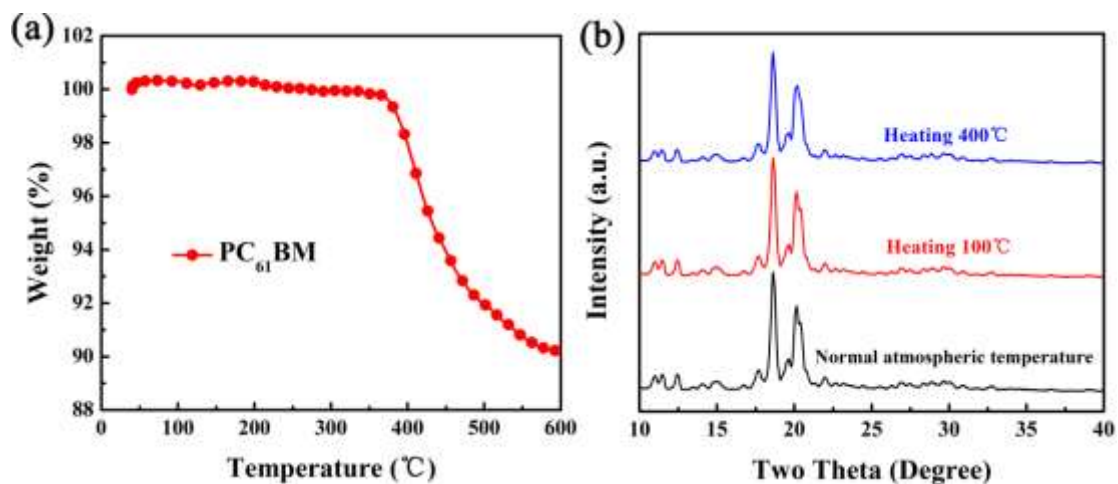


Figure S3. (a) Thermogravimetric analysis of PC₆₁BM powder and (b) X-ray diffraction (XRD) spectra of PC₆₁BM powder under different conditions

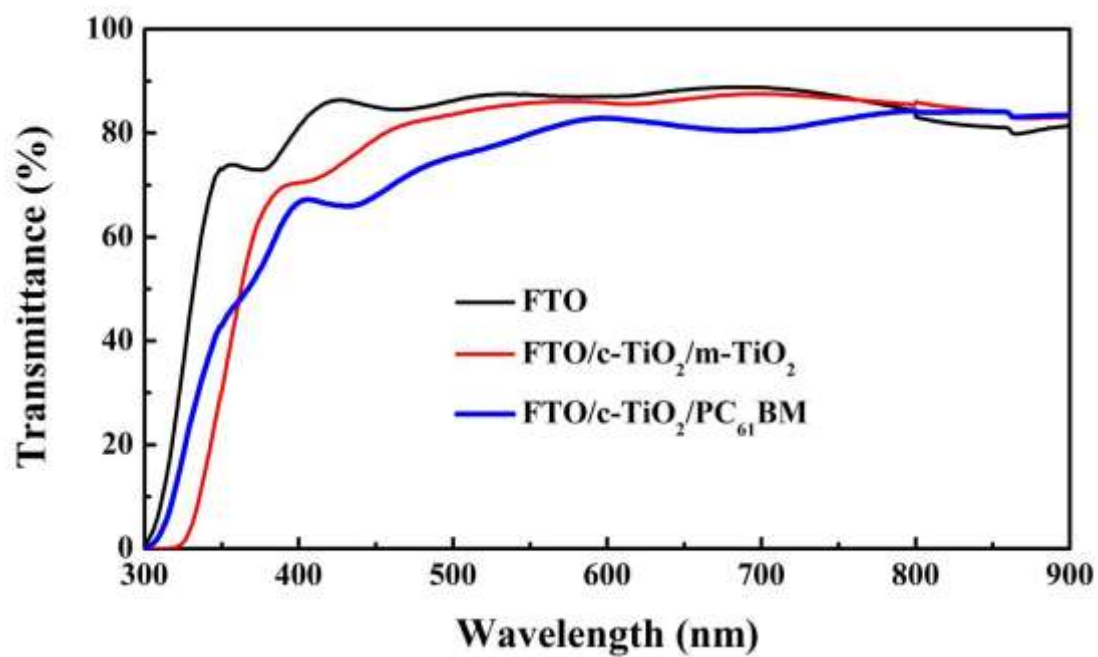


Figure S4. Transmittance spectra of the FTO/c-TiO₂/PC₆₁BM film and control samples.

Table S1. The bi-exponential fitting parameters of photoluminescence data

Sample	A_1	τ_1 (ns)	A_2	τ_2 (ns)	τ_{avg} (ns)
FTO/c-TiO ₂ /m-TiO ₂	9.77	22	90.23	81	75
FTO/c-TiO ₂ /PC ₆₁ BM	0.54	20.420	0.46	102.07	58

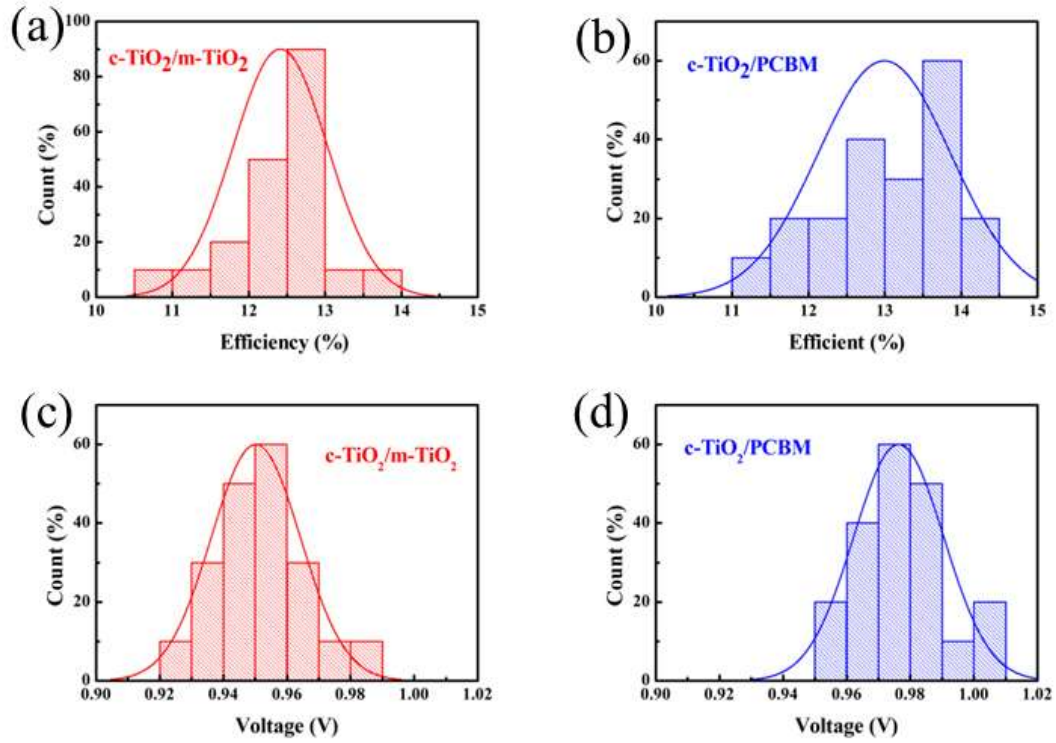


Figure S5. Histogram of PCE and V_{oc} for c-TiO₂/m-TiO₂-based cells and c-TiO₂/PC₆₁BM-based cells

Table S2 Statistics on the performance of 30 individual devices of each type.

ETL	V_{oc} (V)	PCE (%)
c-TiO ₂ /m-TiO ₂	0.94 ± 0.04	12.35 ± 1.53
c-TiO ₂ /PC ₆₁ BM	0.98 ± 0.03	13 ± 1.37