

Supporting Information

High-Performance and Low-Hysteresis Lead Halide Perovskite Solar Cells by Utilizing a Versatile Alcohol-Soluble Bispyridinium Salt as an Efficient Cathode Modifier

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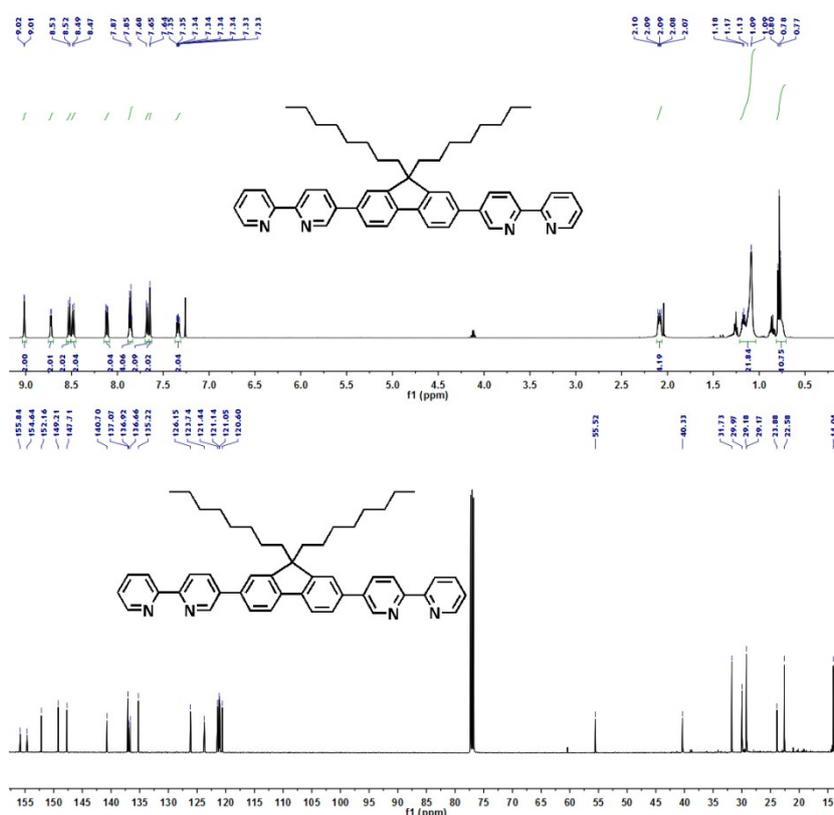


Figure S1. ¹H and ¹³C NMR spectra of FPY in CDCl₃.

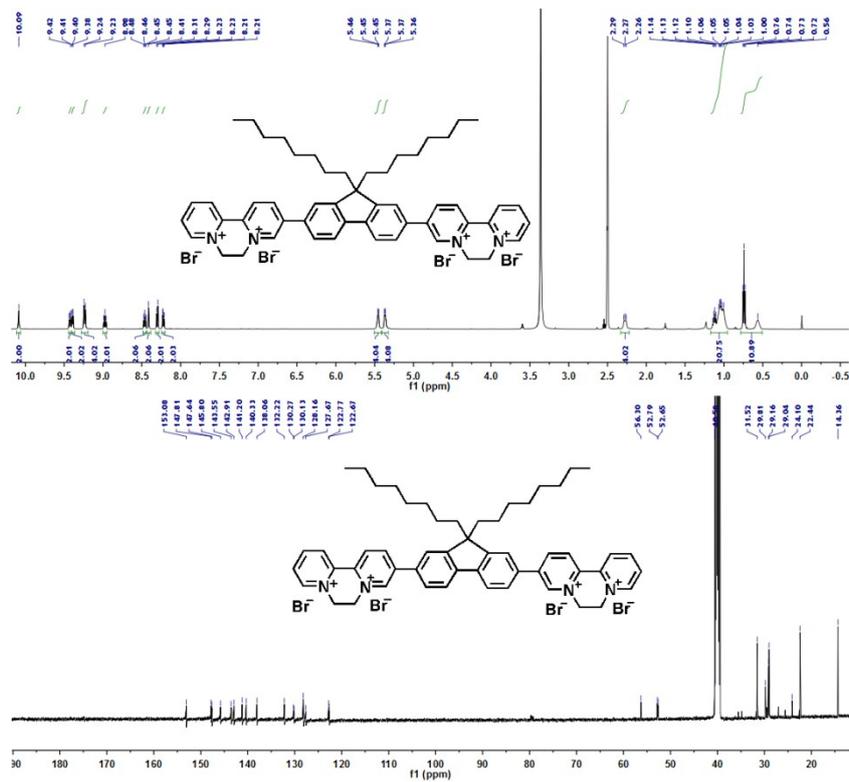


Figure S2. ^1H and ^{13}C NMR spectra of FPyBr in DMSO-d_6 .

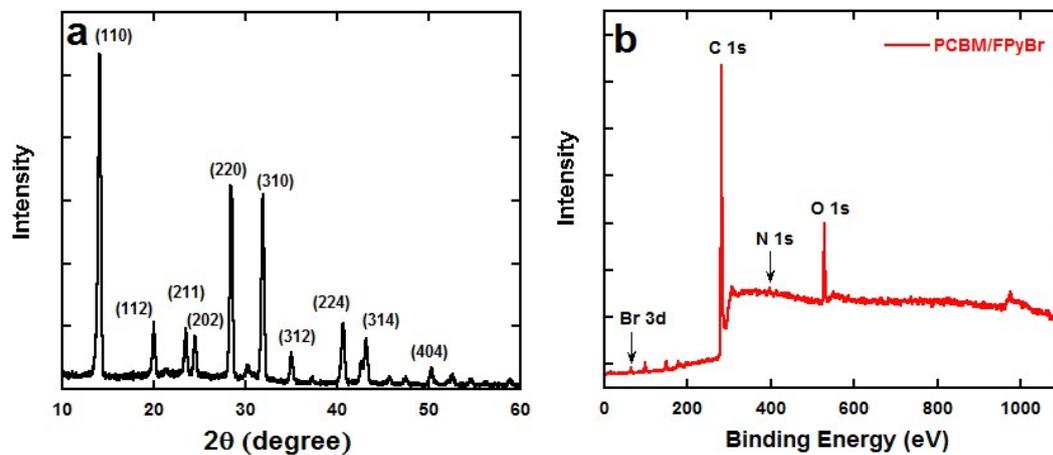


Figure S3. a) XRD pattern of ITO/PEDOT:PSS/PTAA/MAPbI₃, b) XPS spectrum of ITO/PCBM/FPyBr surface. The deposition conditions of all the films were the same as those for the PVSC fabrications.

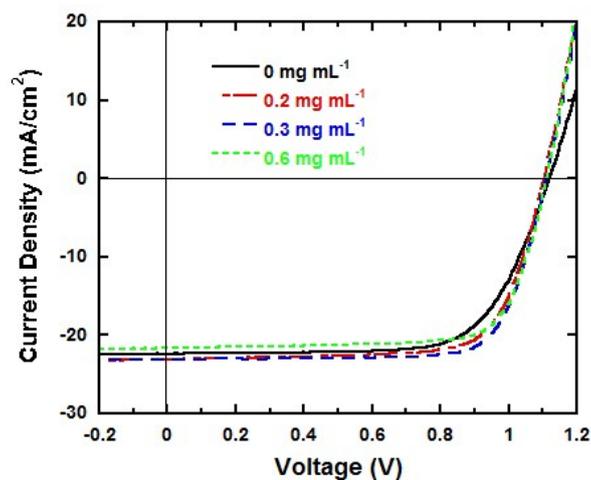


Figure S4. J - V curves of the PVSCs with **FPyBr** CILs deposited from its ethanol solutions with different concentrations (forward scan)

Table S1. Data summary of the PVSCs with **FPyBr** CILs deposited from its ethanol solutions with different concentrations (forward scan).

Concentration (mg mL ⁻¹)	V_{oc} (V)	J_{sc} (mA cm ⁻²)	FF (%)	PCE (%)
0 (pure ethanol)	1.11	22.36	68.9	17.22
0.2	1.10	23.06	72.6	18.45
0.3	1.11	23.11	75.4	19.32
0.6	1.11	21.64	74.8	17.99

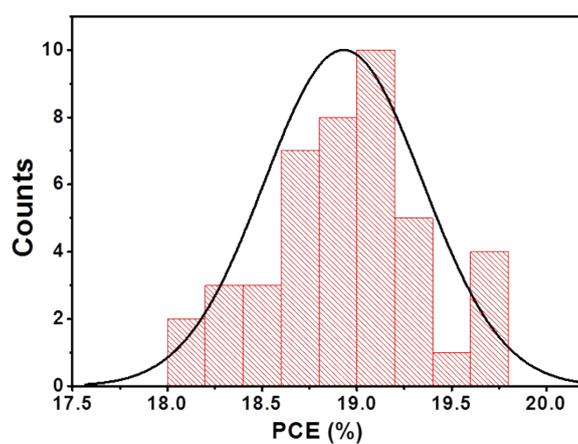


Figure S5. Histogram of the PCE values of **FPyBr**-based 43 PVSC devices.

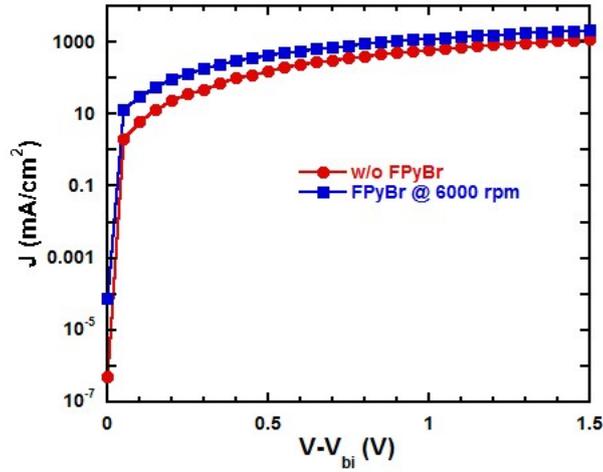


Figure S6. J - V curves of the electron-only devices with or without FPyBr CIL (device structure: Al/PCBM/CIL/Al).

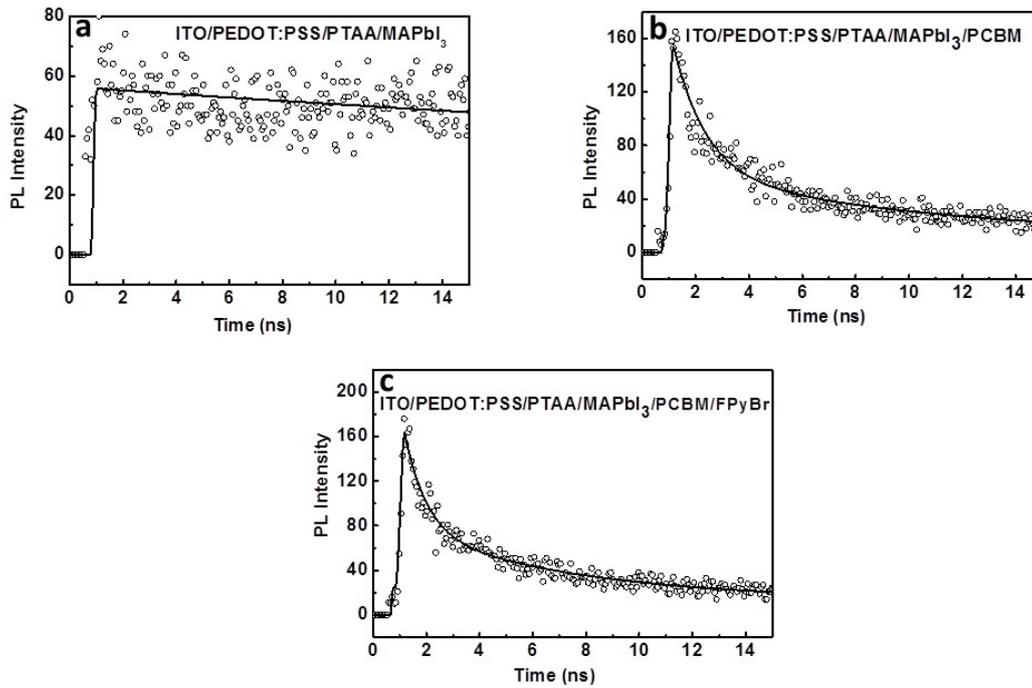


Figure S7. The pristine and fitted TRPL decay measurements of different samples.