Supporting Information

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Enhanced Ambient Stability of Efficient Perovskite Solar Cells by Employing a Modified Fullerene Cathode Interlayer

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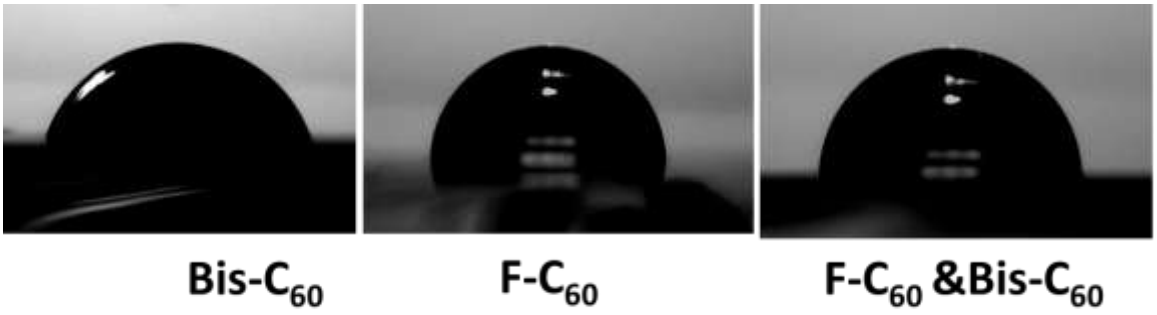

Figure S1. Contact angle measurement of bis-C_{60}, F-C_{60} and hybrid surfactant (bis-C_{60} & F-C_{60}), wherein the contact angle is 68^{o} for bis-C_{60}, 96^{o} for F-C_{60}, and 84^{o} for bis-C_{60} & F-C_{60}.

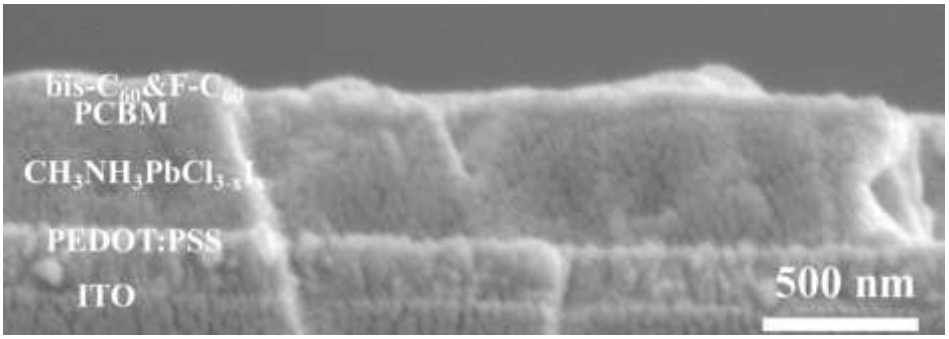

Figure S2. Cross-section SEM image of the top-performing PVSC in this study.

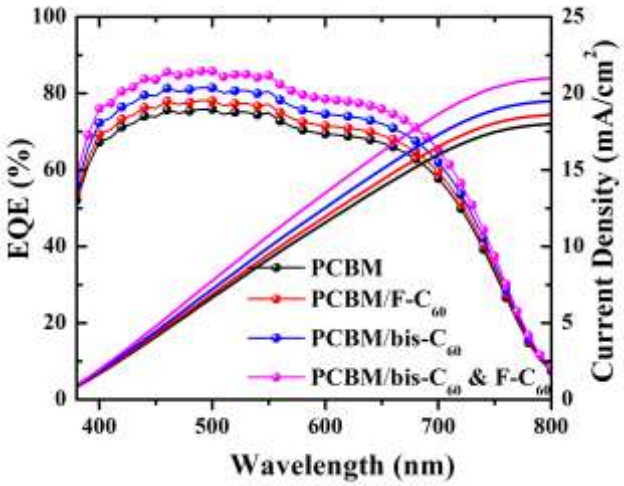

Figure S3. The EQE spectra and their integrated photocurrent densities of the IPCE spectra of perovskite solar cells without interlayer (None) and with interlayer ((B)F-C_{60}, (C) Bis-C_{60}, and (D) Bis-C_{60}&F-C_{60})

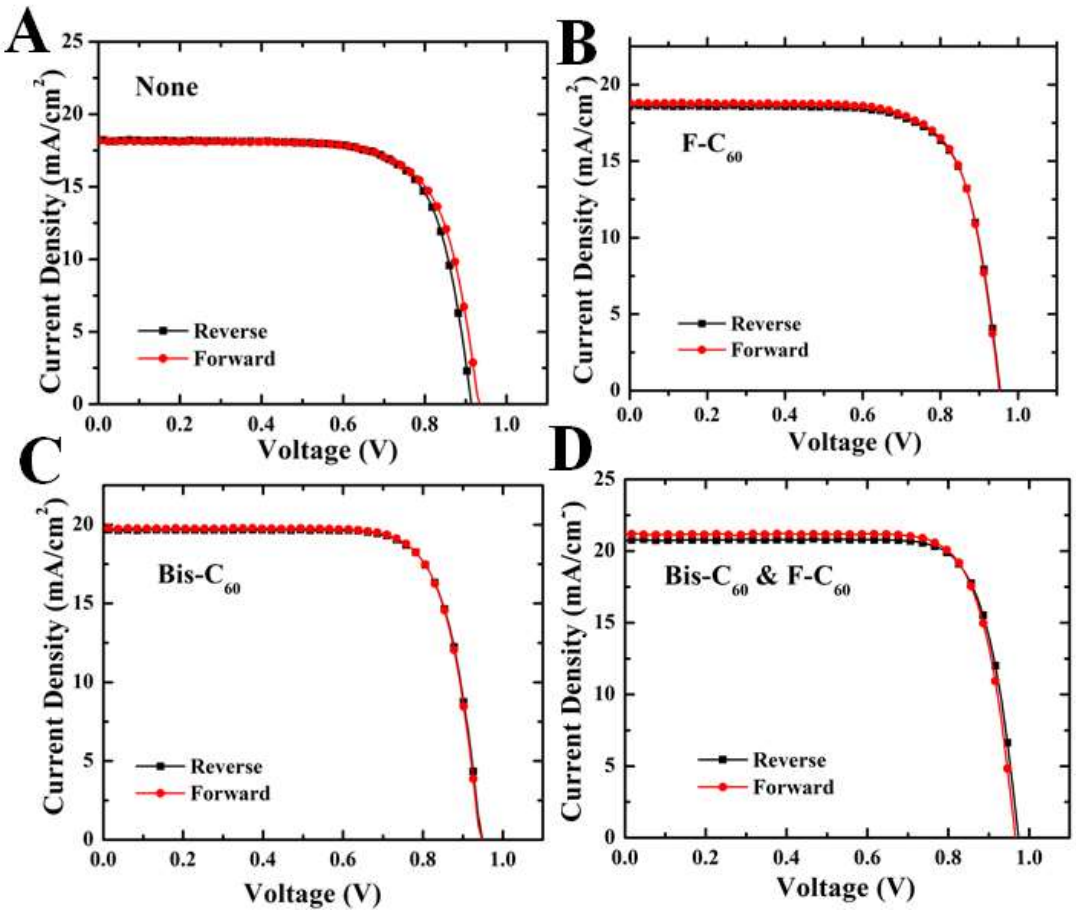

Figure S4. J-V curves for (A) without interlayer (None) and with interlayer ((B)F-C_{60}, (C) Bis-C_{60}, and (D) Bis-C_{60}&F-C_{60}) which measured by forward (from short circuit to open circuit) and reverse (from open circuit to short circuit) scans. All J-V curves were measured under 100 mW/cm^2 air mass 1.5 global (AM 1.5G) illumination.

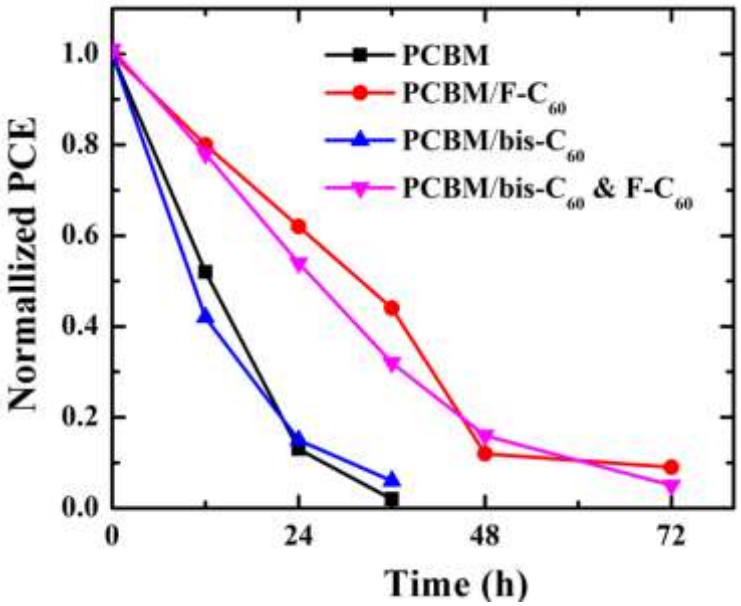

Figure S5. Normalized PCE, of PVSCs without and with using the studied FCIs as a function of storage time in ambient condition (air) with a relative humidity of 85 %.

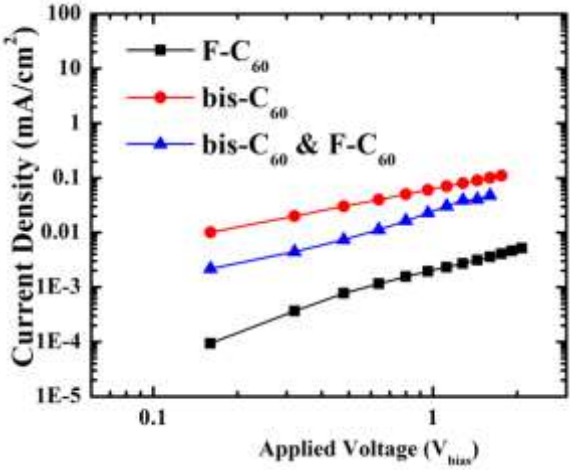

Figure S6. Measured space-charge-limited *J-V* characteristics of the electron-only devices (ITO/ZnO/fullerene surfactants/LiF/Al) under dark conditions.

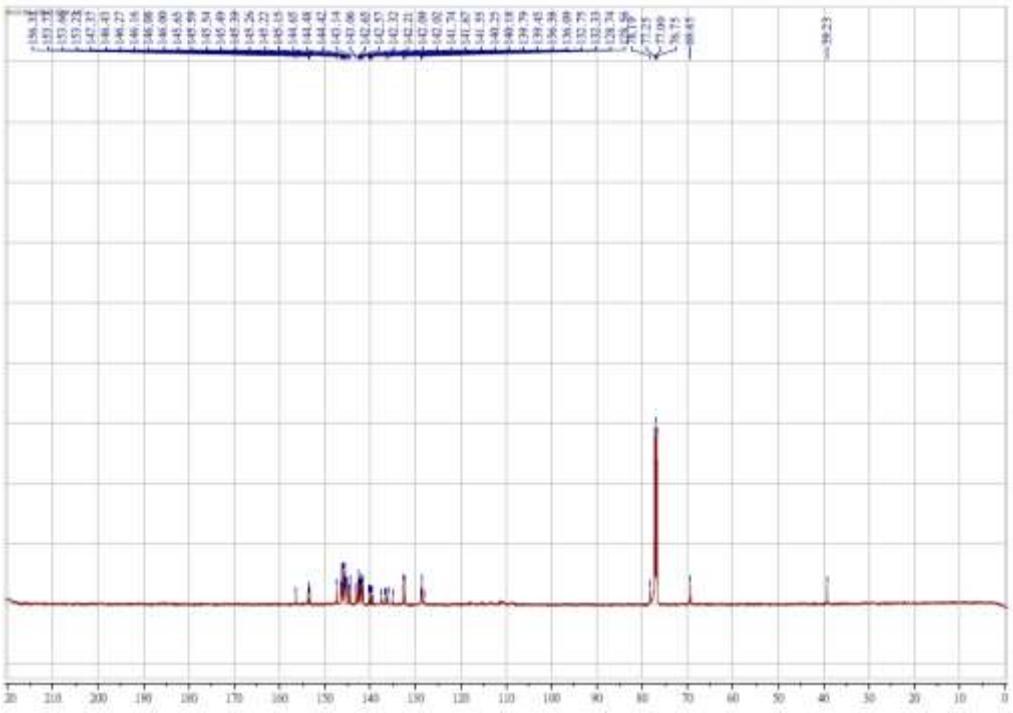

Figure S7. ^{13}C NMR spectra of F-C_{60}.

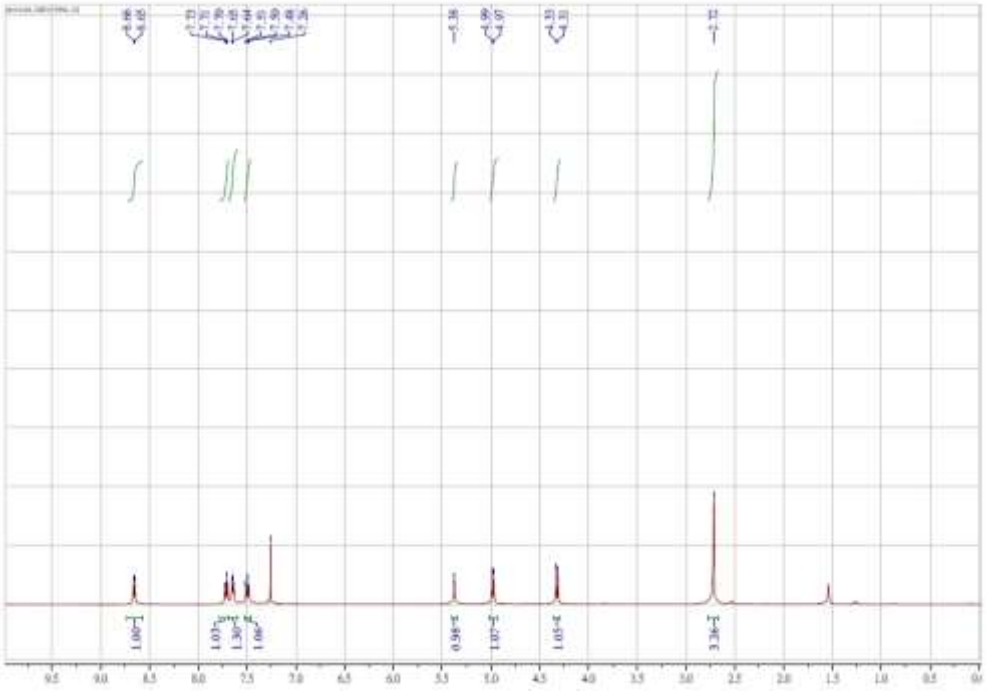

Figure S8. ^{1}H NMR spectra of F-C_{60}

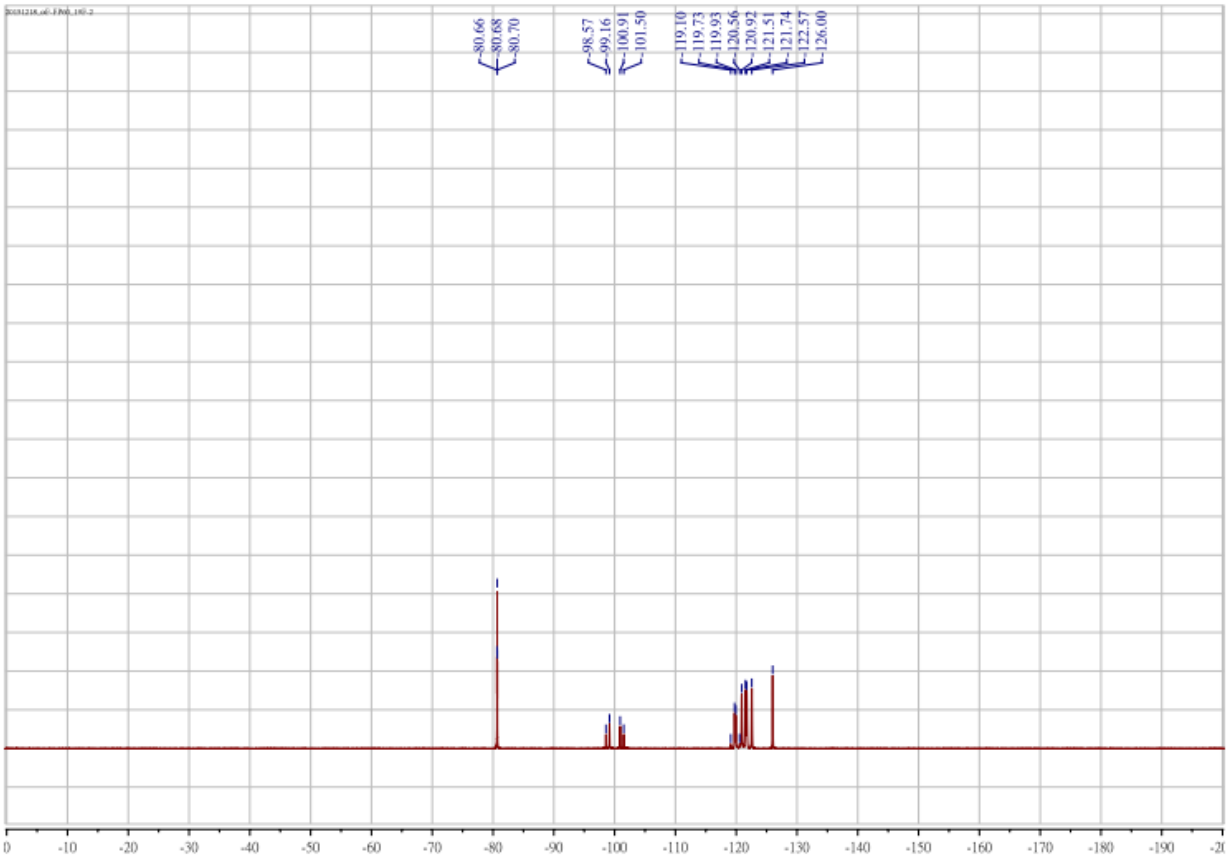

Figure S9. ^{19}F NMR spectrum of F-C_{60}.

Table S1. The estimated SCLC electron mobility of the fullerene surfactants.

	Bis-C_{60},	**F-C_{60}**	**Bis-C_{60} & F-C_{60}**
Mobility ($\times 10^{-4}$ cm^2 $V^{-1}s^{-1}$)	20.6	3.2	10.7
Thickness (nm)	100	100	110