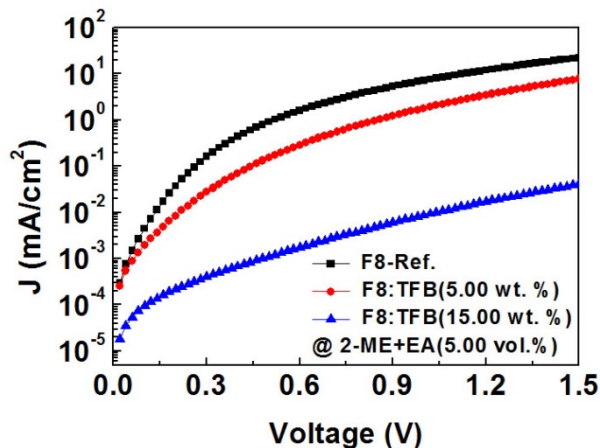
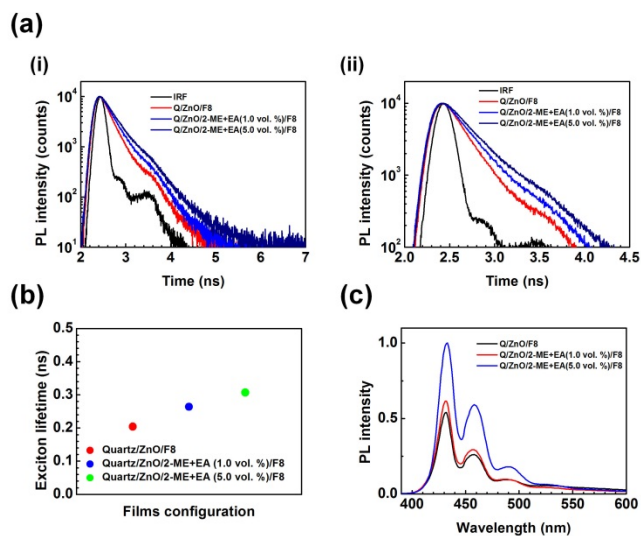


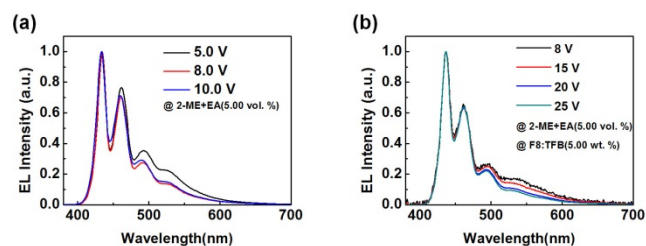
**Fig. S1** *J-V-L* characteristics of IPLEDs with different concentration of polar solvent. The thickness of F8 is  $\sim 250$  nm. (a) Current density versus voltage, (b) luminance versus voltage, (c) luminous efficiency versus current density, (d) power efficiency versus current density, (e) external quantum efficiency versus current density and (f) electroluminescence spectra.



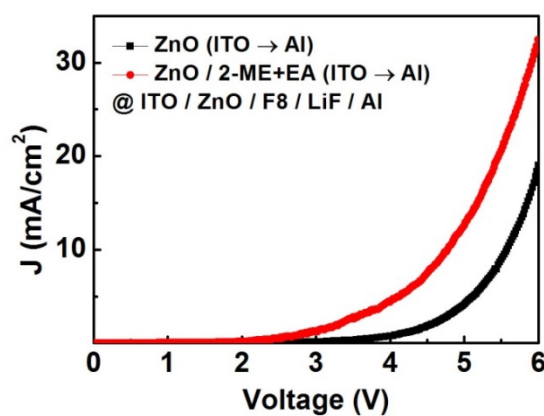
**Fig. S2** Hole-only devices characteristic of indium tin oxide (ITO)/poly(3,4-ethylenedioxythiophene):poly(styrenesulphonic acid) (PEDOT:PSS)/F8/MoO<sub>3</sub>/Au (closed-rectangular black-line), ITO/PEDOT:PSS/F8:TFB (5.00 wt. %)/MoO<sub>3</sub>/Au (closed-round red-line) and ITO/PEDOT:PSS/F8:TFB (15.00 wt. %)/MoO<sub>3</sub>/Au (closed-triangular blue-line).



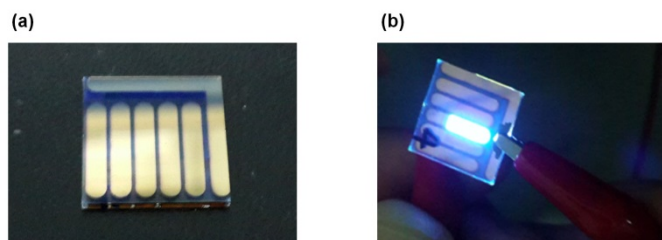
**Fig. S3** (a) Time-resolved PL signals of F8 with or without polar solvent treatment measured by TCSPC at emission wavelengths of 435 nm. (b) Exciton lifetime of F8 with or without polar solvent treatment films. (c) PL spectra of F8 with or without polar solvent treatment.



**Fig. S4** EL spectra of (a) FTO/ZnO/2-ME+EA (5.00 vol. %)/F8/MoO<sub>3</sub>/Au, (b) FTO/ZnO/2-ME+EA (5.00 vol. %)/F8:TFB (5.00 wt. %)/MoO<sub>3</sub>/Au with different operational voltage.



**Fig. S5** *J-V* characteristics of electron-only devices of ITO/ZnO/F8/LiF/Al (closed-rectangular black-line) and ITO/ZnO/2-ME+EA (5.00 vol. %)/F8/LiF/Al (closed-round red-line).



**Fig. S6** (a) The device image and (b) photo of blue emission from IPLED (ITO/ZnO/2-ME+EA/F8:TFB (5.00 wt. %)/MoO<sub>3</sub>/Au) in Fig S6.

**Table S1.** Summarized device performances of IPLEDs with different concentration of polar solvent.

Device configuration (Thickness of F8: 250nm)	L <sub>max</sub> [cd/m <sup>2</sup> ] @ bias	LE <sub>max</sub> [cd/A] @ bias	PE <sub>max</sub> [lm/W] @ bias	EQE <sub>max</sub> [%] @ bias	Turn-on voltage [V] @ 0.1 cd/m <sup>2</sup>
FTO / ZnO / F8 / MoO <sub>3</sub> / Au	220 (8.0 V)	0.035 (7.6 V)	0.015 (7.6 V)	0.035 (7.6 V)	4.6 V
FTO / ZnO / 2- ME+EA (0.50 vol. %) / F8 / MoO <sub>3</sub> / Au	1430 (9.8 V)	0.22 (9.0 V)	0.079 (8.3 V)	0.22 (9.0 V)	3.2 V
FTO / ZnO / 2- ME+EA (1.67 vol. %) / F8 / MoO <sub>3</sub> / Au	1150 (10.2 V)	0.31 (10.2 V)	0.097 (9.8 V)	0.30 (10.2 V)	3.4 V
FTO / ZnO / 2- ME+EA (5.00 vol. %) / F8 / MoO <sub>3</sub> / Au	1330 (10.4 V)	1.55 (6.2 V)	0.82 (5.6 V)	1.28 (6.4 V)	3.6 V
FTO / ZnO / 2- ME+EA (6.67 vol. %) / F8 / MoO <sub>3</sub> / Au	620 (10.4 V)	0.63 (6.8 V)	0.30 (6.4 V)	0.63 (6.8 V)	4.0 V

**Table S2.** Exciton lifetime of F8 with or without polar solvent treatment.

Sample configuration	T <sub>avr</sub> [ns]	X <sup>2</sup>
Quartz / ZnO / F8	0.204	1.29
Quartz / ZnO / 2-ME+EA (1.0 vol. %) / F8	0.264	1.26
Quartz / ZnO / 2-ME+EA (5.0 vol. %) / F8	0.307	1.49