Supplementary Information

Novel Phosphorescent iridium (III) emitters for both vacuum-deposition and inkjet-printing of OLEDs with exceptionally high efficiency

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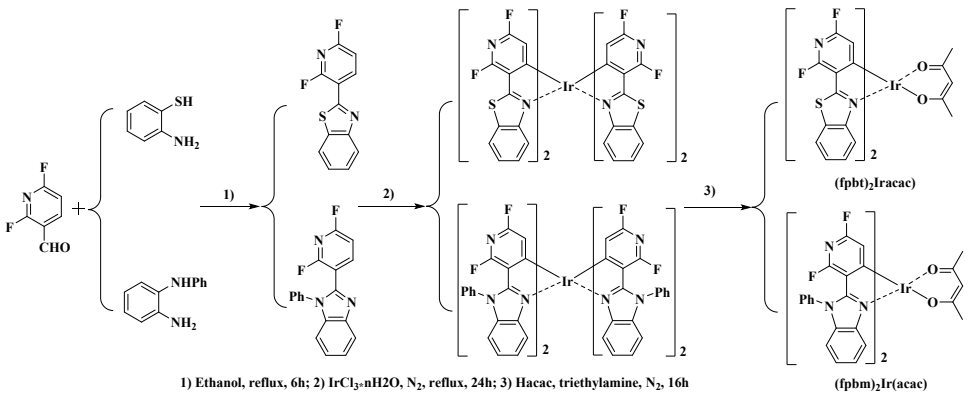
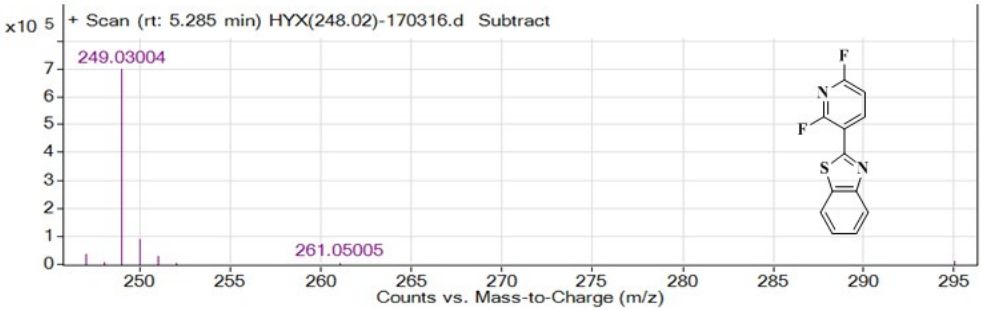
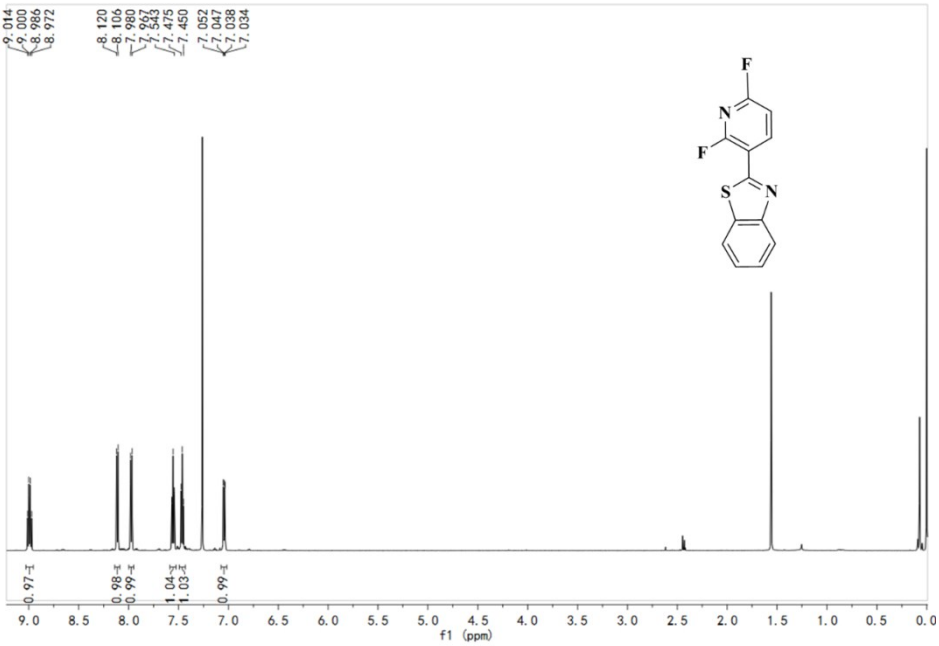


Scheme S1 Synthetic routes for the $(fpbt)_2Ir(acac)$ and $(fpbm)_2Ir(acac)$





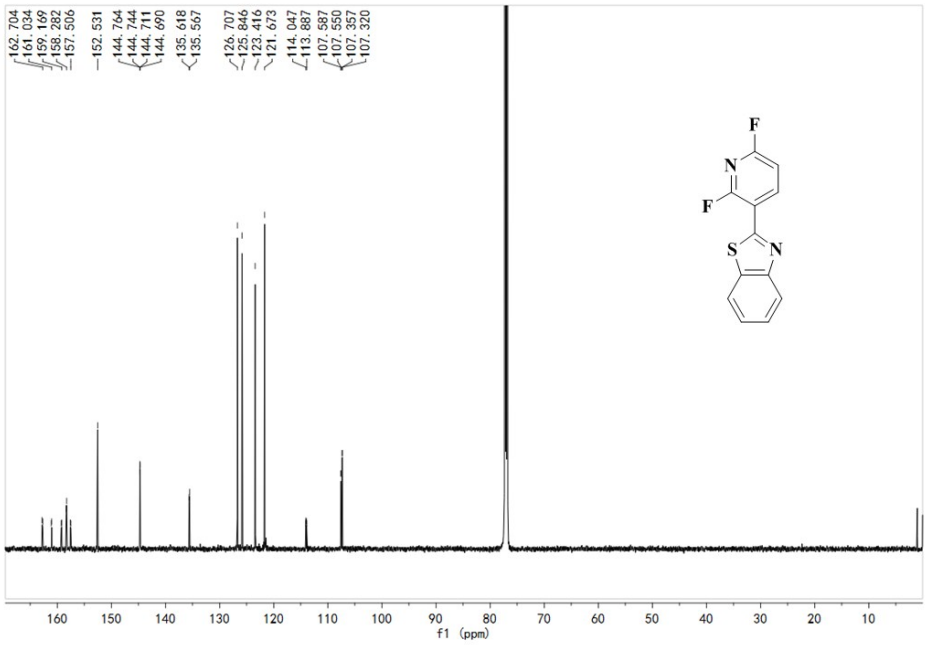
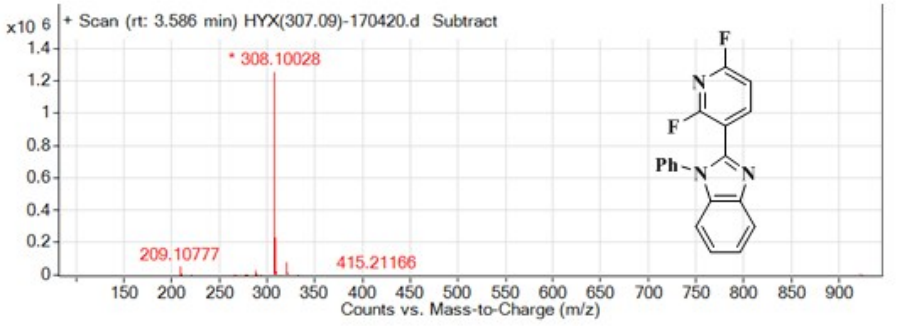
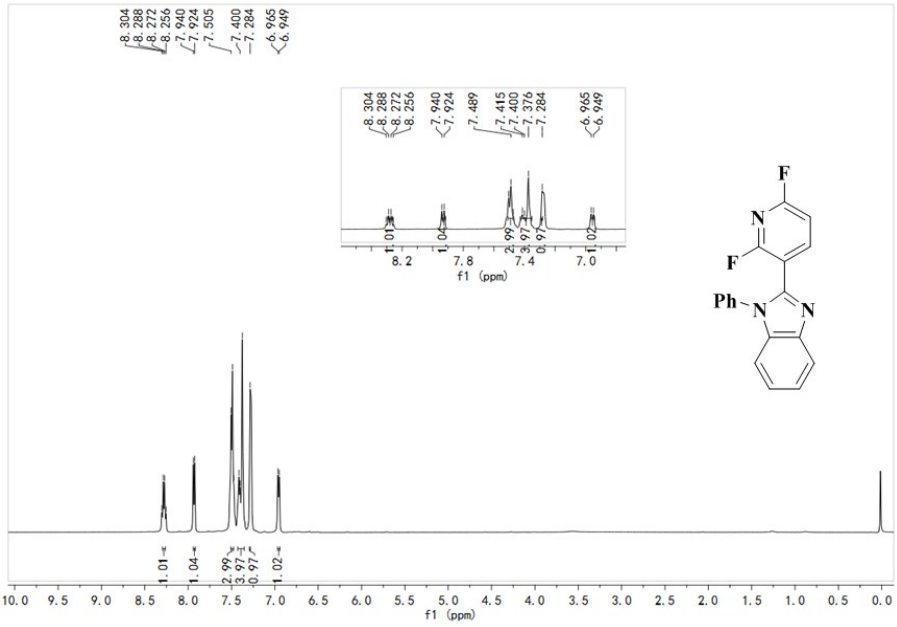


Figure S1 HRMS, ^{1}H NMR and ^{13}C NMR spectra of fpbt.





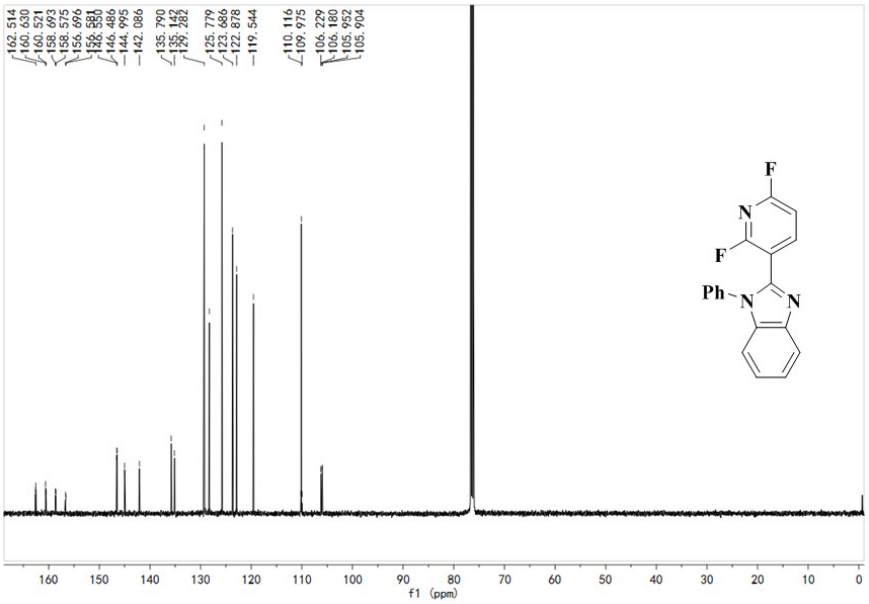
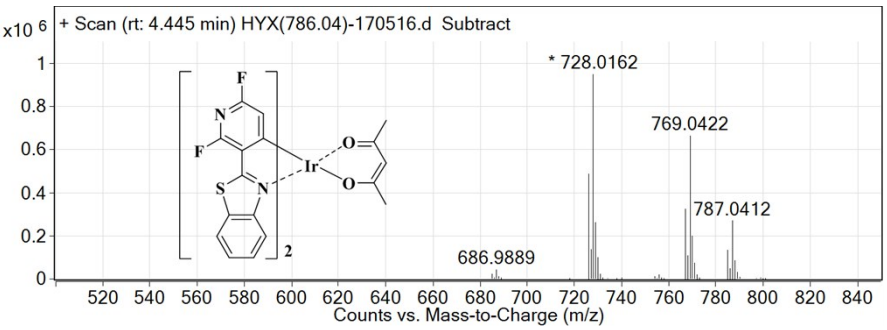
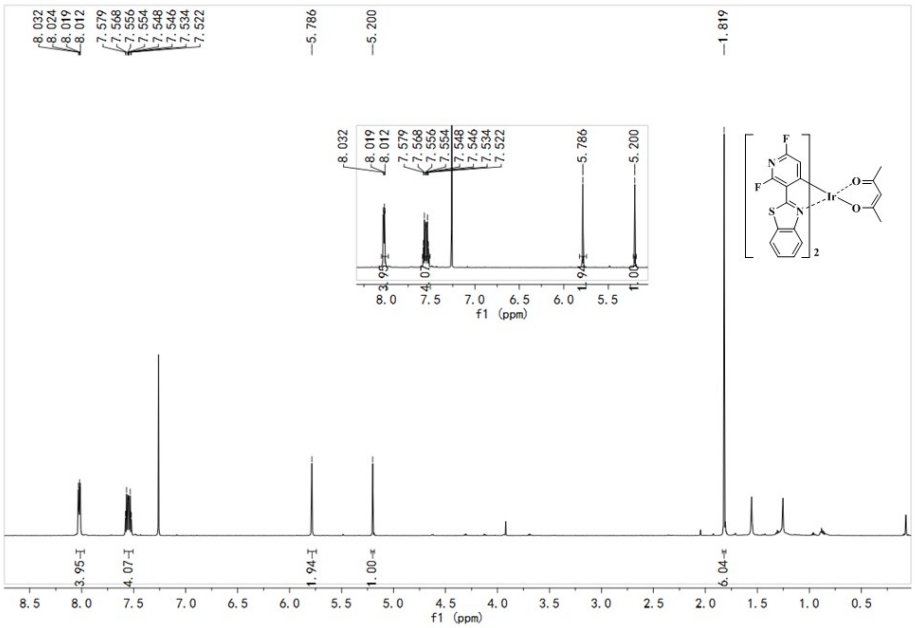


Figure S2 HRMS, ^{1}H NMR and ^{13}C NMR spectra of fpbm.





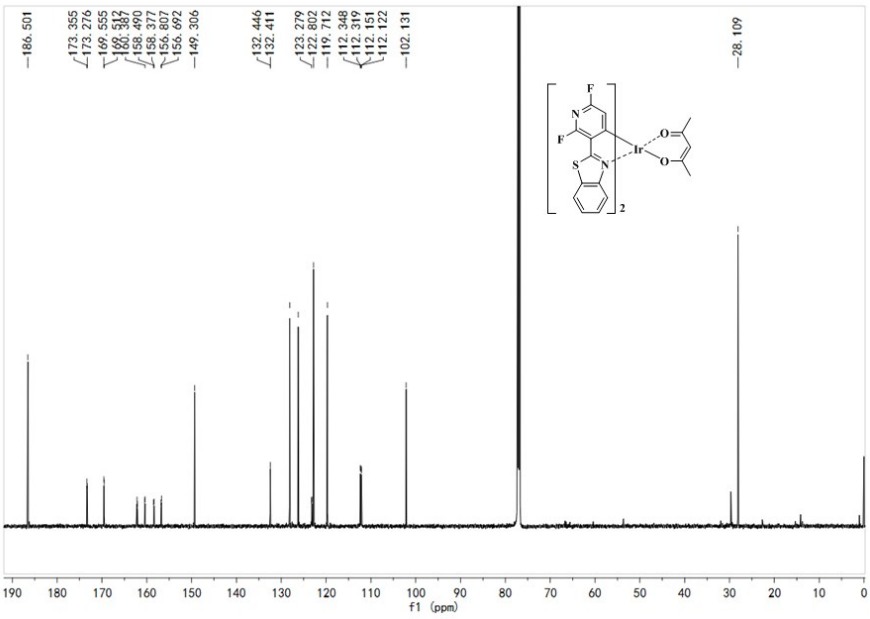
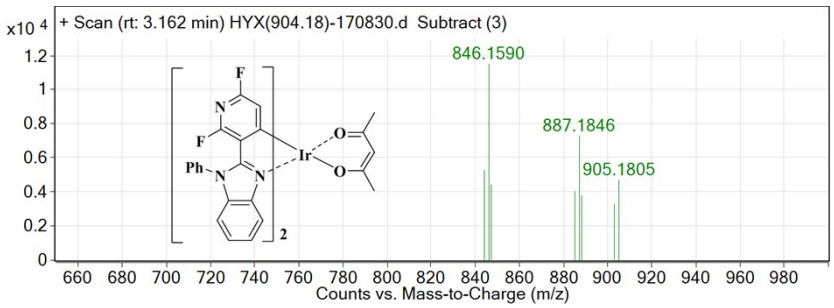
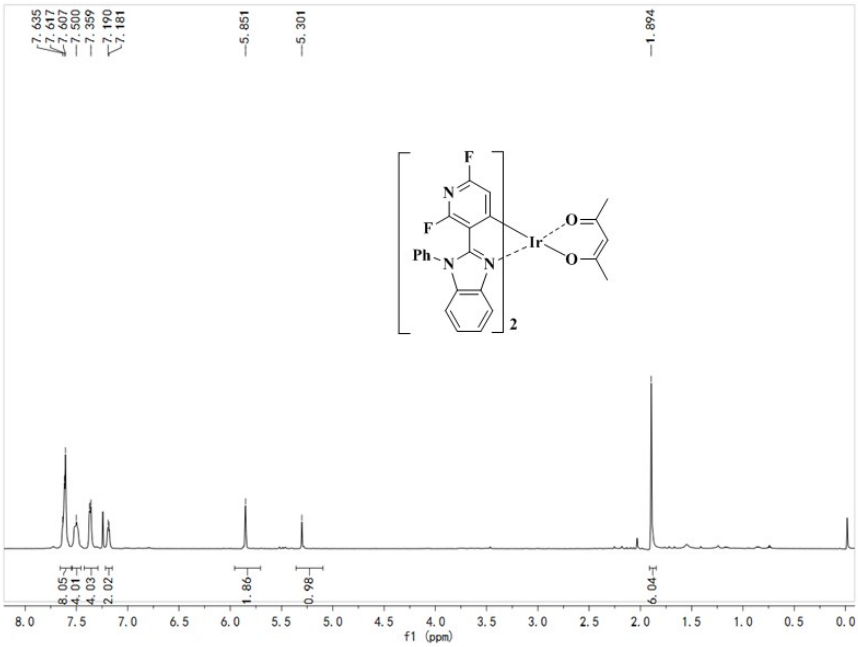


Figure S3 HRMS, ^{1}H NMR and ^{13}C NMR spectra of $(fpbt)_2Ir(acac)$.





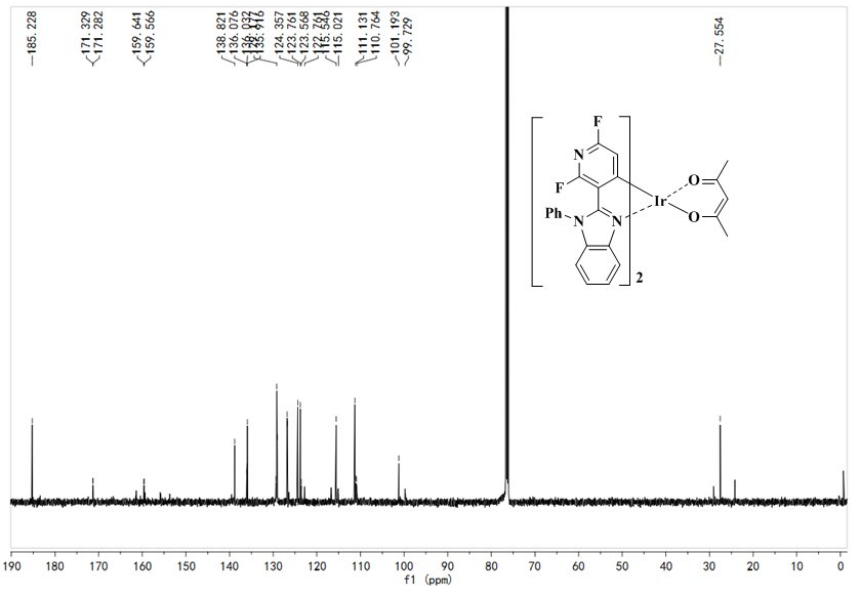


Figure S4 HRMS, ^{1}H NMR and ^{13}C NMR spectra of $(fpbm)_2Ir$ (acac).

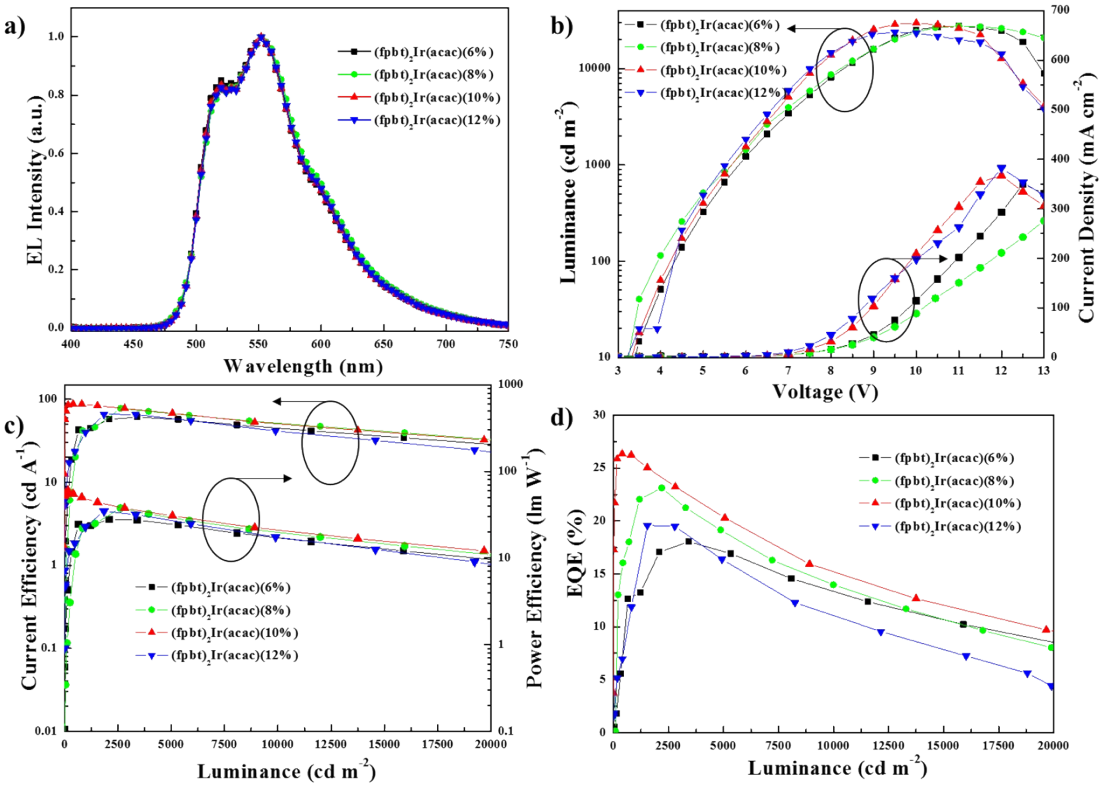


Figure S5 The EL properties of the $(fpbt)_2Ir(acac)$-based $OLED_S$ with different doping concentration.

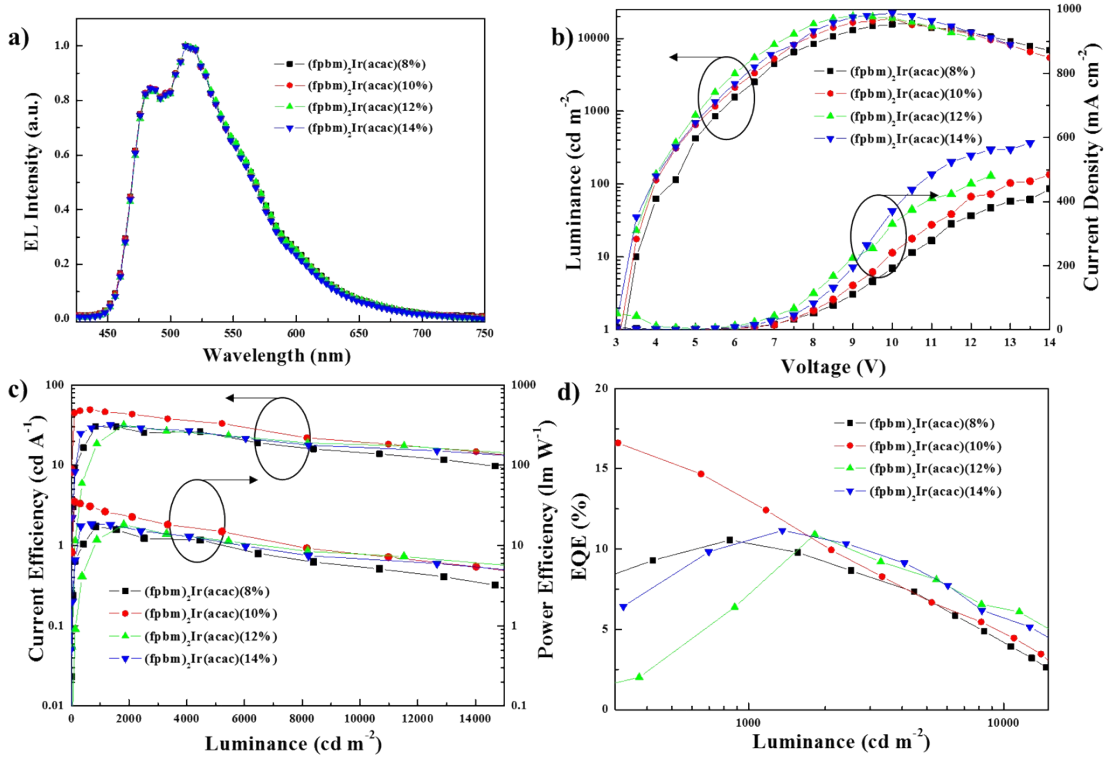


Figure S6 The EL properties of the $(fpbm)_2Ir(acac)$-based $OLED_S$ with different doping concentration.

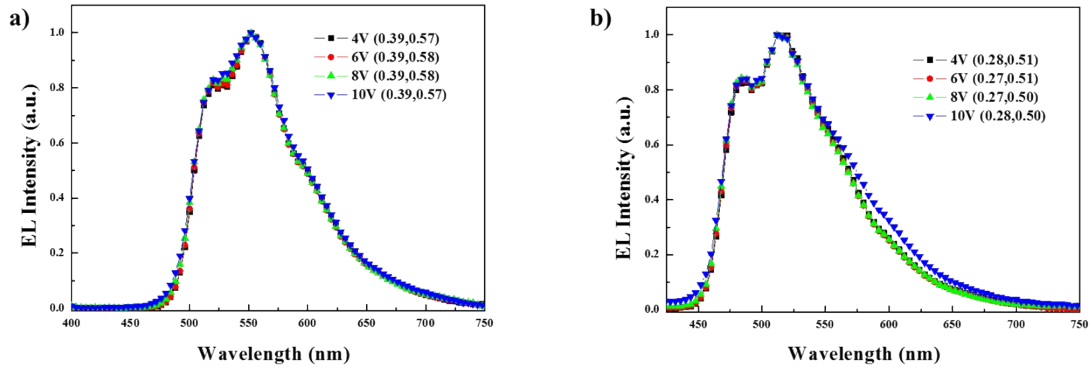


Figure S7 a) EL spectra of $(fpbt)_2Ir(acac)$-doped OLEDs at different voltage and b) EL spectra of$(fpbm)_2Ir(acac)$ -doped OLEDs at different voltage.

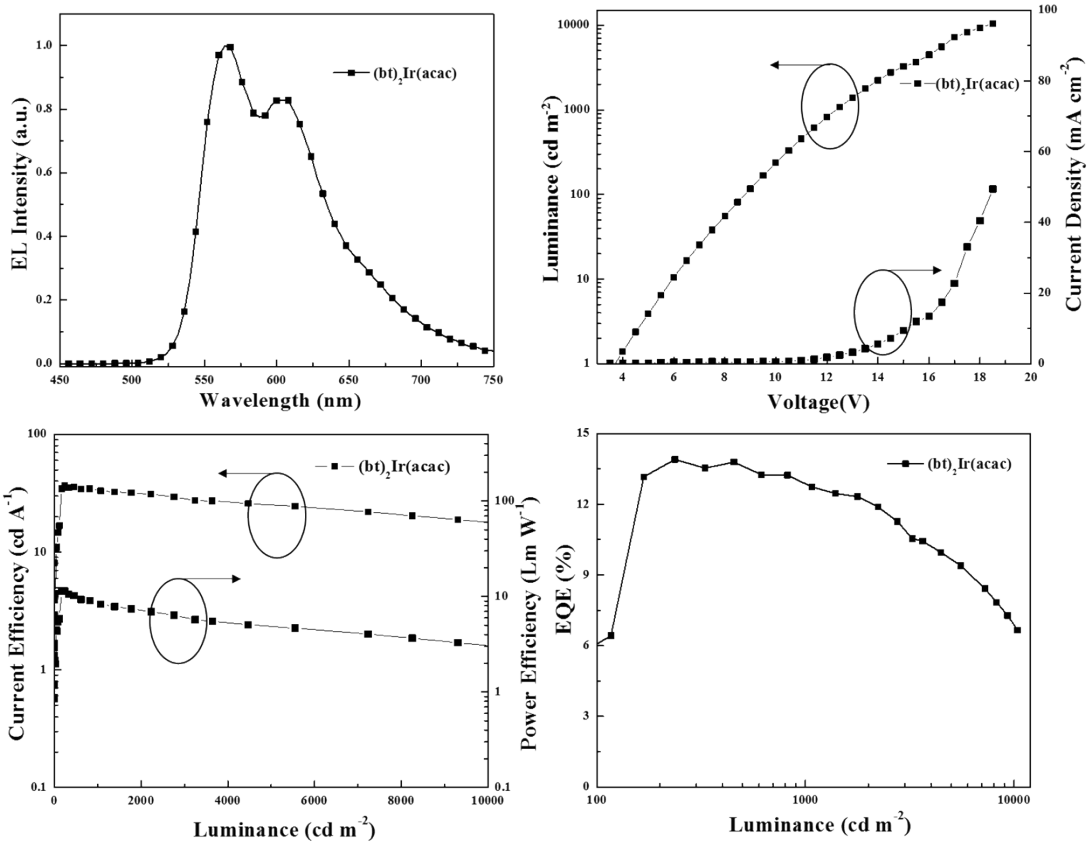


Figure S8 EL properties of the 10%-$(bt)_2Ir(acac)$-doped OLEDs.

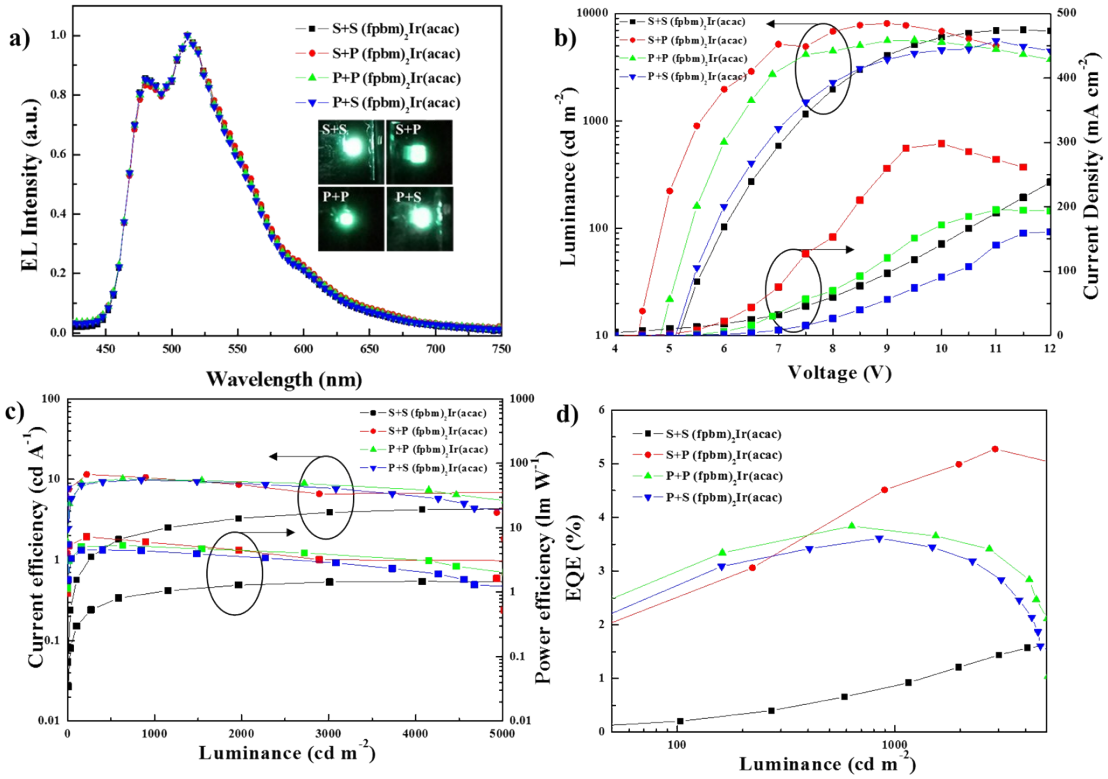


Figure S9 $(fpbm)_2Ir(acac)$-based OLEDs with different processing method: a) EL spectra at 10 V; b) J-V-L characteristic; c) CE and PE versus luminance curves; d) EQE versus luminance curves.

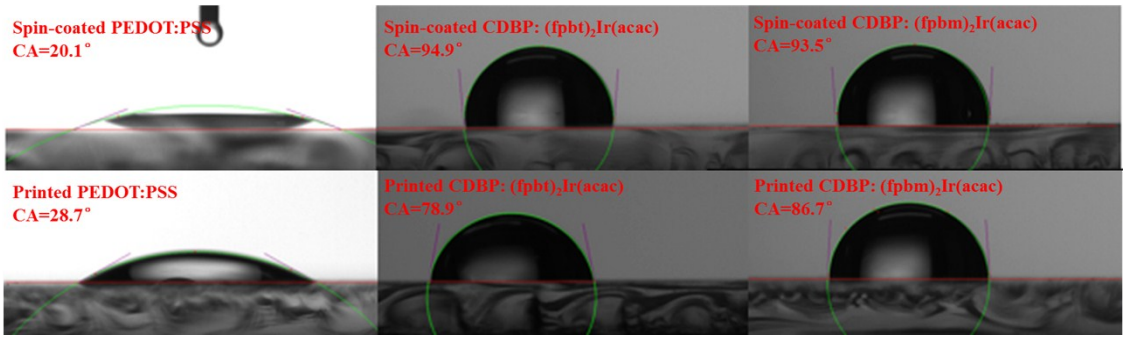


Figure S10 Contact angles (CA) images of water drop on PEDOT: PSS and EMLs with different processing methods.

Table S1 The rheological properties of the solvents and the inks.[a)]

Solvent	Boiling point (℃)	Viscosity(cp)	Surface tension (Mn m^{-1})	Density(g cm^{-3})	Z
PEDOT:PSS	**100**	**7.40**	**65.7**	**1.03**	**5.1**
Ethylene glycol	**197**	**14.83**	**47.9**	**1.14**	**2.3**
Ink- PEDOT:PSS [b)]	**-**	**20.00**	**52.3**	**1.13**	**1.8**
Ink-$(fpbt)_2Ir(acac)$ [c)]	**-**	**2.48**	**26.2**	**1.03**	**9.3**
Ink-$(fpbm)_2Ir(acac)$ [d)]	**-**	**2.99**	**27.1**	**1.03**	**7.9**
chlorobenzene	**132**	**0.76**	**33.6**	**1.11**	**36.7**
Butyl Benzoate	**250**	**2.70**	**33.4**	**1.01**	**8.7**

[a)] Data measured at 25℃; [b)] Ink-PEDOT: PSS : the volume ratio of PEDOT: PSS and ethylene glycol is 1:3; [c)] Ink-$(fpbt)_2Ir(acac)$: the weight ratio of $(fpbt)_2Ir(acac)$: CDBP is 1:9 in Butyl Benzoate; [d)] Ink-$(fpbm)_2Ir(acac)$: the weight ratio of $(fpbm)_2Ir(acac)$: CDBP is 1:9 in Butyl Benzoate.

Table S2 Design of OLEDs with different processing method.

process	PEDOT:PSS	EML(CDBP: $(fpbt)_2Ir(acac)$)	EML(CDBP: $(fpbm)_2Ir(acac)$)
S+S	Spin-coating [a)]	Spin-coating (90:10) [C)]	Spin-coating (90:10) [C)]
S+P	Spin-coating	Printing (90:10)	Printing (90:10)
P+P	Printing [b)]	Printing (90:10) [d)]	Printing (90:10) [d)]
P+S	Printing	Spin-coating (90:10)	Spin-coating (90:10)

[a)] Spin-coating PEDOT: PSS: Spin-coating onto the ITO glass substrate and baked in air at 120°C for 10 min; [b)] Printing PEDOT: PSS: Printing Ink- PEDOT:PSS onto the ITO glass substrate and baked in air at 120°C for 10 min; [c)] Spin-coating EML: Spin-coating EML (the weight ratio of Phosphorescent materials : CDBP is 1:9 in chlorobenzene) onto the PEDOT: PSS and baked in vacuum at 60°C for 15 min; [d)] Printing EML: Printing Ink-EML onto the PEDOT: PSS and baked in vacuum at 60°C for 15 min.

Table S3 EL properties of the $(fpbm)_2Ir(acac)$-based OLEDs with different processing method.

Methods	V_{turnon} (V) [a)]	L_{max}(cd m^{-2}) [b)]	EQE (%) [c)]	CE(cd A^{-1}) [c)]	PE (lm W^{-1}) [c)]	CIE (x,y)[d)]
S +S	4.5	7047	1.6/0.2/0.9	4.4/0.6/2.5	1.5/0.3/1.1	(0.28, 0.49)
S +P	4.0	8096	5.3/3.1/4.5	11.5/11.0/9.2	7.3/6.9/6.5	(0.26, 0.49)
P+P	4.5	5648	3.8/3.3/3.7	10.2/8.8/9.6	5.4/4.9/4.8	(0.27, 0.49)
P+S	4.0	5560	3.6/3.1/3.4	9.9/8.5/9.4	4.5/4.2/4.1	(0.28, 0.49)

[a)] Turn-on voltage at 1 cd m^{-2}; [b)] Maximum luminance; [c)] Order of measured efficiency values: maximum, then values at 100/1000 cd m^{-2} for device; [d)] Commission International de I'Eclairage (CIE) coordinate measured at 10V.