

Supporting Information

Deep blue organic light-emitting devices enabled by bipolar phenanthro[9,10-d]imidazole derivatives

Shuo Chen,^a Yukun Wu,^b Yi Zhao,^{*,b} Daining Fang,^{*,a}

^a *State Key Laboratory for Turbulence and Compound System, College of Engineering, Peking University, Beijing 100871, P.R. China*

^b *State Key Laboratory on Integrated Optoelectronics, College of Electronics Science and Engineering, Jilin University, 2699 Qianjin Street, Changchun 130012, P.R. China*

Index

	Content	Page No.
Figure S1	¹ H NMR spectrum of compound FD4B .	1
Figure S2	¹ H NMR spectrum of compound TD4B .	1
Figure S3	¹ H NMR spectrum of compound PhImBr .	2
Figure S4	¹ H NMR spectrum of compound PhImFD .	2
Figure S5	¹³ C NMR spectrum of compound PhImFD .	3
Figure S6	¹ H NMR spectrum of compound PhImTD .	3
Figure S7	¹³ C NMR spectrum of compound PhImTD .	4
Figure S8	HR-MS spectrum of compound PhImFD .	5
Figure S9	HR-MS spectrum of compound PhImTD .	5
Figure S10	Current density of hole-only and electron-only devices.	6
Figure S11	CIE coordinates of the devices A and B at different luminance.	6
Figure S12	Efficiency versus luminance curves of white OLED devices C and D.	7
Figure S13	Electroluminescence spectra for device C at different voltages.	8
Figure S14	Electroluminescence spectra for device D at different voltages.	8
Figure S15	CIE coordinates of the devices C and D at different luminance.	9
Figure S16	Normalized phosphorescent spectra of PhImFD and PhImTD	10
Table S1	Key performance parameters of doped WOLED devices C and D.	11

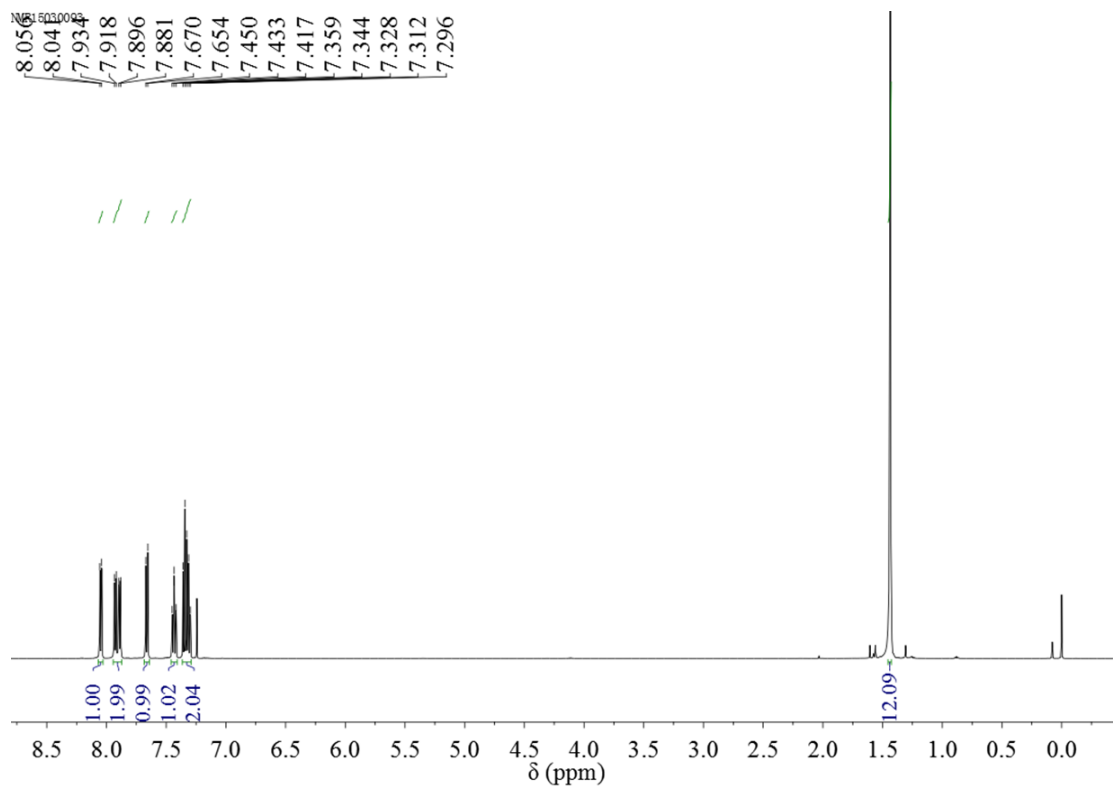


Figure S1. ¹H NMR spectrum of compound **FD4B**.

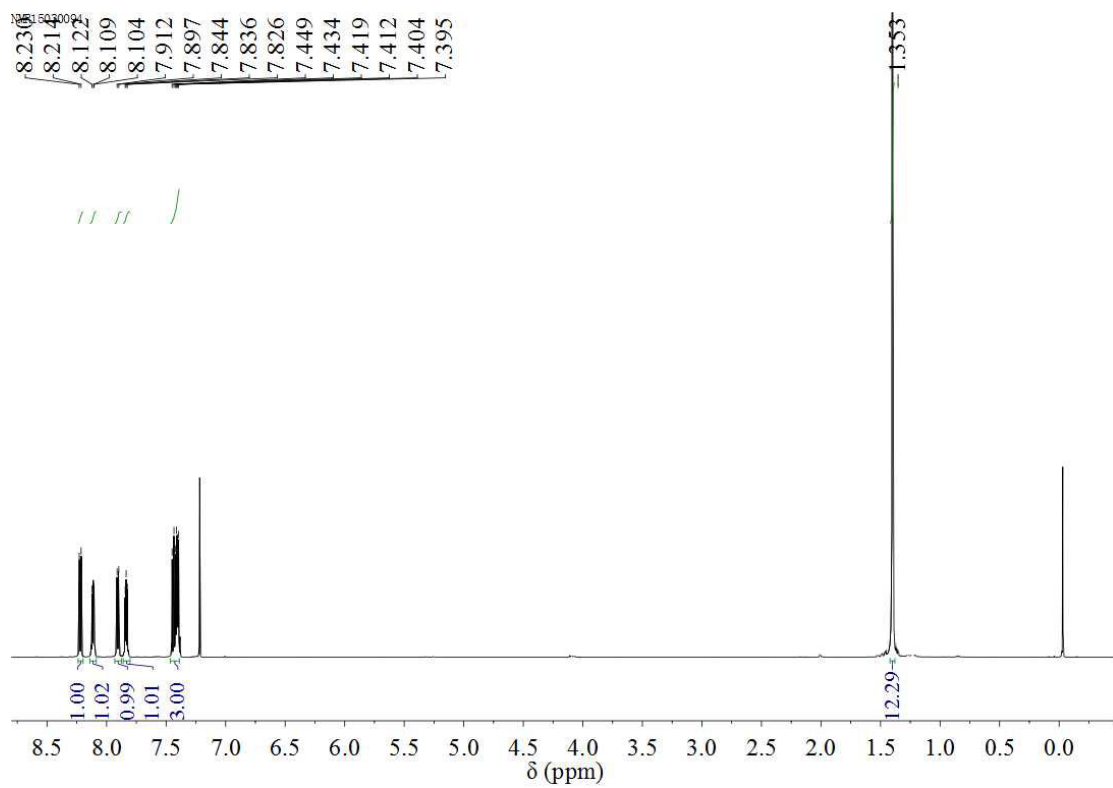


Figure S2. ¹H NMR spectrum of compound **TD4B**.

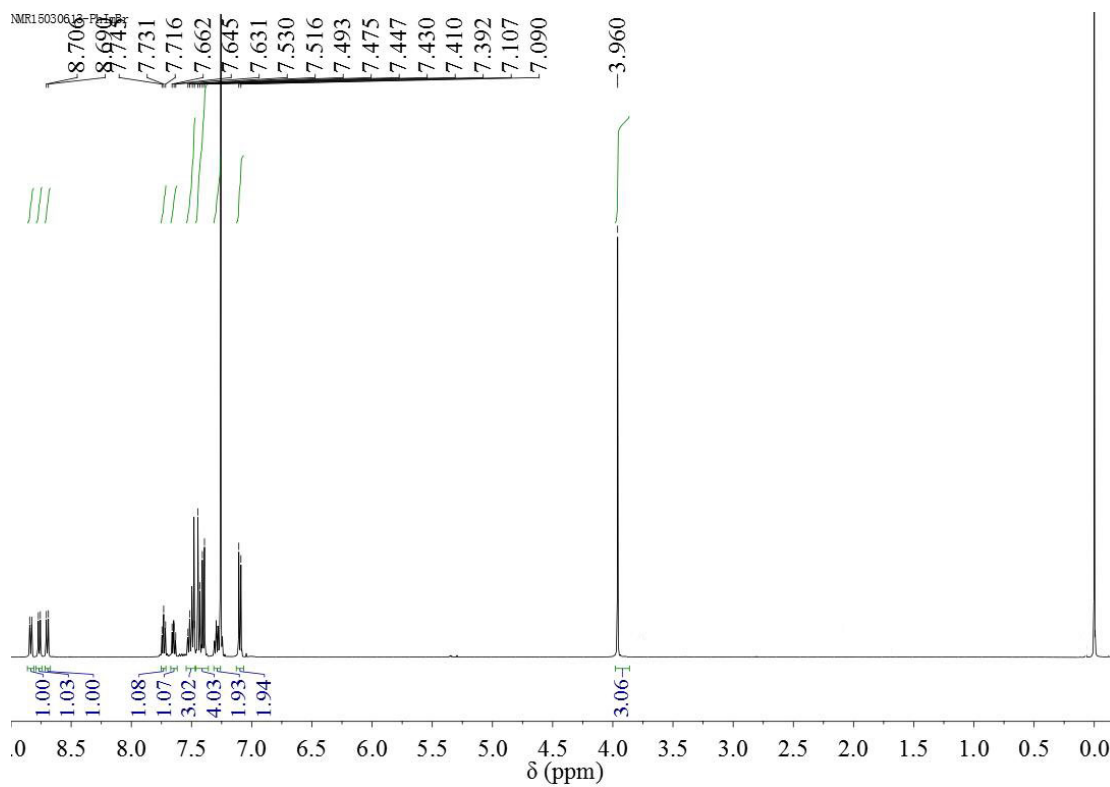


Figure S3. ^1H NMR spectrum of compound **PhImBr**.

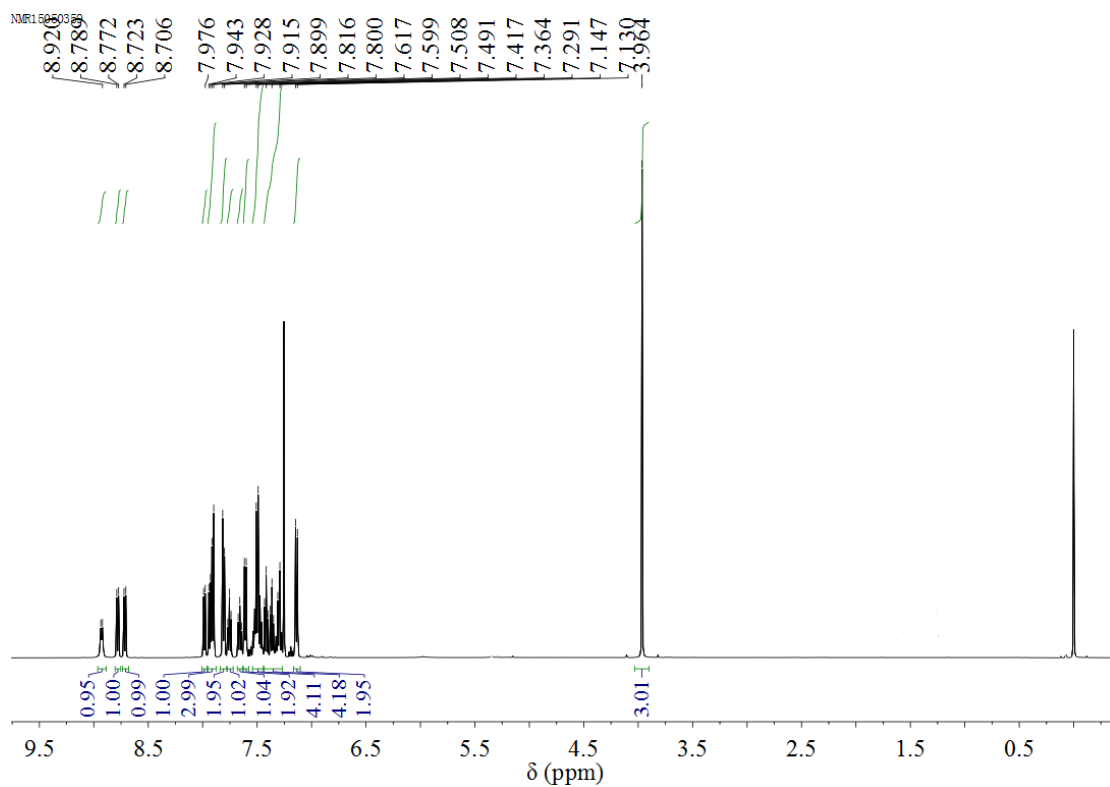


Figure S4. ^1H NMR spectrum of compound **PhImFD**.

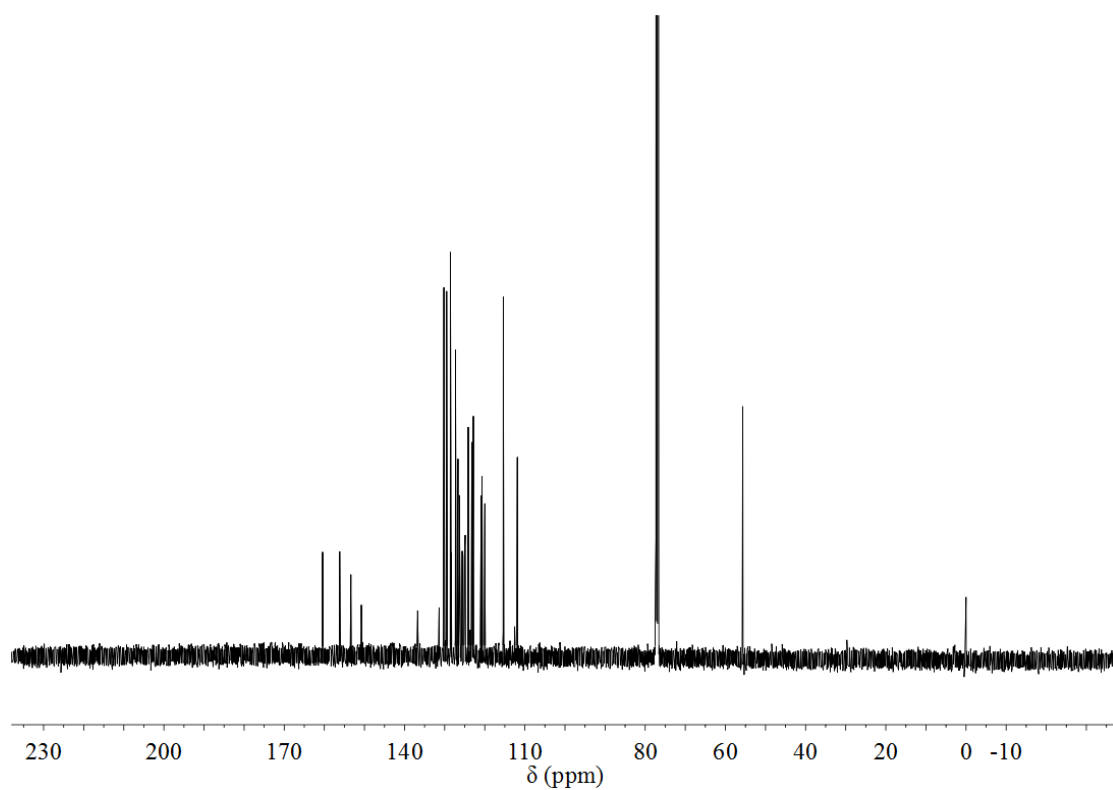


Figure S5. ¹³C NMR spectrum of compound PhImFD.

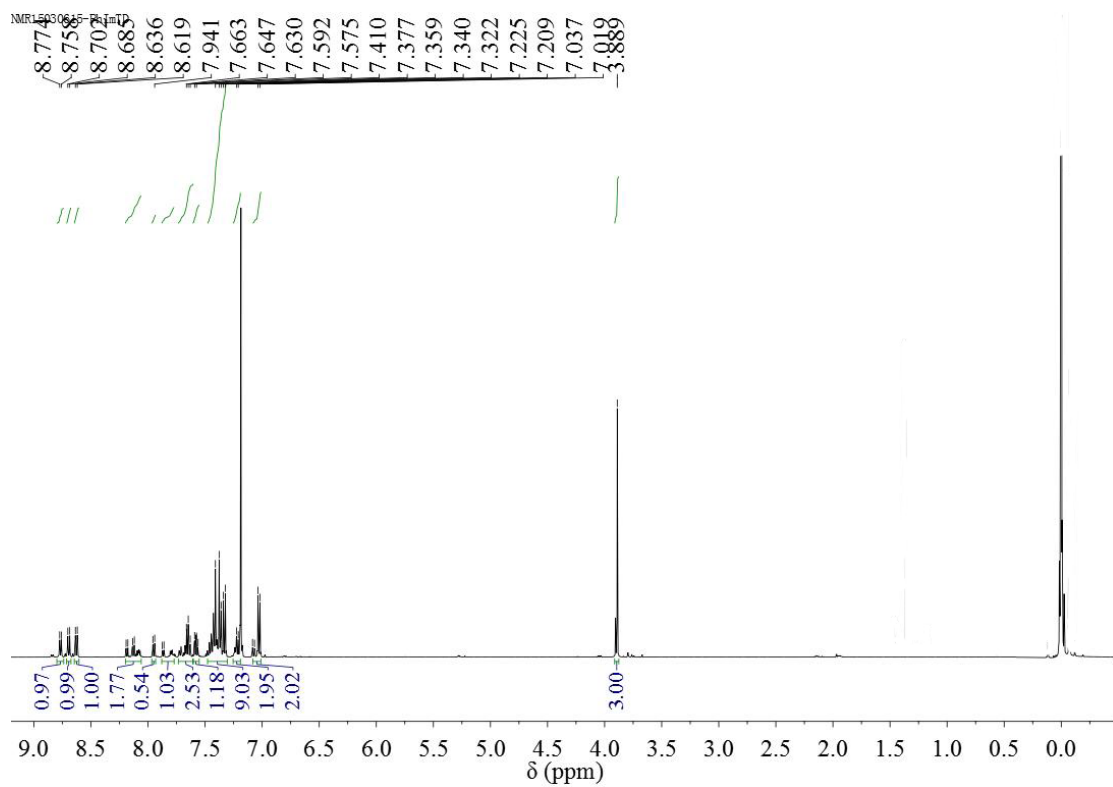


Figure S6. ¹H NMR spectrum of compound PhImTD.

NMR15050556

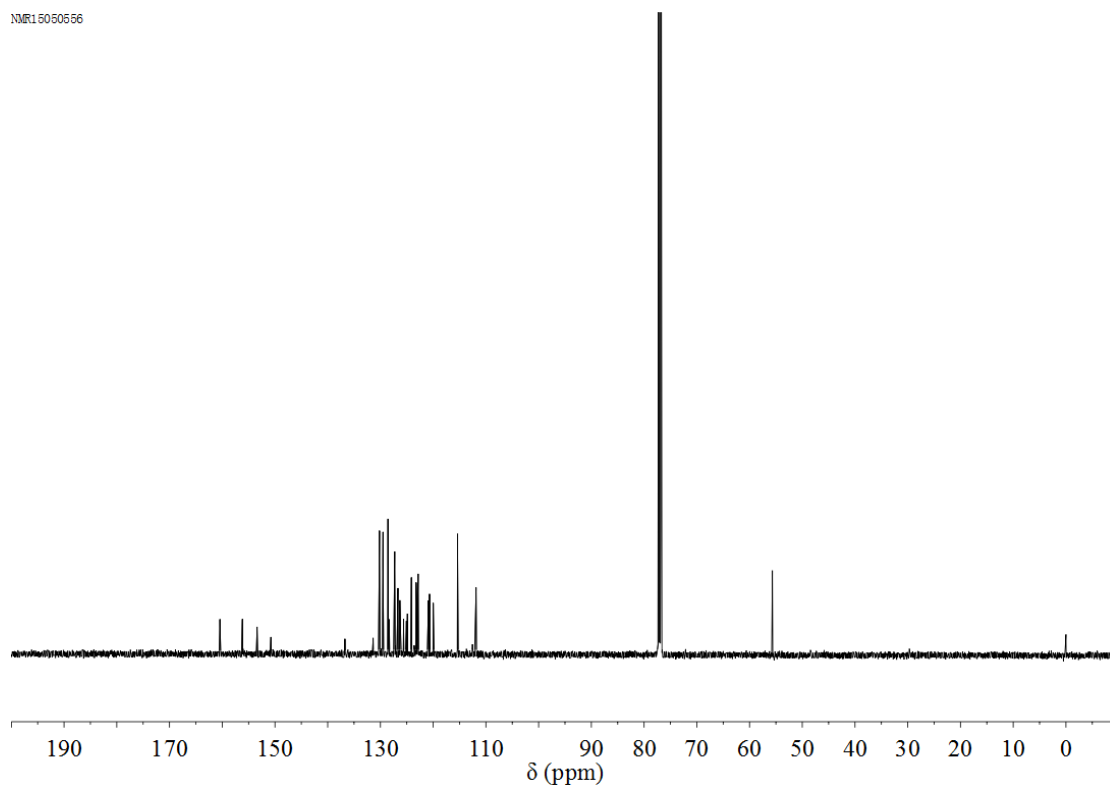


Figure S7. ^{13}C NMR spectrum of compound **PhImTD**.

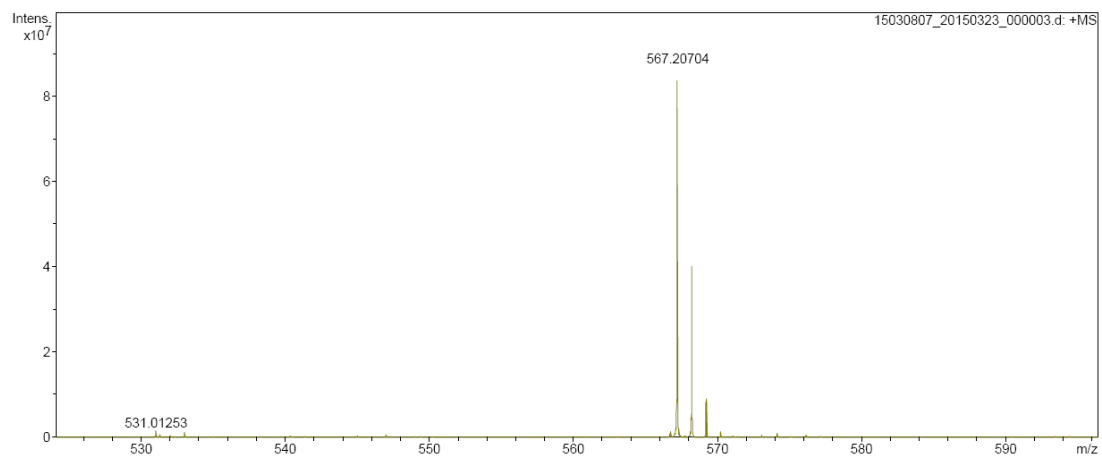


Figure S8. HR-MS spectrum of compound **PhImFD**.

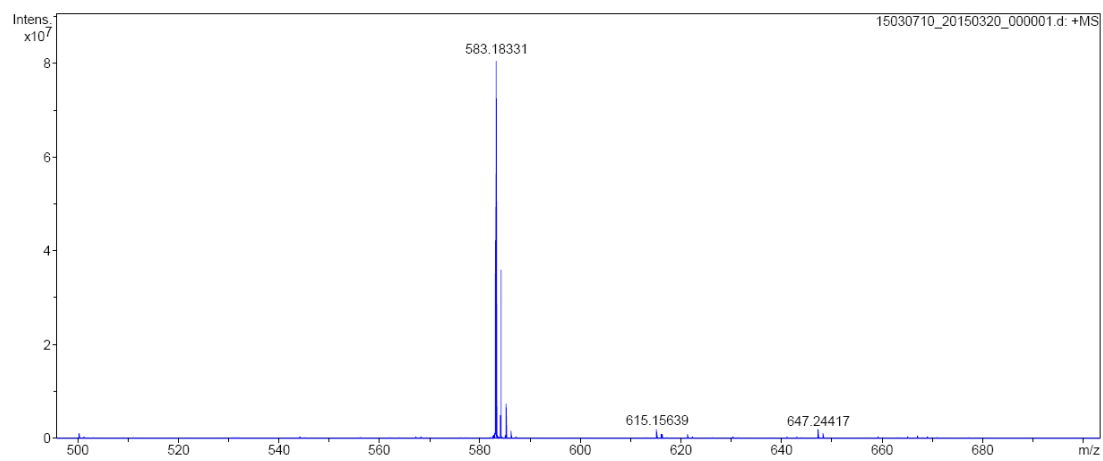


Figure S9. HR-MS spectrum of compound **PhImTD**.

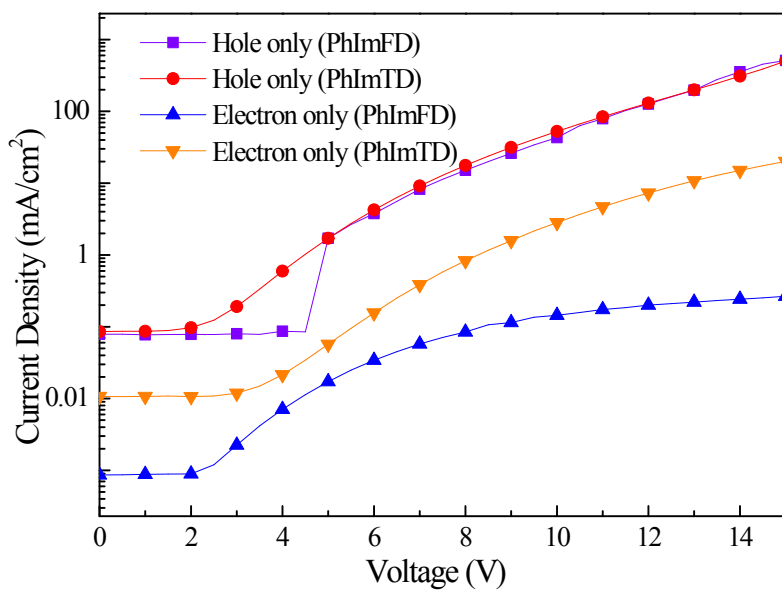


Figure S10. Current density of hole-only and electron-only devices.

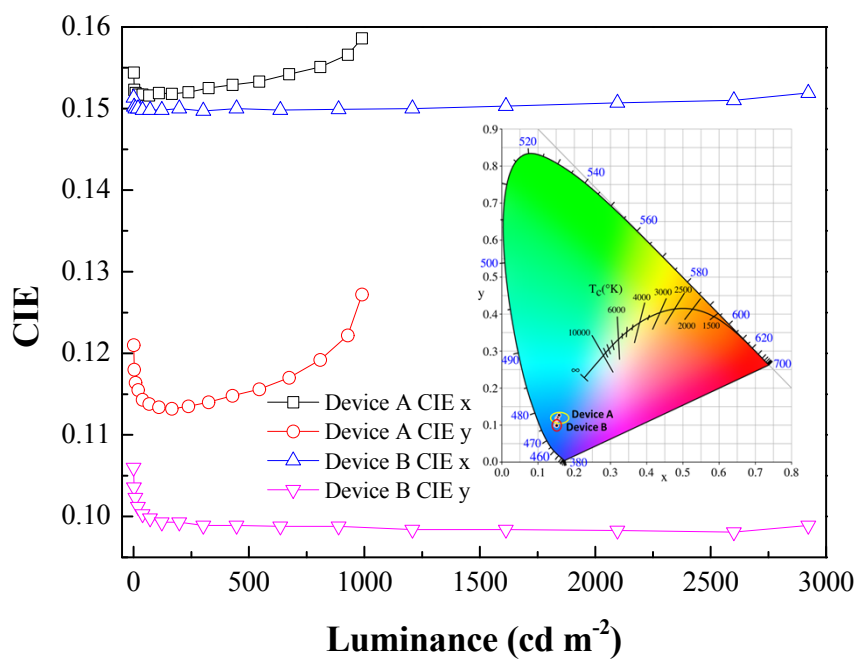


Figure S11. CIE coordinates of the devices A and B at different luminance.

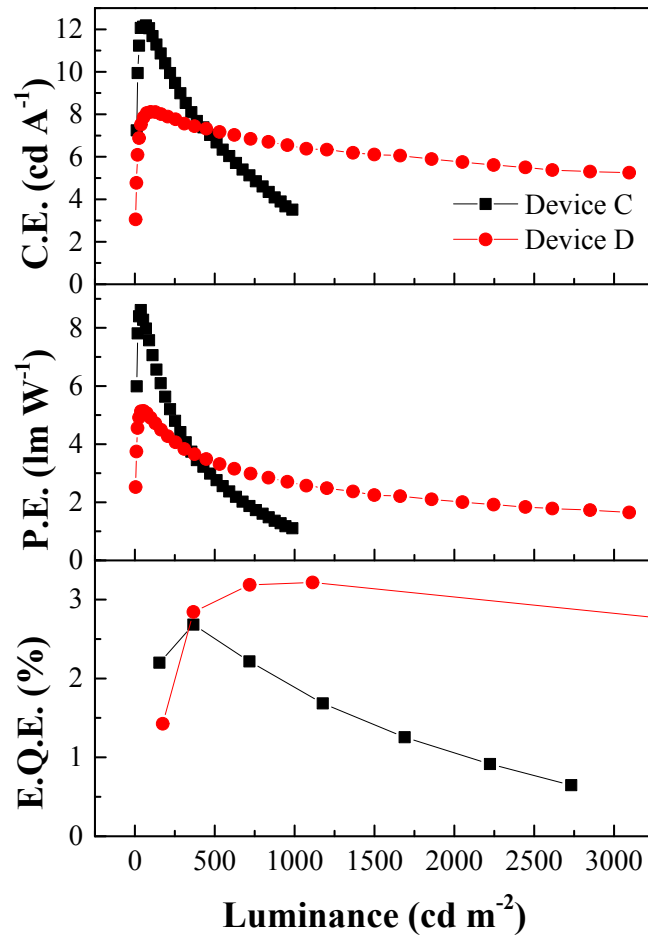


Figure S12. Efficiency versus luminance curves of white OLED devices C and D.

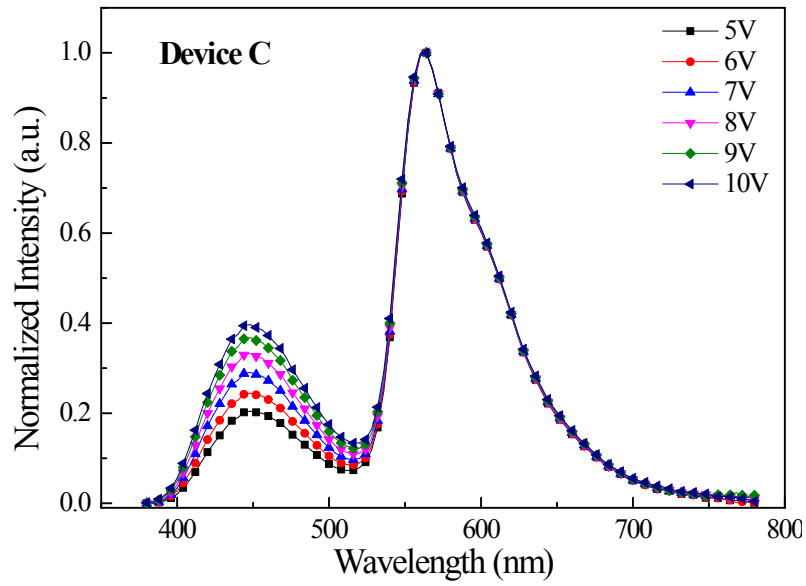


Figure S13. Electroluminescence spectra for device C at different voltages.

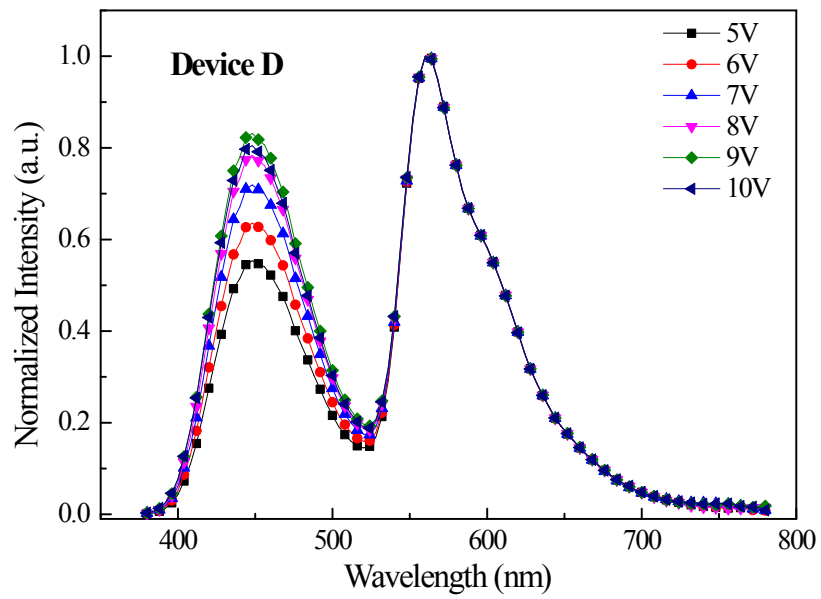


Figure S14. Electroluminescence spectra for device D at different voltages.

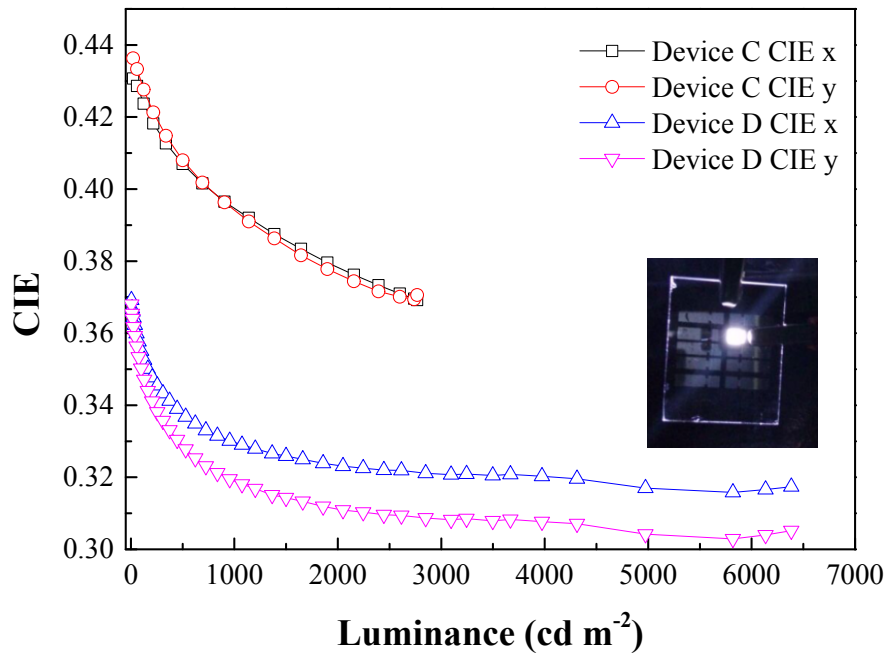


Figure S15. CIE coordinates of the devices C and D at different luminance.

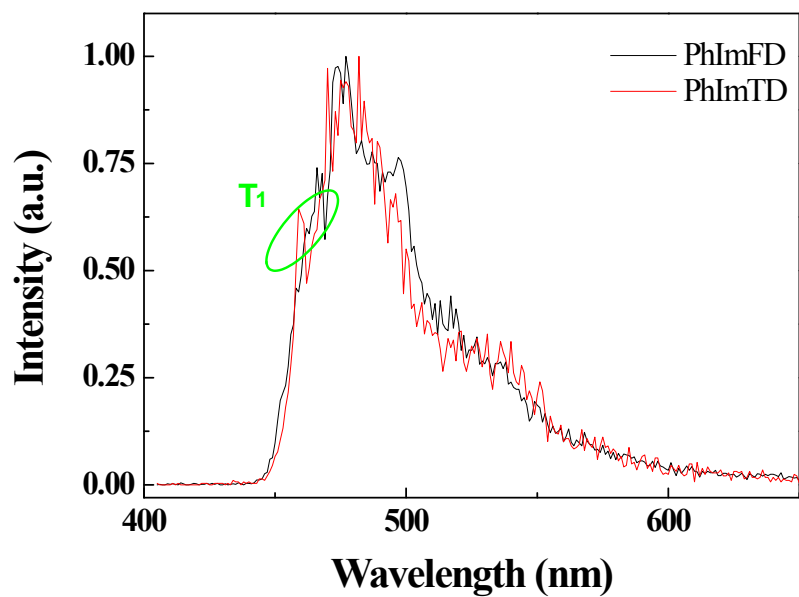


Figure S16. Normalized phosphorescent spectra of **PhImFD** and **PhImTD** in the frozen 2-methyltetrahydrofuran matrix at 77 K. Ex = 345 nm.

Table S1 Key performance parameters of doped WOLED devices C and D.

Material	Device	V_{on} (V) ^a	CE_{max} ^b (cd A ⁻¹)	PE_{max} ^b (lm W ⁻¹)	EQE_{max} ^b (%)	CIE (x, y) ^c
PhImFD+PO-01	C	3.7	12.18	8.61	2.68	(0.392, 0.391)
PhImTD+PO-01	D	3.7	8.12	5.14	3.22	(0.339, 0.330)

^a Voltage required for 1 cd m⁻²;

^b current efficiency (CE_{max}), power efficiency (PE_{max}), external quantum yield (EQE_{max});

^c The CIE are measured at 1000 cd m⁻².