Supporting Information

High Performance Solution-Processable Thermally Activated Delayed Fluorescent OLEDs Realized via the Adjustment of the Composition of the Organoboron Acceptor Monomer in Copolymer Host Materials

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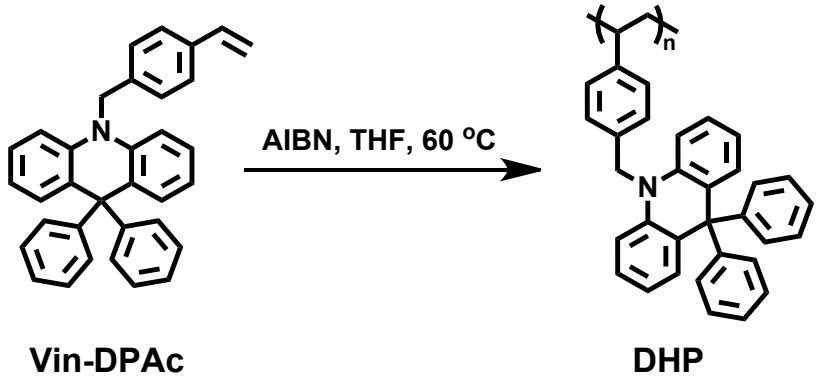
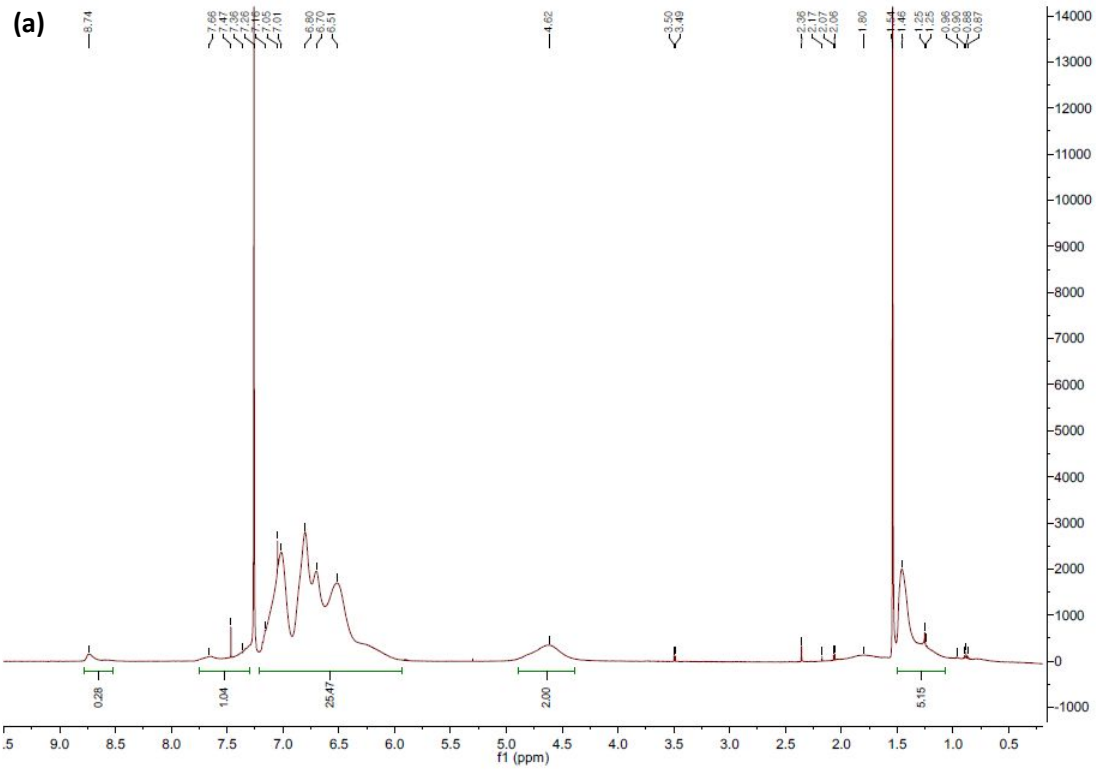
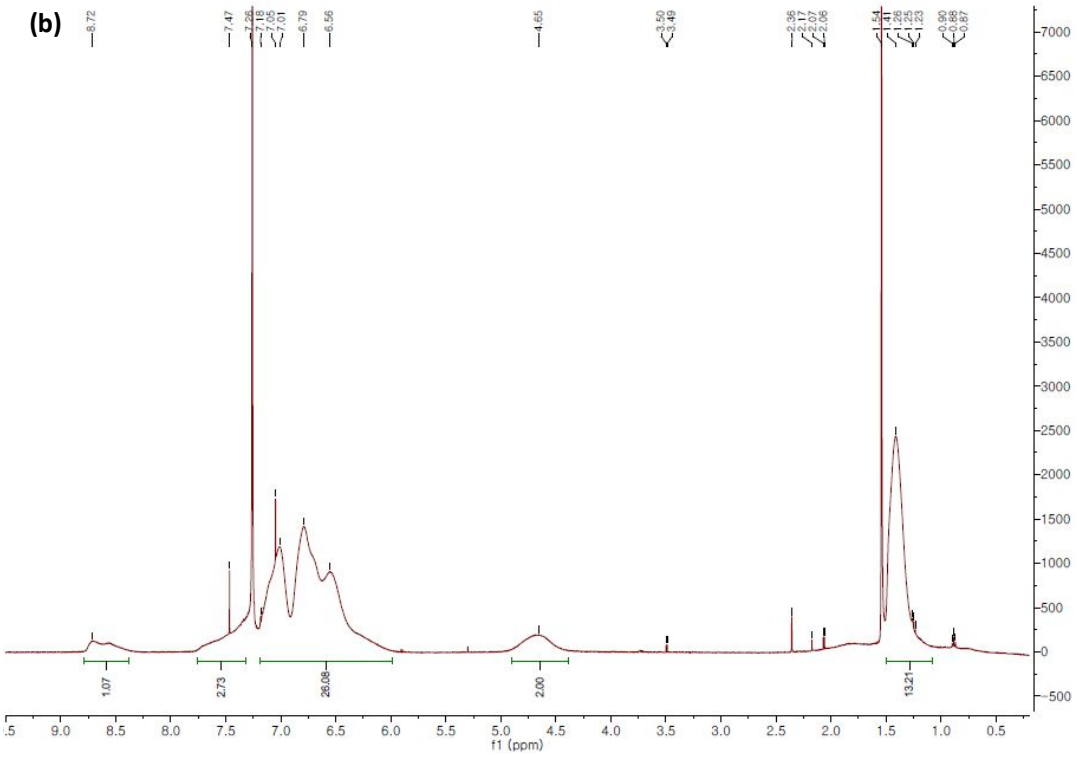
Figures and Tables



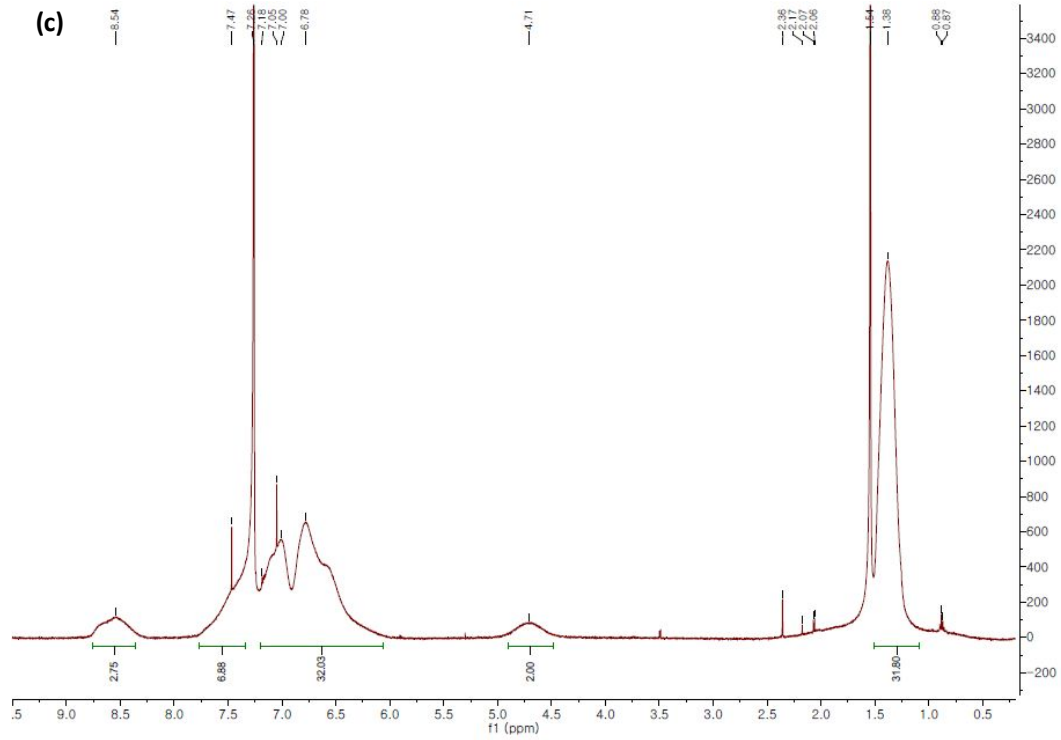
Scheme S1. Synthetic route of donor homopolymer host (**DHP**).

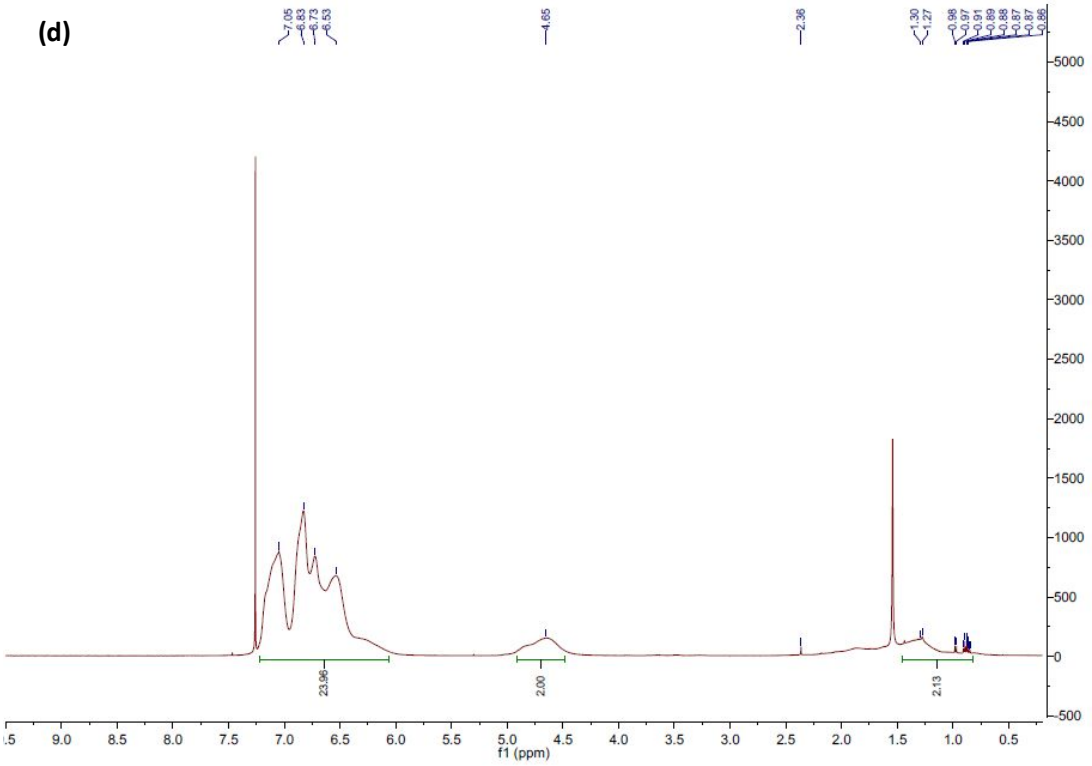


(b)


8.72
7.47
7.26
7.18
7.05
7.01
6.79
6.56
4.65
3.50
3.49
2.36
2.17
2.07
2.06
1.54
1.41
1.26
1.25
1.23
0.90
0.88
0.87
1.07
2.73
26.08
2.00
13.21
f1 (ppm)

(c)


8.54
7.47
7.26
7.18
7.05
7.00
6.78
4.71
2.36
2.17
2.07
2.06
1.64
1.38
0.88
0.87
2.75
6.88
32.03
2.00
31.80
f1 (ppm)


(d)
7.05
6.83
6.73
6.53
4.65
2.36
1.30
1.27
0.98
0.97
0.91
0.89
0.88
0.87
0.87
0.86
23.96
2.00
2.13
f1 (ppm)

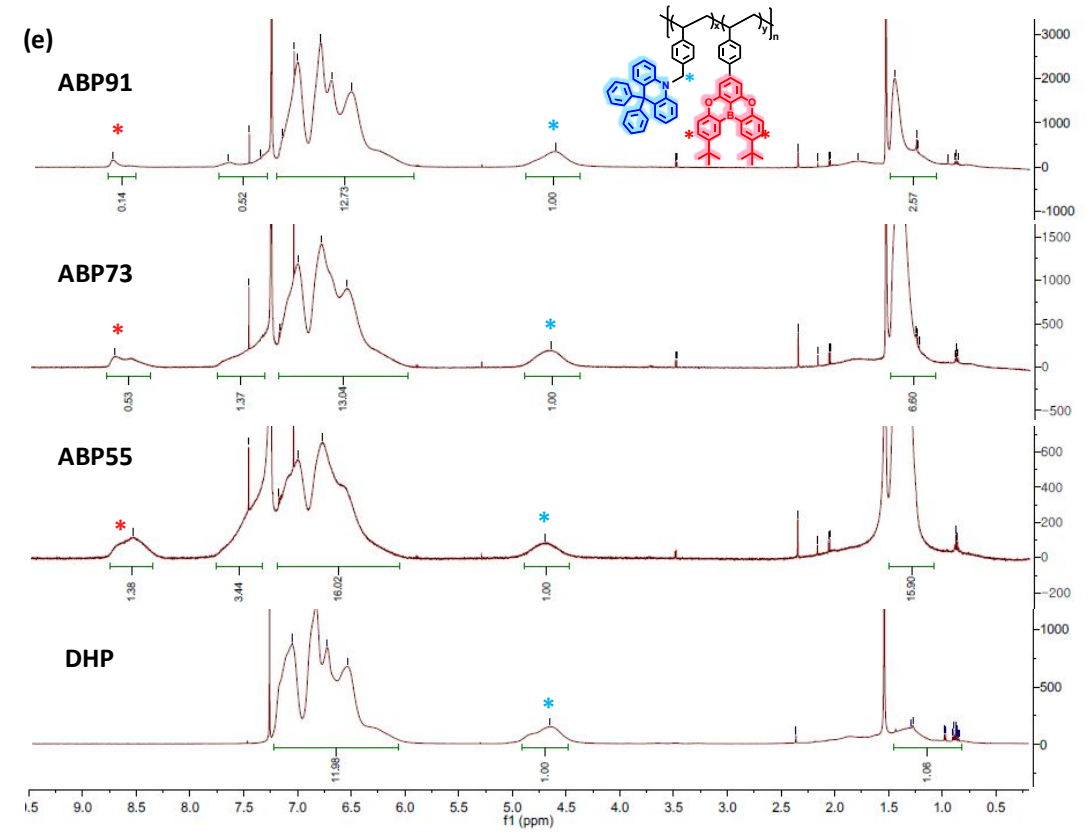

(e)
ABP91
ABP73
ABP55
DHP
0.14
0.52
12.73
1.00
2.57
0.53
1.37
13.04
1.00
6.60
1.38
3.44
16.02
1.00
15.90
11.98
1.00
1.06
f1 (ppm)

Figure S1. 1H NMR spectra of (a) **ABP91**, (b) **ABP73**, (c) **ABP55**, (d) **DHP** and (e) stacked spectra for molar ratio determination.

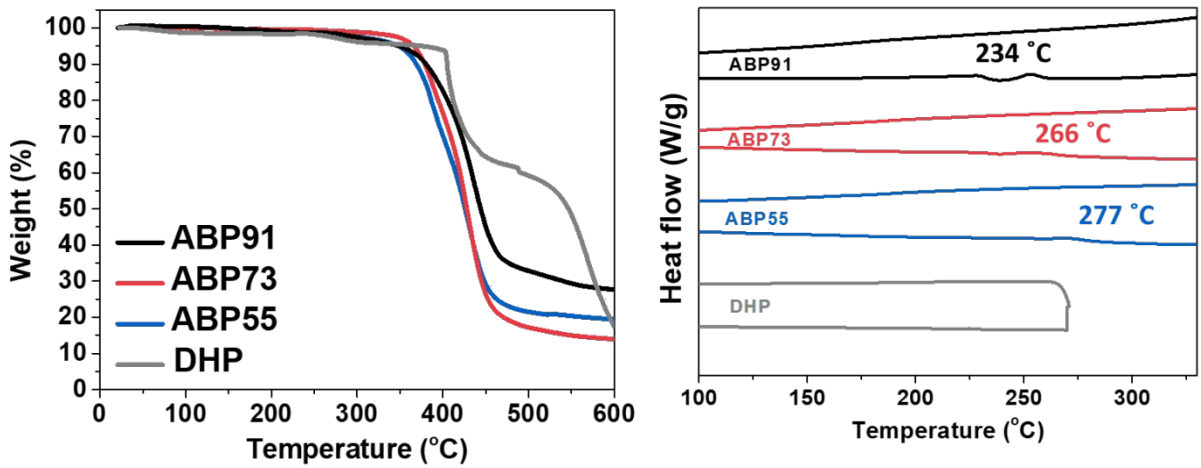


Figure S2. TGA (**a**) and DSC (**b**) thermograms of **ABP91**, **ABP73**, **ABP55**, and **DHP** polymers.

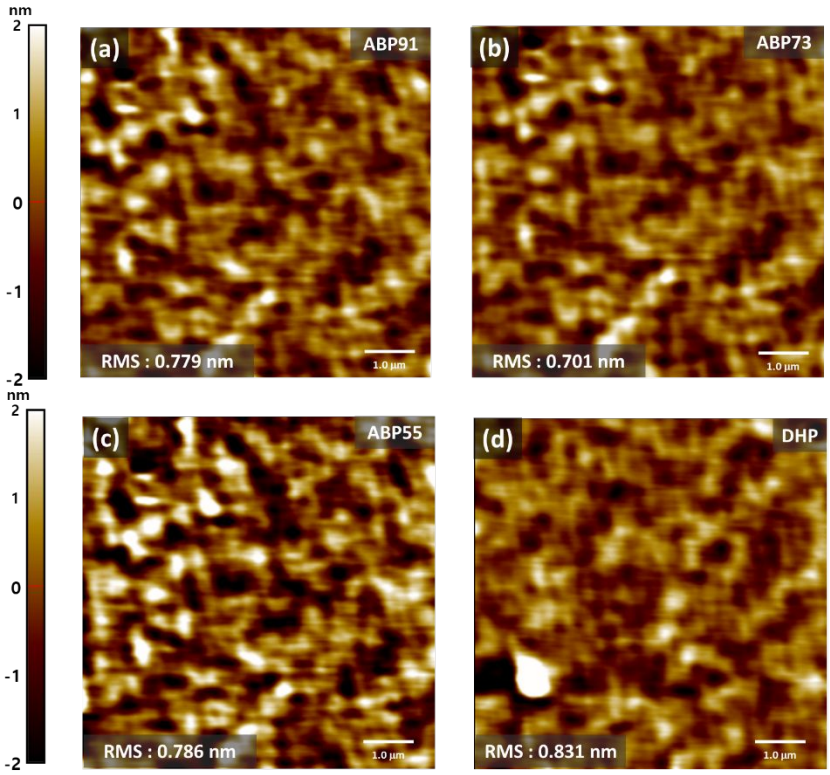


Figure S3. AFM topographic images (5 × 5 μm) of blend films of copolymer hosts: TADF emitter (a) **ABP91**:t4CzIPN, (b) **ABP73**: t4CzIPN, (c) **ABP55**:t4CzIPN, and (d) **DHP**:t4CzIPN.

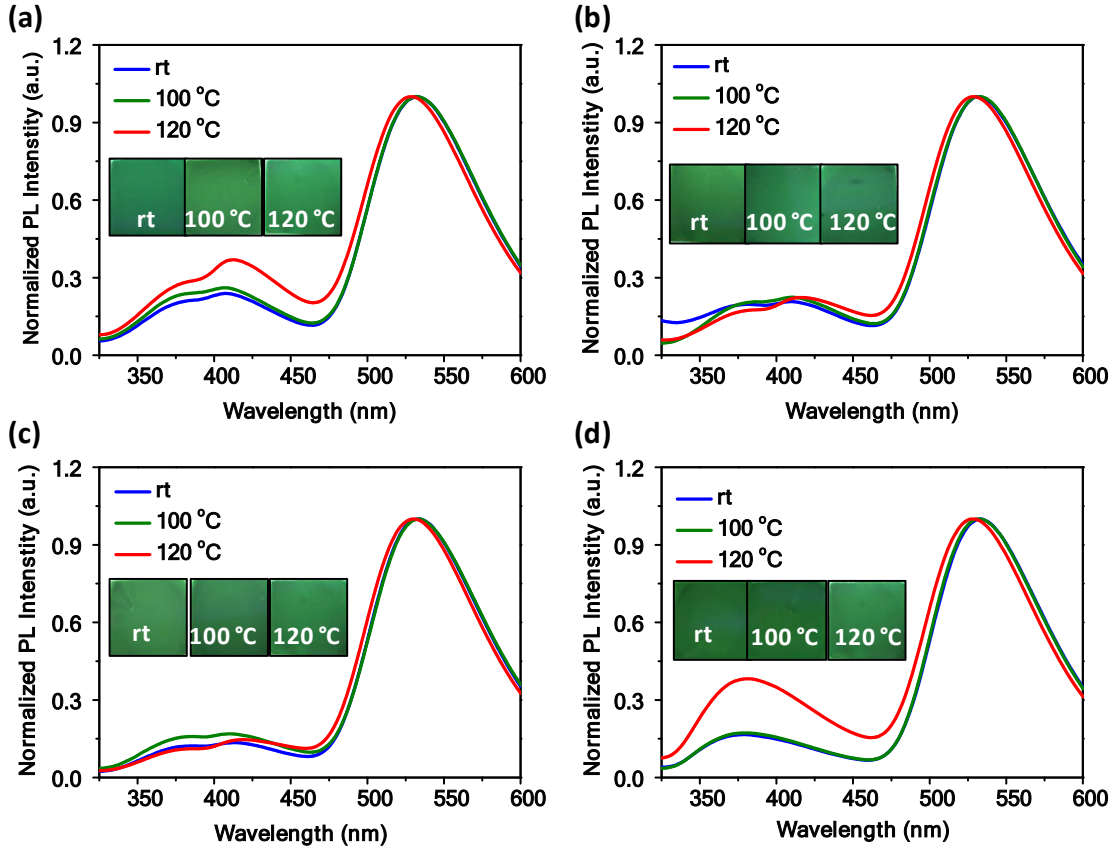


Figure S4. Temperature-dependent PL of (a) **ABP91**:t4CzIPN (5.0 wt%), (b) **ABP73**:t4CzIPN (5.0 wt%), (c) **ABP55**:t4CzIPN (5.0 wt%), (d) **DHP**: t4CzIPN (5.0 wt%) in film state (inset shows photo image of thin films at different temperatures).

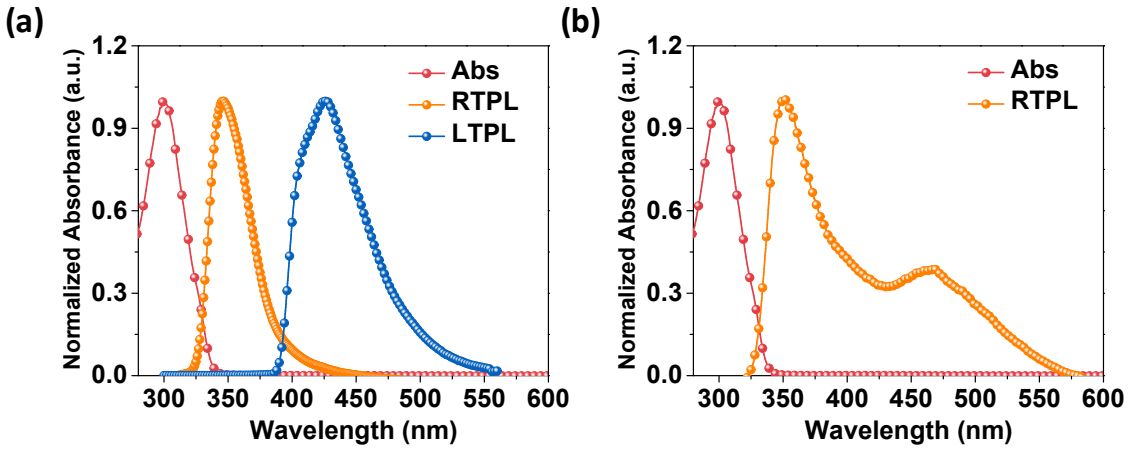


Figure S5. UV-Vis absorption and PL spectra of DHP homopolymer recorded in (a) toluene and (b) film state.

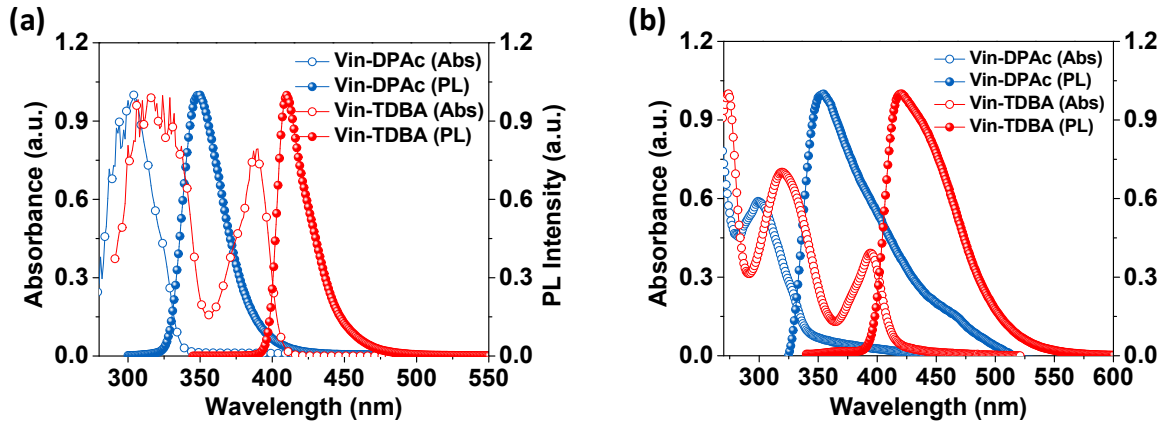


Figure S6. UV-Vis absorption and PL spectra of Vin-DPAC and Vin-TDBA in (a) toluene and (b) film state

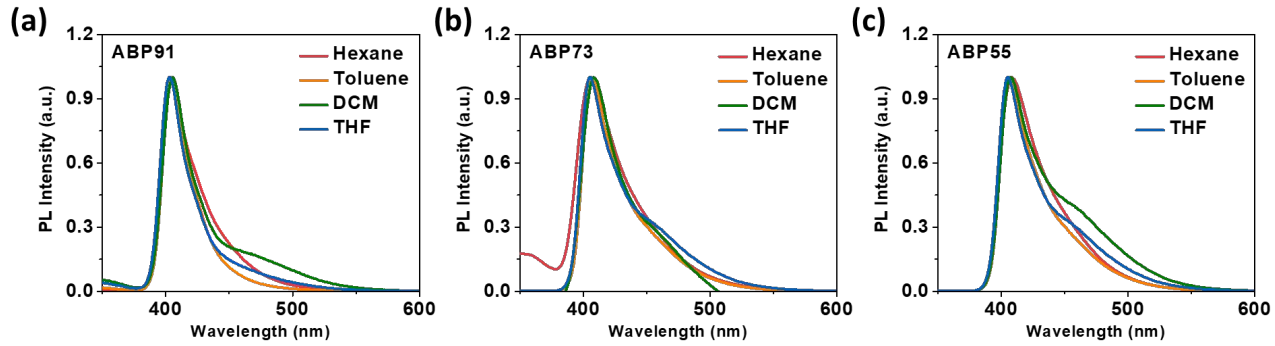


Figure S7. PL spectra of (a) **ABP91**, (b) **ABP73**, and (c) **ABP55** in different polar solvents.

Table S1. PL spectra of polymers in different polar solvents.

Compound	Hexane (nm)	Toluene (nm)	DCM (nm)	THF(nm)
ABP91	404	405	406	403
ABP73	409	407	408	406
ABP55	408	407	408	406

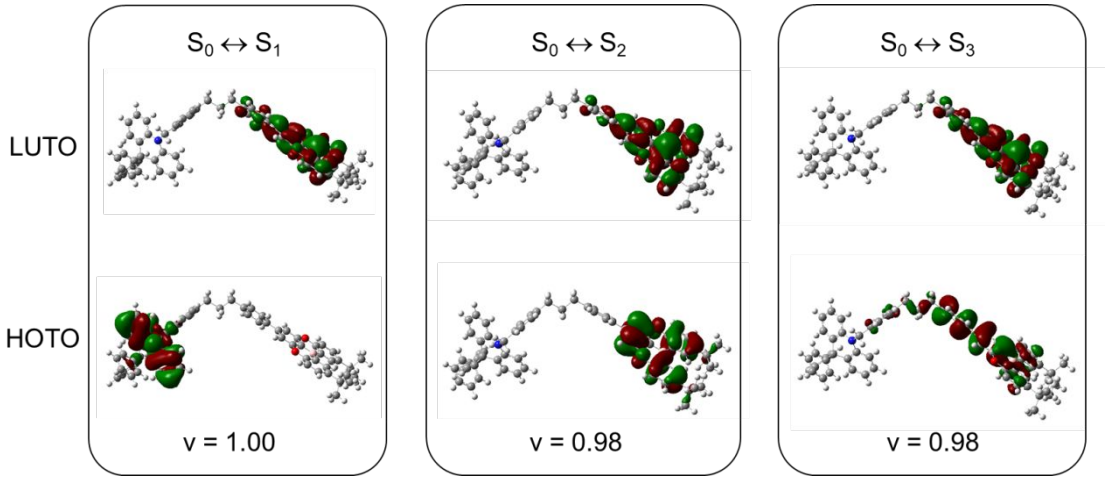


Figure S8. Natural transition orbitals (NTOs) for the transitions ($S_0 \leftrightarrow S_1$, $S_0 \leftrightarrow S_2$, and $S_0 \leftrightarrow S_3$) of ABP model compound. The lowest unoccupied transition orbital (LUTO) and highest occupied transition orbital (HOTO) represent the electron and hole wavefunction, respectively.

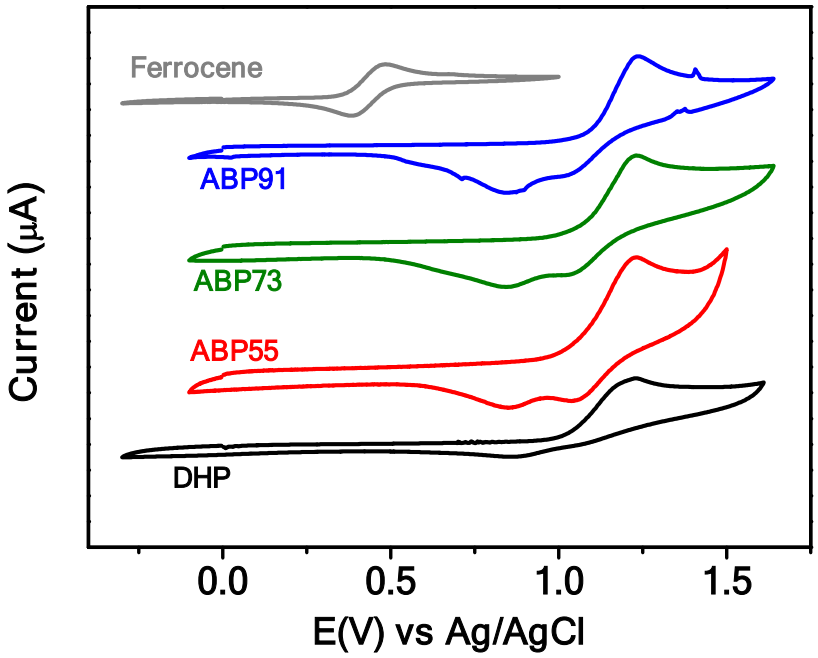


Figure S9. Cyclic voltammograms of new polymers measured in film state (cyclic voltammogram of Ferrocene reference is also displayed).

Table S2. Results of multi-exponential fit to TRPL signals, $I(t)$, of t4CzIPN-doped (5.0 wt%) **ABP91**, **ABP73**, and **ABP55** in the film states at room temperature.

Host	A_1	A_2	A_3	A_4	A_5	τ_1 (ns)	τ_2 (μs)	τ_3 (μs)	τ_4 (μs)	τ_5 (μs)
ABP91	0.885	0.0433	0.00402	0.0493	0.0182	25.6	0.236	0.987	2.57	5.39
ABP73	0.871	0.0463	0.000210	0.0304	0.0524	25.7	0.240	1.000	5.12	2.42
ABP55	0.883	0.0399	0.00118	0.0167	0.0596	24.3	0.246	0.993	6.28	2.83

$I(t) = \sum_{i=1}^{5} A_i \exp(-t/\tau_i)$ with $\sum_{i=1}^{5} A_i = 1$

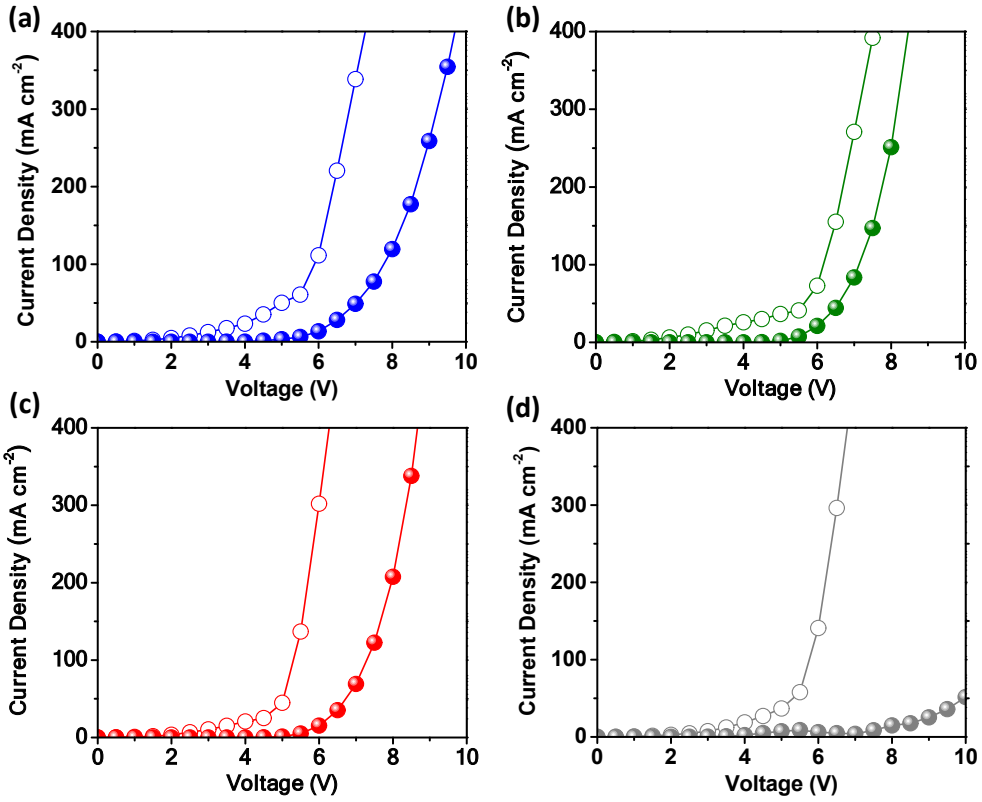


Figure S10. Hole-only (open-circle plots) and electron-only devices (filled-circle plots) of (a) **ABP91**, (b) **ABP73**, (c) **ABP55**, and (d) **DHP**.

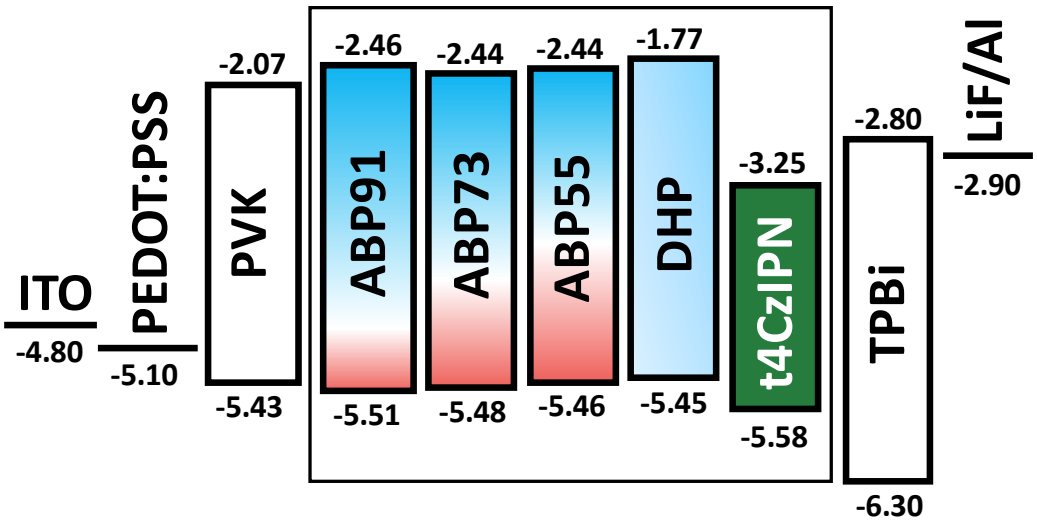


Figure S11. Energy level diagram of OLEDs used in this study.

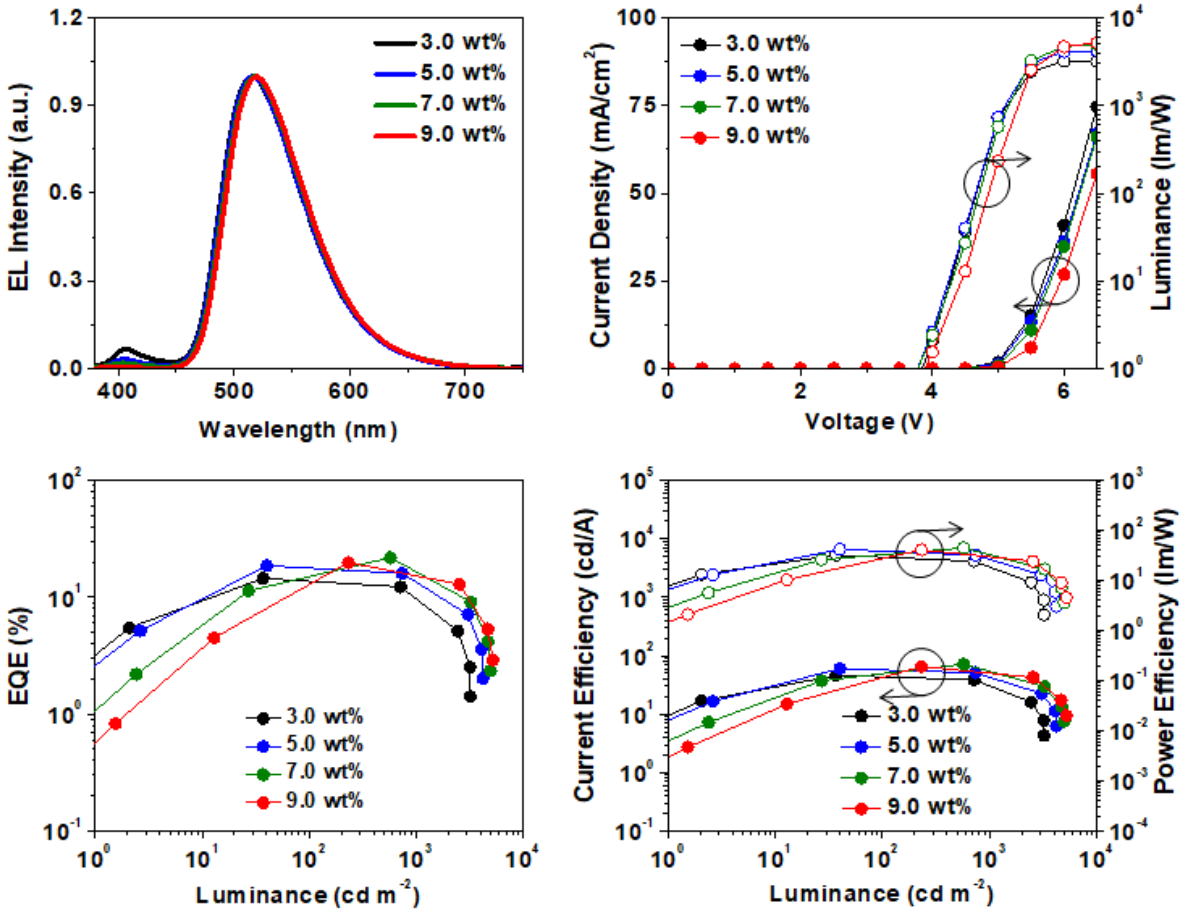


Figure S12. Characteristics of TADF-OLEDs for **ABP91**:t4CzIPN at various dopant concentrations: (a) normalized EL spectra (measured at 1000 cd m^{-2}), (b) current density–voltage–luminance (*J*–*V*–*L*), (c) EQE against luminance, and (d) current efficiency and power efficiency against luminance.

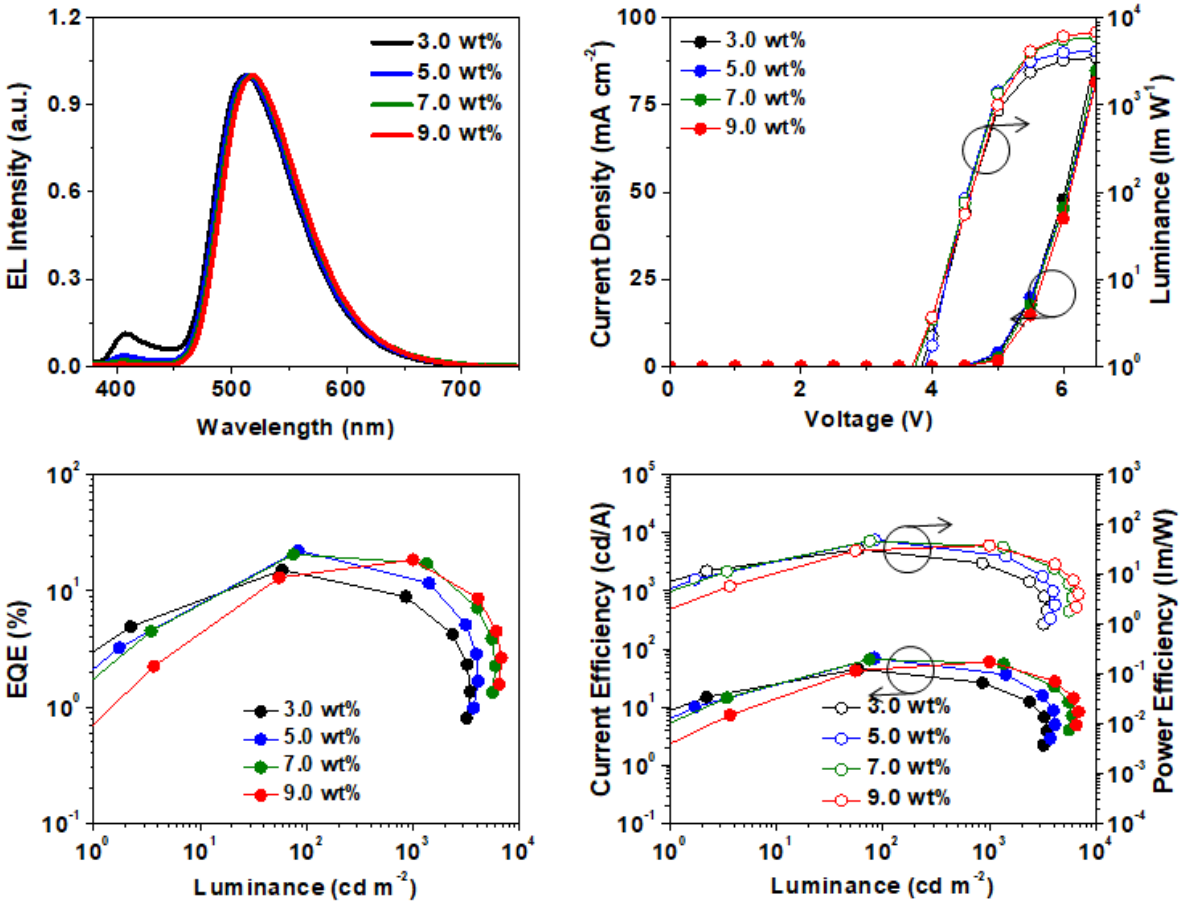


Figure S13. Characteristics of TADF-OLEDs for **ABP73**:t4CzIPN at various dopant concentrations: (a) normalized EL spectra (measured at 1000 cd m^{-2}), (b) current density–voltage–luminance (*J*–*V*–*L*), (c) EQE against luminance, and (d) current efficiency and power efficiency against luminance.

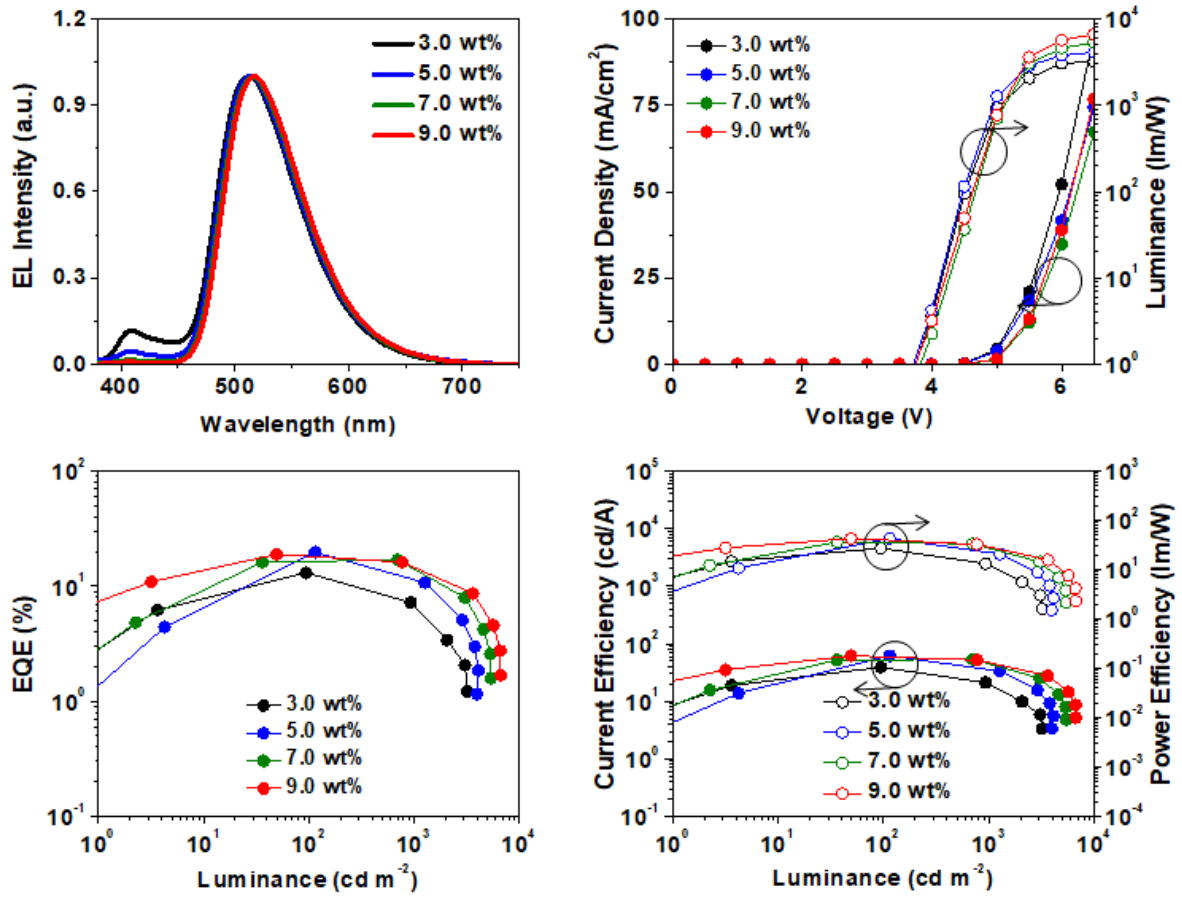


Figure S14. Characteristics of TADF-OLEDs for **ABP55**:t4CzIPN at various dopant concentrations: (a) normalized EL spectra (measured at 1000 cd m^{-2}), (b) current density–voltage–luminance (*J*–*V*–*L*), (c) EQE against luminance, and (d) current efficiency and power efficiency against luminance.

Table S3. Polymer host-based TADF-OLED performance data at various dopant concentrations.

Host	Dopant Conc. (wt.%)	V_{on} (V) [a]	Quantum Efficiency (%)		Current Efficiency (cd A^{-1})		Power Efficiency (lm W^{-1})		L_{max} (cd m^{-2}) [b]	CIE (x, y) [c]
			max	500 cd m^{-2}	max	500 cd m^{-2}	max	500 cd m^{-2}		
ABP91	3.0	3.7	14.5	13.0	46.0	41.1	32.1	26.8	3218	(0.28, 0.57)
	5.0	3.7	18.6	17.0	60.1	54.4	42.0	35.7	4212	(0.28, 0.58)
	7.0	**3.7**	**21.8**	**20.4**	**71.4**	**66.7**	**44.9**	**42.1**	**4968**	**(0.29, 0.59)**
	9.0	3.8	19.8	19.2	65.4	62.8	41.1	39.3	5212	(0.29, 0.59)
ABP73	3.0	3.7	15.1	11.8	45.5	35.1	31.8	23.6	3476	(0.26, 0.54)
	5.0	**3.7**	**22.2**	**19.0**	**70.1**	**59.9**	**48.9**	**41.1**	**4109**	**(0.27, 0.57)**
	7.0	3.7	20.6	19.5	66.7	63.1	46.6	42.7	5983	(0.28, 0.58)
	9.0	3.6	18.4	15.4	60.2	50.8	37.8	33.4	6831	(0.29, 0.59)
ABP55	3.0	3.6	13.1	10.3	39.1	30.5	27.3	20.6	3210	(0.26, 0.53)
	5.0	**3.6**	**19.7**	**16.8**	**61.7**	**52.4**	**43.1**	**35.8**	**4119**	**(0.27, 0.56)**
	7.0	3.7	16.9	16.7	53.9	53.4	36.5	34.6	5406	(0.28, 0.58)
	9.0	3.6	19.0	17.1	61.7	56.1	43.1	36.8	6695	(0.28, 0.58)
DHP	5.0	3.5	14.5	14.2	47.3	45.1	27.4	27.1	2381	(0.30, 0.59)

[a]Turn-on voltage at a luminance of 1 cd m^{-2}. [b]Maximum luminance. [c]CIE coordinates at a luminance of 1000 cd m^{-2}.