Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supporting Information

Highly efficient nondoped OLEDs by using aggregation-induced delayed materials based on 10-phenyl-10*H*-phenothiazine 5,5-dioxide derivatives

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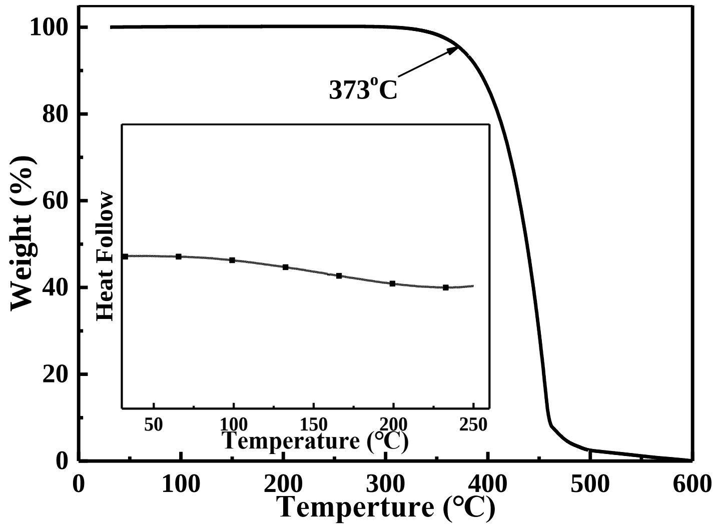

Fig. S1. TGA thermograms of **PXZ2PTO**. Inset: DSC curves of **PXZ2PTO**.

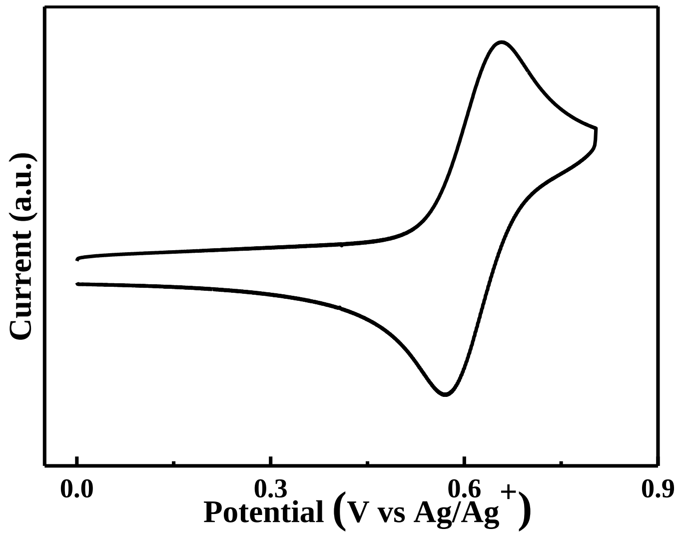

Fig. S2. Cyclic voltammograms of **PXZ2PTO**.

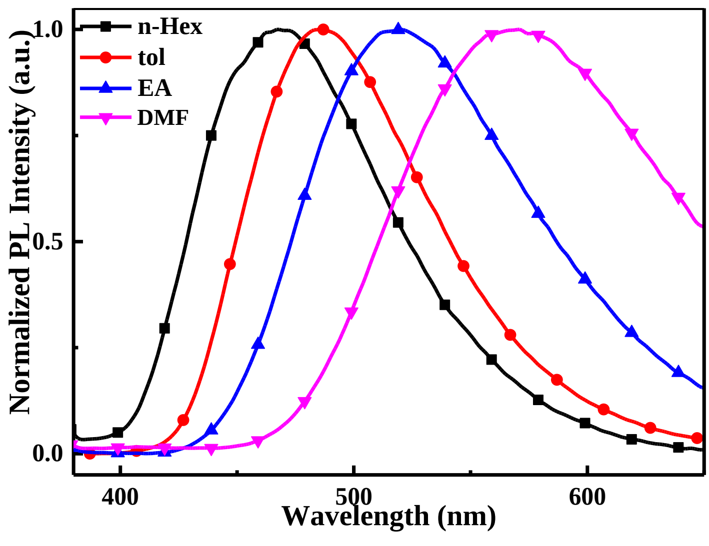

Fig. S3. Solvatochromic of **PXZ2PTO** in different solvents at room temperature.

Table S1. Crystal data and structure refinement for **PXZ2PTO**

CCDC	1842481
Empirical formula	$C_{30}H_{20}N_2O_3S$
Formula weight	488.54
T (K)	100
Crystal system	monoclinic
Space group	P-1
a/Å	7.74804(7)
b/Å	30.9577(2)
c/Å	9.60423(7)
α/°	90
β/°	100.8987(8)
γ/°	90
Volume/Å^3	2262.14(3)
Z	4
ρ_{calc}g/cm^3	1.434
μ/mm^{-1}	1.580
F(000)	1016.0

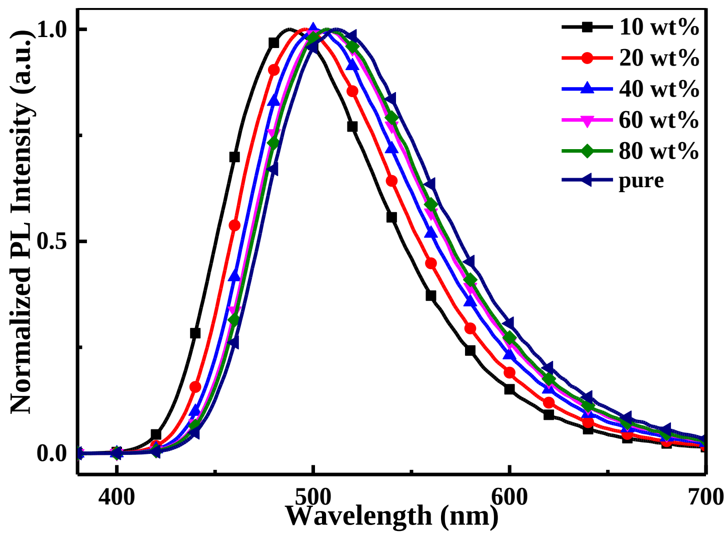

Fig. S4. PL spectra of **PXZ2PTO** at different concentrations in doped films in DPEPO host at room temperature.

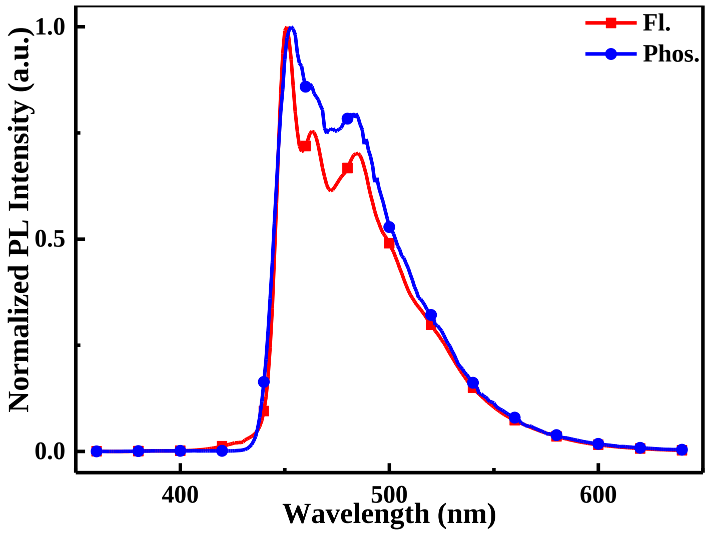

Fig. S5. Low temperature fluorescence and phosphorescence spectra of **PXZ2PTO** at 77 K.

Table S2. PLQY of **PXZ2PTO** with different doped concentration at room temperature.

Doped concentration (wt %)	10	20	40	60	80	pure
PLQY (%)	32.1	51.27	61.05	64.78	68.75	61.54

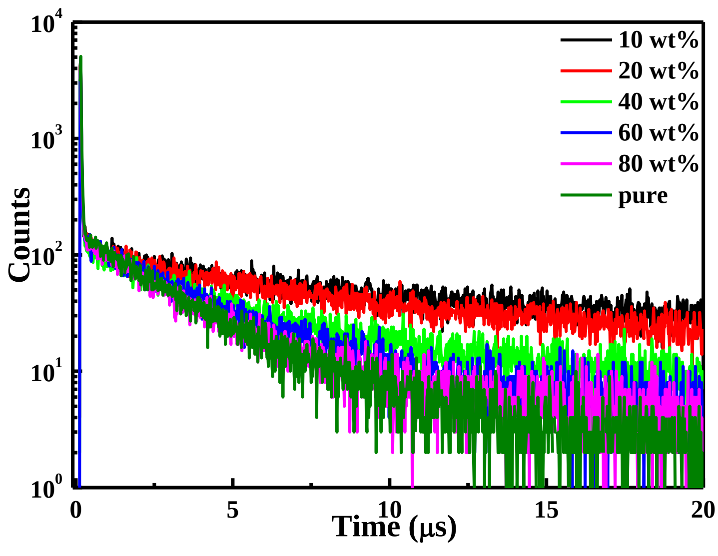

Fig. S6. The transient PL characteristics for **PXZ2PTO** at different concentrations in doped films at room temperature.

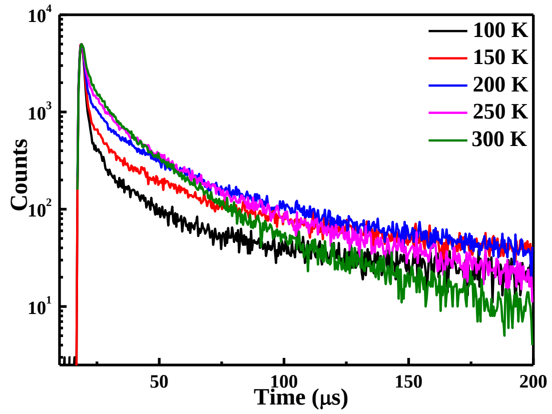

Fig. S7. Temperature-dependence of the transient PL characteristics for **PXZ2PTO** in 10 wt% doped films.

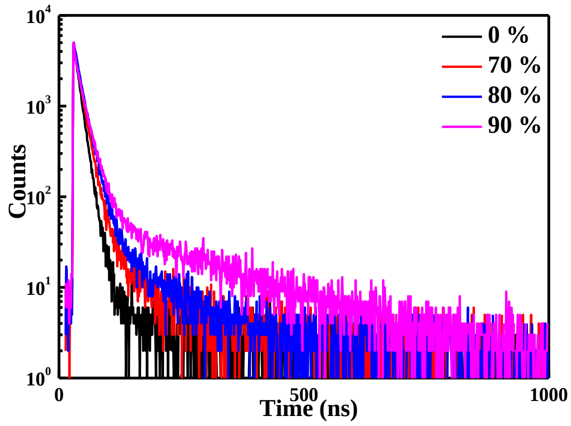

Fig. S8. PL decay curves of **PXZ-2PTO** in THF/water mixtures with different water fractions.

Table S3. Photophysical constants of **PXZ2PTO**.

Compound	τ_p [a] (ns)	τ_d [a] (μs)	Φ_p [b] (%)	Φ_d [b] (%)	Φ [c] (%)	k_{RISC} ($10^5 s^{-1}$)	k_F ($10^7 s^{-1}$)	k_{ISC} ($10^7 s^{-1}$)	k_{TADF} ($10^5 s^{-1}$)
PXZ2PTO	16.1	2.49	20.92	40.62	61.54	1.52	1.30	4.1	2.47

[a] τ_p (the prompt lifetime) and τ_d (the delayed lifetime) were obtained from transient PL decay of neat films at room temperature. [b] Φ_p (the prompt PLQY) and Φ_d (the delayed PLQY) were estimated according to the prompt and delayed proportions in transient decay curves. [c] Absolute PLQY of neat films measured with integrating sphere at room temperature.

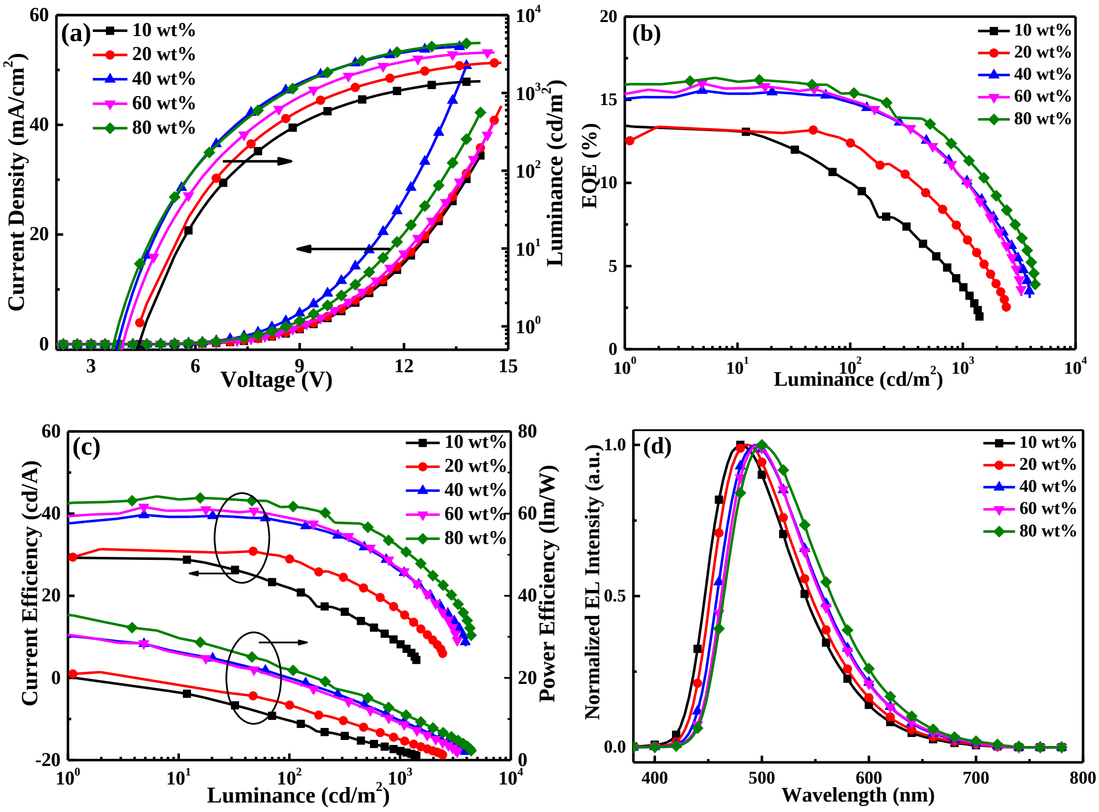

Fig. S9. (a) Current density–voltage–luminance (*J*–*V*–*L*) characteristics. (b) EQE–luminance characteristics. (c) CE–luminance characteristics and PE–luminance characteristics. (d) EL spectra at 100 cd/m^2.

Table S4. EL performance of OLEDs for **PXZ2PTO** with different doped concentration.

concentration	V_{on}^{a} (V)	L_{max}^{b} (cd m^{-2})	Maximum Efficiency			Efficiency at 100 cd m^{-2}			$CIE_{(x,y)}$	λ_{EL}^{e} (nm)
			EQE^{c} (%)	CE^{c} (cd A^{-1})	PE^{c} (lm W^{-1})	EQE^{d} (%)	CE^{d} (cd A^{-1})	PE^{d} (lm W^{-1})		
10 wt%	4.6	1400	13.1	29.2	20.0	10.1	21.9	9.6	(0.20, 0.33)	480
20 wt%	4.4	2450	13.2	30.8	21.4	12.5	29.0	13.3	(0.21, 0.36)	488
40 wt%	3.9	4000	15.5	39.7	29.9	14.8	37.7	20.0	(0.23, 0.42)	496
60 wt%	4.0	3358	16.0	41.6	30.8	15.0	38.9	19.3	(0.24, 0.44)	496
80 wt%	3.8	4444	16.3	43.8	35.2	15.5	41.7	22.1	(0.24, 0.44)	500

^{a} The maximum luminance. ^{b} Operating voltages for onset. ^{c} The maximum efficiencies of EQE (%), CE (cd A^{-1}) and PE (lm W^{-1}). ^{d} The efficiencies of EQE (%), CE (cd A^{-1}) and PE (lm W^{-1}) at 100 cd m^{-2}. ^{e} EL peak wavelength.

Table S5. Recently reported nondoped OLEDs based TADF materials.

Emitter	EL_{max} (nm)	EQE	Ref.
PXZ2PTO	504	16.4 %	**This work**
OPDPO	588	16.6 %	**1**
CP-BP-PXZ	548	18.4 %	**2**
DMAC-TRZ	510	20.0 %	**3**
mSOAD	488	14.0 %	**4**
DBT-BZ-DMAC	516	14.2 %	**5**
SFDBQPXZ	584	10.1 %	**6**
PCZ-CB-TRZ	586	11.0 %	**7**
TPA-CB-TRZ	631	10.1 %	**7**
DBT-BZ-PTZ	563	9.7 %	**8**
DMAC-DPS	480	19.5 %	**9**
DMAC-BP	510	18.9 %	**9**
DCB-BP-PXZ	548	20.1 %	**10**

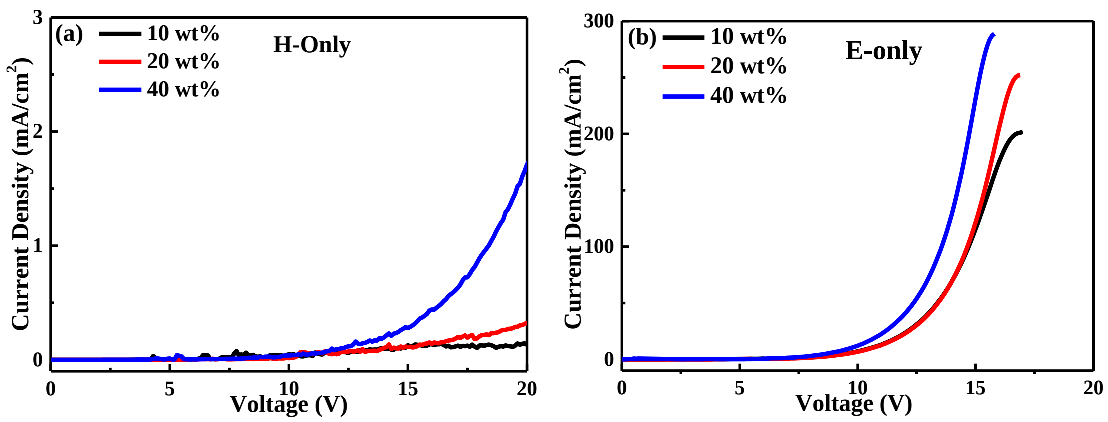

Fig. S10. Current density-voltage characteristics of a) hole-only and b) electron-only devices with different concentrations for **PXZ2PTO**.

References

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