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Graphical abstract

Dinuclear Cyclometalated Iridium(III) Complex Containing Functionalized

Triphenylamine Core: Synthesis, Photophysics and Application in the

Single-Emissive-Layer WOLEDs

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A novel triphenylamine-functionalized dinuclear iridium (III) complex of $C_8TPA(FIrpic)_2$ was synthesized and characterized. White emission with a rising brightness of 1770 cd/m² and current efficiency of 1.31cd/A was obtained in the single-emissive-layer OLEDs with a configuration of ITO/PEDOT:PSS/C₈TPA(FIrpic)₂ (10 wt %):TCTA/ TPBi/LiF/Al using $C_8TPA(FIrpic)_2$ as a single-component emitter.

Dinuclear Cyclometalated Iridium (III) Complex Containing Functionalized Triphenylamine Core: Synthesis, Photophysics and Application in the Single-Emissive-Layer WOLEDs

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ABSTRACT: To obtain highly efficient white-emitting devices, a novel functionaliz -ed dinuclear iridium (III) complex of C₈TPA(FIrpic)₂ was successfully synthesized and characterized. In this phosphor, FIrpic is a blue-emitting phosphorescent chromophore of iridium(III) bis[(4,6-difluorophenyl)pyridinato-N,C2'] picolate and C₈TPA is a blue-emitting fluorescent chromophore of triphenylamine as bridging donor. Its optophysical and electro-phosphorescent properties were primarily investigated. White emission with an increasing current efficiency of 1.31cd/A at 15.3 mA/cm² and brightness of 1770 cd/m² at 656.3 mA/cm² was obtained in its single-emissive-layer OLEDs with a configuration of ITO/PEDOT:PSS/C₈TPA(FIrpic)₂ (10 wt %):TCTA/ TPBi/LiF/Al. The results indicate that an introduction of triphenylamine group into dinuclear iridium (III) complexes as bridged donor can improve the performance of its iridium (III) complexes-doped OLEDs.

Keywords: White-light-emitting; Dinuclear iridium (III) complex; Triphenylamine; WOLEDs; Electroluminescence; Synthesis

1. Introduction

In the past few decades, white organic light-emitting diodes (WOLEDs) have drawn much attention due to their potential applications in full color displays, back lighting of flat-panel displays and solid-state lighting.¹⁻⁵ Usually, WOLEDs were fabricated with different emissive materials in a single or multiple emission layers by co-evaporation or consecutive evaporations.⁶⁻⁷ However, the strategy of mixing different emissive materials usually results in complicated processes, expensive cost and unstable device performance. To overcome the above defects, WOLEDs using single emissive dopant in single emissive layer (SEL) have been emerged because of their simple fabrication.⁸⁻¹¹ As iridium (III) complexes possess unique octahedral structure, relatively short excited-state lifetime, as well as high photoluminescence efficiency, up to now, WOLEDs and white polymer light-emitting devices (WPLEDs) based on various iridium (III) complexes had been made certain progress.¹²⁻¹⁷ However, few reports on the iridium (III) complex in the SEL WOLEDs and WPLEDs were reported.¹⁵⁻¹⁶

Recently, a fluorene-functionalized binuclear iridium (III) complex of (dfppy)₄Ir₂ -(dipic-FL) was reported by our group,¹⁸ and white emission with a maximum luminance of 1040 cd/m² and current efficiency of 1.2 cd/A was obtained in its SEL OLEDs with a configuration of ITO/PEDOT:PSS/ (dfppy)₄Ir₂(dipic-FL) (10 wt%): TCTA/TPBi/LiF/Al. Due to low current efficiency and brightness, as well as luminescent annihilation at high current density, the dinuclear iridium (III) complex-based device do not still meet the practical requirement for application. Therefore, various functionalized binuclear iridium (III) complexes need to be developed by incorporating carrier-transporting functional groups into their ligands to overcome these problems.

With this consideration, in this paper, we reported our effort to obtain a functionalized dinuclear iridium (III) complex by incorporating a triphenylamine (TPA) group into its ligand and get high-efficiency near white-emitting OLEDs. The designed functional dinuclear iridium (III) complex of C₈TPA(FIrpic)₂ with an acceptordonor-acceptor (A-D-A) structure, where FIrpic unit as an acceptor unit can generate a strong blue emission, $^{9-10}$ and C₈TPA i.e. 4-(octyloxymethyl)-*N*,*N*-diphenyl-benzene -amine is used as donor and bridged unit. The synthetic route is shown in Scheme 1 and its opto-physical properties were studied. C₈TPA is designed as a bridge unit in dinuclear iridium (III) complex based on the following considerations. First, incorporating a hole-transporting TPA group instead of fluorene (FL) unit,18 into both chromophores of iridium (III) complexes is available to improve its carriertransporting property.¹⁹⁻²¹ Second, the non-planar TPA unit is favorable for suppress -ing molecular aggregation owing to its bulk space effect.²¹ Third, TPA inserted between two acceptor units as a bridged donor can build an A-D-A framework and result in a long wavelength emission via intramolecular charge transfer (ICT).¹⁸ Mean -while, incorporating an octyl chain can increase solubility of iridium (III) complex. Compared to (dfppy)₄Ir₂(dipic-FL), C₈TPA(FIrpic)₂ should have an obvious advantage to get a higher white light-emitting efficiency in their doped devices. As expected, in the SEL-based OLED using $C_8TPA(FIrpic)_2$ as a single-component emitter at 10

wt% dopant concentration, white emission was observed with a maximum luminance of 1770 cd/m² and an increasing current efficiency of 1.31 cd/A. Accordingly, introducing hole-transporting TPA unit into the dinuclear iridium (III) complex is responsible for the improved device performance. To our knowledge, this is one of the best examples in term of dinuclear iridium (III) complex as single dopant in the high-performance white-emitting SEL-OLEDs.



Scheme 1. Synthetic route of C₈TPA(FIrpic)₂.

2. Synthesis and characterization

As shown in Scheme 1, compounds of 1, 3, 4 and 5 were synthesized according to the literature procedures.^{18,19} Iridium (III) complex of FIrpic-Br was prepared based on the reported article.¹⁸ C_8 TPA(FIrpic)₂ was obtained via Suzuki coupling reaction using a catalyst of Pd(PPh₃)₄ in a moderate yield of 56%. It was confirmed with ¹H

NMR, ¹³C NMR and MALDI-TOF mass spectrometry, as well as elemental analysis (see Electron Supporting Information, ESI).

3. Photophysical properties

The UV-vis absorption spectra of the dinuclear iridium (III) complex and its parent FIrpic were measured in dichloromethane (DCM) solution at room temperature (RT) and are depicted in Fig. 1. Their corresponding data are illustrated in Table 1. Two obvious peaks at 258 and 391 nm are observed in the DCM solution of C₈TPA-(FIrpic)₂. The high-lying absorption is assigned to the spin-allowed ligand-central (LC) π - π * transition of FIrpic chromophore. And the low-lying absorption is attributed to the intramolecular charge transfer (ICT) transition from the TPA unit to the FIrpic chromophore, to some extend metal-ligand charge transfer (MLCT) transition. Compared to the parent FIrpic, C₈TPA(FIrpic)₂ exhibits a significantly enhanced low-lying absorption with higher molar absorption coefficient, implying that the ICT effect play -s an important role in enhancing absorption due to an incorporation of TPA unit.



Fig. 1. Normalized UV-vis absorption spectra of FIrpic and C₈TPA(FIrpic)₂

in dilute $DCM(10^{-5} M)$ at RT.

The PL spectra of C₈TPA(FIrpic)₂ and FIrpic in dilute DCM and in their neat films at RT are displayed in Fig. 2. And their corresponding photophysical data are summarized in Table 1. Two intense emission peaks at 465 nm and 542 nm with a long wavelength shoulder about 600 nm are observed in C₈TPA(FIrpic)₂. Compared the PL spectrum of FIrpic, the high-lying emission peak at 465 nm is assigned to the mixed spin-allowed and spin-forbidden singlet MLCT transitions in FIrpic chromophore. The low-lying emission at 542 nm is attributed to the ICT effect from the TPA to FIrpic chromophore. It is further found that the intensity for this low-lying emission is enhanced with increasing C₈TPA(FIrpic)₂ concentrations from 2×10^{-4} to 2×10^{-3} M



Fig. 2. Normalized PL spectra of FIrpic and $C_8TPA(FIrpic)_2$ in DCM (10⁻⁵ M) and their neat films at RT.

in Fig. S9 (see ESI). It is worth noting that $C_8TPA(FIrpic)_2$ shows an obvious redshift PL spectrum comparing with $(dfppy)_4Ir_2(dipic-FL)$ in dilute DCM, which is ascribed to the increasing conjugated system and ICT effect. However, C_8TPA -(FIrpic)₂ exhibits a remarkably blue-shifted one in its film. The similar phenomenon was observed in $(dfppy)_4Ir_2(dipic-FL)$, which is owing to the motional relaxation of the excited state geometry.¹⁸

4. Thermal property

The thermal stability was characterized by thermogravimetric analysis (TGA) at a scanning rate of 20 °C/min under a nitrogen atmosphere, and the TGA curve of C_8 TPA(FIrpic)₂ and FIrpic are shown in Fig. 3. High decomposition temperatures (T_d) of 362 and 337 °C are observed at a 5% weight loss, respectively. It indicates this dinuclear iridium (III) complex with an incorporating TPA functional group presents an enhancing thermal stability.



Fig. 3. TGA curve of C₈TPA(FIrpic)₂ at a scanning rate of 20 °C/min.

5. Electrochemical property

The oxidation properties of $C_8TPA(FIrpic)_2$ was calculated by cyclic voltammetry (CV) method using ferrocene as an internastandard.^{18, 22} An irreversible oxidation wave (E_{ox}) at 1.06 V is observed versus Fc/Fc⁺ in Fig. 4. According to the E_{ox} and the

onset of UV/vis absorption spectrum in the film, the highest occupied molecular orbital (HOMO) and the lowest unoccupied molecular orbital (LUMO) energy levels (E_{HOMO} and E_{LUMO}) of C₈TPA(FIrpic)₂ can be calculated based on the following empirical formula: $E_g^{opt} = 1240/\lambda_{edge} = E_{ox} - E_{red} = E_{HOMO} - E_{LUMO}$, $E_{HOMO} = -(E_{ox} + 4.41)$.²³ As a result, the E_{HOMO} and E_{LUMO} values are -5.47 eV and -2.77 eV for C₈TPA(FIrpic)₂, respectively. The resulting CV data are summarized in Table 2. Com -pared to (dfppy)₄Ir₂(dipic-FL), C₈TPA(FIrpic)₂ displays a higher HOMO and LUMO energy level.





Table 1. Photophysical, thermal and electrochemical properties of $C_8TPA(FIrpic)_2$ and	FIrpic
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Complex	UV	$^{a}\lambda_{\mathrm{PL}}$	${}^b\lambda_{ m PL}$	$^{c}E_{\rm red}$	$^{d}E_{\rm ox}$	^e E _{HOMO}	^f E _{LUMO}	${}^{g}E_{\rm g}^{\rm opt}$	T _d
X	(nm)	(nm)	(nm)	(V)	(V)	(eV)	(eV)	(eV)	(°C)
FIrpic	258	471	489	/	/	-5.62	-3.20	2.42	337
	385	596	501						
C ₈ TPA(FIrpic)	258	465,542	424,445	-1.64	1.06	-5.47	-2.77	2.70	362
	391	572,623	480,534,577						

^{*a*} PL spectra in DCM ($\lambda_{ex} = 380 \text{ nm}$); ^{*b*} PL spectra in the neat film ($\lambda_{ex} = 380 \text{ nm}$); ^{*c*} $E_{red} = E_{ox}$ - E_g^{opt} ; ^{*d*} Potential values are obtained by cyclic voltammetry; ^{*e*} $E_{HOMO} = -(4.41 + E_{ox}) \text{ eV}$; ^{*f*} $E_{LUMO} = E_{HOMO} - E_g^{opt}$; ^{*g*} $E_g^{opt} = 1240/\lambda_{edge}$.

6. Electroluminescent property

The electroluminescent (EL) spectra of the C₈TPA(FIrpic)₂ doped devices in a dopant concentration of 10 wt% at different driving voltages from 4.8 to 8.8 V are showed in Fig. 5, and their corresponding CIE chromaticity diagrams are inserted it. Obviously, these EL emissions at a maximum peak at 535 nm with three shoulders at 433, 475, and 561 nm are observed in the given different voltages. The EL spectra cover whole visible range from 375 to 750 nm. The emission at 535 nm with the shoulder at 561 nm is assigned to the ICT transition, to some extend the IL π - π * excited states. The emission at 475 nm originates from the intrinsic emissions of the FIrpic groups.^{24, 25} The emission at 433 nm is attributed to the TCTA host. The CIE c-



Fig. 5. EL spectra and CIE chromaticity diagram of the C₈TPA(FIrpic)₂-doped device in a 10 wt% dopant concentration under different applied voltage from 4.8 V to 8.8 V.

hromaticity coordinates vary in a region from (0.39, 0.52) to (0.27, 0.35) under given driving voltages. It is clear these CIE coordinates are located in the near white regions of (0.33, 0.33) at the applied voltages from 6.8 V to 8.8 V, indicating this dinuclear



iridium (III) complex emits near white EL at the situation.. It indicates that novel dinuclear iridium (III) complex is a promising white-emitting phosphor.

Fig. 6. The *J-B-V* (a) and *J-LE* (b) curves of the $C_8TPA(FIrpic)_2$ -doped device at a 10 wt % dopant concentration.

Fig. 6a shows the luminance-voltage-current density (*L-V-J*) curves of the device at 10 wt% dopant concentration. For comparison, the device performances are summa-

rized in Table 2. A maximum brightness of 1770 cd/m^2 at 656.3 mA/cm² was obtain -ed in the device, which was 1.7 times value from the (dfppy)₄Ir₂(dipic-FL)-doped device with the same device structure. Even at the 100 mA/cm², the device remained brightness as high as 728.8 cd/m^2 .

On the other hand, the turn-on voltage of the device is observed to be 4.7 V. As shown in Fig. 6b, the device presented a maximum current efficiency of 1.31 cd/A at 15.3 mA/cm^2 . Distinctly, compared to the $(dfppy)_4Ir_2(dipic-FL)$, $C_8TPA(FIrpic)_2$ has a higher luminance and current efficiency owing to introduction of the non-planar TPA unit, which is available to improve carrier-transporting properties and suppress aggregations. Hence, this work provides a good strategy to design novel dinuclear cyclometalated iridium (III) complex with the A-D-A structure to achieve higher-efficiency white-light-emission.

Table 2. Performance of C₈TPA(FIrpic)₂-doped device at a 10 wt % dopant concentration

Dopant	Turn-on	Maximum <i>LE^b</i>		Maximum LE^b $J = 100 \text{ mA/cm}^2$		Maximum <i>L^b</i>	
Ratio ^a	Voltage	J	LE	L	LE	J	L
(wt%)	(V)	(mA/cm ²)	(cd/A)	(cd/m^2)	(cd/A)	(mA/cm ²)	(cd/m^2)
10	4.7	15.3	1.31	728.8	0.72	656.3	1770

^{*a*} The doping 10 wt % of $C_8TPA(FIrpic)_2$ in the device with a configuration of ITO/PEDOT: PSS/C₈TPA(FIrpic)₂ (10 wt %):TCTA/ TPBi/LiF/Al; ^{*b*} The luminance (*L*) and luminous efficiency (*LE*) were measured with a silicon photodiode and calibrated using a PR-705 SpectraScan Spectrophotometer (Photo Research).

7. Conclusions

The synthesis, and photophysical, electrochemical, electroluminescent properties of $C_8TPA(FIrpic)_2$ were investigated. The results have proved that introducing an A-D-A framework into dinuclear iridium (III) complex is available to get a widespectrum emission. Furthermore, near white emission was observed in the C_8TPA - $(FIrpic)_2$ -doped SEL OLEDs with various applied voltages from 4.8 to 8.8 V. An creasing luminance of 1770 cd/m² and current efficiency of 1.31 cd/A as well as a low turn on voltage of 4.7 V were obtained in the C₈TPA(FIrpic)₂-doped devices. Our results demonstrate that grafting suitable bridged donor unit into dinuclear iridium (III) complex is efficient way to achieve high-efficiency white emission for its dinuclear iridium (III) complex as single emissive dopant in the SEL OLEDs

8. Experiments

8.1. Methods

All ¹H and ¹³C NMR spectra were obtained using a Bruker Dex-400 NMR instrument using CDCl₃ as a solvent. Elemental analysis was performed on a Harrios elemental analysis instrument. Mass spectra (MS) were recorded on a Bruker Autoflex MALDI-TOF instrument using dithranol as a matrix. The UV/vis absorption and photoluminescent spectra were measured with a Varian Cray 50 and Perkin– Elmer LS50B luminescence spectrometer, respectively. Cyclic voltammetry was carried out on a CHI 600A electrochemical work station in a 0.1 mol/L tetrabutylammonium hexafluorophosphate (Bu₄NPF₆) acetonitrile solution at a 100 mV/s scan rate under nitrogen protection. The platinum plate, platinum wire and Ag/AgCl electrode were used as working electrode, counter electrode, reference electrode, respectively. The thermogravimetric analysis (TGA) was performed with a NETZSCH STA449 from 25 °C to 600 °C at a 20 °C/min heating rate under a nitrogen atmosphere.

8.2. Device fabrication and characterization

C₈TPA(FIrpic)₂ was dissolved in chlorobenzene with a concentration of 4 mg/mL at room temperature overnight. The hole-injection layer of poly(ethylenedioxy-thio phene)/poly(styrene-sulfonate) (PEDOT: PSS) was spin-coated on indium tin oxide (ITO) at 3000 rpm in N₂ atmosphere. Then the emitter layer was prepared by spincoating onto the PEDOT: PSS layer at 1500 rpm in N₂ atmosphere. Finally, 30 nm electronic-injection layer of TPBi, 1 nm cathode of LiF and 150 nm capping layer of aluminum were successively deposited on the top of emitting layer through a shadow mask in vacuum. The fabricated SEL devices have a configuration of ITO/PEDOT: PSS (40 nm)/C₈TPA(FIrpic)₂:TCTA (10 wt%) (50 nm)/TPBi (30 nm)/LiF (1 nm)/Al (150 nm). The emitting layer consisted of the host of TCTA and dopant of C₈TPA-(FIrpic)₂. The dopant concentration was 10 wt%. EL spectra were recorded with an Insta-Spec IV CCD system (Oriel). Luminance was measured with a Si photodiode and calibrated by using a PR-705 spectrascan spectrophotometer (Photo Research).

8.3. General information

All solvents were carefully dried and distilled prior to use. Commercially available reagents were used without further purification unless otherwise stated. All reactions were performed under nitrogen atmosphere and were monitored by thin-layer chromatography. FIrpic-Br and compounds of 3, 4, 5 were synthesized according to the reported procedures.¹⁸⁻¹⁹

8.4. (4-(bis(4-bromophenyl)amino)phenyl)methanol (6)

A mixture of compound 5 (4.12 g, 9.58 mmol) and NaBH₄ (0.80 g, 21.00 mL) in THF (30 mL) and ethanol (30 mL) was stirred at room temperature (RT) under the

protection of nitrogen atmosphere overnight. Then 20 mL water was added to stop reaction, the mixing solution was poured into the water (100 mL) and extracted with DCM (3 × 30 mL). The residue was purified by silica gel column chromatography using PE/EA (V/V = 1/2) as eluent to gain colorless viscous liquid. (3.30 g, 97.3%). ¹H NMR (CDCl₃, 400 MHz, TMS), δ (ppm): 7.34 (d, J = 8.5 Hz, 4H), 7.31-7.25 (m, 2H), 7.04 (d, J = 8.2 Hz, 2H), 6.93 (d, J = 8.6 Hz, 4H), 4.65 (s, 2H).

8.5. 4-bromo-N-(4-bromophenyl)-N-(4-(octyloxymethyl)phenyl)benzenamine (7)

A mixture of compound **6** (2.43 g, 5.65 mmol), $C_8H_{17}Br$ (5.45 g, 28.30 mmol) and NaH (1.20 g, 50.00 mmol) in THF (30 mL) was stirred at RT under nitrogen atmosphere for 48 h. The solution was poured into water (80 mL) and extracted with DCM (3 × 25 mL). The combined organic layer was washed with brine and dried over MgSO₄. After removal of the solvent by rotary evaporation, the residue was purified by silica gel column chromatography with PE/DCM (*V/V* = 1:1) as the eluent to provide compound **7** as colorless viscous liquid (1.95mg, yield 74.1%). ¹H NMR (CDCl₃, 400 MHz, TMS), δ (ppm): 7.33 (d, *J* = 8.6 Hz, 4H), 7.28-7.21 (m, 2H), 7.02 (d, *J* = 8.2 Hz, 2H), 6.92 (d, *J* = 8.5 Hz, 4H), 4.44 (s, 2H), 3.49 (t, *J* = 6.6 Hz, 2H), 1.64-1.62 (m, 2H), 1.36-1.23 (m, 10H), 0.88 (t, *J* = 6.7 Hz, 3H).

8.6.*N*-(4-(octyloxymethyl)phenyl)-4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl) -*N*-(4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl)benzenamine (8)

A mixture of compound **7** (0.28 g, 0.52 mmol), bis(pinacolato)diboron (0.40 g, 1.30 mmol), potassium acetate (0.80 g, 7.62 mmol) and PdCl₂(dppf)CH₂Cl₂ (80 mg, 0.09 mmol) in 1,4-dioxane (25 mL) was heated at 75 °C under nitrogen atmosphere over-

night. After cooled to RT, the mixture was poured into water (100 mL) and extracted with DCM (3 × 30 mL). The combined organic layer was dried over MgSO₄ and then concentrated under reduced pressure. The residue was purified by silica gel column chromatography using DCM/PE (V/V = 2/1) as eluent to gain red viscous solid. (93 mg , 79.2%) 1 H NMR (CDCl₃, 400 MHz, TMS), δ (ppm): 7.66 (d, J = 7.6 Hz, 4H), 7.24 (m, 2H), 7.06 (m, 6H), 4.45 (s, 2H), 3.52-3.46 (m, 2H), 1.63-1.55 (m, 2H), 1.33 (s, 24H), 1.30-1.22 (m, 10H), 0.90-0.86 (m, 3H).

8.7. C₈TPA(FIrpic)₂

To a mixture of compound **8** (50 mg, 0.08 mmol), FIrpic-Br (135 mg, 0.18 mmol), and Pd(PPh₃)₄ (11 mg) was added a degassed mixture of THF (10 mL), anhydrous ethanol (1 mL) and 2 M potassium carbonate aqueous solution (1 mL). The mixture was refluxed for 24 h under the protection of nitrogen. After cooled to RT, the mixture was poured into 100 mL distilled water. It was extracted with DCM (3 × 30 mL) and the combined organic layer was dried over anhydrous magnesium sulfate. The solvent was removed off by rotary evaporation and the residue was passed through a flash silica gel column with THF/DCM (V/V = 1/5) as the eluent to give pale yellow solid (77 mg, yield 56%). ¹H NMR (CDCl₃, 400 MHz, TMS), δ (ppm): 8.79 (d, J = 5.0 Hz, 2H), 8.32 (t, J = 9.3 Hz, 4H), 8.25 (d, J = 8.1 Hz, 2H), 8.08 (d, J =7.9 Hz, 2H), 7.93 (s, 2H), 7.79 (t, J = 7.0 Hz, 4H), 7.50 (d, J = 5.1 Hz, 2H), 7.31 (d, J= 7.7 Hz, 2H), 7.20-7.24 (m, 6H), 7.15-7.04 (m, 6H), 6.98 (t, J = 6.1 Hz, 2H), 6.53-6.31 (m, 4H), 5.86 (d, J = 7.6 Hz, 2H), 5.57 (d, J = 7.3 Hz, 2H), 4.47 (s, 2H), 3.53 (t, J = 6.3 Hz, 2H), 1.65 (m, 2H), 1.47-1.10 (m, 10H), 0.87 (t, J = 6.3 Hz, 3H).

¹³C NMR (CDCl₃, 100 MHz, TMS), δ (ppm): 172.84, 166.09, 164.55, 162.67, 160.22, 160.09, 152.61, 151.81, 149.85, 149.07, 148.72, 148.15, 145.59, 140.63, 138.44, 136.06, 135.50, 129.44, 128.97, 128.76, 128.23, 127.94, 126.16, 124.18, 123.66, 123.46, 123.04, 122.85, 122.77, 122.45, 114.94, 114.69, 114.52, 98.36, 98.16, 97.91, 97.64, 72.55, 71.32, 32.01, 29.94, 29.63, 29.44, 26.40, 22.83, 14.25. MALDI-MS (m/z): 1773.41 for [M]⁺. MALDI-TOF MS (m/z) for C₈₃H₆₁F₈Ir₂N₇O₅, Calcd: 1773.39, Found, 1773.40, 1796.38 [M⁺+Na]. Anal. Calcd for C₈₃H₆₁F₈Ir₂N₇O₅: C 56.23, H 3.47, N 5.53% (C 56.17, H 3.43, N 5.36%).

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Supporting Information

Supporting information associated with this article can be found in the online version, at xxxxx.

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Research Highlights

- A triphenylamine-functionalized dinuclear iridium complex of C₈TPA(FIrpic)₂ was synthesized.
- > The optophysical and electroluminescent properties of $C_8TPA(FIrpic)_2$ were investigated.
- ▶ White emission was observed in its doped single-emissive-layer OLEDs.
- A rising current efficiency of 1.31 cd/A and luminance of 1770 cd/m² were obtained in the device.