

Supporting Information

Exciplex polymer with strong AIE property for constructing fully-solution-processed organic light-emitting diodes with 100-folds efficiency improvement comparing to physical blend exciplex

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#Xinxin Ban and Suyu Qiu contributed equally to this work.

General information

The UV-Vis absorption spectra of the compounds were measured by SHIMADZU UV-2450. The photoluminescence emission spectra were recorded on HORIBA FLUOROMAX-4. Differential scanning calorimetry (DSC) curves were recorded with a Netzsch simultaneous thermal analyzer (STA) system (STA 409PC) and DSC 2910 modulated calorimeter under a dry nitrogen gas flow at a heating rate of 10 °C min⁻¹. All chemicals and reagents were used as received from commercial sources without further purification. Solvents for chemical synthesis were purified according to the standard procedures. The manipulations involving air-sensitive reagents were performed under a dry nitrogen atmosphere. ¹H and ¹³C NMR spectra were recorded on a BRUKER AMX instrument. Elemental analysis was determined by an Elementar Vario EL CHN elemental analyzer. Molecular masses were measured by a BRUKER DALTONICS Matrix-assisted laser desorption-ionization time-of-flight mass spectrometry (MALDI-TOF-MS). As for the investigation of oxygen quenching effect, the integrating sphere was purged with flowing nitrogen during the whole measuring process. Cyclic voltammetry (CV) was performed on a CHI750C voltammetric analyzer in a typical three-electrode cell with a platinum plate working electrode, a platinum wire counter electrode and a silver wire reference electrode. The optimized structure was calculated by Gaussian 09 at the B3LYP functional with 6-31G basis sets.

Device Fabrication and Measurements. Indium tin oxide (ITO)-coated glass substrates were precleaned carefully using deionized water and ultrasonicated sequentially in ethanol and acetone successively. After cleaned in a UV-ozone oven for 20 min, the PEDOT:PSS aqueous solution was spin-coated onto the ITO substrate with 3000 rpm for 60 s to get a 30 nm hole transporting layer. The substrates were then dried at 200 °C for 10 min and taken into a nitrogen glove box, where the concentration of 10 mg/mL P-TRZ-TPA were spin-coated onto PEDOT:PSS layer with 2000 rpm for 30 s and annealed at 100 °C for 30 min. As for in-situ polymerization, V-TPA:V-TRZ needs another thermal annealing at 200 °C for 20 min. After cooling, a 50 nm PhPO as the electron transporting layer was spin-coated onto emission layer with 2000 rpm for 30 s from isopropanol and annealed at 100 °C for 30 min. the substrate was transfer to High Vacuum Turbo Evaporator with the pressure of below 5×10^{-4} , where 1 nm Cs_2CO_3 and 100 nm Al was deposited as the cathode. The combination of an Ocean Optics spectrograph, a Konica Minolta LS-110 luminance meter and a Keithley 2400 Source meter were used to get the EL spectra, device luminance, and current density-voltage characteristics. All the device was tested in the condition of the atmosphere with no protective encapsulation.

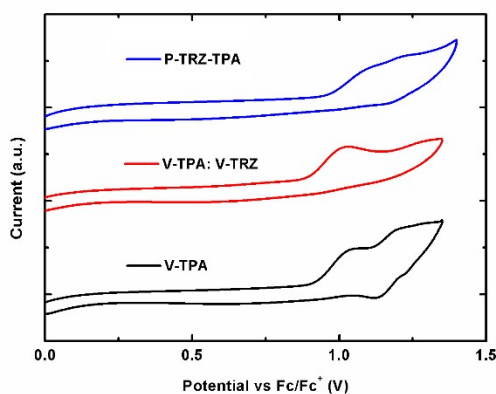


Figure S1. Cyclic voltammograms of P-TRZ-TPA, V-TPA:V-TRZ and V-TPA at the first scan circle.

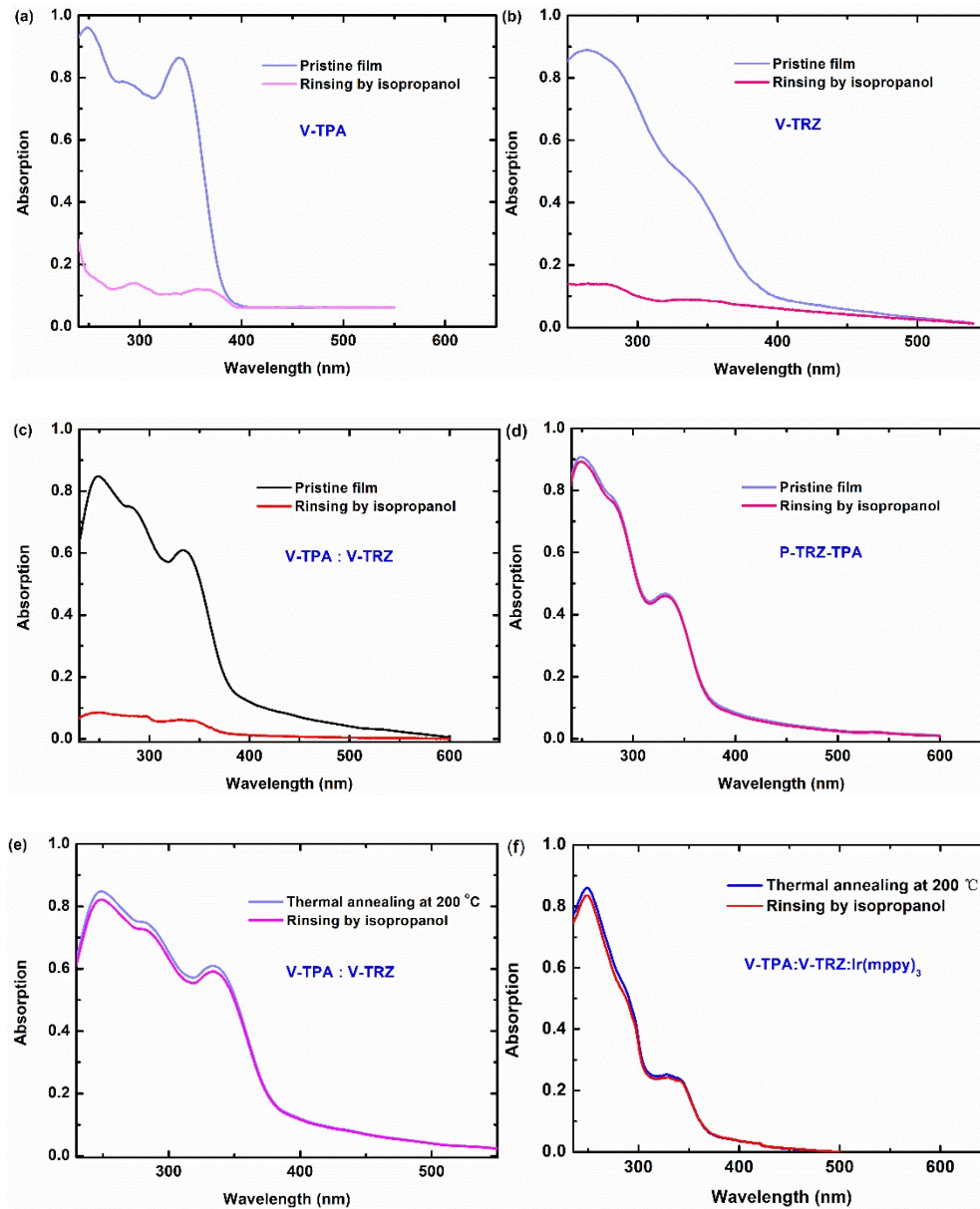


Figure S2. UV absorption spectra of (a) V-TPA, (b) V-TRZ, (c) V-TPA:V-TRZ (d) P-TRZ-TPA (e) V-TPA:V-TRZ thermal annealing, (f) V-TPA:V-TRZ:Ir(mppy)₃ thermal annealing films before and after rinsing with isopropanol on quartz.

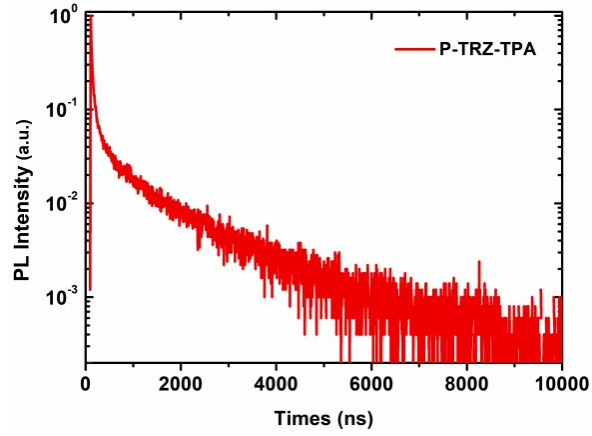


Figure S3. Transient photoluminescence decay curves of P-TRZ-TPA.

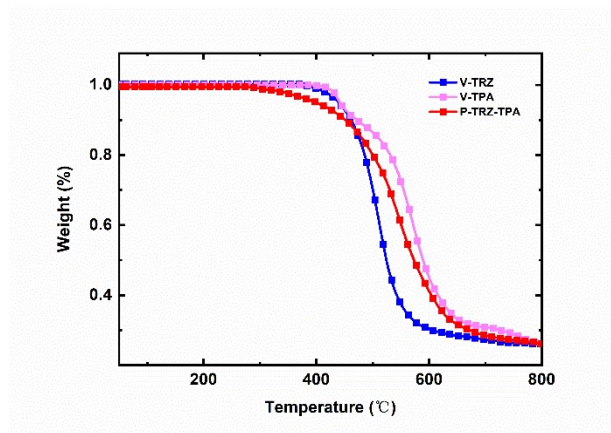


Figure S4. TGA curves of V-TRZ, V-TPA and P-TRZ-TPA recorded at a heating rate of $10\text{ }^{\circ}\text{C min}^{-1}$.

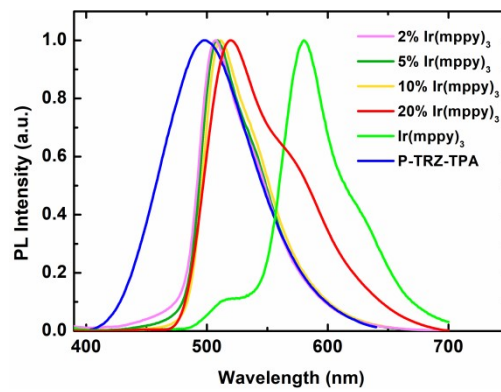


Figure S5. The PL spectra of P-TRZ-TPA: Ir(mppy)₃ doped films with various doping.

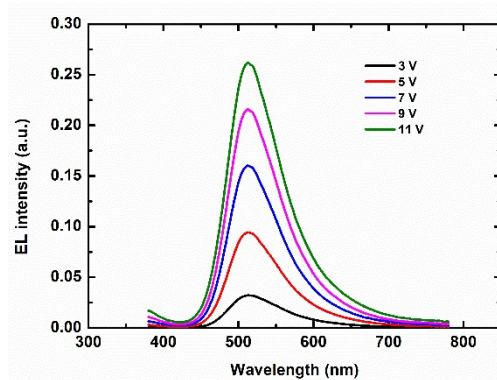


Figure S6. EL spectra of P-TRZ-TPA as luminescent layer

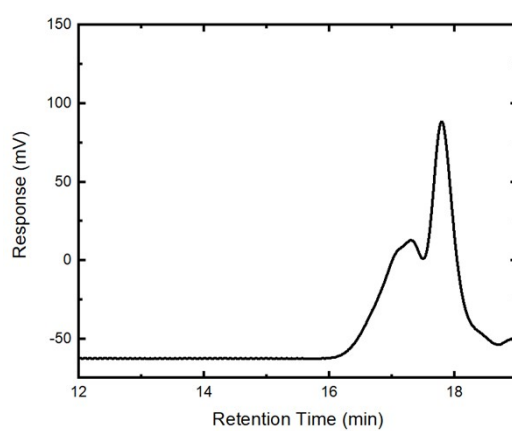


Figure S7. GPC curve of P-TRZ-TPA

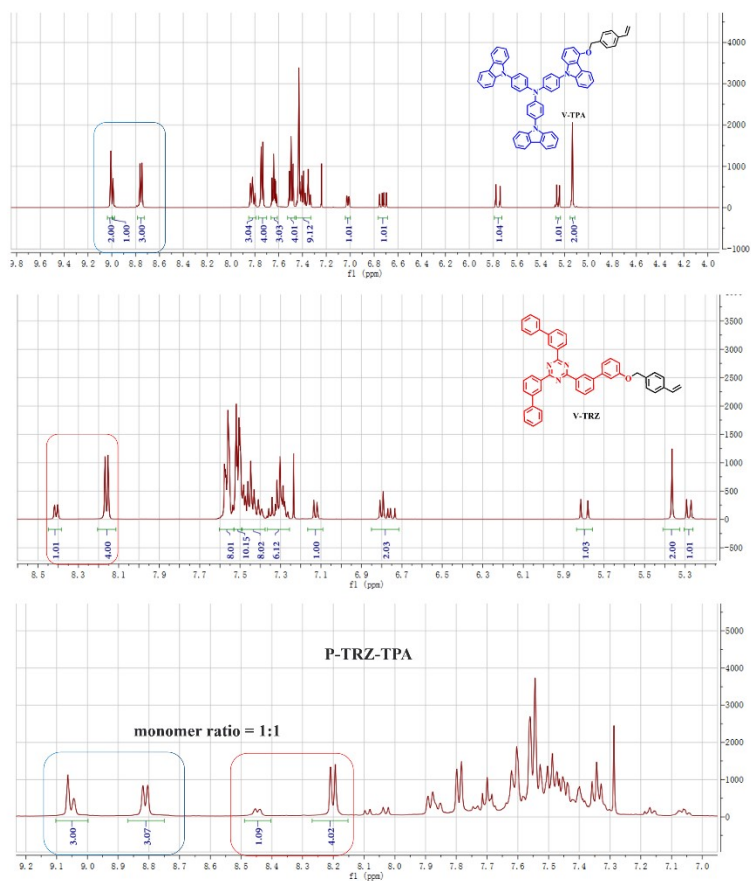


Figure S8. $^1\text{H NMR}$ spectrum of V-TPA, V-TRZ and P-TRZ-TPA.

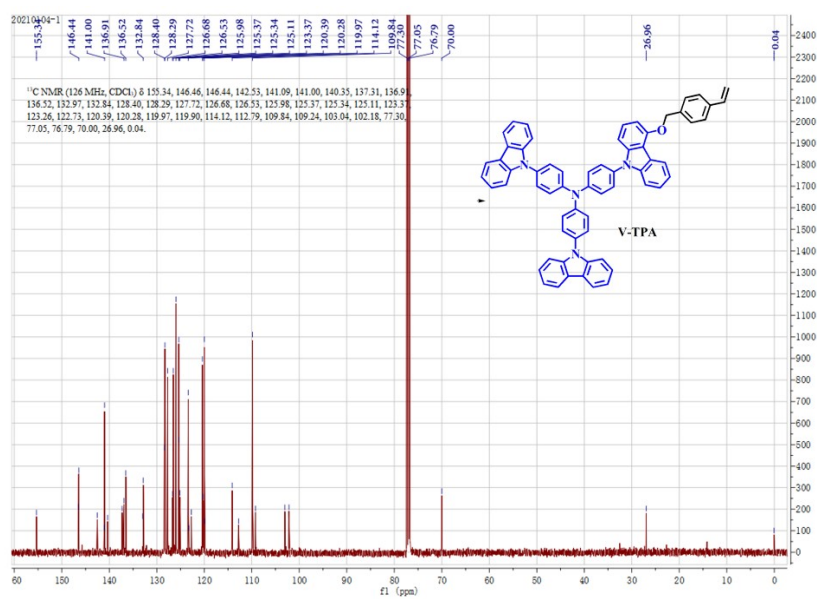


Figure S9. $^{13}\text{C NMR}$ spectrum of V-TPA.

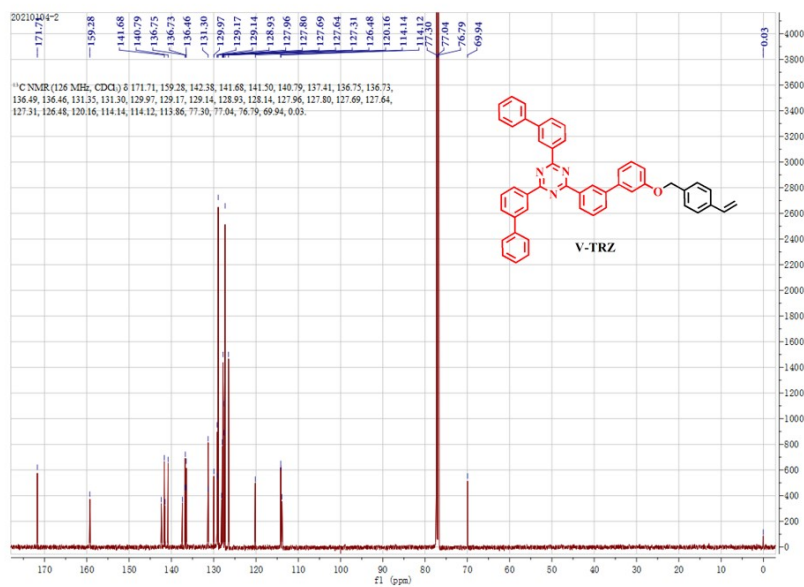


Figure S10. ¹³C NMR spectrum of V-TRZ.