Supporting Information

Highly Efficient and Stable Blue Organic Light-Emitting Diodes through Selective Quenching of Long-Living Triplet Exciton of Thermally Activated Delayed Fluorescence Emitter

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Supplementary figures

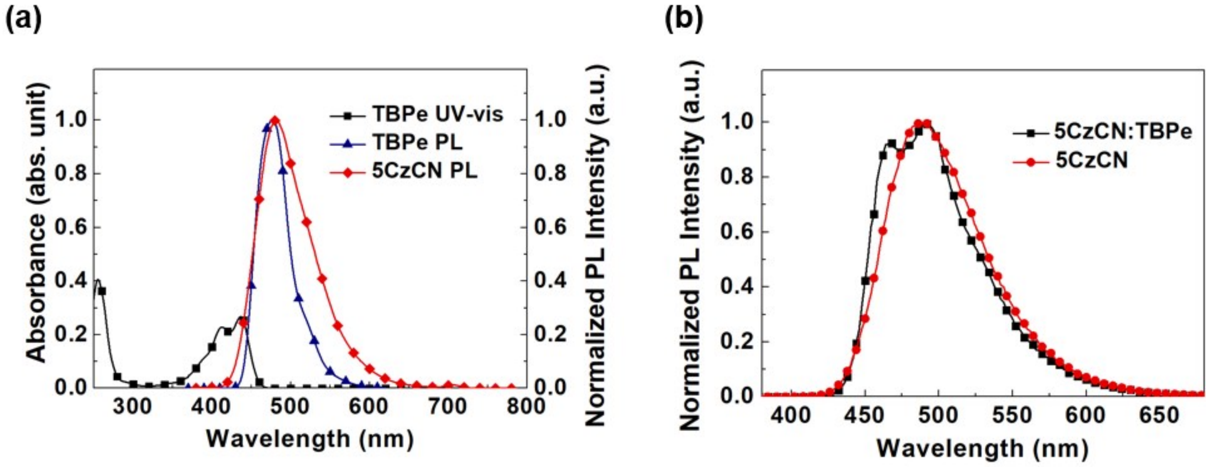

Figure S1. (a) UV-vis absorption spectra and normalized PL spectra of TBPe and 5CzCN (1.0×10^{-5} M THF solution). (b) Normalized PL spectra of 5CzCN film, 5CzCN:TBPe co-doped film (in DPEPO film doped with 20 wt% or 20 wt%:1 wt%).

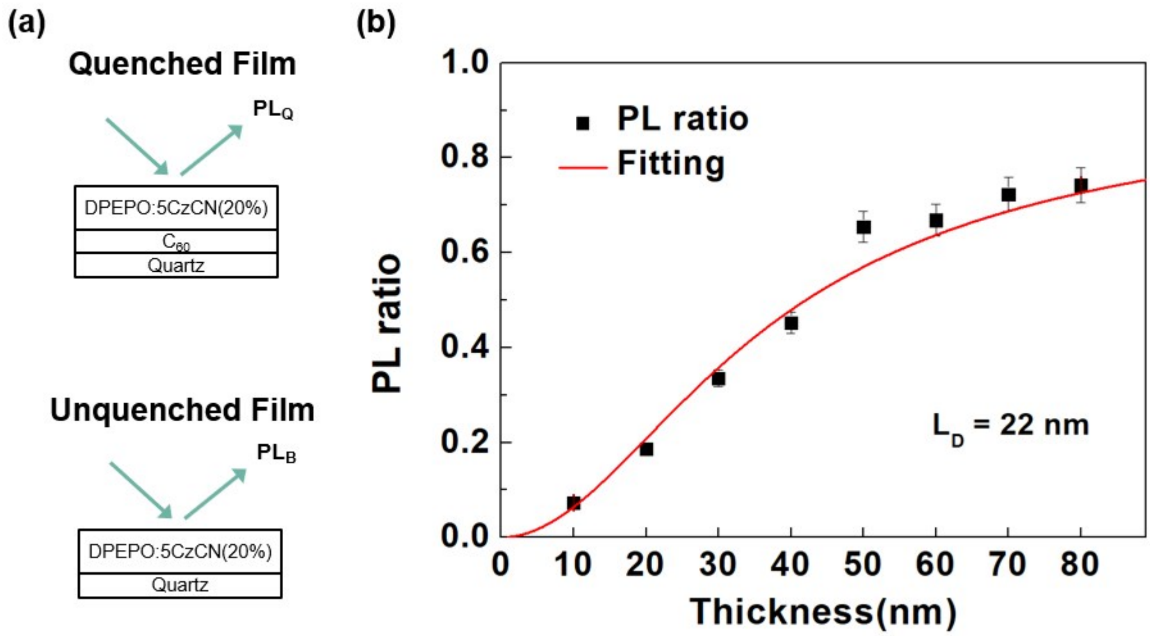

Figure S2. (a) Experimental film structure of the thickness dependent PL ratio measurement. (b) PL ratios, corresponding fitting, and the fitted value for L_D of 5CzCN emitter doped with 20 wt% in DPEPO matrix.

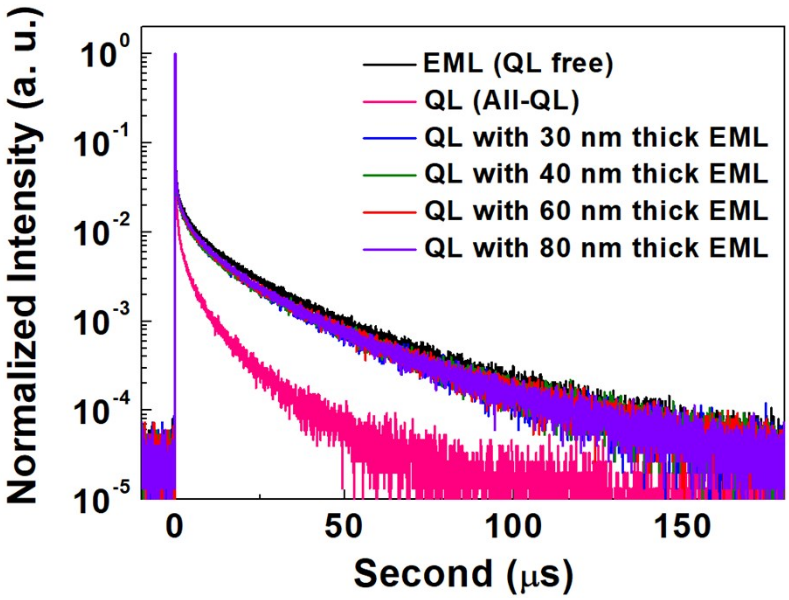

Figure S3. The transient PL decay of all films.

Supplementary equations for exciton diffusion length (Figure S2)

The exciton diffusion equation could be expressed as[1-4]

$$L_D{}^2 \cdot \frac{\partial^2 n(x)}{\partial x^2} - n(x) + \tau \cdot G = 0 \qquad (1)$$

where L_D is the exciton diffusion length, x is the distance from the surface in the layer, n(x) is the exciton density, τ is the exciton lifetime and G is exciton generation rate.

In addition, assuming that a layer of thickness d has a quenching interface (C_{60}), the boundary conditions are

$$n(x = 0) = 0, \qquad (2\text{-}1)$$

$$\left.\frac{\partial n}{\partial x}\right|_{x = d} = 0, \qquad (2\text{-}2)$$

$$G(x) = G_0. \qquad (2\text{-}3)$$

Solving equation 1 with the boundary conditions of equation 2,

$$\frac{PL_Q}{PL_B}(PL\,ratio) = 1 - \frac{L_D}{d} \cdot \frac{1 - exp(-2d/L_D)}{1 + exp(-2d/L_D)}. \qquad (3)$$

Reference

[1] L. A. A. Pettersson, L. S. Roman, O. Inganäs, *J. Appl. Phys.* **1999**, 86, 487.

[2] P. Peumans, A. Yakimov, S. R. Forrest, *J. Appl. Phys.* **2003**, 93, 3693.

[3] W. A. Luhman, R. J. Holmes, *Adv. Funct. Mater.* **2011**, 21, 764.

[4] S. M. Menke, R. J. Holmes, *J. Phys. Chem. C* **2016**, 120, 8502.