Electronic Supplementary Information

After optimizing the device configurations, we concluded that the device incorporated with DPAInT2 as the hole injection and DPAInF as the hole transportation layers give the best results. The optimized device structure is: [ITO/ DPAInT2 (20 nm)/ DPAInF (20 nm)/TCTA (10 nm)/DFBTA (30 nm)/ETL (30 nm)/LiF (0.5 nm)/Al (150 nm)]. We used DFBTA, Alq3, and TAZ as the electron transporting layer (ETL), respectively. By comparison of the EL spectra of devices incorporated with different ETLs (DFBTA, Alq3, and TAZ) to the PL spectrum of Alq3 (Fig. S-1), in addition, the PL of DFBTA thin film nicely fits to the device EL spectrum (Fig. 2 in the main text), thus the EL from Alq3 can be clearly excluded.

However, the device with 3-(biphenyl-4-yl)-4-phenyl-5-(4-tert-butylphenyl)-1,2,4- triazole (TAZ), instead of Alq3, as the ETL in the optimized device configuration: [ITO/ DPAInT2 (20 nm)/ DPAInF (20 nm)/TCTA (10 nm)/DFBTA (30 nm)/ETL (30 nm)/LiF (0.5 nm)/Al (150 nm)] gave relatively
lower maximum $\eta_{\text{ext}}$ (3.13%) as compared to that of the parent device. Fig. S-2 depicts the comparisons of the device characteristics of these two devices.

Fig. S-2. Performances of devices using TAZ and Alq3 as the ETL in device of ITO/\textbf{DPAInT2} (20 nm)/\textbf{DPAInF} (20 nm)/TCTA (10 nm)/\textbf{DFBTA} (30 nm)/ETL (30 nm)/LiF (0.5 nm)/Al (150 nm): (a) current density–voltage–brightness ($I$–$V$–$L$) characteristics; (b) external quantum efficiency and luminance efficiency plotted with respect to current density.

Fig. S-3. Ultraviolet photoelectron spectroscopy (UPS) measurements of \textbf{DFBTA}, \textbf{DPAInT2} and \textbf{DPAInF}.

Fig. S-4. The energy band diagrams of \textbf{DFBTA}, \textbf{DPAInT2} and \textbf{DPAInF} can be obtained from the UPS data as illustrated.