Efficient Red Hyperfluorescent OLEDs Based on Solution-Processable Cibalackrot

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Hyperfluorescent organic light-emitting diodes (HF-OLEDs) have allowed remarkable device performances to be achieved using fluorescent emitters. Superior device performance has been realised using thermally evaporated emissive layers.1 However, for future large-scale commercialisation it is essential to obtain similar device performances using low-cost solution-processing techniques. In the case of HF-OLEDs, there remains a delicate interplay of molecular interactions and spacing between the three active components: host, thermally activated delayed fluorescent (TADF) assistant host, and fluorescent emitter.2 Dispersion of the materials is a dominating factor towards the device efficiencies, making efficient solution-processed devices all the more difficult to achieve. In this study, we demonstrated solution-processed HF-OLEDs with external quantum efficiencies (EQEs) of 15.3% using Cibalackrot as the fluorescent emitter and 4CzIPN-tBu as the TADF assistant host in CBP. By studying the use of either 4CzIPN or 4CzIPN-tBu as the TADF assistant host in both ternary, and host-free binary blends, we found that the addition of the tert-butyl groups to the TADF material made a significant contribution to device performance. These sterically hindered groups effectively reduced losses caused by triplet diffusion between the TADF assistant host and the fluorescent emitter by spatially separating adjacent molecules and making concurrent frontier molecular orbital (FMO) less likely.

References