Highly efficient and bright blue organic light-emitting devices based on solvent engineered, solution-processed thermally activated delayed fluorescent emission layer

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Organic light-emitting diodes (OLEDs) have been successfully developed and have now entered the commercial marketplace, such as smart phones, flat panel displays and solid-light emitting applications. OLED displays give high contrast, large viewing angle and low energy consumption, together with high brightness and vivid colors. Thermally activated delayed fluorescent (TADF) materials are ideal candidates for high efficient OLEDs. Inefficient blue emission is one of the key bottlenecks limiting the development of solution processable displays and white light sources, which is essentially governed by the film quality of the solution-processed emission layer (EML).

In this work, we use an efficient blue TADF emitter, bis [4-(9,9-dimethyl-9,10-dihydroacridine) phenyl]solfone (DMAC-DPS), as EML and propose a solvent engineering strategy to achieve high efficiency and brightness. The strategy employs synergetic solvents to improve the film morphology of the solution-processed DMAC-DPS EML. The improved film quality enhances the carrier injectionwhile reduces the surface trap charges, as revealed by the hole-/ electron-only device performance and the transient electroluminescence measurements.

As expected, the blue OLEDs employing synergetic solvent strategy presents an increment of 22.8% in efficiency and 19.4% in luminescence, which reaches the highest efficiency of 15.76 cd/A and an efficiency of 9.63 cd/A at a luminance of 1000 cd/m2. These values are generally higher than the reported values from the blue OLEDs based on solution-processed DMAC-DPS EML.

References

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