THERMALLY CROSS-LINKABLE HOLE-TRANSPORTING MATERIAL FOR EFFICIENT SOLUTION-PROCESSED ORGANIC LIGHT EMITTING DIODES

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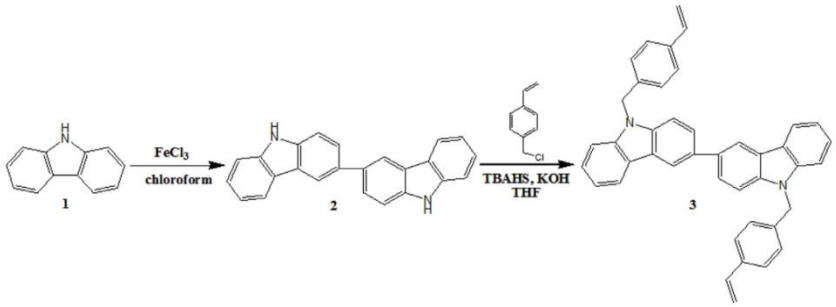
Organic light-emitting diodes (OLEDs) have drawn enormous attention in academia and industries because of their amazing applications in both next generation full-color flat-panel display and solid-state lighting, owing to their potential for fabrication over a large area, light weight, rapid response and low power consumption dvices[1, 2]. Thermal cross-linking units are usually used for cross-linkable hole transportin layer (HTL) materials because of the relatively simple deposition procedure. Remarkably, they can be proficiently applied for any type of cross-linkable material via annealing at high temperatures (> 100 °C), with formation of cross-linked electro-active layers [3, 4].

In this study, we have designed and synthesized a thermally crosslinkable HTL material **3** for solution-process based multilayer monochromatic and white OLEDs. The synthesis of the derivative **3** was carried out by the synthetic route shown in Scheme 1.



Scheme 1. Schematic illustration of synthesis of the cross-linkable hole transporting material **3**

The cross-linkable compound **3** features a larger bandgap and a higher triplet energy level. The material can be thermally cross-linked to form a solvent-resistant layer upon isothermal heating at 250℃ for 30 min. The crosslinked layer possesses not only hole-collecting ability (HOMO = −5.25 eV), but also electron-confining capability (LUMO = −1.87 eV), which significantly improve the number of exciton into the desired recombination zone, hence noticeable efficiency enhancement for red, green, and blue OLEDs, especially at higher voltage. An OLED device consisting of low band gap red emitter displayed 58 and 45% increments in correspondingly power efficiency and current efficiency at 1000 cd cm^{-2} as compared with similar device without the cross-linked compound **3** layer.

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References

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