New host materials for high performance single layer phosphorescent light emitting diodes

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Nowadays, OLEDs (Organic Light-Emitting Diodes) technology is present in everyday life. It is mainly found in smartphone and television screens, but also, more recently, for lighting. Organic electrophosphorescent diodes (PhOLEDs) are the second and most mature generation of OLEDs. In this technology, all the high-efficiency PhOLEDs are multi-layer devices constituted, in addition to the emissive layer (EML), of a stack of functional organic layers. These layers play a crucial role in the device performance as they improve the injection, transport, and recombination of charges within the EML. However, in order to fit with the energetic and ecological transition, PhOLED technology should still be improved. Single-layer PhOLEDs (SL-PhOLEDs) represent ideal OLEDs, consisting only of the electrodes and the EML[1]. Simplifying the multilayers structure is then crucial to reduce the amount of commodities, the manufacture complexity, the production and recycling costs for real-life applications. However, reaching high-performance SL-PhOLED is far from easy, as removing the functional layers of an OLED stack dramatically decreases the performance. To achieve high SL-PhOLED efficiency, the efficient injection, transport, and recombination of charges should be insured by the EML, and particularly, by the host material[2-4]. Herein, two host materials have been investigated. They are constructed on the association of an electron-rich unit (indoloacridine or dihydroquinolinoacridine) connected by a shared spiro carbon atom to an electron-deficient 2,7-bis(diphenylphosphineoxide)-fluorene. In addition to a high E_T value, adequate highest occupied molecular orbital/lowest unoccupied molecular orbital energy levels and important thermal stability, the key point in this molecular design is the suitable balance between hole and electron mobilities, which leads to good performance in a SL-PhOLED.

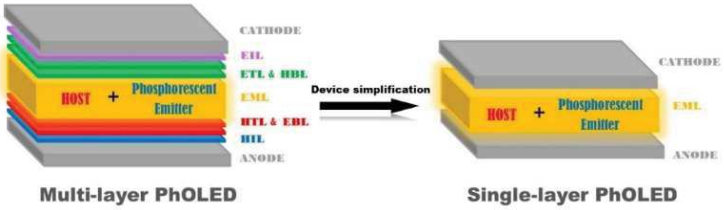

Figure 1. Schematic representation of a multi-layer PhOLED (left) and a single-layer PhOLED (right).

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[2] Poriel, C.; et.al., *Adv. Opt. Mater.* **2019,** *8* (2), 1901225.
[3] Poriel, C.; et.al., *J. Mater. Chem. C.* **2020,** *8* (46), 16354-16367.
[4] Poriel, C.; et.al., *Mat. Chem. Front.* **2021** in press.