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Spirophenylacridine-2,7-(diphenylphosphineoxide)-fluorene : A Bipolar Host for High-Efficiency Single-Layer Blue Phosphorescent Organic Light-Emitting Diodes

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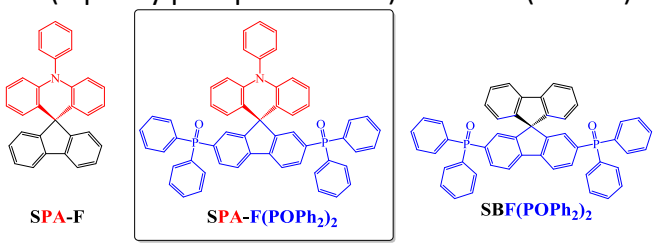
Phosphorescent Organic Light-Emitting Diodes (PhOLEDs), discovered at the end of the nineties have encountered a fantastic development for the last twenty years.[1, 2] To date, most of the high-efficiency blue PhOLEDs (with External Quantum Efficiency EQE>20%) are multi-layer devices, which are constituted of a stack of organic layers in order to improve the injection, transport and recombination of charges within the EML. Despite this technology is mastered, it suffers from a real complexity, a high cost, and is time-consuming.
Simplifying the multi-layers structure with the so-called Single-Layer PhOLEDs (SL-PhOLEDs), the simplest device only made of the electrodes and the EML is therefore one key step for the future. High efficiency SL-PHOLEDs can be obtained with precise design of the **host material**, which should fulfil several criteria which will be first presented.
We will then present **SPA-F(POPh$_2$)$_2$** (see structure below) constructed on the association of an electron rich phenylacridine unit (in red) connected by a spiro carbon atom to an electron-deficient 2,7-bis(diphenylphosphine-oxide)-fluorene (in blue).



SPA-F(POPh$_2$)$_2$ and the Model compounds used in this study (**SPA-F** and **SBF(POPh$_2$)$_2$**)

The synthesis, the main photophysical and electronic properties of **SPA-F(POPh$_2$)$_2$** compared to those of the model compounds **SPA-F** and **SBF(POPh$_2$)$_2$** will then been detailed. Finally, the performances of green and blue SL-PhOLEDs using **SPA-F(POPh$_2$)$_2$** as host will be presented. Particularly, SL-PhOLEDs with **SPA-F(POPh$_2$)$_2$** doped with the blue phosphor FIrpic presents one of highest performance reported to date for blue SL-PhOLEDs and more importantly shows the potential of the molecular design of **SPA-F(POPh$_2$)$_2$** to reach very high performance single-layer devices.

1 M. A. Baldo, D. F. O'Brien, Y. You, A. Shoustikov, S. Sibley, M. E. Thompson and S. R. Forrest, *Nature*, 1998, **395**, 151.
2 Y. Tao, C. Yang and J. Qin, *Chem. Soc. Rev.*, 2011, **40**, 2943.