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[4]-Cyclo-2,7-carbazole as host material in high-efficiency red Phosphorescent OLEDs: A new perspective for molecular nanohoops in organic electronics

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Molecular nanohoops are a new class of organic semiconductors. These materials are cylindrical oligomers possessing a radially distributed π-conjugated system. Such distribution induces to nanohoops radically different electronic properties compare to their acyclic homologues.[1-3] Thus, considering that linear oligomers are the molecular pillars which have allowed the development of organic electronics, investigating their cylindrical counterparts appears as an exciting challenge.[4-5] Since their first synthesis in 2008 by Jasti, Bertozzi *et al.*[6] and the great advances made in terms of reaction yields and scale,[7] molecular nanohoops are now considered for their application in organic electronics.[8] In the present work, we report the first incorporation of a molecular nanohoop (constituted by four carbazole units), namely **[4]C-Bu-Cbz**[6], as host material in a high efficiency red phosphorescent organic light emitting diode (PhOLED). This work shortens the gap between fundamental knowledge and practical use of molecular nanohoops. Photophysical and electronic properties of **[4]C-Bu-Cbz** have been investigated and compare to those of **[4]L-Bu-Cbz**, its linear counterpart. The PhOLED device incorporating **[4]C-Bu-Cbz** displays a higher maximal external quantum efficiency (EQE_{max}) compare to **[4]L-Bu-Cbz** (17.0% *vs* 11.1%).

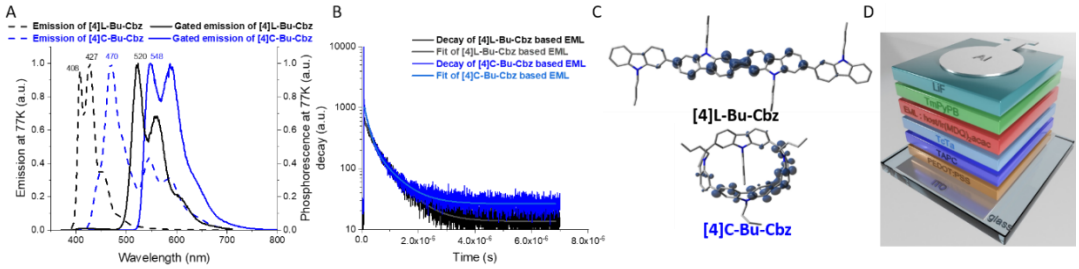

Figure 1 (A) Normalized emission and delayed emission at 77 K of [4]C-Bu-Cbz and of [4]L-Bu-Cbz (black lines, λexc= 360 nm for both); (B) time resolved photoluminescence (λexc = 310 nm , λem = 650 nm); (C) Triplet Spin Density distribution: TD-DFT B3LYP 6-311+g(d,p) and (D) Schematic representation of the PhOLED stack used in this work.

Références

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