Helicene-organic dyes for chiral optoelectronic applications

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Chiral molecular materials have recently attracted considerable attention in optoelectronic domains, especially due to their specific interaction with circularly polarized light, which may have high potential for 3D displays or information storage. [1] Helicenes and its derivatives have been the archetype of choice for reaching intense chiroptical properties due to the unique intrinsically chiral 3D helical π–conjugated skeleton.[2] Our group has investigated the molecular engineering of chiral [6]helicenes by metalation or functionalization with organic chromophores to extend their chiral photophysical properties (circular dichroism (CD) and circularly polarized luminescence (CPL)) for optoelectronic devices (chiral OLEDs, OPV and switches).[3] The great potential of these new chiral π-conjugated materials will be illustrated through selected examples where enantiopure [6]helicenes are functionalized with naphthalimide or diketopyrrolopyrrole organic chromophores. Their chiroptical properties will be discussed as well as their integration in devices such as OPV or OLEDs where chirality may bring new perspectives for these optoelectronic applications.

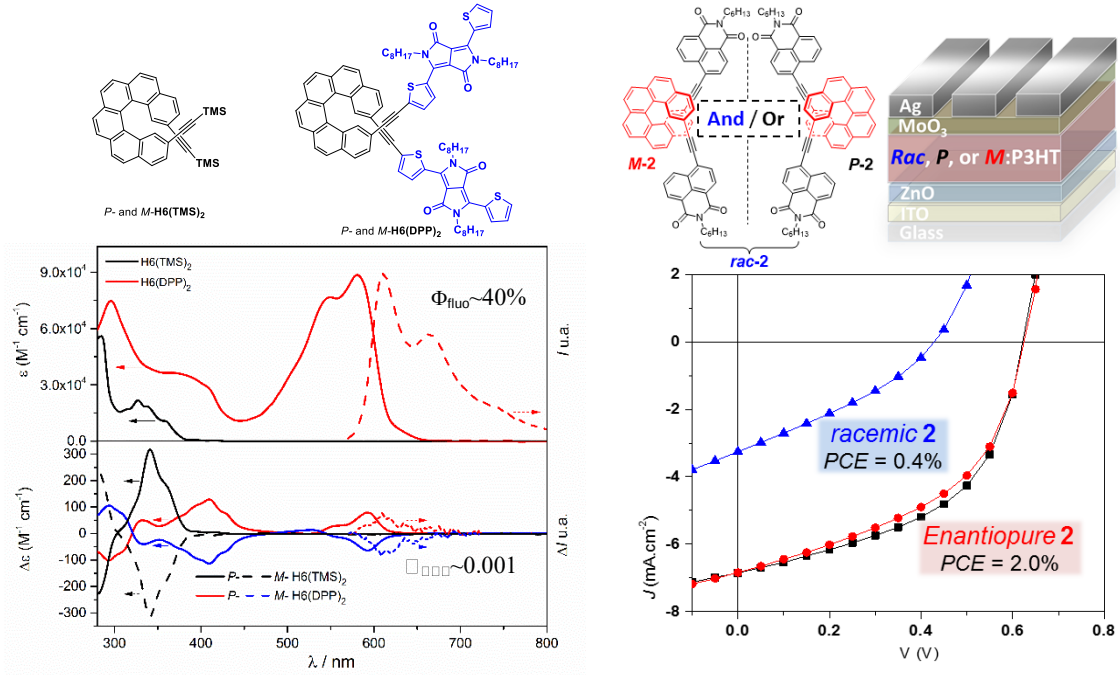

Figure 1. Left, top: Epsilon (straight) and luminescence (dashed) spectra of **H6(TMS)**$_2$ (black) and **H6(DPP)**$_2$ (red); bottom: CD and CPL spectra of the corresponding enantiomers. Right: Current density-voltage characteristics of inverted *rac*-**2** (blue), *P*-**2** (black) and *M*- (red) **2** based OPV devices.

References:

[1] *Chirality at the Nanoscale, Nanoparticles, Surfaces, Materials and more (Ed.: D. Amabilino)*, Wiley-VCH, **2009**; b)Molecular Switches *(Eds: B. L. Feringa, W.R. Browne)*, Wiley-VCH, 2nd ed., **2011**.
[2] a)C.-F. Chen and Y. Shen, *Helicene Chemistry: From Synthesis to Applications*, Springer-Verlag, Berlin, **2017** and *Chem. Rev.* **2012**, *112*, 1463; c)M. Gingras, *Chem. Soc. Rev.* **2013**, *42*, 1051.
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