CHIRAL ASSEMBLIES VIA METALLOPHILIC INTERACTIONS FOR CIRCULARLY POLARIZED LIGHT-EMITTING DIODES (CP-OLEDS)

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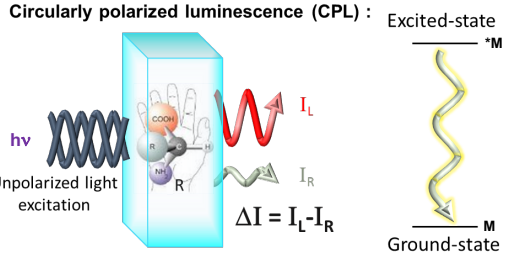
Chirality is a fundamental property of symmetry at all scales, from (bio)molecules to (nano)particles and up to macroscopic objects. It also also of paramount importance in light-matter interaction (*e.g.,* circularly-polarized light -CPL-) as well as in advanced technologies such as opto-electronics.[1] Nowadays, CPL is practically obtained from non-polarized light sources by using polarizers, yielding devices with reduced efficiency, more complex architecture and hard to miniaturize. Indeed, CPL materials represent an important mean to reduce power consumption in light-emitting devices, as well as they are of pivotal importance in application such as holographic three-dimensional OLEDs (3D-OLEDs).

From practical viewpoint, the differential emission intensity between right- and left- CPL (I_R and I_L) arising from an electronic excited state in a chiral field, over the total emitted light, is quantified by the dissymmetry factor, g_{lum} (see figure). Efficient CPL emitters display approaching ±2, but only rare efforts of rational design of CPL emitters have been paid to date, and maximizing g_{lum} value requires careful chemical considerations.[2] Molecular organometallic *d*-block compounds are appealing candidates as CPL emitters due to their synthetic flexibility and accessibility, excellent optical and redox properties that can be tuned by suitable chemical design as well as the possibility to obtain electrically-populated excited states.[3]



By a molecular thinking approach and based on our expertise in the field,[4] this interdisciplinary project aims at the synthesis and photophysical investigation of highly-emissive, *chiral*, phosphorescent transition metal complexes based on multidentate square-planar d^8 Pt(II)/Au(III) as well as linear d^{10} Au(I) complexes. The compounds will be designed to self-assemble into extended and highly-oriented chiral structures by means of metallophilic interactions like $d^8\cdots d^8$ Pt(II)···Pt(II) or $d^{10}\cdots d^{10}$ Au(I)-Au(I), which are able to efficiently emit circularly polarized light (CPL). The PhD candidate will be trained in both syntetic chemistry and photochemistry/photophysics, including organic ligand and organometallic synthesis, in-depth steady state and time-resolved photophysical techniques. In the frame of our well-established national and international collaborations state-of-the-art theoretical investigation will also support our molecular design and will provide useful insights onto excited states photophysics; whereas electroluminescence performances will be tested in circularly-polarized organic light-emitting diodes (CP-OLEDs).

[**1**] a) D.-W. Zhang, M. Li, C.-F. Chen, *Chem. Soc. Rev.* **2020**, *49*, 1331; b) J. Han, S. Guo, H. Lu, S. Liu, Q. Zhao, W. Huang, *Adv. Opt. Mater.*, **2018**, 6, 1800538; [**2**] (a) H. Tanaka, Y. Inoue, T. Mori, *ChemPhotoChem*, **2018**, *2*, 386; (b) G. Albano, G. Piscitelli, L. Di Bari, *Chem. Rev.*, **2020**, *120*, 10145; [**3**] Photoluminescent materials and electroluminescent devices, *Top. Curr. Chem.*, **2016**, 1–395, Springer; [3] A. Bonfiglio, C. Gourlaouen, V. César, S. Bellemin-Laponnaz, C. Daniel, F. Polo, H.-C. Su, M. Mauro, *Chem. Mater.*, **2022**; (b) A. Aliprandi, M. Mauro, L. De Cola, *Nature Chem.*, **2016**, *8*, 10; (c) M. Mauro, A. Aliprandi, C. Cebrián, D. Wang, C. Kübel, L. De Cola, *Chem. Commun*, **2014**, *50*, 7269.