Circularly Polarised Luminescence from chiral chromium(III) complexes

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Circularly Polarized Luminescence (CPL) is a matter of study not only because it provides valuable information about the structure of the excited-states in chiral chromophores, but also because it is a powerful tool in the field of bio-applications and material sciences. Generally, promising photoactive emissive chiral materials should fulfill at least: (i) good chemical stability, (ii) large dissymmetry factor (g_{lum}), which quantifies the degree of handedness of a CP emission, and (iii) large absorption and emission properties. Chiral luminophores based on organic molecules and 4d and 5d metal complexes can be straightforwardly prepared, but they usually suffer from low g_{lum} because of the strong electric dipole (ED) character of their radiative transitions [1]. Contrary, some f-f transitions can provide large g_{lum} and thus 4f-based metal complexes are currently the best candidates in the field of CPL [2]. However, (i) 4f metals require considerable production costs and (ii) 4f-based metal complexes are usually labile which can make difficult chiral resolutions and subsequent CPL solution studies. Alternatively, chiral complexes based on earth-abundant metals, particularly those incorporating the "inert" Cr(III) ion, benefit from a renewed interest according to their favorable spin-flip luminescence. In this contribution, we will discuss: (i) the state-of-the art in the CPL field (ii) the design principle, chiral resolution and chiroptical properties of a family of Cr(III) complexes as well as their insertion into silica nanoparticles and OLEDs devices [3, 4, 5, 6, 7].

References

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