

Conferencia: Molecules and systems with strong discrimination of circularly polarized light

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Molecules and systems with strong discrimination of circularly polarized light

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Circularly polarized light has relevant applications in various fields, from the classical assignment of absolute configuration of molecules, to its very recent use in optoelectronic devices, 3D displays, security inks. The lecture shall cover two aspects: molecules that emit light with strong circular polarization and systems (supramolecular assemblies) which discriminate polarized beams.

Conjugated polymers or oligomers display strong absorption bands, that can be used to fabricate photovoltaic cells or field-effect transistors. Often, they constitute rodlike systems, giving rise to parallel aggregates in the solid state. We shall demonstrate how the structures of molecular aggregates respond to the introduction and the control of chiral elements and some of its consequences.¹ We shall display materials exhibiting uncommonly high dissymmetry factors, i.e. able to discriminate left- and right- polarized light.²

In the context of light emitting devices (LED), we use chiral lanthanide complexes with high circularly polarized luminescence (CPL). The heterobimetallic CsEu(hfbc)₄ displays an unsurpassed dissymmetry value $g=1.38$. We shall briefly review the concepts for obtaining high polarization of emitted light.³ We have recently demonstrated the application of this complex in an organic LED shining light with high circular polarization and we shall discuss its architecture.⁴

References

1. (a) Resta, C.; Di Pietro, S.; Majerić Elenkov, M.; Hameršak, Z.; Pescitelli, G.; Di Bari, L., *Macromol.* **2014**, *47*, 4847-4850; (b) Destri, S.; Barba, L.; Gelmetti, I.; Di Bari, L.; Porzio, W., *Macromol. Chem. Phys.* **2015**, *216*, 801-807.
2. Resta, C.; Pescitelli, G.; Di Bari, L., *Macromol.* **2014**, *47*, 7052-7059.
3. Zinna, F.; Di Bari, L., *Chirality* **2015**, *27*, 1-13.
4. Zinna, F.; Giovanella, U.; Di Bari, L., *Adv. Mater.* **2015**, *27*, 1791-1795.



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Current research interests

- design and applications of chiral chromophores oligomers and polymers
- molecular and supramolecular stereochemistry
- chiral lanthanide complexes
- Chiroptical spectroscopies: electronic and vibrational Circular Dichroism (ECD, VCD) and circularly polarized luminescence (CPL).

Publications and patents

110 papers
1 patent
8 Book chapters

Education

1982-1987 Chemistry studies at Pisa University (Italy) and at Scuola Normale Superiore – Pisa (Italy)
1988-1991 Scuola Normale Superiore – Pisa (Italy),
Ph D student (Supervisor: Professors C. A Veracini)

Academic career

1988-1990 Adjoint PhD fellow at the University of Lausanne (Institut de Chimie Organique, Supervisor Prof. G. Bodenhausen)
1991-1992 Postdoc at the University of Stockholm (with Prof. J. Kowalewski and Prof. M. H. Levitt)
1992-2002 Assistant Professor of Organic Chemistry at Pisa University
2002-2015 Associate Professor of Organic Chemistry at Pisa University
Since 2015 Full Professor of Organic Chemistry at Pisa University

June-August 2010 Visiting Professor, Universitat des Isles Balears at Palma de Mallorca (ES)

May-June 2012 Visiting Professor at École Normale Supérieure de Lyon (FR)