

Synthesis and characterization of new chiral oligothiophenes for innovative optoelectronic applications

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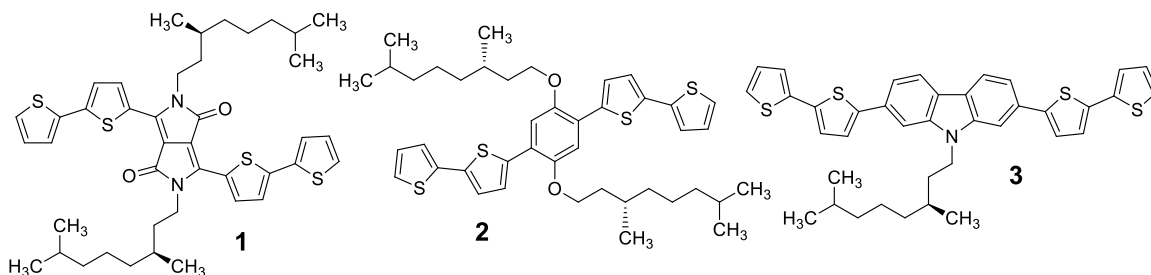
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In recent years, π -conjugated polymers and oligomers have found considerable attention as organic semiconductor in the field of optoelectronics; in this field a very important role is played by oligothiophene-based systems.

Their fundamental optical and electrical properties (light absorption and emission, charge transport, exciton transfer, etc.) depend not only on their chemical structure and conformation assumed, but also on the supramolecular interactions and nano/mesoscale organization in the solid-state¹. Chirality represents a way of controlling supramolecular aggregation of these systems: the introduction of chiral groups in their structure can drive them to organize into architectures with chiral geometries, where a perfect alignment between proximate chains is disfavoured with respect to a twisted arrangement. Moreover, non-racemic chiral π -conjugated systems can be studied using chiroptical spectroscopic techniques, in particular the electronic circular dichroism (ECD), which give access to a range of structural information otherwise not observable with other common spectroscopies. However, more importantly, these compounds may be used as chiral organic semiconductors in novel optoelectronic applications: circularly polarized light sensors², OFET able to discriminate enantiomers³, spin filters⁴, etc.

In light of this, we designed and synthesized a set of new chiral oligothiophenes for the realization of some innovative optoelectronic devices.



In particular, in this contribution we shall describe: a) the synthetic route developed for the preparation of these molecules; b) the investigation of their supramolecular aggregation in solution and as thin films through optical (UV-VIS) and chiroptical (ECD) spectroscopies, in connection with optical microscopy analysis; c) preliminary studies about their use as organic semiconductor in sensors of the visible light polarization and in spin filters.

References

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