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Hydrogen bonded supramolecular polymerization of rhodanine-oligothiophenes for chiral electronics

Ana M. Garcia, Kyeong-Im Hong, and Amparo Ruiz-Carretero*

Institut Charles Sadron, University of Strasbourg, CNRS, Strasbourg, France

ABSTRACT: Compared to conventional polymers, supramolecular polymers have unique characteristics such as reversibility and directionality in their structures. An attractive property of supramolecular polymers is the ability to precisely control their structure by spatially controlling the position of functional groups. Furthermore, the chirality of supramolecular polymers is also influenced by external stimuli such as solvent, temperature, and ultrasonication. For example, Meijer, Naaman and co-workers investigated the conformational change on supramolecular helicity of nanofibers using coronene bisimide derivatives by changing the temperature.[1] These self-assembled structures are being employed to develop functional materials for biomedical engineering and optoelectronic devices. Especially, unidirectionally assembled structures of π-conjugated molecules have contributed to efficient charge carrier transport in conjugated materials. Recently, chiral semiconductors have arose as promising new materials in organic photovoltaic devices. A preferred spin would be selectively transferred through chiral supramolecular structures when charge carriers are created, which is known as chiral-induced spin selectivity (CISS). The key factor for the CISS effect to happen is to obtain a chiral supramolecular structure. In this regard, several chiral polythiophene-rhodanine based molecules were synthesized to study the CISS effect. The formation of their supramolecular polymers was influenced by the composition of solvents, resulting in aggregates with different helicity.[2] Through microwave spectroscopy measurements, the ability of the supramolecular aggregates as charge carriers is being investigated. Detailed aspects of this system will be discussed in this conference.

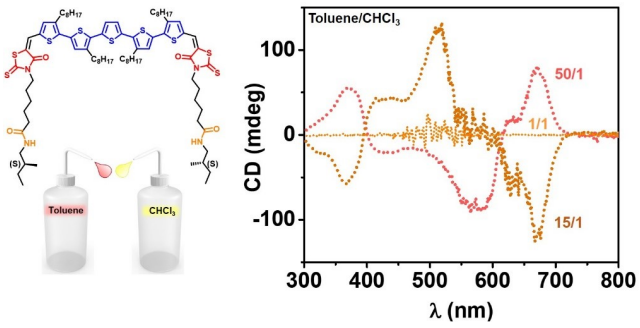

Figure: chirality inversion in rhodanine-oligothiophene derivative by solvents

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KEY WORDS: Hydrogen bond, Supramolecular polymer, Thiophene, CISS effect

References

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