## Control of chiral nanostructures in thin films of supramolecular polymers for applications in optoelectronics

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Dynamic nature of non-covalent interactions makes Natural chemical systems responsive to external stimuli, thereby allowing (self)-regulation and functioning in non-equilibrium states [1]. The latter two constitute key features of all living organisms. One common feature of biopolymers is their intrinsic chirality (lack of mirror symmetry), a fundamental property which determines biological functions by stereoselectivity of non-covalent interactions. Importantly, just as molecules can exist in left-handed (LH) and right-handed (RH) mirror image pairs (enantiomers), light can feature either LH or RH circular polarization. Bioinspired materials comprising chiral structures, like helices, reveal particularly interesting properties when interacting with light, e.g. emission of circularly polarized light (CPL) [2] or it's selective reflection, depending on the screw sense of the helix [3].

Although in many cases organic (macro)molecules are inherently optically active, it has been only recently since we observe an increased effort to utilize chiroptical information. Recently a new category of polymers, "supramolecular polymers", has attracted great attention because of their potential for the design of self-healing and responsive materials with novel unprecedented properties [4]. Supramolecular polymers are one-dimensional assemblies of small molecules that are brought together through reversible and directional noncovalent interactions, leading to polymeric properties in solution and bulk states. Surprisingly, despite the great effort put on the development of new materials for organic electronics, the strategy of utilization of cooperative supramolecular polymers has been rarely reported. One of the most studied synthetic cooperative systems is based on benzene-1,3,5-tricarboxyamides (BTAs), which forms 1D helical fibers by combination of noncovalent interactions: threefold hydrogen bonds and  $\pi$ - $\pi$  interactions. Despite extensive molecular engineering targeted on the BTA side chains, their practical use as electro- and photo-active materials appears impractical, due to the small aromatic core. To address this issue, we have recently developed a supramolecular motif based on a  $C_3$ -symmetrically substituted triphenylene core decorated with three amide groups, a triphenylene-2,6,10-tricarboxamide (TTA) [5].

Within this presentation the fabrication of helical supramolecular polymer (*p*TTA) fibers will be shown. Several parameters will be discussed as potential control means in obtaining polymer fibers on surface, including TTA (monomer) concentration and deposition method. Apart from exploring the influence of deposition method on the morphology the work aimed at explaining the impact of surface properties of a substrate onto which TTA polymers are deposited. Finally, optimized supramolecular nanostructures with programmed chiral morphology were implemented in electronic devices, to examine their charge transport properties. The long-term goal of the presented studies is to create a new molecular engineering platform consisting of helical functional materials, which will be focused on development of chiral optoelectronic applications, i.e. chiroptoelectronics.

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