Helical Polymers as Unique Chiral Materials

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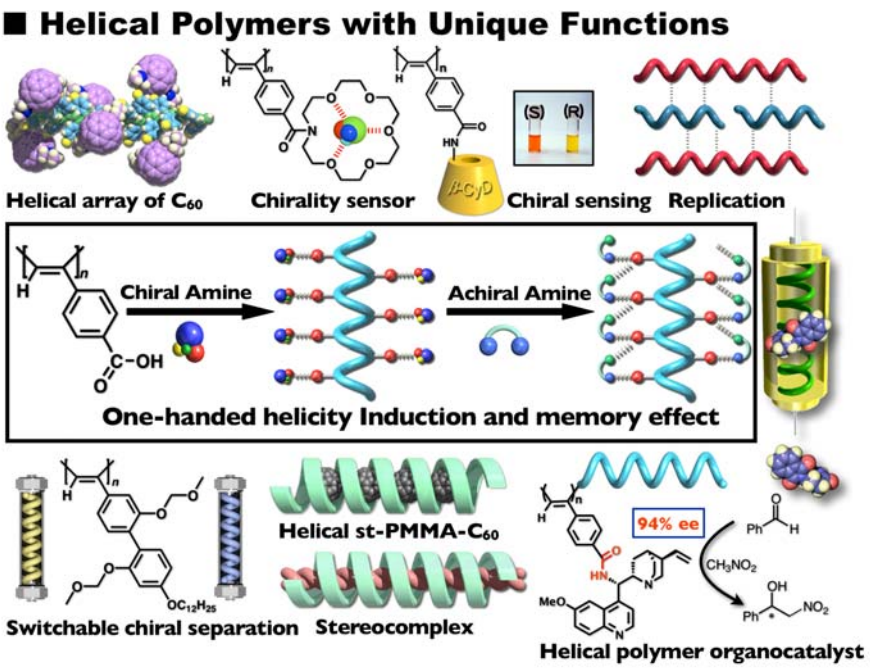
The helix is ubiquitous in nature, and one of the prevalent structural motifs for biological polymers, playing key roles in their sophisticated functions. In polymer and supramolecular chemistry, control of helicity is an attractive challenge because of possible applications in materials science. Here we show unique macromolecules that fold into a preferred-handed helical conformation induced by chiral substituents covalently bonded to the main-chains or external chiral stimuli followed by memory of the helical chirality, which provide useful chiral materials for separating enantiomers as well as asymmetric catalysis.[1] The helicity induction and memory strategy has a remarkable advantage from a practical viewpoint such that a preferred-handed helicity can be induced in commodity plastics, such as syndiotactic poly(methyl methacrylate) (st-PMMA).[2] The direct observations of helical structures of synthetic helical polymers by atomic force microscopy (AFM) will be also presented. A series of double helices composed of different components and sequences that exhibit specific functions, such as chiral recognition, enantioselective asymmetric catalysis and anisotropic spring-like motion are also described.[1,3-5]



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