

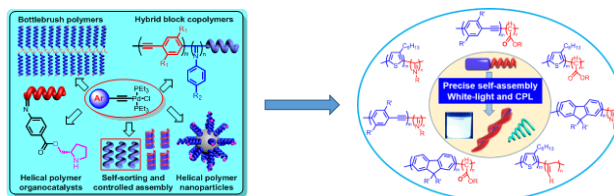
## One-handed Helical Polymers: From Controlled Synthesis to Chiral Functions

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Inspired by the exquisite helical structures and functions of biological polymers, e.g.,  $\alpha$ -helix of proteins and double-helix of DNA, artificial helical polymers have attracted significant research attention. Helical polymers can exhibit optical activity solely owing to the excess of one-handed helix. Precise syntheses of helical polymers involve not only the control over the chain length and dispersity, but also the helicity of the backbone. To solve these challenges, we have developed a series of chiral catalysts, which initiate the living polymerizations of various achiral monomers such as isocyanides, allenes, and diazoacetates, lead to the formation of one-handed helices with defined helicity, controlled molecular weights, and narrow dispersity.<sup>1,2</sup>

Through modification on the catalysts and monomers, a variety of topological helical polymers have been successfully realized, including hybrid block copolymers, bottlebrush polymers, core- or shell cross-linked polymer, and cyclic helical polymers as well. Owing to the chirality of helices, these polymers have showed broad applications in chiral recognition and resolution, chiral drug delivery, and asymmetric catalysis.<sup>3,4</sup> Incorporating helical polymers onto semiconducting  $\pi$ -conjugated polymers could control the self-assembly process, resulting in well-defined single-handed supramolecular helical architectures with tunable optical properties, such as white-light emission and circular polarized luminescence CPL).<sup>5,6</sup> The one-handed helical polymer have been utilized in asymmetric catalysis by incorporating catalytic moieties onto the pendant of helical polymers. Such helix-based chiral catalysts show high activity and enantioselectivity with combined advantages of homogeneous catalysts and heterogeneous process.<sup>7</sup>



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