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PREFACE

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Special Topic: Chirality in Polymers

Chirality is a fundamental structural feature widely observed in nature, ranging from molecular building blocks and biomacromolecules to hierarchical biological architectures. The precise control of chirality enables sophisticated biological functions, including molecular recognition, selective interactions, and information transfer. Inspired by these natural systems, synthetic chiral polymers have emerged as a unique class of functional materials that integrate molecular asymmetry with macromolecular architectures. Through advances in polymer synthesis, stereochemical control, and hierarchical assembly, chiral polymers have shown great potential in chiral separation, asymmetric catalysis, circularly polarized luminescence (CPL), sensing, and optical technologies.

In recent years, chiral polymers have evolved from structurally defined helical systems toward multifunctional materials with tunable properties and applications. Amplifying molecular chirality into higher-order structures provides an effective strategy for advanced chiral materials, while integrating chirality with optical, mechanical, and responsive properties enables new polymer systems. Nevertheless, challenges remain in precise structural construction, understanding structure–property relationships, and translating chiral architectures into functional applications. We are honored to present the Special Topic “Chirality in Polymers” in the *Chinese Journal of Polymer Science* (CJPS), featuring 2 review articles and 8 research articles that collectively highlight recent advances in the construction, regulation, and application of chiral polymer materials. The contributions in this Special Topic are categorized into three key themes:

(1) Construction of chiral polymer architectures. Precise construction of chiral polymer architectures is fundamental for developing advanced chiral materials. Jian-Ping Deng, Biao Zhao and co-workers reviewed CPL materials based on helical polymers, emphasizing the relationship between polymer conformation, hierarchical organization, and chiroptical performance. Wei Zhang, Zhi-Wei Zhao and co-workers summarized strategies for constructing polymer-based CPL materials, including covalent chiral polymers, chiral induction approaches, and hierarchical chiral superstructures. Research articles further demonstrate new strategies for constructing chiral polymers. Sheng Wang *et al*. reported one-handed helical poly(*m*-terphenyl acetylene)s with broad optical activity from ultraviolet-visible to near-infrared regions through molecular design and conformational regulation. Wei You, Yu Wang and co-workers developed highly regio- and *trans*-selective ring-opening metathesis polymerization of chiral aza-norbornene monomers for stereochemical control of polymer backbones.

(2) Regulation of chiral polymer properties. Beyond structural construction, regulating the relationship between chirality and material properties is essential for functional chiral polymers. Jie Zhang and co-workers developed a side-chain-to-backbone Förster resonance energy transfer strategy in helical poly(phenylacetylene)s to achieve tunable CPL, enabling regulation of excited-state processes and chiroptical responses. Afang Zhang, Wen Li, and co-workers constructed multiple-responsive chiral hydrogels by integrating helical polymers with dynamic covalent crosslinking. Feng Wang and co-workers established a cooperative assembly strategy in telechelic polydimethylsiloxane systems, where directional hydrogen bonding promoted hierarchical chiral organization and network reinforcement. Ye Liu, Xiao-Bing Lu, and co-workers introduced rotationally constrained biaryl units into poly(ether-*alt*-ester)s to regulate polymer conformation and improve thermal properties.

(3) Functional applications of chiral polymers. The unique structural features of chiral polymers enable applications in molecular recognition and separation technologies. Jun Shen and co-workers demonstrated that controlling the crystalline organization of cellulose phenylcarbamate derivatives significantly enhanced chiral recognition, revealing the critical role of ordered polymer structures in enantioseparation. Zong-Quan Wu, Na Liu and co-workers further explored optically active helical poly(phenyl isocyanide)s as chiral stationary phases and chiral crystallization agents, achieving efficient resolution of various racemic compounds.

Together, these contributions highlight the rapidly expanding landscape of chirality in polymer science, spanning molecular synthesis, stereochemical regulation, hierarchical organization, optical functionality, and practical applications. Recent advances have accelerated the development of chiral polymers by integrating precise molecular design, advanced polymerization, supramolecular assembly, and functional material engineering.

We sincerely acknowledge all contributing authors and reviewers for their invaluable contributions, as well as the CJPS editorial team for their dedicated efforts. We hope this Special Topic will inspire further exploration of polymer chirality and stimulate new approaches toward innovative chiral polymer systems.

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