Asymmetric Amplification in Catalysis Using Dynamic Helical Macromolecular Catalysts

Michinori Suginome

Department of Synthetic Chemistry and Biological Chemistry, Kyoto University
Katsura, Nishikyo-ku, Kyoto 615-8510, Japan
suginome@sbchem.kyoto-u.ac.jp

Poly(quinoxaline-2,3-diyl) (PQX) is a unique class of helical synthetic polymers, which adopt dynamic but thermodynamically stable right- and left-handed helical conformations. By attaching functional achiral pendants to the helical scaffold in a modular manner, the macromolecules are endowed with unique chiral functions as chiral catalysts and materials for circularly polarized light emission/reflection. One of the most characteristic features of PQX is the switchability of their helical chirality. PQX of which chiral side chains serve as determinant of helical chirality adopt right or left-handed helical conformation, depending on the organic solvent in which PQX is dissolved.[4] Taking advantage of this feature, we have developed chirality-switchable chiral catalysts as well as CPL materials.

Our current interest is focused on the utilization of PQX devoid of chiral groups within the polymer structure. Those achiral PQXs have been successfully deracemized to single-handed PQX by using chiral guests or chiral solvents as external determinants of the helical chirality. Notably, the helix induction is accompanied by significant amplification of chirality, allowing use of chiral guests or solvents with low enantiomeric purities. Highly enantioselective asymmetric catalysis using the achiral PQX in abundant chiral organic solvents is illustrated. Moreover, our effort on the development of water-soluble PQXs and their use in asymmetric catalysis in water is also discussed.



