Supramolecular chirogenesis in porphyrin chemistry: Application for chirality and molecular sensing

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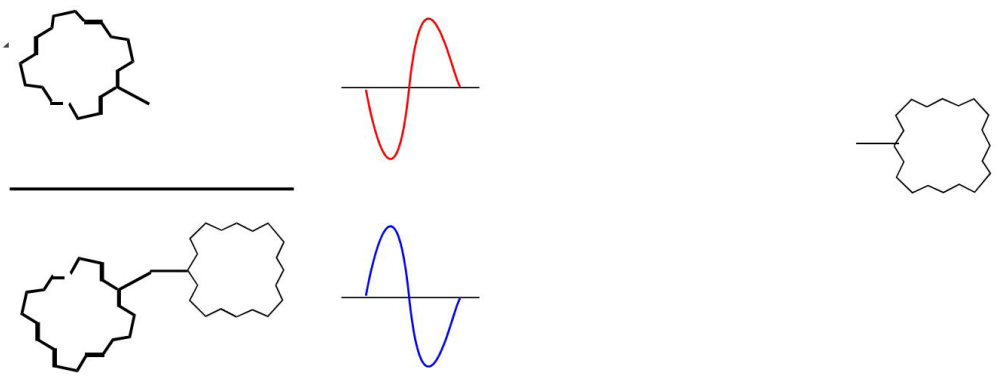
Chirality is one of the most fundamental issues of Nature and plays a profound role in many natural and various artificial systems making it of paramount importance not only for fundamental science but also for different practical applications including pharmaceuticals, agriculture, fragnances, cosmetics, food and bio additives, catalysis, functional materials, nonlinear optics, etc. Therefore, the process of chirality sensing is of prime interest of modern research endeavors. Amongst known methods the supramolecular chirogenic approach to detect chirality is the most challenging and prospective. Porphyrinoid based supramolecular chirogenic structures so far have attracted much attention for chirality-sensing purposes, owing to their appropriate chemical, physico-chemical, and spectral properties, easy handling and versatile modification, direct relation to many biological processes, and wide applicability. This prompted us to apply porphyrinoid-based supramolecular systems for design and development of smart chirality sensors.

Several years ago, we have discovered that a simple ethane-bridged bis-porphyrin and bis-chlorin structural motifs can be effectively served for different application purposes owing to the specific molecular and supramolecular functionalities. In particular, the unique functional property of this bis-porphyrin host is based upon the structural semi- flexibility of covalent linkage between two porphyrin units resulting in the environmentally assisted syn-anti conformational switching and tweezer formation depending upon the guest structure, which can be effectively detected by various spectroscopic methods and employed in different sensing areas, such as chirogenic probes, chiral recognitions, and chemical sensors.

Further developments and prospects toward new chiral and achiral bis- and multi porphyrin systems on the basis of heterometallic bis- and multi-porphyrin structures will be discussed



Recent Publications

1. Borovkov V (2014) Supramolecular chirality in porphyrin chemistry. Symmetry 6:256-294.
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3. Borovkov V, Inoue Y (2009) A versatile bisporphyrinoid motif for supramolecular chirogenesis. Eur.J.Org.Chem. 189-197.
4. Hembury GA, Borovkov VV, Inoue Y (2008) Chirality sensing supramolecular systems. Chem.Rev. 108:1-73.
5. Borovkov VV, Inoue Y (2006) Supramolecular chirogenesis in host-guest systems containing porphyrinoids. Top. Curr.Chem. 265:89-146.
6. Borovkov VV, Hembury GA, Inoue Y (2004) Origin, control, and application of supramolecular chirogenesis in bis-porphyrin- based systems. Acc.Chem.Res. 37:449-459

Biography

Victor Borovkov works as a full Professor of Chemistry at South-Central University for Nationalities, China and a Senior Research Scientist at Tallinn University of Technology, Estonia. He is a member of the editorial boards of several scientific journals, an author of 127 publications including research papers, reviews, and books with the h-index of 27 (WOS and Scopus), 10 patents, and serving as an external peer-reviewer of various international journals and scientific foundations. He participated in different international and industrial collaboration projects and attended numerous international and national conferences as an invited and keynote speaker being a member of several advisory committees. His current research interests include supramolecular chemistry, nanoscience, chirality, sensor devices, chemistry of porphyrins and related macrocycles, functional materials, and asymmetric catalysis.

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