Eiji Yashima, J Chromatogr Sep Tech 2015, 6:4
http://dx.doi.org/10.4172/2157-7064.S1.010

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International Conference and Expo on
Separation Techniques
August 10-12, 2015 San Francisco, USA

Reversible switching and memory of macromolecular helicity of a polyacetylene in the solid state and application to switchable enantio-separation in HPLC

Eiji Yashima
Nagoya University, Japan

The helix is ubiquitous in nature and one of the prevalent structural motifs for biological polymers, playing key roles in their sophisticated functions, such as chiral recognition, enantio-selective catalysis, and replication. Here, a quite unique helical polyacetylene is shown, whose main-chain helicity and axial chirality of the pendants are induced in the solid state accompanied by significant amplification of the chirality in a sequential or synchronized fashion upon interaction with a non-racemic alcohol. The induced macromolecular helicity and axial chirality are automatically memorized and further switched in the solid state. This unprecedented feature enables in this polymer the switchable chiral stationary phase (CSP) for separating enantiomers by high-performance liquid chromatography (HPLC) whose elution order or enantio-selectivity can be reversibly switched in the column for the first time. Separation of enantiomers by HPLC is now an essential technique for the research and development of chiral drugs in the pharmaceutical industry and a number of CSPs have been commercialized. However, none of them can switch the elution order of enantiomers, which is one of the most important issues to resolve.

Biography

Eiji Yashima received his BS, MS, and PhD (1988) from Osaka University. In 1986, he joined Kagoshima University. After a Postdoc with David Tirrell at UMass (1988-1989), he moved to Nagoya University in 1991 and was promoted to a full Professor in 1998. He has published over 300 papers including 23 reviews and has been serving as an Editorial Board or Editorial Advisory Board Member of 10 international journals. His current research interests are in the design and synthesis of helical molecules, supramolecules, and polymers with novel structures and functions.

yashima@apchem.nagoya-u.ac.jp

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