Abstract

Patric Bierganns

Synthesis, Structure and (Supra-)Molecular Functionality of Conformational Chiral Biphenyl and Phenanthrene Derivatives

In this work, syntheses of new conformational chiral biphenyl and phenanthrene derivatives and studies on their structures as well as on their abilities in the area of (supra-)molecular functionality are presented.
The synthetic strategies that have been established in this work institute a general and divers approach toward functional, bay-substituted phenanthrene derivatives, which until now could be accessed only in special cases and with difficulties. In this manner, a number of interesting, chiral phenanthrene-4,5-diesters have been achieved using oxidative cleavage of pyrene and further derivatization. The synthesis of enatiomeric pure and functional phenanthrene derivatives has been implemented *via* oxidative photocyclization of 3,3´-bridged stilbene derivatives. Using this method, a flexible (tropos) phosphoramidite ligand was synthesized, which was successfully and with high enantioselectivity applied in the copper-catalyzed 1,4-addition of diethylzinc. In combination with literature results, the achieved findings led to new perceptions into the principle of *induced atropisomerism* in catalytic processes.
A further synthetic approach that has been developed in the course of this work opens the access to highly substituted, twisted phenanthrene derivatives with a differentiated *bay*- and peripheral area. Furthermore, synthetic methods towards new benzene, stilbene and biphenyl derivatives with complex substitution patterns are presented, which could be applicable in the field of molecular sensors, supramolecular organization, asymmetric catalysis or natural product (analogue) synthesis.

The second part of this work describes studies on the synthesis of 2,5-dioxa-1,4(1,2)-dibenzenacyclohexaphanes, a class of natural product derivatives, *via* a novel, copper-catalyzed coupling reaction of *ortho*-iodobenzyl alcohols. It could be demonstrated that a great number of functional groups and substitution patterns are tolerated by this reaction and, thus, a structural diversity of potential biologically active compounds was made accessible.