Universität Basel

Research Project

Asymmetric Catalysis

Third-party funded project

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Organisation / Research unit
Departement Chemie / Synthetische organische Chemie (Pfaltz)
Department
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The main goal of our project is to develop efficient, practical enantioselective catalysts. An important part of our research efforts will be devoted to the design and synthesis of new classes of generally useful chiral ligands, which allow effective stereocontrol of metal-catalyzed reactions.

In our recent research, we have focused on the asymmetric hydrogenation of olefins using iridium complexes derived from P,N-ligands as catalysts. These catalysts show exceptionally high activity and enantioselectivity in the hydrogenation of unfunctionalized olefins, in contrast to Rh- and Ru-diphosphine catalysts, which require a polar coordinating group next to the C=C bond. For the first time purely alkyl-substituted olefins as well as furans and benzofurans could be hydrogenated with high enantioselectivity using iridium catalysts of this type. New classes of substrates and functional group tolerance will be studied in order to expand the application range for the hydrogenation of C=C, C=N, and C=O bonds. In addition, the still unknown reaction mechanism will be studied by spectroscopic, kinetic, and computational methods.

We have recently developed a new mass-spectrometric screening method that can be used to determine the intrinsic enantioselectivity of chiral catalysts. In contrast to conventional screening protocols, our method allows simultaneous screening of catalyst mixtures. We will further explore the potential of this method, which opens up new possibilities for catalyst discovery and development.

The catalysts and methods that we are developing, bear the potential for application in many areas of chemistry, e.g. in the production of pharmaceuticals, fragrances, or agrochemicals. Especially Ir-catalyzed hydrogenation has now reached the stage, where industrial applications become possible.

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Follow-up project of 242123 Asymmetric Catalysis

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