JUSTUS-LIEBIG-
UNIVERSITÄT
GIESSEN

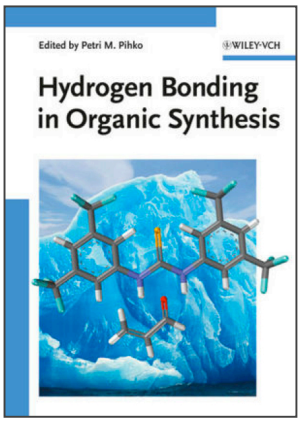
Institute for Organic Chemistry
prs • group

Bachelor's and Master's Theses

in

Organocatalysis

Key words: biomimetic catalysis, environmentally benign methods, molecular recognition, non-covalent interactions, hydrogen bonding, stereoselective reactions, sustainable chemistry



Organocatalysis combines the concepts of molecular recognition as well as supramolecular chemistry with enzyme-like catalytic activity. Noting that about half of all enzymes do not carry a metal center it is obvious that this approach has long been underrated. Although this is an entirely new field, it is already possible to catalyze many types of organic reactions with small, well-designed organic molecules. This circumvents the use of often toxic metals (leading to *environmentally benign methods*, *green chemistry*), and the preparation of the catalysts is much easier as it relies on the well-developed synthetic arsenal for tailor-making organic structures. In our group we have developed thiourea-based catalysts that are effective in catalyzing a variety of transformations such as Diels-Alder reactions, acetalization, THP-protection, stereoselective acyl transfer, reductions, epoxide openings and many more.

Your B. Sc. or M. Sc. work would help us develop this chemistry further by finding new organic reactions that do not need metals or strong acids and bases. In particular, we are interested in the topics below. You will be part of an international team working at the forefront of organic methodology development.

Topics:

1. Synthesis of new peptide-based catalysts
2. Preparation of novel, unnatural amino acids
3. Organocatalytic Epoxidations
4. Acylation methods: mimicking Nature
5. Computational mechanistic studies

Interested? Talk to us: labs on the 5th–7th floor, OC wing

Prof. Dr. Peter R. Schreiner
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Selected papers:

[1] *(Thio)urea Organocatalysis – What can be Learnt from Anion Recognition*. Zhiguo Zhang and Peter R. Schreiner *Chem. Soc. Rev.* **2009**, *38*, 1187–1198.

[2] *Enantioselective Kinetic Resolution of trans-cycloalkane-1,2-diols*. Christian E. Müller, Lukas Wanka, Kevin Jewell, and Peter R. Schreiner *Angew. Chem.* **2008**, *120*, 6275–6378.

[3] *Cooperative Brønsted Acid Type Organocatalysis: Alcoholysis of Styrene Oxides*. Torsten Weil, Mike Kotke, Christian M. Kleiner, and Peter R. Schreiner *Org. Lett.* **2008**, *10*, 1513–1516. **Highlight**: Benjamin List, Corinna Reisinger *Synfacts* **2008**, 1513–1516.

[4] *Thiourea Catalyzed Transfer Hydrogenation of Aldimines*. Zhiguo Zhang and Peter R. Schreiner *Synlett* **2007**, 1455–1458. **Highlight**: Benjamin List, Subhas Chandra Pan *Synfacts* **2007**, 988.