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**VABILO NA PREDAVANJE
V OKVIRU DOKTORSKEGA ŠTUDIJA
KEMIJSKE ZNANOSTI**

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z naslovom:

**Chirality and Light: Enantioselective Catalysis of
Photochemical Reactions**

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Vljudno vabljeni!



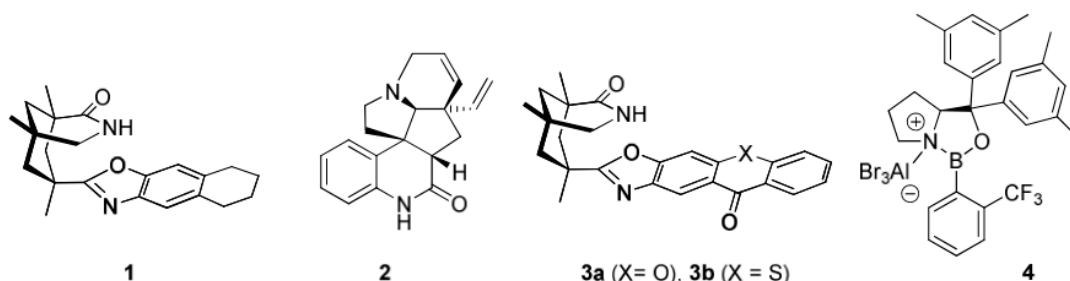
Abstract

CHIRALITY AND LIGHT: ENANTIOSELECTIVE CATALYSIS OF PHOTOCHEMICAL REACTIONS

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[2+2] Photocycloaddition reactions belong undisputedly to the most important reaction classes in photochemistry. The creation of up to four new stereogenic centers in a single step and the further use of the formed cyclobutane rings – either directly or after appropriate ring opening – are hallmarks of this powerful transformation. In our group, we have studied two different approaches to achieve a catalytic enantioselective reaction course in [2+2] photocycloaddition reactions. The first approach is based on a triplet energy transfer by hydrogen-bonding chiral catalysts, which in turn are derived from the previously described template **1**¹ successfully employed in the total synthesis of (+)-meloscine (**2**).² The second approach relies on chiral Lewis acids, which change the photophysical parameters of the substrate and allow a selective excitation in the chiral environment, which they provide.



Initial attempts to employ electron transfer or energy transfer for catalytic enantioselective reactions³ have been successfully extended to sensitized [2+2] photocycloaddition reactions.^{4,5} Xanthone **3a** turned out to be an efficient organocatalyst providing good turnover (10 mol%) and high enantioselectivities (>90% *ee*) in [2+2] photocycloaddition reactions⁴ while thioxanthone **3b** allows for enantioselective reactions promoted by visible light.⁵ Apart from this approach, we have also looked into the possibility of Lewis-acid mediated enantioselectivity in photochemical reactions. Lewis acid **4** was developed for coumarin [2+2] photocycloaddition reactions and is currently being further explored.⁶ The presentation discusses the background of the above-mentioned studies and provides the latest results of our research efforts in this area.

1. For recent work, see: a) K. A. B. Austin, E. Herdtweck, T. Bach, *Angew. Chem. Int. Ed.* **2011**, *50*, 8416-8419; b) S. C. Coote, T. Bach, *J. Am. Chem. Soc.* **2013**, *135*, 14948-14951.
2. a) P. Selig, T. Bach, *Angew. Chem. Int. Ed.* **2008**, *47*, 5082-5084; b) P. Selig, E. Herdtweck, T. Bach, *Chem. Eur. J.* **2009**, *15*, 3509-3525.
3. Review: R. Brimiolle, D. Lenhart, M. M. Maturi, T. Bach, *Angew. Chem. Int. Ed.* **2015**, *54*, in press.
4. a) C. Müller, A. Bauer, T. Bach, *Angew. Chem. Int. Ed.* **2009**, *48*, 6640-6642; b) C. Müller, M. M. Maturi, A. Bauer, M. C. Cuquerella, M. A. Miranda, T. Bach, *J. Am. Chem. Soc.* **2011**, *133*, 16689-16697; c) M. M. Maturi, T. Bach, *Angew. Chem. Int. Ed.* **2014**, *53*, 7661-7664.
5. R. Alonso, T. Bach, *Angew. Chem. Int. Ed.* **2014**, *53*, 4368-4371.
6. a) H. Guo, T. Bach, *Angew. Chem. Int. Ed.* **2010**, *49*, 7782-7785; b) R. Brimiolle, T. Bach, *Science* **2013**, *342*, 840-843; c) R. Brimiolle, T. Bach, *Angew. Chem. Int. Ed.* **2014**, *53*, 12921-12924.