Laboratory of Natural Products Chemistry





HEAD:

Prof. Zbigniew Czarnocki^{*}, PhD DSc

GROUP MEMBERS:

Piotr Roszkowski, PhD DSc; Zuzanna Molęda, PhD; Joanna Szawkało, PhD; Anna Zawadzka, PhD PhD students: Anna Kończyk, Karolina Staniak

RESEARCH PROFILE:

Asymmetric catalysis, stereoselective organic synthesis, medicinal chemistry

CURRENT RESEARCH ACTIVITIES:

Our main research areas are connected with the chemistry of natural products. In particular, we are interested in the stereoselective organic synthesis, often choosing natural compounds as our synthetic goals (alkaloids, lignans) or as chiral auxiliaries in various kinds of stereoselective synthesis, like asymmetric transfer hydrogenation (ATH).

Also, different heterocycles of pharmacological relevance are the subject of our study, together with the estimation of their biological activity. We were able to complete the synthesis of several natural products (cryspine A, podophyllotoxin, trypargine) and some heterocycles of pharmacological importance (aptazepine, praziquantel).

We are also interested in atropisomerism, which is a type of stereochemistry being a consequence of the hindered rotational barrier in suitably substituted biaryls and analogous compounds. Many biologically active compounds exist in the form of pure atropisomers and this phenomenon has important implications for medicinal chemistry.

We also work on the development of new multipotent cholinesterase inhibitors, designing and synthesizing hybrids of melatonin, tacrine and galantamine. The new hybrid cholinesterases inhibitors are protected by patents and can be used in relief and/or treatment of the neurodegenerative disorders, among them the Alzheimer's disease. For an effective screening of biologically active compounds, we are using target-guided synthesis approach, in which the target enzyme synthesizes its own inhibitors, selecting from a combinatorial library pairs of building blocks, which form together the best final ligands.





SELECTED PUBLICATIONS:

1. P. Pomarański, P. Roszkowski, J.K. Maurin, Z. Czarnocki, Regio- and atropselective synthesis of selected ortho-phenyl substituted arylpyridine derivatives, Journal of Molecular Structure. 1177 (2019) 564-570.

2. P. Pomarański, P. Roszkowski, J.K. Maurin, A. Budzianowski, Z. Czarnocki, Some mechanistic aspects regarding the Suzuki–Miyaura reaction between selected ortho-substituted phenylboronic acids and 3,4,5-tribromo-2,6-dimethylpyridine, Beilstein Journal of Organic Chemistry. 14 (2018) 2384–2393.

3. K. Lisiecki, Z. Czarnocki, Advances in the Synthesis of Aryltetralin and Arylnaphthalene Lignans using Photocyclization, Organic Preparations and Procedures International – in press. 50(6) (2018) 527-543.

4. K. Lisiecki, Z. Czarnocki, Flow Photochemistry as a Tool for the Total Synthesis of (+)-Epigalcatin, Organic Letters. 20 (2018) 605–607.

5. K. Lisiecki, P. Roszkowski, K.K. Krawczyk, J.K. Maurin, Z. Czarnocki, Unexpected regioselectivity in the photocyclization of a chiral 2,3-bisbenzylidenesuccinate, leading to a podophyllotoxin related cyclolignan, Journal of Photochemistry and Photobiology A: Chemistry. 364 (2018) 297–302.

6. K. Kucharewicz, M. Dudkowska, A. Zawadzka, M. Ogrodnik, A.A. Szczepankiewicz, Z. Czarnocki, E. Sikora, Simultaneous induction and blockade of autophagy by a single agent, Cell Death and Disease. 9(3) (2018) 353.

7. K. Lisiecki, K.K. Krawczyk, P. Roszkowski, J.K. Maurin, A. Budzianowski, Z. Czarnocki, Unusual visible-light photolytic cleavage of tertiary amides during the synthesis of cyclolignans related to podophyllotoxin, Tetrahedron. 73(44) (2017) 6316-6328.

8. P. Roszkowski, J.K. Maurin, Z. Czarnocki, New N,N-diamine ligands derived from (-)-menthol and their application in the asymmetric transfer hydrogenation, Tetrahedron: Asymmetry. 28 (2017) 532–538.

9. P. Pomarański, P. Roszkowski, J.K. Maurin, A. Budzianowski, Z. Czarnocki, Convenient synthesis of selected meta- and ortho- substituted pentaarylpyridines via the Suzuki-Miyaura cross-coupling reaction, Tetrahedron Letters. 58 (2017) 462-465.

10. S. Ahmad, L. Shukla, J. Szawkało, P. Roszkowski, J.K. Maurin, Z. Czarnocki, Synthesis of novel chiral guanidine catalyst and its application in the asymmetric Pictet-Spengler reaction, Catalysis Communications. 89 (2017) 44-47.