

Name/Permanent working place

Michał Michalak
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Scientific diploma and degrees

- X.1997-VI.2002 M. Sc. In chemistry, University in Białystok, Faculty of Biology and Chemistry “*Studies on alkylation of ketone on the solid phase*”; supervisor: Prof. dr hab. Ryszard Łażny;
- XI.2002-VI.2007 Ph.D. in chemistry, Institute of Organic Chemistry Polish Academy of Sciences “*Total synthesis of terpenes. Application of the metathesis reaction for the synthesis of cyclooctacyclopentane derivatives*”; supervisor: Prof. dr hab. Jerzy Wicha;
- 28.II.2020 Habilitation in chemistry, Institute of Organic Chemistry Polish Academy of Sciences, “*Application of N-heterocyclic carbene complexes for the activation of terminal alkynes*”.

Information on employment in scientific institutions

- VIII.2007-I.2008 **Assistant** at the Institute of Organic Chemistry PAN
- I.2008-XII.2008 **Postdoctoral fellow** at the Laboratory of Organic Chemistry, Ecole Polytechnique (Prof. Samir Zard; development of new radical olefination methods; L’Oréal fellowship); Palaiseau, France;
- II.2009-III.2010 **Postdoctoral fellow** at the Laboratory of Organometallic Synthesis, Faculty of Chemistry, University of Warsaw (Prof. Karol Grela, development of new ruthenium complexes for olefin metathesis; European grant EUMet), Warsaw, Poland.
- IV.2010-II.2012 **Postdoctoral fellow** at the Institute of Organic Chemistry PAN, Studies on the total synthesis of Ezetimibe („IniTech” programme);
- III.2012- **Independent research, Institute of Organic Chemistry Polish Academy of Sciences**
Application of N-heterocyclic carbene copper(I) complexes for the synthesis of fluorinated heterocycles via direct catalytic alkylation on water (Grant „IuventusPlus”);
Development of new fluorinated dibenzodiazocyn with V-shaped structure

(Grant NCN „Miniatura”);
Development new chiral N-heterocyclic carbene gold complexes and their application in enantioselective catalysis Grant NCN „Sonata Bis”

Scientific achievements

Research publications

1. Lazny, R.; Michalak, M. Application of piperazine-derived hydrazone linkers for alkylation of solid-phase immobilized ketones. *Synlett* **2002**, 1931-1934.
2. Michalak, M.; Michalak, K.; Wicha, J. A facile synthetic approach to cyclopentacyclooctane diterpenoid skeleton using ring-closing metathesis. *Chem. Listy* **2003**, 97, 290.
3. Michalak, K.; Michalak, M.; Wicha, J. Studies toward the total synthesis of di- and sesterterpenes with a dicyclopenta a,d cyclooctane skeleton. Construction of a versatile A/B ring building block via a ring-closing metathesis reaction and carbocationic rearrangement. *Tetrahedron Letters* **2005**, 46, 1149-1153.
4. Michalak, K.; Michalak, M.; Wicha, J. Studies towards the total synthesis of di- and sesterterpenes with dicyclopenta a,d cyclooctane skeletons. Three-component approach to the A/B rings building block. *Molecules* **2005**, 10, 1084-1100.
5. Michalak, M.; Wicha, J. Efficient olefin isomerization-ring-closing metathesis reaction in sterically hindered systems: Study on simultaneous use of the Grubbs metathesis and ruthenium hydride isomerization catalysts. *Synlett* **2005**, 2277-2280.
6. Michalak, K.; Michalak, M.; Wicha, J. A synthetic approach to the functionalized hydroazulene core of guanacastepenes and heptemerenes. *Tetrahedron Letters* **2008**, 49, 6807-6809.
7. Michalak, K.; Michalak, M.; Wicha, J. A facile construction of the tricyclic 5-7-6 scaffold of fungi- derived diterpenoids. The first total synthesis of (+/-)- heptemerone G and a new approach to Danishefsky's intermediate for a guanacastepene A synthesis. *Tetrahedron Letters* **2010**, 51, 4344-4346.
8. Michalak, K.; Michalak, M.; Wicha, J. Construction of the Tricyclic 5-7-6 Scaffold of Fungi-Derived Diterpenoids. Total Synthesis of (+/-)-Heptemerone G and an Approach to Danishefsky's Intermediate for Guanacastepene A Synthesis. *Journal of Organic Chemistry* **2010**, 75, 8337-8350.
9. Wang, H.; Michalak, K.; Michalak, M.; Jimenez-Oses, G.; Wicha, J.; Houk, K. N. Steric Control of alpha- and beta-Alkylation of Azulenone Intermediates in a Guanacastepene A Synthesis. *Journal of Organic Chemistry* **2010**, 75, 762-766.
10. Brioché, J.; Michalak, M.; Quiclet-Sire, B.; Zard, S. Z. Elimination versus Ring Opening: A Convergent Route to Alkylidene-Cyclobutanes. *Organic Letters* **2011**, 13, 6296-6299.
11. Leitgeb, A.; Szadkowska, A.; Michalak, M.; Barbasiewicz, M.; Grela, K.; Slugovc, C. Unequal siblings: Adverse characteristics of naphthalene-based hoveyda-type second generation initiators in ring opening metathesis polymerization. *Journal of Polymer Science Part A: Polymer Chemistry* **2011**, 49, 3448-3454.
12. Michalak, M.; Michalak, K.; Urbanczyk-Lipkowska, Z.; Wicha, J. Synthetic Studies on Dicyclopenta[a,d]cyclooctane Terpenoids: Construction of the Core Structure of Fusicoccins and Ophiobolins on the Route Involving a Wagner-Meerwein Rearrangement. *The Journal of Organic Chemistry* **2011**, 76, 7497-7509.
13. Michalak, M.; Stodulski, M.; Stecko, S.; Mames, A.; Panfil, I.; Soluch, M.; Furman, B.;

- Chmielewski, M. A Formal Synthesis of Ezetimibe via Cycloaddition/Rearrangement Cascade Reaction. *The Journal of Organic Chemistry* **2011**, 76, 6931-6936.
14. Michalak, M.; Wicha, J. Application of a metathesis reaction in the synthesis of sterically congested medium-sized rings. A direct ring closing versus a double bond migration-ring closing process. *Organic & Biomolecular Chemistry* **2011**, 9, 3439-3446.
 15. Barbasiewicz, M.; Michalak, M.; Grela, K. A New Family of Halogen-Chelated Hoveyda-Grubbs-Type Metathesis Catalysts. *Chemistry – A European Journal* **2012**, 18, 14237-14241.
 16. Michalak, M.; Stodulski, M.; Stecko, S.; Woźnica, M.; Staszewska-Krajewska, O.; Kalicki, P.; Furman, B.; Frelek, J.; Chmielewski, M. Synthesis of N,4-diaryl substituted β -lactams via Kinugasa cycloaddition/rearrangement reaction. *Tetrahedron* **2012**, 68, 10806-10817.
 17. Stecko, S.; Michalak, M.; Stodulski, M.; Mucha, Ł.; Parda, K.; Furman, B.; Chmielewski, M. Practical One-Pot Synthesis of Protected l-Glyceraldehyde Derivatives. *Synthesis* **2012**, 44, 2695-2698.
 18. Wappel, J.; Grudzień, K.; Barbasiewicz, M.; Michalak, M.; Grela, K.; Slugovc, C. Initiation efficacy of halo-chelated cis-dichloro-configured ruthenium-based second-generation benzylidene complexes in ring-opening metathesis polymerization. *Monatshefte für Chemie - Chemical Monthly* **2015**, 146, 1153-1160.
 19. Horeglad, P.; Cybularczyk, M.; Litwinska, A.; Dabrowska, A. M.; Dranka, M.; Zukowska, G. Z.; Urbanczyk, M.; Michalak, M. Controlling the stereoselectivity of rac-LA polymerization by chiral recognition induced the formation of homochiral dimeric metal alkoxides. *Polymer Chemistry* **2016**, 7, 2022-2036.
 20. Wozniak, L.; Staszewska-Krajewska, O.; Michalak, M. Diastereoselective synthesis of propargylic N-hydroxylamines via NHC-copper(i) halide-catalyzed reaction of terminal alkynes with chiral nitrones on water. *Chemical Communications* **2015**, 51, 1933-1936.
 21. Wolosewicz, K.; Michalak, M.; Adamek, J.; Furman, B. Studies on the Enantioselective Kinugasa Reaction: Efficient Synthesis of β -Lactams Catalyzed by N-PINAP/CuX Complexes. *European Journal of Organic Chemistry* **2016**, 2016, 2212-2219.
 22. Czerwiński, P.; Molga, E.; Cavallo, L.; Poater, A.; Michalak, M. NHC-Copper(I) Halide-Catalyzed Direct Alkynylation of Trifluoromethyl Ketones on Water. *Chemistry – A European Journal* **2016**, 22, 8089-8094.
 23. Czerwiński, P.; Michalak, M. NHC-Cu(I)-Catalyzed Friedländer-Type Annulation of Fluorinated o-Aminophenones with Alkynes on Water: Competitive Base-Catalyzed Dibenzo[b,f][1,5]diazocine Formation. *The Journal of Organic Chemistry* **2017**, 82, 7980-7997.
 24. Misztalewska-Turkowicz, I.; Markiewicz, K. H.; Michalak, M.; Wilczewska A. Z. NHC-copper complexes immobilized on magnetic nanoparticles: synthesis and catalytic activity in the CuAAC reactions *Journal of Catalysis*, **2018**, 362, 46-54.

Reviews/Monographies

1. Lazny, R.; Michalak, M. Tools for combinatorial chemistry. Part 2. Linkers used in solid-phase organic synthesis *Wiadomości Chemiczne* **2003**, 57, 1061-1091.
2. Michalak, M.; Gułajski, Ł.; Grela, K. Alkene Metathesis. In *Science of Synthesis: Houben-Weyl Methods of Molecular Transformations*, de Meijere, A., Ed. Georg Thieme Verlag KG: 2010; Vol. 47, pp 327-437.
3. Michalak, M.; Michalak, K.; Wicha, J. The synthesis of cardenolide and bufadienolide aglycones, and related steroids bearing a heterocyclic subunit. *Natural Product Reports* **2017**, 34, 361-410.
4. Czerwiński, P. J.; Michalak, M., Synthetic Approaches to Chiral Non-C2-symmetric N-

Heterocyclic Carbene Precursors. *Synthesis* **2019**, *51*, 1689-1714.

5. Michalak, M.; Kośnik, W., Chiral N-heterocyclic Carbene Gold Complexes: Synthesis and Applications in Catalysis. *Catalysts* **2019**, *9*, 890-929.

Patents/Patents applications

1. Patent No. 216649 M. Barbasiewicz, M. Michalak, K. Grela *New complexes of ruthenium, method for their preparation, and their application in olefin metathesis reactions*, Intellectual property was purchased by the UMICORE **AG Co. & Kg, Hanau-Wolfgang** from Germany.

2. Patent WO2012168183 (A1) US2014171607 (A1) US9074028 (B2) PL395131 (A1) PL216649 (B1) JP2014523407 (A) EP2718016 (A1) CN103648644 (A) CN103648644 (B) K. Grela, M. Barbasiewicz, **M. Michalak** *New complexes of ruthenium, method for their preparation, and their application in olefin metathesis reactions*.

3. Application No. P-395262, 2011 M. Śnieżek, I. Panfil, S. Stecko, M. Soluch, M. Mikołajczyk, **M. Michalak**, B. Furman, M. Chmielewski *Method for the synthesis of the substituted azetidiones and intermediates for their synthesis*.

4. Application No. P-397120; Patent No. PL217611 2011 **M. Michalak**, M. Stodulski, S. Stecko, B. Furman, M. Chmielewski *Process for preparing of O,O-ketals L-glyceraldehyde*.

5. European Patent PCT PCT/PL2012/050022 WO2012/173504A2 2012 M. Śnieżek, I. Panfil, S. Stecko, M. Soluch, M. Mikołajczyk, M. Michalak, B. Furman, M. Chmielewski *Method for the synthesis of the substituted azetidiones and intermediates for their synthesis*.

6. Application No. P-406150; Patent No. PL 224931 P. Czerwiński, **M. Michalak** *Method for producing trifluoromethyl propargylic alcohols*.

7. M Michalak, M. Nowacki Patent Applications nr P.435408 *Method for synthesis of N-heterocyclic carbene gold(III) complexes and its applications*.

Grants

1. Grant Promotorski (grant for Ph.D. students, "supervisor's grant"), (Ministry of Education and Science) Total synthesis of terpenoids bearing cyclopentacyclooctane carbon skeleton (17.V.2005-16.V.2007, Nr 3 T09A 006 28, Institute of Organic Chemistry Polish Academy of Sciences) – **main investigator**; principal investigator: prof. Jerzy Wicha;

2. European grant EUMet (7th framework programme) Design, development, utilization and commercialization of olefin metathesis catalysts (II.2009-III.2010, CP-FP 211468-2 EUMET, Faculty of Chemistry University of Warsaw) – **main investigator**; principal investigator: prof. Karol Grela;

3. Project INITECH (The National Centre for Research and Development) Development of new synthetic route to ezetimibe – selective inhibitor of cholesterol absorption (IV.2010-IV.2011, No.: ZPB/51/64927/IT2/10) – **investigator**; principal investigator: prof. Marek Chmielewski (01.VII.2009-30.VI.2012);

4. Grant POIG Sugars renewable materials for the synthesis of products with high added value (POIG.01.01.02-14-102/09, IV.2011-IV.2012) – **investigator**; task 3, head of task: Prof. Bartłomiej Furman; task 4, head of task: prof. Marek Chmielewski (01.01.2010 – 31.12.2014);
5. Grant Iuventus Plus (Ministry of Science and Higher Education of Poland) Applications of N-heterocyclic carbene copper(I) complexes as the catalysts of 1,3-dipolar cycloaddition of nitrones with alkynes. Further transformations of adducts” (IP2010 025770) – **principal investigator** (22.XII.2010-31.XII.2011);
6. Grant Iuventus Plus (Ministry of Science and Higher Education of Poland) Addition of terminal alkynes to an activated carbonyl group. N-Heterocyclic carbene copper(I) complexes as a catalyst in aqueous media – **principal investigator** (Nr IP2012 064172; 28.VI.2013- 27.XII.2015);
7. Grant “Fast Track” (The National Centre for Research and Development) Development of a high-performance method for the determination of metabolites of Vitamin D The development of a high-yielding method for the detection of Vitamin D metabolites(POIR.01.01.01-00-0816) – **deputy head of chemical synthesis** (01.03.2018 -28.02.2021);
8. Grant “Fast Track” (The National Centre for Research and Development) Development of a method for the monitoring of therapies with hemp preparations The development of a method for the monitoring of therapies performed with the use of hemp-derived preparations (POIR.01.01.01-00-1097/17) - **deputy head of chemical synthesis** (01.09.2018 - 31.08.21).
9. Grant MINIATURA (National Science Center of Poland) Synthesis of new analogs of Träger base bearing an oxygen bridge – **principal investigator** (DEC-2017/01/X/ST5/01384; 8.XII.2017-7.XII.2018);
10. Grant SONATA BIS (National Science Center of Poland) New N-heterocyclic carbene gold complexes: from catalytic activity to medical application – **principal investigator** (2017/26/E/ST5/00510, 26.IV.2018-25.IV.2023).