

PERSONAL DETAILS

Date and place of birth:

May 17th 1983, Łódź, Poland

Nationality:

Polish

Current position:

Assistant professor

Affiliation and official address:

University of Warsaw
Centre of New Technologies
Banacha 2C
02-097 Warsaw, Poland
e-mail: m.kalek@cent.uw.edu.pl
tel.: +48 22 55 43730

EDUCATION AND PROFESSIONAL EXPERIENCE

2016 – present

Assistant professor

Centre of New Technologies, University of Warsaw

Jun 2015 – Aug 2015

Researcher

Department of Organic Chemistry, Arrhenius Laboratory, Stockholm University

2013 – 2015

Postdoctoral fellow (asymmetric organocatalysis)

Division of Chemistry and Chemical Engineering, California Institute of Technology (with Prof. Gregory C. Fu)

2011 – 2013

Postdoctoral fellow (computational chemistry)

Department of Organic Chemistry, Arrhenius Laboratory, Stockholm University (with Prof. Fahmi Himo)

2006 – 2011

Graduate student (Ph.D.)

Department of Organic Chemistry, Arrhenius Laboratory, Stockholm University (with Prof. Jacek Stawiński)

Thesis: "Synthesis of C(sp²)-P bonds by palladium-catalyzed reactions. Mechanistic investigation and synthetic studies"

Jan 2006 – Sep 2006

Marie Curie fellow in the Early Stage Research Training (under EU 6th Framework Program)

Nucleic Acid Center, University of Southern Denmark, Odense (with Prof. Jesper Wengel)

2002 – 2005

Undergraduate student (M.Sc., with honors)

Centre for Interfaculty, Individual Studies in Mathematical and Natural Sciences, University of Warsaw (with Dr. Jacek Jemielity/ Dr. Janusz Stępiński)

Thesis: "Synthesis of mRNA 5' cap analogs resistant to enzymatic degradation"

AWARDS AND SCHOLARSHIPS

2017	Minister of Science and Higher Education Fellowship for Outstanding Young Scientists
2012	Swedish Research Council International Postdoc Fellowship
2010	Swedish Chemical Society travel grant
2010	C. F. Liljevalch Jr. travel scholarship
2009	AstraZeneca Nils Löfgren Memorial Award
2009	4th ICIQ Summer School participation grant
2008	IS3NA-SNAC travel award
2008	J.-A. Ekströms Foundation donation grant
2007	K. & A. Wallenbergs Foundation travel scholarship
2005	Marie Curie fellowship for Early Stage Research Training (under 6th EU FP)
2004	Minister of Education of Poland Awards for outstanding achievements during undergraduate studies
2003	Minister of Education of Poland Awards for outstanding achievements during undergraduate studies
2002	Minister of Education of Poland Award for outstanding achievements during high school education
2002	4th place and a gold medal on the 34th International Chemistry Olympiad, Groningen, the Netherlands

RESEARCH FUNDING

2017 – 2022	National Science Centre – Poland (<i>Narodowe Centrum Nauki</i>) grant Sonata Bis @ University of Warsaw 1 996 800 PLN
2015 – 2019	National Science Centre – Poland (<i>Narodowe Centrum Nauki</i>) grant Sonata @ University of Warsaw 975 360 PLN
2013 – 2015	Swedish Research Council (<i>Vetenskapsrådet</i>) International Postdoc Grant @ California Institute of Technology and Stockholm University 2 362 500 SEK

SERVICE TO PROFESSIONAL JOURNALS

Reviewer for: *Journal of the American Chemical Society*, *The Journal of Organic Chemistry*, *Organometallics*

CITATION METRICS

Sum of times cited: **906**

Sum of times cited without self-citations: **862**

h-index: **18**

PUBLICATION LIST

I. Peer-reviewed original articles

1. Kalek, M.; Jemielity, J.; Stepinski, J.; Stolarski, R.; Darzynkiewicz, E.
"A direct method for the synthesis of nucleoside 5'-methylbis(phosphonate)s from nucleosides"
Tetrahedron Lett. **2005**, *46*, 2417-2421.
2. Stepinski, J.; Zuberek, J.; Jemielity, J.; Kalek, M.; Stolarski, R.; Darzynkiewicz, E.
"Novel dinucleoside 5',5'-triphosphate cap analogues and affinity for murine translation factor eIF4E"
Nucleosides Nucleotides Nucleic Acids **2005**, *24*, 629-633.
3. Kalek, M.; Jemielity, J.; Grudzien, E.; Zuberek, J.; Bojarska, E.; Cohen, L. S.; Stepinski, J.; Stolarski, R.; Davies, R. E.; Rhoads, R. E.; Darzynkiewicz, E.
"Synthesis and biochemical properties of novel mRNA 5' cap analogs resistant to enzymatic hydrolysis"
Nucleosides Nucleotides Nucleic Acids **2005**, *24*, 615-621.
4. Grudzien, E.; Kalek, M.; Jemielity, J.; Darzynkiewicz, E.; Rhoads, R. E.
"Differential inhibition of mRNA degradation pathways by novel cap analogs"
J. Biol. Chem. **2006**, *281*, 1857-1867.
5. Kalek, M.; Jemielity, J.; Darzynkiewicz, Z. M.; Bojarska, E.; Stepinski, J.; Stolarski, R.; Davies, R. E.; Darzynkiewicz, E.
"Enzymatically stable 5' mRNA cap analogs: synthesis and binding studies with human DcpS decapping enzyme"
Bioorg. Med. Chem. **2006**, *14*, 3223-3330.
6. Kalek, M.; Madsen, A. S.; Wengel, J.
"Effective modulation of DNA-duplex stability by reversible transition metal complex formation in the minor groove"
J. Am. Chem. Soc. **2007**, *129*, 9392-9400.
7. Kalek, M.; Stawinski, J.
"Pd(0)-catalyzed phosphorus-carbon bond formation. Mechanistic and synthetic studies on the role of the palladium sources and anionic additives."
Organometallics **2007**, *26*, 5840-5847.
8. Darzynkiewicz, Z. M.; Bojarska, E.; Kowalska, J.; Lewdorowicz, M; Jemielity, J.; Kalek, M.; Stepinski, J.; Davis R. E.; Darzynkiewicz E.

- "Interaction of human decapping scavenger with 5' mRNA cap analogues: structural requirements for catalytic activity"
J. Phys.: Condens. Matter **2007**, *19*, 285217.
9. Wierzchowski, J.; Pietrzak, M.; Stepinski, J.; Jemielity, J.; Kalek, M.; Bojarska, E.; Jankowska-Anyszka, M.; Davis, R. E.; Darzynkiewicz, E.
"Kinetics of *C. Elegans* DcpS cap hydrolysis studied by fluorescence spectroscopy"
Nucleosides Nucleotides Nucleic Acids **2007**, *26*, 1211-1215.
10. Bartoszewicz, A.; Kalek, M.; Nilsson, J.; Hiresova, R.; Stawinski, J.
"A new reagent system for efficient silylation of alcohols – silyl chloride-N-methylimidazole-iodine"
Synlett **2008**, 37-40.
11. Kalek, M.; Benedikson, P.; Vester, B.; Wengel, J.
"Identification of efficient and sequence specific bimolecular artificial ribonucleases by a combinatorial approach"
Chem. Commun. **2008**, 762-764.
12. Deshmukh, M. V.; Jones, B. N.; Quang-Dang, D.; Flinders, J. C.; Floor, S. N.; Kim, C.; Jemielity, J.; Kalek, M.; Darzynkiewicz, E.; Gross J. D.
"mRNA decapping is promoted by an RNA binding channel in Dcp2"
Mol. Cell **2008**, *29*, 324-336.
13. Bartoszewicz, A.; Kalek, M.; Stawinski, J.
"The case for the intermediacy of monomeric metaphosphates during oxidation of *H*-phosphonothioate, *H*-phosphonodithioate, and *H*-phosphonoselenoate monoesters. Mechanistic and synthetic studies."
J. Org. Chem. **2008**, *73*, 5029-5038.
14. Kalek, M.; Stawinski, J.
"Palladium-catalyzed C-P bond formation: mechanistic studies on the ligand substitution and the reductive elimination. An intramolecular catalysis by the acetate group in Pd^{II} complexes."
Organometallics **2008**, *27*, 5876-5888.
15. Bartoszewicz, A.; Kalek, M.; Stawinski, J.
"Iodine-promoted silylation of alcohols with silyl chlorides. Synthetic and mechanistic studies."
Tetrahedron **2008**, *64*, 8843-8850.
16. Kalek, M.; Ziadi, A.; Stawinski, J.
"Microwave-assisted palladium-catalyzed cross-coupling of aryl and vinyl halides with *H*-phosphonate diesters"
Org. Lett. **2008**, *10*, 4637-4640.
17. Wallin, R.; Kalek, M.; Bartoszewicz, A.; Thelin, M.; Stawinski, J.
"On the sulfurization of *H*-phosphonate diesters and phosphite triesters using elemental sulfur"
Phosphorus, Sulfur Silicon Relat. Elem. **2009**, *184*, 908-916.
18. Kalek, M.; Stawinski, J.

- "Efficient synthesis of mono- and diarylphosphinic acids: a microwave-assisted palladium-catalyzed cross-coupling of aryl halides with phosphinate"
Tetrahedron **2009**, *65*, 10406-10412.
19. Kalek, M.; Jezowska, M.; Stawinski, J.
"Preparation of arylphosphonates by Pd(0)-catalyzed cross-coupling in the presence of acetate additives. Synthetic and mechanistic studies."
Adv. Synth. Catal. **2009**, *351*, 3207-3216.
20. Lavén, G.; Kalek, M.; Jezowska, M.; Stawinski, J.
"Preparation of benzylphosphonates via a palladium(0)-catalyzed cross-coupling of H-phosphonate diesters with benzyl halides. Synthetic and mechanistic studies."
New J. Chem. **2010**, *34*, 967-975.
21. Kalek, M.; Johansson, T.; Jezowska, M.; Stawinski, J.
"Palladium-catalyzed propargylic substitution with phosphorus nucleophiles: efficient, stereoselective synthesis of allenylphosphonates and related compounds"
Org. Lett. **2010**, *12*, 4702-4704.
22. Kalek, M.; Stawinski, J.
"Novel, stereoselective and stereospecific synthesis of allenylphosphonates and related compounds via palladium-catalyzed propargylic substitution"
Adv. Synth. Catal. **2011**, *353*, 1741-1755.
23. Söderberg, L.; Lavén, G.; Kalek, M.; Stawinski, J.
"³¹P NMR and computational studies on stereochemistry of conversion of phosphoramidate diesters into the corresponding phosphotriesters"
Nucleosides Nucleotides Nucleic Acids **2011**, *30*, 552-564.
24. Jiménez-Halla, J. O. C.; Kalek, M.; Stawinski, J.; Himo, F.
"Computational study of the mechanism and selectivity of palladium-catalyzed S_N2' propargylic substitution with phosphorus nucleophiles"
Chem. Eur. J. **2012**, *18*, 12424-12436.
25. Kalek, M.; Himo, F.
"Combining Meyer-Schuster rearrangement with aldol and Mannich reactions – DFT study of the intermediate interception strategy"
J. Am. Chem. Soc. **2012**, *134*, 19159-19169.
26. Huang, G.; Kalek, M.; Himo, F.
"Mechanism and selectivity of rhodium-catalyzed 1:2 coupling of aldehydes and allenes"
J. Am. Chem. Soc. **2013**, *135*, 7647-7659.
27. Biswas, S.; Dahlstrand, C.; Watile, R. A.; Kalek, M.; Himo, F.; Samec, J. S. M.
"Atom-efficient gold(I) chloride-catalyzed synthesis of alpha-sulfenylated carbonyl compounds from propargylic alcohols and aryl thiols: substrate scope and combined experimental and computational mechanistic investigation"
Chem. Eur. J. **2013**, *19*, 17939–17950.

28. Huang, G.; Kalek, M.; Liao, R.-Z.; Himo, F.
“Mechanism, reactivity, and selectivity of iridium-catalyzed C(sp³)-H borylation of chlorosilanes”
Chem. Sci. **2015**, *6*, 1735-1746.
29. Lee S. Y.; Fujiwara, Y.; Nishiguchi, A.; Kalek, M.; Fu, G. C.
“Phosphine-catalyzed enantioselective intramolecular [3+2] cycloadditions to generate fused ring systems”
J. Am. Chem. Soc. **2015**, *137*, 4587-4591.
30. Kalek, M.; Fu, G. C.
“Phosphine-catalyzed doubly stereoconvergent γ -additions of racemic heterocycles to racemic allenates: the catalytic enantioselective synthesis of protected α,α -disubstituted α -amino acid derivatives”
J. Am. Chem. Soc. **2015**, *137*, 9438-9442.
31. Santoro, S.; Kalek, M.; Huang, G.; Himo, F.
“Elucidation of mechanisms and selectivities of metal-catalyzed reactions using quantum chemical methodology”
Acc. Chem. Res. **2016**, *49*, 1006-1018.
32. Kalek, M.; Fu, G. C.
“Caution in the use of nonlinear effects as a mechanistic tool for catalytic enantioconvergent reactions: intrinsic negative nonlinear effects in the absence of higher order species”
J. Am. Chem. Soc. **2017**, *139*, 4225-4229.
33. Kalek, M.; Himo, F.
“Mechanism and selectivity of cooperatively-catalyzed Meyer-Schuster rearrangement/Tsuji-Trost allylic substitution. Evaluation of synergistic catalysis by means of combined DFT and kinetics simulations.”
J. Am. Chem. Soc. **2017**, *139*, 10250-10266.
34. Qiu Y.; Mendoza, A.; Posevins D.; Himo, F.; Kalek, M.; Bäckvall, J.-E.
“Mechanistic insight into enantioselective palladium-catalyzed oxidative carbocyclization-borylation of enallenes”
Chem. Eur. J. **2018**, *24*, 2433-2439.
35. Rajkiewicz, A. A.; Kalek, M.
“*N*-Heterocyclic carbene-catalyzed olefination of aldehydes with vinylidonium salts to generate α,β -unsaturated ketones”
Org. Lett. **2018**, *20*, 1906-1909.

II. Book chapters

1. Kalek, M.; Stawinski, J.
“Stereoselective methods for carbon-phosphorus (C–P) bond formation”

in: "Stereoselective synthesis of drugs and natural products", Andrushko, V. and Andrushko, N. (Eds.), John Wiley & Sons, 2013 (ISBN 978-1-118-03217-6), pp. 1443-1472.

III. Conference proceedings

1. Kalek, M.; Jemielity, J.; Grudzien, E.; Zuberek, J.; Darzynkiewicz, Z.M.; Bojarska, E.; Stepinski, J.; Stolarski, R.; Davis, R.E.; Rhoads, R.E.; Darzynkiewicz, E.
"Synthesis and biochemical properties of the novel, enzymatically stable mRNA cap analogues with versatile potential applications" in:
Collection Symposium Series (M. Hocek, Ed.), Vol. 7, p. 355-359, Institute of Organic Chemistry and Biochemistry, Academy of Sciences of the Czech Republic, Prague 2005.
2. Kalek, M.; Stawinski, J.
"Synthetic studies on the P-C bond formation *via* a Pd-catalyzed cross-coupling reaction. Application to the synthesis of P-arylated nucleic acids" in:
Collection Symposium Series (M. Hocek, Ed.), Vol. 10, p. 214-218, Institute of Organic Chemistry and Biochemistry, Academy of Sciences of the Czech Republic, Prague 2008.
3. Bartoszewicz, A.; Kalek, M.; Stawinski, J.
"Synthesis of nucleoside phosphorothio-, phosphorodithio- and phosphoroselenoate diesters *via* oxidative esterification of the corresponding H-phosphonate analogues" in:
Collection Symposium Series (M. Hocek, Ed.), Vol. 10, p. 219-223, Institute of Organic Chemistry and Biochemistry, Academy of Sciences of the Czech Republic, Prague 2008.
4. Kalek, M.; Bartoszewicz, A.; Stawinski, J.
"Synthesis of nucleoside phosphorothio-, phosphorodithio- and phosphoroselenoate diesters *via* oxidative esterification of the corresponding H-phosphonate analogues",
Nucleic Acids Symposium Series **2008**, 52, 285-286.

CONFERENCE PRESENTATIONS

By MK:

1. Kalek, M.; Kowalska, J.; Jemielity, J.; Darzynkiewicz, E.
"Synthesis of nucleotides modified in the phosphate chain" (poster; in Polish)
46th Meeting of the Polish Chemical Society, Lublin, Poland, September 2003.
2. Kalek, M.; Grudzien, E.; Jemielity, J.; Zuberek, J.; Bojarska, E.; Cohen, L. S.; Stepinski, J.; Stolarski, R.; Davies, R. E.; Rhoads, R. E.; Darzynkiewicz, E.
"Synthesis of cap analogues selectively modified in triphosphate chain: tools in studies of decapping process" (poster)
29th FEBS Meeting, Warsaw, Poland, June 2004.
3. Kalek, M.; Jemielity, J.; Stepinski, J.; Stolarski, R.; Darzynkiewicz, E.
"Simple and efficient method for synthesis of nucleosides 5'-methylenebis(phosphonate)s" (poster)

16th International Roundtable on Nucleosides, Nucleotides and Nucleic Acids, Minneapolis, USA, September 2004.

4. Kalek, M.; Jemielity, J.; Zuberek, J.; Grudzien, E.; Bojarska, E.; Cohen, L. S.; Stepinski, J.; Stolarski, R.; Davies, R. E.; Rhoads, R. E.; Darzynkiewicz, E.
"Synthesis and biochemical properties of novel mRNA 5' cap analogs resistant to enzymatic hydrolysis" (poster)
16th International Roundtable on Nucleosides, Nucleotides and Nucleic Acids, Minneapolis, USA, September 2004.
5. Kalek, M.; Jemielity, J.; Grudzien, E.; Zuberek, J.; Darzynkiewicz, Z.M.; Bojarska, E.; Stepinski, J.; Stolarski, R.; Davis, R. E.; Rhoads, R. E.; Darzynkiewicz, E.
"Synthesis and biochemical properties of the novel, enzymatically stable mRNA cap analogues with versatile potential applications" (oral communication)
13th Symposium on Chemistry of Nucleic Acids Components, Špindlerův Mlýn, Czech Republic, September 2005.
6. Kalek, M.; Wengel, J.
"Preliminary studies on sequence specific artificial ribonucleases based on LNA" (poster)
27th International Round Table on Nucleosides, Nucleotides and Nucleic Acids, Bern, Switzerland, September 2006.
7. Kalek, M.; Stawinski, J.
"Efficient method for the P-C bond formation *via* palladium-catalyzed coupling and its application to the synthesis of P-arylated nucleic acids" (poster)
3rd Nucleic Acid Chemical Biology (NACB) Symposium, Odense, Denmark, June 2007.
8. Kalek, M.; Stawinski, J.
"Synthetic studies on the P-C bond formation *via* Pd-catalyzed cross-coupling reaction. Application to the synthesis of P-arylated nucleic acids" (oral communication)
14th Symposium on Chemistry of Nucleic Acids Components, Český Krumlov, Czech Republic, June 2008.
9. Kalek, M.; Bartoszewicz, A.; Stawinski, J.
"Synthesis of nucleoside phosphorothio-, phosphorodithio- and phosphoroselenoate diesters *via* oxidative esterification of the corresponding H-phosphonate analogues" (poster)
Joint Symposium of 18th International Round Table on Nucleosides, Nucleotides and Nucleic Acids and 35th International Symposium on Nucleic Acid Chemistry, Kyoto, Japan, September 2008.
10. Kalek, M.; Ziadi, A.; Stawinski, J.
"Microwave-assisted palladium-catalyzed cross-coupling of aryl and vinyl halides with H-phosphonate diesters" (poster)
4th CRC International Symposium on "Cross-Coupling and Organometallics", Stockholm, Sweden, November 2008.
11. Kalek, M.; Jezowska, M.; Stawinski, J.

"Intramolecular catalysis of the ligand exchange by acetate during C-P forming cross-coupling. Mechanistic studies and synthetic application." (poster)
18th EuCheMS Conference on Organometallic Chemistry, Göteborg, Sweden, June 2009.

12. Kalek, M.; Stawinski, J.
"Microwave-assisted, palladium-catalyzed synthesis of arylphosphinates" (poster)
14th International Symposium on Relations between Homogeneous and Heterogeneous Catalysis, Stockholm, Sweden, September 2009.
13. Kalek, M.; Jezowska, M.; Stawinski, J.
"Synthesis of allenylphosphonates by palladium-catalyzed propargylic substitution" (oral communication)
18th International Conference on Phosphorus Chemistry, Wroclaw, Poland, July 2010.
14. Kalek, M.; Jezowska, M.; Stawinski, J. (oral communication)
"Palladium-catalyzed propargylic substitution with phosphorus nucleophiles"
240th ACS National Meeting & Exposition, Boston, USA, August 2010.
15. Kalek, M.; Himo, F.;
"Numerical simulation of chemical kinetics – a tool for the analysis of complex kinetic networks. A case study of contemporaneous dual catalysis." (oral communication)
23rd Organikerdagarna, Göteborg, Sweden, June 2012.
16. Kalek, M.; Himo, F.;
"Simulation of chemical kinetic networks – a tool for the analysis of complex catalytic cycles. Case study of cooperative catalysis." (poster)
International Conference "Catalysis in Organic Synthesis", Moscow, Russia, September 2012.
17. Kalek, M.
"Analysis of selectivity in synergistic catalysis by means of combined DFT calculations and kinetics simulations" (invited oral communication)
4th Meeting on Challenges in Computational Homogeneous Catalysis, Stockholm, Sweden, June 2017.
18. Kalek, M.
"Intrinsic nonlinear effect in catalytic enantioconvergent reactions" (invited oral communication; in Polish)
60th Meeting of the Polish Chemical Society, Wroclaw, Poland, September 2017.
19. Kalek, M.; Qiu, Y.; Mendoza, A.; Posevins, D.; Himo, F.; Bäckvall, J.-E.
"Computational studies on mechanism and selectivity of asymmetric palladium-catalyzed oxidative carbocyclization–borylation of enallenes" (poster)
11th Nationwide Polish Symposium of Organic Chemistry, Warsaw, Poland, April 2018.

By others:

1. Bartoszewicz, A.; Kalek, M.; Stawinski, J.

“Synthesis of nucleoside phosphorothio-, phosphorodithio- and phosphoroselenoate diesters *via* oxidative esterification of the corresponding H-phosphonate analogues”
XIV Symposium on Chemistry of Nucleic Acids Components, Český Krumlov, Czech Republic, June 2008
(oral communication).

2. Rajkiewicz, A. A.; Kalek, M.
“NHC-Catalyzed synthesis of vinyl ketones via coupling of aldehydes with vinylodonium salts” (poster; in Polish)
60th Meeting of the Polish Chemical Society, Wroclaw, Poland, September 2017.
3. Rajkiewicz, A. A.; Kalek, M.
“NHC-Catalyzed coupling of aldehydes with vinylodonium salts leading to α,β -unsaturated ketones” (oral communication; in Polish)
11th Nationwide Polish Symposium of Organic Chemistry, Warsaw, Poland, April 2018.

OTHER TALKS

1. “Conjugates of DNA with transition metal complexes and their application in duplex stability modulation and catalysis of RNA cleavage”
University of Warsaw, Poland 02/2007
2. “Phosphine-catalyzed enantioselective stereoconvergent reactions. Development of new processes, mechanistic investigations, and studies of non-linear effects.”
Stockholm University, Sweden 03/2017
3. “Mechanistic and synthetic investigations on catalytic reactions”
Institute of Organic Chemistry, Polish Academy of Sciences, Poland 02/2018