

Mateusz Urbańczyk

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Education

2002-2006: XXV Wybicki High-school in Warsaw

2006-2011: Master Studies, Faculty of Chemistry, University of Warsaw, Discipline: chemistry, specialization: chemical informatics

2011: Master Thesis: "Raman optical activity and vibrational circular dichroism spectra of carvone and limonene: experiment and theory" Supervisor: prof. Magdalena Pecul-Kudelska

2011-2016: PhD studies at Faculty of Chemistry, University of Warsaw.

2017: PhD Thesis: "Application of the sparse regularization in NMR Diffusometry measurements", Supervisors: prof. Wiktor Koźmiński, prof. Krzysztof Kazimierczuk

Employment

2011: Association of Students and Graduates of the Faculty of Chemistry of the Warsaw University of Technology "Klatrat"- Teacher in Chemical Academy for junior high-school students

2015-2016: Centre of New Technologies - Leader of grant PRELUDIUM from Polish National Science Centre

2015-Present: Spektrino Sp.z o.o.(Spin-off from University of Warsaw) - Vice-President, co-founder

2016: Spektrino Sp.z o.o. - Programmer in project: NMR in Cloud

2017-2018: Laboratory of NMR Spectroscopy, Centre of New Technologies, University of Warsaw - Postdoctoral researcher/research assistant

2018-2020: NMR Research Unit, University of Oulu, - Postdoctoral researcher.

2020-2021: Laboratory of NMR Spectroscopy, Centre of New Technologies, University of Warsaw - Postdoctoral researcher/research assistant

2021-Present: Institute of Physical Chemistry, Polish Academy of Sciences

Scientific Internship

2010: Student internship in Institute of Physical Chemistry, Polish Academy of Sciences

2014: Swedish NMR Centre, University of Gothenburg, Gothenburg, Sweden

Grants Leader:

"Fast Laplace NMR methods for time-dependent processes analysis" grant OPUS from Polish National Science Centre (2015-2016), **leader**

"Novel insight into complex reactions. A portable setup for Time-resolved Non-uniform sampling and Laplace NMR" grant SONATA from Polish National Science Centre (2023-2026),

"Sparse regularization in NMR Relaxometry " grant PRELUDIUM from Polish National Science Centre (2015-2016), **leader**

Grants Researcher:

"Towards new applications of NMR spectroscopy in chemical and biomolecular structural studies" (2010-2014) TEAM Project, Foundation for Polish Science, **researcher/PhD student**

"Regularization algorithms for the processing of NMR spectra of metabolite mixtures", grant HARMONIA from Polish National Science Centre: (2013-2014), **researcher**

„Molecular basis of structure, physicochemical properties of pharmaceutical formulation of human insulin and biotechnology modified insulin“ Polish National Centre for Research and Development, PBS2/A27/09/2013, **researcher**

"Time-resolved N-dimensional spectroscopy for monitoring of physical and chemical processes" grant OPUS from Polish National Science Centre: (2016-2019), **researcher/postdoc**

"Ultrafast Laplace NMR", ERC Consolidator Grant, **postdoctoral researcher**.

"Methods of non-stationary signal analysis for more sensitive NMR spectroscopy", TEAM Project, Foundation for Polish Science, **postdoctoral researcher**.

Honors and Awards

PhD scholarship from Foundation for Polish Science in TEAM project

PhD scholarship from KNOW project (national leading research facility)

Second Prize for Best poster at: Ampere NMR School 2013 in Zakopane, Poland

SMASH Poster Prize at: SMASH NMR 2014 Atlanta, USA

Research interest

NMR Diffusometry and Relaxometry

Heterogenous material analysis with NMR

Compressed Sensing in NMR

Algorithms for ILT

Reaction monitoring

Teaching activity:

Teaching assistant at Laboratory: "Molecular Spectroscopy" for 2nd year BSc

Teaching assistant at Laboratory: „Physics”, for 1st year BSc students

Teaching assistant at Laboratory: Spectroscopy and molecular properties" for 1st year MSc students

Teacher in Chemical Academy for junior high-school students organized by: Association of Students and Graduates of the Faculty of Chemistry of the Warsaw University of Technology "Klatrat".

Thesis Supervision

2018-2022: Secondary supervisor of PhD thesis of Yashu Kharbanda. Thesis title: "FAST, SENSITIVE AND PORTABLE NMR METHODS FOR CHARACTERIZING POROUS STRUCTURES, FLUID DYNAMICS AND MOLECULAR EXCHANGE PHENOMENA IN BIOMATERIALS"

2019-2020: Secondary supervisor of MSc thesis of Sampo Ylisiurua. Thesis title: "Investigation of cereal grains by low-field NMR spectroscopy"

Other activities:

Local organizing committee member at international conferences:

BioNMR 2014, Warsaw, Poland

MMCE2015, Krynica-Zdrój, Poland

XLI Finnish NMR Symposium, Rokua, Finland

Scientific skills

Basic chemical laboratory skills for use with NMR spectroscopy: preparation of liquid NMR samples, setup of experiments, analysis of results with specialized software

Advanced NMR skills like:

Creating scripts/macros for untypical experiments of Agilent, Bruker and Magritek spectrometers

Pulse sequence modification on Agilent and Magritek

Data processing using software like NMRPipe, MDDNMR, NMRGlue or by writing programs for specific tasks

Programming languages and computer skills:

Advance: Matlab, Python, JavaScript, Angular-JS, Bash, Latex

General knowledge: C, PHP

LINUX/UNIX administration

Languages

- Polish (native)
- English (fluent)
- Russian (basic)
- German (basic)

Publications

- [1] Magdalena Pecul, Mateusz Urbańczyk, Artur Wodyński, and Michał Jaszuski. DFT calculations of ^{31}P spin-spin coupling constants and chemical shift in dioxaphosphorinanes. *Magnetic Resonance in Chemistry*, 49(7):399–404, 2011.
- [2] Mateusz Urbańczyk, Diana Bernin, Wiktor Koźmiński, and Krzysztof Kazimierczuk. Iterative Thresholding Algorithm for Multiexponential Decay applied to PGSE NMR data. *Analytical Chemistry*, 85(3):1828–1833, 2 2013.
- [3] Mateusz Urbańczyk and Krzysztof Kazimierczuk. A method for joint sparse sampling of time and gradient domains in diffusion-ordered NMR spectroscopy. In *2013 Signal Processing Symposium, SPS 2013*, pages 1–6. IEEE, 2013.
- [4] Mateusz Urbańczyk, Wiktor Koźmiński, and Krzysztof Kazimierczuk. Accelerating diffusion-ordered NMR spectroscopy by joint sparse sampling of diffusion and time dimensions. *Angew. Chem. Int. Ed. Engl.*, 53(25):6464–6467, 2014.
- [5] P. Horeglad, M. Cybularczyk, A. Litwińska, A. M. Dąbrowska, M. Dranka, G. Z. Zukowska, M. Urbańczyk, and M. Michalak. Controlling the stereoselectivity of rac-LA polymerization by chiral recognition induced the formation of homochiral dimeric metal alkoxides. *Polymer Chemistry*, 7(11):2022–2036, 2016.
- [6] Mateusz Urbańczyk, Diana Bernin, Alan Czuroń, and Krzysztof Kazimierczuk. Monitoring polydispersity by NMR diffusometry with tailored norm regularisation and moving-frame processing. *Analyst*, 141(5):1745–1752, 2016.
- [7] Anna Maria Dąbrowska, Aleksander Hurko, Maciej Dranka, Vojtech Varga, Mateusz Urbańczyk, and Paweł Horeglad. Towards NHC stabilized alkylgallium alkoxide/aryloxide cations – The advances, the limitations and the challenges. *Journal of Organometallic Chemistry*, 840:63–69, 2017.
- [8] Mateusz Urbańczyk, Michał Nowakowski, Wiktor Koźmiński, and Krzysztof Kazimierczuk. Joint non-uniform sampling of all incremented time delays for quicker acquisition in protein relaxation studies. *Journal of Biomolecular NMR*, 68(2):155–161, 6 2017.
- [9] Alexandra Shchukina, Mateusz Urbańczyk, Paweł Kasprzak, and Krzysztof Kazimierczuk. Alternative data processing techniques for serial NMR experiments. *Concepts in Magnetic Resonance Part A: Bridging Education and Research*, 46A(2):e21429, 3 2017.
- [10] Jerzy Sitkowski, Wojciech Bocian, Elżbieta Bednarek, Mateusz Urbańczyk, Wiktor Koźmiński, Piotr Borowicz, Grażyna Płucienniczak, Natalia Łukasiewicz, Iwona Sokołowska, and Lech Kozerski. Insight into human insulin aggregation revisited using NMR derived translational diffusion parameters. *Journal of Biomolecular NMR*, 71(2):101–114, 6 2018.

- [11] Dariusz Gołowicz, Mateusz Urbańczyk, Alexandra Shchukina, and Krzysztof Kazimierczuk. SCoT: Swept coherence transfer for quantitative heteronuclear 2D NMR. *Journal of Magnetic Resonance*, 294:1–6, 9 2018.
- [12] Dariusz Gołowicz, Krzysztof Kazimierczuk, Mateusz Urbańczyk, and Tomasz Ratajczyk. Monitoring Hydrogenation Reactions using Benchtop 2D NMR with Extraordinary Sensitivity and Spectral Resolution. *ChemistryOpen*, 8(2):196–200, 2 2019.
- [13] Mateusz Urbańczyk, Alexandra Shchukina, Dariusz Gołowicz, and Krzysztof Kazimierczuk. TReNDS—Software for reaction monitoring with time-resolved non-uniform sampling. *Magnetic Resonance in Chemistry*, 57(1):4–12, 1 2019.
- [14] Yashu Kharbanda, Mateusz Urbańczyk, Ossi Laitinen, Kirsten Kling, Sakari Pallaspuo, Sanna Komulainen, Henriikki Liimatainen, and Ville-Veikko Telkki. Comprehensive NMR Analysis of Pore Structures in Superabsorbing Cellulose Nanofiber Aerogels. *Journal of Physical Chemistry C*, 123(51):30986–30995, 12 2019.
- [15] Mateusz Urbańczyk, Yashu Kharbanda, Otto Mankinen, and Ville Veikko Telkki. Accelerating Restricted Diffusion NMR Studies with Time-Resolved and Ultrafast Methods. *Analytical Chemistry*, 92(14):9948–9955, 7 2020.
- [16] Paweł Kasprzak, Mateusz Urbańczyk, and Krzysztof Kazimierczuk. Clustered sparsity and Poisson-gap sampling. *Journal of Biomolecular NMR*, 75(10-12):401–416, 12 2021.
- [17] Ewa K. Nawrocka, Mateusz Urbańczyk, Kamil Koziański, and Krzysztof Kazimierczuk. Variable-temperature NMR spectroscopy for metabolite identification in biological materials. *RSC Advances*, 11(56):35321–35325, 11 2021.
- [18] Kristina Kristinaityte, Mateusz Urbańczyk, Adam Mames, Mariusz Pietrzak, and Tomasz Ratajczyk. Photoreactivity of an exemplary anthracene mixture revealed by nmr studies, including a kinetic approach. *Molecules*, 26(21):6695, 11 2021.
- [19] Ville Veikko Telkki, Mateusz Urbańczyk, and Vladimir Zhivonitko. Ultrafast methods for relaxation and diffusion. *Progress in Nuclear Magnetic Resonance Spectroscopy*, 126-127:101–120, 10 2021.
- [20] Mariusz Pietrzak, Sylwia Jopa, Adam Mames, Mateusz Urbańczyk, Mateusz Woźny, and Tomasz Ratajczyk. Recent Progress in Liquid State Electrochemistry Coupled with NMR Spectroscopy. *ChemElectroChem*, 2021.
- [21] Alexandra Shchukina, Paweł Małecki, Borja Mateos, Michał Nowakowski, Mateusz Urbańczyk, Georg Kontaxis, Paweł Kasprzak, Clara Conrad-Billroth, Robert Konrat, and Krzysztof Kazimierczuk. Temperature as an Extra Dimension in Multidimensional Protein NMR Spectroscopy. *Chemistry - A European Journal*, 27(5):1753–1767, 2021.
- [22] Yashu Kharbanda, Mateusz Urbańczyk, Vladimir V. Zhivonitko, Sarah Mailhiot, Mikko I. Kettunen, and Ville-Veikko Telkki. Sensitive, Efficient and Portable Analysis of Molecular Exchange Processes by Hyperpolarized Ultrafast NMR. *Angewandte Chemie International Edition*, page e202203957, 5 2022.
- [23] Javier A Romero, Paulina Putko, Mateusz Urbańczyk, Krzysztof Kazimierczuk, and Anna Zawadzka-Kazimierczuk. Linear discriminant analysis reveals hidden patterns in NMR chemical shifts of intrinsically disordered proteins. *bioRxiv*, page 2022.06.08.495234, 6 2022.
- [24] Kristina Kristinaityte, Adam Mames, Mariusz Pietrzak, Franz F. Westermair, Wagner Silva, Ruth M. Gschwind, Tomasz Ratajczyk, and Mateusz Urbańczyk. Deeper Insight into Photopolymerization: The Synergy of Time-Resolved Nonuniform Sampling and Diffusion NMR. *Journal of the American Chemical Society*, 7 2022.

- [25] Y. Kharbanda, S. Mailhiot, O. Mankinen, M. Urbańczyk, and V. V. Telkki. Monitoring cheese ripening by single-sided nuclear magnetic resonance. *Journal of Dairy Science*, 106(3):1586–1595, 1 2023.
- [26] Alexandra Shchukina, Paweł Kasprzak, Mateusz Urbańczyk, and Krzysztof Kazimierczuk. The Non-uniform Sampling of 2D NMR Data. In *Fast 2D Solution-state NMR*, pages 115–153. The Royal Society of Chemistry, 5 2023.
- [27] Sarah Mailhiot, Otto Mankinen, Jing Li, Yashu Kharbanda, Ville-Veikko Telkki, and Mateusz Urbańczyk. CAT on MOUSE: Control and automation of temperature for single-sided NMR instruments such as NMR-MOUSE. *Magnetic Resonance in Chemistry*, 6 2023.

Conferences:

(Only with own-presented talks&posters)

- 19-20 January 2012, New frontiers in structural biology, Poznan, Poland. **Oral Presentation:** “Implementation of Compressed Sensing Method in processing of Diffusion-Ordered Spectroscopy spectra”, M. Urbańczyk, W. Koźmiński, K. Kazimierczuk
- 16-18 May 2012 2nd EASTNMR Young Investigators’ Meeting, Bratislava, Slovakia. **Oral Presentation:** “Iterative Thresholding Algorithm for Multi-exponential Decay applied to PFG NMR data”, M. Urbańczyk, D. Bernin, W. Koźmiński, K. Kazimierczuk
- 1-5 July 2012, EUROMAR 2012, Dublin, Ireland. **Poster:** “Iterative Thresholding Algorithm for Multiexponential Decay applied to PFG NMR data”, M. Urbańczyk, D. Bernin, W. Koźmiński, K. Kazimierczuk
- 16-19 September 2012 CEUM 2012, Golden Sands, Bulgaria. **Poster:** “Iterative Thresholding Algorithm for Multi-exponential Decay applied to PFG NMR data”, M. Urbańczyk, D. Bernin, W. Koźmiński, K. Kazimierczuk
- 26-28 September 2012 NMR in Chemistry, Biology and Medicine, Warsaw, Poland. **Oral Presentation:** “Iterative Thresholding Algorithm for Multi-exponential Decay applied to PFG NMR data”, M. Urbańczyk, D. Bernin, W. Koźmiński, K. Kazimierczuk
- 5-7 December 2012, Turkish NMR Meeting, Istanbul Turkey. **Oral Presentation:** “Iterative Thresholding Algorithm for Multi-exponential Decay applied to PFG NMR data”, M. Urbańczyk, D. Bernin, W. Koźmiński, K. Kazimierczuk
- 23-29 June 2013, AMPERE NMR School, Zakopane, Poland. **Poster** “A method for joint sparse sampling of time and gradient domains in diffusion-ordered NMR spectroscopy”, M. Urbańczyk W. Koźmiński, K. Kazimierczuk
- 1-5 July 2013, EUROMAR-2013 Hersonisos, Greece. **Poster** “A method for joint sparse sampling of time and gradient domains in diffusion-ordered NMR spectroscopy”, M. Urbańczyk W. Koźmiński, K. Kazimierczuk
- 26-28 August 2013 Diffusion Fundamentals V, Leipzig, Germany, **Poster:** “A method for joint sparse sampling of time and gradient domains in diffusion-ordered NMR spectroscopy”, M. Urbańczyk W. Koźmiński, K. Kazimierczuk
- 27-29 September 2013, Od MPD do Know, Rawa Mazowiecka, Poland, **Oral Presentation:** “A method for joint sparse sampling of time and gradient domains in diffusion-ordered NMR spectroscopy”, M. Urbańczyk W. Koźmiński, K. Kazimierczuk

11. 9-13 December 2013, Matheon Workshop 2013 Compressed Sensing and its Applications, Berlin, Germany, **Poster** "A method for joint sparse sampling of time and gradient domains in diffusion-ordered NMR spectroscopy", M. Urbańczyk W. Koźmiński, K. Kazimierczuk
12. 29 June-3 July 2014, EUROMAR 2014, Zurich, Switzerland, **Oral Presentation**: „Diffusion-ordered NMR with joint sparse sampling of time-gradient domain.” M. Urbańczyk W. Koźmiński, K. Kazimierczuk
13. 7-10 September 2014, SMASH NMR 2014, Atlanta, USA, **Poster**: „Diffusion-ordered NMR with joint sparse sampling of time-gradient domain.” M. Urbańczyk W. Koźmiński, K. Kazimierczuk
14. 24-26 September 2014, VIIIth Symposium NUCLEAR MAGNETIC RESONANCE IN CHEMISTRY, PHYSICS AND BIOLOGICAL SCIENCES 2014, Warsaw, Poland, **Oral Presentation**: „Non-Uniform Sampling Meets DOSY.” M. Urbańczyk W. Koźmiński, K. Kazimierczuk
15. 29 September- 2 October 2014, 36th FGMR DISCUSSION MEETING, Berlin, Germany, 2014, **Poster**: „Non-Uniform Sampling Meets DOSY.” M. Urbańczyk W. Koźmiński, K. Kazimierczuk
16. 25 February-1 March 2015, MMCE 2015, Krynica-Zdrój, Poland **Oral Presentation**: „Non-Uniform Sampling Meets DOSY.” M. Urbańczyk W. Koźmiński, K. Kazimierczuk
17. 5-10 July 2015, EUROMAR 2015, Praha, Czech Republic **Poster**: „INVERSE LAPLACE TRANSFORM WITH NOT NECESSARY SPARSE REGULARIZATION.” M. Urbańczyk, D. Bernin, W. Koźmiński, K. Kazimierczuk
18. 3-7 July 2016, EUROMAR 2016, Aarhus, Denmark, **Poster**: „Sparse (or not) regularization of Inverse Laplace transform in protein studies and reaction monitoring.” M. Urbańczyk , D. Bernin , A. Czuroń , M. Nowakowski , J. Sitkowski, W. Bocian , E. Bednarek , L. Kozerski , K. Kazimierczuk , W. Koźmiński
19. 26-31 March 2017, ENC 2016, Pacific Grove, USA, **Poster**: „Joint Non-Uniform Sampling of Fourier inverse-Laplace Space for Quicker Acquisition in NMR Diffusometry and Relaxometry.” M. Urbańczyk M. Nowakowski , J. Sitkowski, W. Bocian , E. Bednarek , L. Kozerski , W. Koźmiński, K. Kazimierczuk
20. 2-6 July 2017, EUROMAR 2017, Warsaw, Poland, **Poster**: „Joint non-uniform sampling of all incremented time delays for quicker acquisition in protein relaxation studies.” M. Urbańczyk M. Nowakowski, W. Koźmiński, K. Kazimierczuk
21. 17-20 September 2017, SMASH NMR 2017, Baveno, Italy, **Poster**: “NEW SOFTWARE KIT FOR REACTION MONITORING USING INTERLEAVED ACQUISITION FOR HIGH AND LOW FIELD NMR”, M. Urbańczyk, A. Shchukina, D. Gołowicz, K. Kazimierczuk
22. 31 January – 1 February 2019, Quantitative NMR Methods for Reaction and Process Monitoring, Kaiserlautern, Germany **Invited Talk**: "Interleaved time-resolved non-uniform sampling NMR for reaction monitoring", Mateusz Urbańczyk
23. 5-7 June, 2019, XLI Finnish NMR Symposium, Rokua, Finland, **Oral Presentation** "Why and how should you use interleaved time-resolved non-uniform sampling NMR for reaction monitoring?", Mateusz Urbańczyk, Alexandra Shchukina, Dariusz Gołowicz, Krzysztof Kazimierczuk
24. 8-12 July, 2019, Applied Inverse Problems Conference 2019, Grenoble, France **Invited Talk**: "Speeding up Laplace NMR", Mateusz Urbańczyk
25. 25-30 August 2019, EUROISMAR 2019, Berlin, Germany **Poster** "Comprehensive NMR Analysis of Pore Structure of Superabsorbing Cellulose Nanofibril Aerogels" Mateusz Urbańczyk, Yashu Kharbanda, Ossi Laitinen, Henrikki Liimatainen, Sakari Pallaspuuro, Sanna Komulainen, Ville-Veikko Telkki

26. 15-18 June 2022, CSBC 2020, Kuopio, Finland **Poster**"Synergy of Time-Resolved NUS and DOSY for the monitoring of photopolymerization of anthracene derivatives" Kristina Kristinaityte, Adam Mames, Mariusz Pietrzak, Tomasz Ratajczyk and Mateusz Urbańczyk
27. 10-14 July 2022, EUROMAR 2022, Utrecht, Netherlands **Poster**"Synergy of Time-Resolved NUS and DOSY for the monitoring of photopolymerization of anthracene derivatives" Kristina Kristinaityte, Adam Mames, Mariusz Pietrzak, Tomasz Ratajczyk and Mateusz Urbańczyk

Hobby:

Analogue photography

Arctic and sub-arctic long-distance trekking (e.g. Spitsbergen, Greenland)

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