



**List of potential supervisors at the BioMedChem Doctoral School of the UL
and Lodz Institutes of the Polish Academy of Sciences
in the academic year 2025/2026 in the chemical sciences**

Name of academic staff member	Area of scientific and research interests/ Proposed topics for the doctoral thesis
<p>Prof. dr hab. Piotr Bałczewski Centre of Molecular and Macromolecular Studies Polish Academy of Sciences in Łódź / Jan Długosz University in Częstochowa</p> <p>✉ piotr.balczewski@cbmm.lodz.pl ☎ +48 42 680 32 13 ORCID: https://orcid.org/0000-0001-5981-551X</p> <p><i>Leading discipline - chemical sciences</i></p>	<p><u>Area of scientific and research:</u> organic and heteroorganic chemistry, materials chemistry, pharmaceutical chemistry, ecotoxicological chemistry.</p> <p><u>Proposed topics for the doctoral thesis:</u> Synthesis of pharmaceutical formulations containing cardiovascular drugs and natural chemical compounds</p>
<p>Dr hab. Marek Brzeziński, prof. CMMS PAS Centre of Molecular and Macromolecular Studies Polish Academy of Sciences in Lodz</p> <p>✉ marek.brzezinski@cbmm.lodz.pl ☎ +48 42 68 03 328 ORCID: https://orcid.org/0000-0001-7620-4438</p> <p><i>Leading discipline - chemical sciences</i></p>	<p><u>Area of scientific and research:</u> polymer chemistry, polymer micro- and nanoparticles, biodegradable polymers, supramolecular chemistry, drug delivery systems, anticancer therapy, antibacterial materials.</p> <p><u>Proposed topics for the doctoral thesis:</u> Supramolecular nanoparticles able to block calcium channels in cancer cells.</p>



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<p>Prof. dr hab. Arkadiusz Chworoś Centre of Molecular and Macromolecular Studies Polish Academy of Sciences in Lodz</p> <p>✉ arkadiusz.chworos@cbmm.lodz.pl ☎ +48 42 680 32 20 ORCID: https://orcid.org/0000-0001-9924-0503</p> <p><i>Leading discipline - chemical sciences</i></p>	<p><u>Area of scientific and research:</u> Structural nucleic acids (DNA, RNA), bionanomaterials, RNA modifications, RNA-protein and protein-ligand interactions in theoretical and experimental studies</p> <p><u>Proposed topics for the doctoral thesis:</u></p>
<p>Dr hab. Kacper Druźbicki Centre of Molecular and Macromolecular Studies Polish Academy of Sciences in Lodz</p> <p>✉ kacper.druzbicki@cbmm.lodz.pl ☎ +48 42 68 03 324 ORCID: https://orcid.org/0000-0003-1759-2105</p> <p><i>Leading discipline - chemical sciences</i></p>	<p><u>Area of scientific and research:</u> Physical chemistry; chemical physics; theoretical chemistry; crystallography; optical and neutron vibrational spectroscopy (IR, Raman, INS); solid-state nuclear magnetic resonance spectroscopy (ssNMR); terahertz spectroscopy (THz); X-ray and neutron diffraction; neutron scattering methods; crystal lattice dynamics; phonons; density functional theory (DFT); <i>ab initio</i> molecular dynamics simulations (AIMD); nuclear quantum effects (NQE); High-Performance Computing (HPC).</p> <p><u>Proposed topics for the doctoral thesis:</u> <i>to be determined</i> (hybrid organic-inorganic materials for optoelectronics and photovoltaics: a combined experimental and theoretical approach).</p>
<p>Dr hab. Marta Dudek, prof. CBMM Centre of Molecular and Macromolecular Studies Polish Academy of Sciences in Lodz</p> <p>✉ marta.dudek@cbmm.lodz.pl ☎ + 48 42 680 32 39 ORCID: https://orcid.org/0000-0003-3412-0177</p> <p><i>Leading discipline - chemical sciences</i></p>	<p><u>Area of scientific and research:</u> Understanding of polymorphism of organic molecular crystals and crystallization processes, crystal structure prediction (CSP) calculations, solid-state and crystalline structure of organic compounds, design and synthesis of pharmaceutical cocrystals, solid-state NMR spectroscopy as a part of NMR crystallography approach.</p> <p><u>Proposed topics for the doctoral thesis:</u></p> <ol style="list-style-type: none"> 1. Understanding of crystallization preferences of pharmacologically active compound using crystal structure prediction calculations 2. Do monomorphic molecules exist? – theoretical and experimental evaluation of potentially monomorphic systems



Prof. dr hab. Anna Kowalewska

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Leading discipline - chemical sciences

Area of scientific and research:

Materials chemistry and nanotechnology (hybrid materials with advanced antimicrobial properties), organometallic chemistry, organic chemistry, polymer chemistry.

Proposed topics for the doctoral thesis:

Novel hybrid coatings with advanced antimicrobial properties for surface modification in atmospheric water harvesting systems. Preparation and characterization of hybrid nanostructured (super)hydrophilic polysilsesquioxane coatings (mono- and multicomponent); analysis of their morphology with special focus on their phase separation and surface properties.

**Dr hab. Agnieszka Krakowiak, assistant prof.
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*Leading discipline - chemical sciences (75%)
biological sciences 25%*

Area of scientific and research:

Interdisciplinary research in the field of chemistry, biochemistry and cellular studies of nucleosides, nucleotides and nucleic acids and their analogs and the possibility of their action as drugs, e.g. anticancer drugs, study of their transport into eukaryotic cells and search for new carriers for them, including nanoparticles.

Molecular biology; enzymology, in particular proteins from the histidine triad family (HIT proteins): method of isolation and purification, mechanism of action, course of reactions catalyzed by the enzyme studied, substrates, inhibitors, kinetics of enzymatic reactions, function of the enzymes studied in the cell.

Proposed topics for the doctoral thesis:

Study on the effect of new selenium nucleotide derivatives on the induction of reductive stress and redox balance and on the viability of cancer cells.



Dr hab. Tomasz Makowski, prof. CMMS
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Leading discipline - chemical sciences

Area of scientific and research:

The research conducted in my group focuses on various aspects of organic and polymeric materials, with particular emphasis on their modification, physicochemical properties, and applications in advanced technologies. The main research directions include:

1. Modification of biodegradable polymer surfaces – analysis of the effects of chemical and physical methods on the properties of agricultural-based materials.
2. Biodegradable nonwovens – development of fabrication methods and investigation of the properties of nonwovens based on biodegradable polymers.
3. Oriented organic layers – studies on the physicochemical properties of thin layers, including phase transitions and electrical properties.
4. Surface analysis of organic layers – application of X-ray techniques and atomic force microscopy (AFM) to examine the structure of thin layers.
5. Highly oriented organic layers – fabrication and analysis of small-molecule and polymer layers exhibiting anisotropic optical properties and nonlinear optical effects.

These studies are crucial for the development of modern functional materials, including biocompatible polymers and advanced optoelectronic coatings.

Proposed topics for the doctoral thesis:

Multifunctional Modification of Fibrous Materials: Properties and Applications of Nonwovens Based on Polymers from Natural Raw Materials.

Dr hab. Magdalena Małecka, prof. UŁ
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Leading discipline - chemical sciences

Area of scientific and research interests:

Crystallography, crystallochemistry, crystal structures of biologically active compounds, experimental electron density studies, intermolecular interactions, inclusion complexes, multicomponent crystals

Proposed topics for the doctoral thesis: Multicomponent Crystals, Theoretical and Physicochemical Analysis of Selected Drugs with Nitrogen-Containing Heterocyclic Compounds



<p>Dr hab. Beata Miksa, prof. CMMS PAS Centre of Molecular and Macromolecular Studies Polish Academy of Sciences in Lodz</p> <p>✉ miksa@chemia.uni.lodz.pl ☎ +48 42 680 32 18 ORCID: https://orcid.org/0000-0003-1288-4125</p> <p><i>Leading discipline - chemical sciences</i></p>	<p><u>Area of scientific and research:</u> The research focuses on designing drug carriers for targeted therapy using polysaccharide capsules. Studies are also being conducted on the encapsulation of proteins and enzymes using biomimetic liposome structures and polysaccharide capsules. The synthesis of conjugates based on a phenazine scaffold, to which anticancer compounds are attached, is planned. The research aims to develop modern therapy related to diagnostics and pharmacology.</p> <p><u>Proposed topics for the doctoral thesis:</u> Encapsulation of anticancer compounds in polysaccharide capsules for targeted therapy. Synthesis of modern anticancer drugs with theranostic properties.</p>
<p>Dr hab. Urszula Mizerska, prof. CMMS PAS Centre of Molecular and Macromolecular Studies Polish Academy of Sciences in Lodz</p> <p>✉ urszula.mizerska@cbmm.lodz.pl ☎ + 48 42 68 03 203 ORCID: https://orcid.org/0000-0003-3507-5486</p> <p><i>Leading discipline - chemical sciences</i></p>	<p><u>Area of scientific and research:</u></p> <ol style="list-style-type: none">1. Organosilicon polymeric materials forming linear, branched or cross-linked nano- and microstructures2. Surface properties of materials3. Coating materials for photovoltaic panels4. Porous, hybrid, pre-ceramic and ceramic materials <p><u>Proposed topics for the doctoral thesis:</u></p> <ol style="list-style-type: none">1. Synthesis of composite materials containing silicon carbide ceramic microspheres2. Advanced coating materials for photovoltaic panel glass
<p>Prof. dr hab. Marcin Palusiak University of Lodz, Faculty of chemistry</p> <p>✉ marcin.palusiak@chemia.uni.lodz.pl ☎ + 48 42 635 57 37 ORCID: https://orcid.org/0000-0002-0032-0878</p> <p><i>Leading discipline - chemical sciences</i></p>	<p><u>Area of scientific and research:</u> Structural Chemistry, Computational Chemistry, X-ray, Crystallography, High-Performance Computer Modeling.</p> <p><u>Proposed topics for the doctoral thesis:</u> Synthesis and structural studies of crystals of biologically active compounds.</p>



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Leading discipline - chemical sciences

Area of scientific and research:

Structural chemistry

Proposed topics for the doctoral thesis:

Undiscovered solid state forms of drugs - new challenges to structural chemistry.

Dr hab. Ireneusz Piwoński

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Leading discipline - chemical sciences

Area of scientific and research interests:

Nanotechnology and materials chemistry. Preparation and physicochemical characterization of nanomaterials exhibiting photocatalytic and adsorption properties (metal oxides modified with metals and other types of nanostructures). Silica systems with a large specific surface area for adsorption and binding of active ingredients such as selected pesticides, drugs, dyes and their controlled release under the influence of external stimuli, e.g. pH. Application of microscopic methods - scanning electron microscopy with elemental analysis SEM/EDS, atomic force microscopy AFM and spectroscopic methods (UV-Vis, FT-IR, Raman, xps) and others for research in the field of materials engineering and chemistry (ceramic, metallic nanomaterials). BET, XRD, porosimetric measurements. Synthesis methods: sol-gel, hydro-, solvothermal.

Proposed topics for the doctoral thesis:

"Functional Dendrimeric Silica for Adsorption, Degradation and Controlled Release of Contents".

The work will consist in developing methods for the synthesis of a new type of silica material with dendrimer morphology. The obtained material, after the stage of characterization of physicochemical properties, will be used for the adsorption of selected nanomaterials (nanoparticles, drugs and dyes). The next direction of use will be the modification of the obtained silica structures with photocatalysts for the decomposition of pollutants. The last stage will be the use of silica to enclose active ingredients (e.g. pesticides) in its pores and then their release in a controlled manner under the influence of external factors, e.g. pH.



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Leading discipline - chemical sciences

Area of scientific and research:

My scientific interests revolve around electrochemistry. Specifically, I am interested in the production of electrochemical systems, the application of electrochemistry in energy conversion, phase boundaries such as liquid-liquid interfaces, electrochemistry of biomimetic systems, 3D printing, miniaturization for electrochemistry and electrochemical miniaturization, membrane-based techniques, electrochemical synthesis of new materials including electrochemically assisted deposition reaction, and the design of electrochemical sensors.

Proposed topics for the doctoral thesis:

Direct Ink Writing for bioelectrochemical applications.

3D printed electrodes for energy storage and conversion applications.

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Leading discipline - chemical sciences

Area of scientific and research interests:

electrochemistry; electroanalysis; miniaturization of electroanalytical systems; sensors; food chemistry; preparation of biological samples; environmental analysis

Proposed topics for the doctoral thesis:

Self-Assembled Soft Sensing Monolayers for Fungal metabolites detection

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Leading discipline - chemical sciences

Area of scientific and research:

Physicochemistry of semicrystalline polymers, including biodegradable and/or derived from renewable sources; the role of the micro-/nanostructure of the amorphous and crystalline phases; barrier, mechanical, and thermo-mechanical properties of polymer systems

Proposed topics for the doctoral thesis:

The role of the microstructure of the amorphous phase in the barrier and mechanical properties of semicrystalline polymers.



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Leading discipline - chemical sciences

Area of scientific and research interests:

Analytical chemistry and electrochemistry, with particular focus on:

- designing new types of sensors
- modifications of working electrodes used in voltammetry
- new procedures for detecting biologically active substances
- interactions between nucleic acids and various chemical substances
- food analysis

Proposed topics for the doctoral thesis:

Title” Advanced electrochemical techniques in bioelectroanalysis”

The proposed doctoral research focuses on the development and application of advanced electrochemical methods for the analysis of bioactive compounds, with particular emphasis on chemotherapeutic agents. The objective of the study is to design highly sensitive and selective sensors capable of rapid and precise identification of these compounds in various biological matrices, as well as conducting a detailed interdisciplinary investigation of their interactions with DNA.

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Leading discipline - chemical sciences

Area of scientific and research:

Polymers, Nanocomposites, Polymer Blends, Plastics Engineering, Materials Science, Polymer Structure Analysis, Solid State Physics, Shape Memory Effect, Plastic Deformation, Lattice Structure, 3D/4D Printing, Finite Element Analysis.

Proposed topics for the doctoral thesis:

Effect of Severe Plastic Deformation on Crystallinity and Mechanical Properties of Biodegradable Polymer Systems; Development of Hierarchical Lattice Structures from Polymer Blends for Energy Absorption Applications; Controlled Crazing in PHA-Based Systems: Mechanism, Morphological Evolution, and Functional Property Enhancement.



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