

Faculty of Chemical Technology
University of Pardubice

Suggestions for the PhD topics for
foreign candidates

PhD study program: **Analytical chemistry**

Requirements for the student's knowledge: The candidate must have master's degree in biochemistry or analytical chemistry.

Development and optimization of uni- and two-dimensional liquid chromatography of naturally occurring compounds, physiologically relevant, and industrial mixtures

Supervisor: Assoc. Prof. Petr Česla

Analysis of biologically active compounds in natural products

Description: Development of HPLC and HPLC/MS methods for separation and quantification of biologically active compounds present in different natural products (herbs, plants, foods etc.).

Supervisor: Assoc. Prof. Lenka Česlová

Metabolic pathways of sphingolipids and phospholipids in cancer

Supervisor: Prof. Michal Holčápek

Metabolomics in the quantitative analysis of biological samples using mass spectrometry

Supervisor: Prof. Michal Holčápek

Statistical analysis and bioinformatic processing of large data sets of lipidomic data

Supervisor: Prof. Michal Holčápek

PhD study program: **Inorganic Chemistry**

Requirements for the student's knowledge: The candidate must have master's degree in the field of chemistry.

Lactyl lactylates and their use in the cosmetic industry

Supervisor: Prof. Aleš Růžička

Preparation and characterization of compounds containing metal - non-metal multiple bonds

Supervisor: Prof. Aleš Růžička

Preparation and synthesis of phthalocyanines and their use in medicine

Supervisor: Prof. Aleš Růžička

Synthesis and characterization of diborane and guanidine complexes

Supervisor: Prof. Aleš Růžička

Positively charged polyhedral (hetero)borane compounds

Supervisor: Prof. Aleš Růžička

The chemistry of redox non-innocent N,N-chelating ligands in the field of heavier group 15 elements.

Supervisor: Assoc. Prof. Libor Dostál

C,N-coordinating ligands based on an indole framework for coordination of main group elements.

Supervisor: Assoc. Prof. Libor Dostál

Transition metal complexes of selected stibinidene ligands.

Supervisor: Assoc. Prof. Libor Dostál

Metallocene-based hybrid ligands

Supervisor: Assoc. Prof. Milan Erben

Group 5 heterocycles bearing metallocene fragments

Supervisor: Assoc. Prof. Milan Erben

Preparation and catalytical activity of TM complexes containing non-symmetrical E,Y,E'-chelating ligands (E, E' = Si, Ge, Sn; Y = C or N)

Supervisor: Prof. Roman Jambor

Insertion reactions of N-coordinated tetraenes alkoxides to C=Y polar bonds (Y = O or N).

Supervisor: Prof. Roman Jambor

Determination of free radicals by EPR spectroscopy

Supervisor: Prof. Jaromír Vinklár

Preparation and characterization of vanadocene complexes with potential cytostatic activity

Supervisor: Prof. Jaromír Vinklár

PhD study program: **Inorganic Technology**

Requirements for the student's knowledge: The candidate must have master's degree in the field of inorganic chemistry or materials chemistry.

Study of phase changes of inorganic glasses

Supervisor: Assoc. Prof. Pavla Honcová

Inorganic substances for thermal energy storage

Supervisor: Assoc. Prof. Pavla Honcová

Preparation of special inorganic pigments with high NIR reflectivity

Supervisor: Assoc. Prof. Žaneta Dohnalová

Oxide perovskites as effective adsorbents of organic colorants

Supervisor: Assoc. Prof. Žaneta Dohnalová

Requirements for the student's knowledge: the candidate must have a master's degree in the field of biochemistry or analytical chemistry (analysis of biological samples).

Dried blood spot technique for the diagnosis of various metabolic diseases

Description: dried blood spot technique, sample preparation, high-performance liquid chromatography coupled to mass spectrometry, gas chromatography coupled to mass spectrometry.

Supervisor: Prof. Roman Kandár

Dried blood spot technique for studying human metabolism

Description: dried blood spot technique, sample preparation, high-performance liquid chromatography coupled to mass spectrometry, gas chromatography coupled to mass spectrometry.

Supervisor: Prof. Roman Kandár

Methods for identification of immunoreactive targets in plasma of multiple myeloma patients

Supervisor: Prof. Bílková Zuzana

Spread of bacterial resistance genes in wastewater

Description: a study of microbiological quality of different wastewater (processed plant water, municipal wastewater, hospital wastewater), determination of antibiotics resistance (sampling, cultivation techniques, PCR, real-time PCR, electrophoresis), gene transfer, and spread.

Supervisor: Assoc. Prof. Marcela Pejchalová

Development of a novel method detecting DNA fragmentation

Description: quantification of DNA fragmentation, detection of apoptosis induction, fluorescence microscopy or imaging platform, cell cultivation, tissue culture.

Supervisor: Assoc. Prof. Tomáš Roušar

Estimating the oxidative stress in blood cells treated with heavy metals

Description: quantification of the oxidative status in blood cells by different techniques, cell cultivation.

Supervisor: Assoc. Prof. Tomáš Roušar

PhD study program: **Economics and Management of Businesses with Process Manufacturing Operations**

Requirements for the student's knowledge: The candidate must have master's degree in the field of economics and management of businesses with process manufacturing operations.

Design of sustainable packaging for consumer chemicals

Supervisor: Assoc. Prof. Lenka Branská

Reuse strategy in relation to consumer chemicals

Supervisor: Assoc. Prof. Lenka Branská

The role of responsible innovation in business performance

Supervisor: Assoc. Prof. Michaela Kotková Stříteská

Evaluation of value creation of process manufacturing products

Supervisor: Jan Vávra, Ph.D.

PhD study program: **Physical chemistry**

Requirements for the student's knowledge: The candidate must have a master's degree in chemistry and chemical-technology programs.

Trapdoor adsorption and cation gating in the zeolites

Supervisor: Prof. Roman Bulánek

Selective separation of alkenes from alkanes by adsorption on molecular sieves

Supervisor: Prof. Roman Bulánek

Advanced synthesis of borosilicate materials for catalytic applications

Supervisor: Prof. Roman Bulánek

Zeolite reductive demetalation for preparation of CO₂ hydrogenation catalysts

Supervisor: Prof. Roman Bulánek

Viscosity behavior of highly supercooled chalcogenide liquids

Supervisor: Prof. Jiří Málek

Universal structural relaxation in amorphous solids below the glass transition

Supervisor: Prof. Jiří Málek

Crystallization kinetics in glasses, amorphous materials and supercooled liquids

Supervisor: Prof. Jiří Málek

Core@shell SiO₂@LDH and Al₂O₃@LDH-based materials with tuneable morphology and acid-base / redox properties

Supervisor: Prof. Libor Čapek

The use of mixed oxides as heterogeneous catalysts for valorization of ethanol

Supervisor: Assoc. Prof. Martin Hájek

Vegetables oils as raw material to preparation of epoxides and their applications

Supervisor: Assoc. Prof. Martin Hájek

PhD study program: **Chemical and Process Engineering**

Specialization: Chemical Engineering
 Environmental Engineering

Requirements for the student's knowledge: The candidate must have master's degree in the field of chemistry and chemical technology.

Fate of gadolinium-based contrast agents in the environment and their entry into food chains

Supervisor: Assoc. Prof. Anna Krejčová

The separation of various pollutants from wastewaters using combined membrane processes.

Supervisor: Prof. Petr Mikulášek

Study or application of innovative disposable electrochemical techniques for environmental and health protection.

Supervisor: Prof. Ladislav Novotný

New methods of electrochemical monitoring of biologically active organic substances in environmental, biological and food matrices.

Supervisor: Assoc. Prof. Renáta Šelešovská

Recycling of used textile dye baths by the action of ionic liquids.

Supervisor: Assoc. Prof. Tomáš Weidlich

Treatment of wastewater contaminated with halogenated biocides by hydrodehalogenation.

Supervisor: Assoc. Prof. Tomáš Weidlich

PhD study program: **Chemistry and Technology of Inorganic Materials**

Requirements for the student's knowledge: The candidate must have master's degree in the field of chemistry with a background in materials chemistry, materials technology, materials characterization methods, solid-state chemistry, solid-state physics.

Phase-changes in chalcogenide-based thin films

Supervisor: Prof. Petr Němec

Photosensitive glasses - preparation, structure, properties

Supervisor: Assoc. Prof. Eva Černošková

Preparation of chalcogenide thin films and surface functionalization for various applications

Supervisor: Prof. Miroslav Vlček

Upconversion photoluminescence in rare-earth-doped BaCeO₃ perovskites

Supervisor: Prof. Tomáš Wágner

Exploring physical correlations in Bi₂Se₃ - from defect structure to electronic transport, magnetism and superconductivity

Supervisor: Prof. Čestmír Drašar

Exploratory search for new low-dimensional compounds for electronic applications - complex TM iodobismuthates and iodoantimonates

Supervisor: Prof. Čestmír Drašar

Optical properties of thin film transition metal dichalcogenides

Supervisor: Prof. Čestmír Drašar

Structure and properties of transition metal containing phosphate and borophosphate glasses

Supervisor: Prof. Petr Mošner

PhD study program: **Organic chemistry**

Requirements for the student's knowledge: The candidate must have master's degree programmes in chemistry or chemical technology, materials chemistry, chemical and process engineering and chemical-biological sciences.

Heterogeneous catalysts based on graphitic carbonitride in organic synthesis

Supervisor: Prof. Miloš Sedlák

Synthesis and characterization of molecularly imprinted polymers designed for separation of biologically active compounds

Supervisor: Prof. Miloš Sedlák

Study of the mechanism of click reaction between sydnone and alkynes

Supervisor: Prof. Jiří Hanusek

Organic electrolytes for Li-ion batteries

Supervisor: Prof. Filip Bureš

Volatile organometallics for atomic layer deposition

Supervisor: Prof. Filip Bureš

Visible light-initiated transformations in organic synthesis

Supervisor: Prof. Filip Bureš

Controlling regio(site)selectivity of transition metal assisted directed C-H functionalization reactions

Supervisor: Assoc. Prof. Jiří Váňa

Photoswitchable C-H functionalization reactions

Supervisor: Assoc. Prof. Jiří Váňa

PhD study program: **Organic technology**

Requirements for the student's knowledge: The candidate must have master's degree in the field of chemistry, preferably in the field of organic chemistry, organic technology, textile chemistry, pharmaceutical chemistry or dyestuff chemistry.

Isolation, Characterization and Targeted Synthesis of Selected Fluorinated Prostaglandine Impurities

Supervisor: Assoc. Prof. Aleš Imramovský

Novel Salicylic Acid Based Organic Compounds as Proteasome Inhibitors

Supervisor: Assoc. Prof. Aleš Imramovský

New Materials with Strong Solid-state Near Infrared Emission – Efficient Strategy to Hyperfluorescence

Supervisor: Assoc. Prof. Aleš Imramovský

Synthesis, characterization and application of organic colorants with anti-corrosion properties

Supervisor: Prof. Radim Hrdina

Synthesis, characterization and application of organic colorants with antimicrobial properties

Supervisor: Prof. Radim Hrdina

Preparation, characterization and application of new wound dressings based on polysaccharides

Supervisor: Prof. Radim Hrdina

New hydrogen peroxide stabilizers for bleaching flax wool and bleaching of ramie yarn

Supervisor: Prof. Radim Hrdina

Detergents for washing in sea water

Supervisor: Prof. Radim Hrdina

PhD study program: **Engineering of Energetic Materials**

Requirements for the student's knowledge: The candidate must have master's degree in the field of chemistry, preferably in the field of organic chemistry or organic technology.

Infrared and Raman spectra of isotopically labeled energetic materials

Supervisor: Assoc. Prof. Zdeněk Jalový

Synthesis and characterisation of energetic additives for propellants

Supervisor: Assoc. Prof. Robert Matyáš

Dust explosion of the dusts containing explosives particles

Supervisor: Assoc. Prof. Břetislav Janovský