Annex No. 1 to the Call for Applications for Postdoctoral Research Positions for the Academic Year 2025/2026

TOPIC 1

Workplace: Faculty of Science, Institute of Physic, Department of Condensed Matter Physics

Topic: Preparation and study of catalysts for the production of green hydrogen by photoelectrolysis of water.

Annotation: The postdoctoral research will be focused on the synthesis of low-cost active and stable catalysts for photoelectrochemical hydrogen evolution. The aim is to improve the catalytic capabilities of mixed iron and copper oxides (CFO) by using appropriate preparation techniques. Accordingly, various strategies will be used to synthesize CFO-based samples, such as sputtering and surface treatment of the catalysts with various layers in order to improve the stability and activity of the catalyst. Selected methods of structural and morphological characterization will also be used to investigate the physical properties of the produced catalysts.

Host professor: Prof. Ing. Martin Orendáč DrSc.
Email: martin.orendac@upjs.sk

Supervisor: Doc. Mgr. Vladimir Komanický Ph.D.
Email: vladimir.komanicky@upjs.sk

Professional requirements/criteria for the candidate: The applicant for this position must have experience in research in the field of photoelectrocatalysis, electrocatalysis, fuel cells and electrolyzers, must have strong theoretical and practical experience in the field of condensed matter physics, physical chemistry and materials research. One of the main requirements is also practical skills in the preparation of thin catalytic layers using magnetron sputtering and electrodeposition. The applicant's professional qualifications must be supported by publications or patents in the field of electrocatalysis or photocatalysis.

TOPIC 2

Workplace: Faculty of Science, Institute of Physic, Department of Condensed Matter Physics

Topic: Optimized Magnetic Nanoparticles for Enhanced Nucleic Acid Separation Processes.

Annotation: Magnetic nanoparticles have high surface area to volume ratio, high binding rate with detection substances, and can perform magnetically controllable aggregation and dispersion and separation of nucleic acids simple and easy. Magnetic separation of nucleic acids has several advantages compared to other techniques used for the same purpose. Nucleic acids can be isolated directly from crude sample materials such as blood, tissue homogenates, cultivation media, water, etc. Due to the possibility of adjusting the magnetic properties of the

nanoparticles, they can be removed relatively easily and selectively even from viscous sample suspensions.

The aim of the postdoctoral researcher position will be the preparation, structural and magnetic characterization of magnetic nanoparticle systems of different shapes and chemical compositions and the subsequent verification of the quality of magnetic nanoparticles for the isolation of nucleic acids.

The work will focus on the systematic study of the influence of different shapes and different chemical compositions of nanoparticles, as well as the influence of functional groups bound on the surface of nanoparticles on their physicochemical properties, magnetic separation and affinity for nucleic acids. Magnetic measurements and experimental methods such as electron microscopy, X-ray diffraction, dynamic and electrophoretic light scattering, Fourier transform infrared spectroscopy, as well as tests to determine the separation efficiency of the nanoparticles such as fluorescence displacement assays of ethidium bromide and RNA extraction using nanoparticles will be used to characterize the nanoparticles produced. The goal is to optimize surface chemical functionalization for maximum yield and specificity of separation of genetic material from complex biological samples.

The results of this research will contribute to the development of novel, high-efficiency magnetic extraction systems that will find applications in advanced diagnostic technologies and biomedical research.

Host professor: prof. RNDr. Pavol Sovák, CSc.
Email: pavol.sovak@upjs.sk

Supervisor: Assoc. Prof. Adriana Zeleňáková, DrSc.
Email: adriana.zelenakova@upjs.sk

Professional requirements/criteria for the candidate: Completed a PhD on a topic dealing with the preparation and characterization of nanoparticles. The candidate should have experience in nanoparticle synthesis as well as experience with protocols and experiments to determine the separation efficiency of magnetic nanoparticles. For the postdoctoral position, the applicant will submit at least two published papers registered in Current Contents and a list of participation in at least 8 scientific conferences.

TOPIC 3

Workplace: Faculty of Science, Institute of Physics, Department of Condensed Matter Physics

Topic: Magnetization processes in soft magnetic materials in application conditions

Annotation: The project is focused on the study of selected soft magnetic materials with outstanding features such as electrical steels and compacted composite materials. The influence of preparation parameters on magnetic properties in various magnetization conditions, which are crucial for applications, will be studied. The aim will be to optimize the properties of the studied materials based on the understanding of the active magnetization processes.

Host professor: prof. Ing. Martin Orendáč, DrSc.
Email: martin.orendac@upjs.sk

Supervisor: doc. RNDr. Ján Füzer, PhD.
Email: jan.fuzer@upjs.sk

Professional requirements/criteria for the candidate:

- PhD. in Condensed Matter Physics, Materials Science, Electronics or a related field
- experience in the field of magnetic and/or structural characterization of soft magnetic materials
- at least three publications in scientific journals listed in the WoS database, at least one of them as the first or corresponding author

TOPIC 4

Workplace: Faculty of Science, Institute of Chemistry, Department of Analytical Chemistry

Topic: Development of green analytical procedures based on the combination of microextraction methods with innovative devices for UV-Vis and fluorescence detection

Annotation: The main objective of the project will be the development of new analytical methods in line with current requirements for innovation, efficiency and environmental friendliness. In this respect, combinations of microextraction techniques, mainly based on the use of alternative green solvents, with UV-Vis and fluorescence spectrometry methods are seen as very promising. However, such combinations need efficient tools for measuring the analytical signals, which include optical and fluorescence probes. The introduction of these innovative devices will be beneficial for online detection of selected analytes when coupled with green microextraction techniques, or alternatively, with extraction-free procedures. This not only greatly simplifies and speeds up the analysis, but also allows us to analyse composite samples directly at the specified location and in real time with high sensitivity. The reliability of the developed methods and procedures will be verified by chemometric evaluation of the obtained results.

Host professor: Prof. Dr. Yaroslav Bazeľ, DrSc.
Email: yaroslav.bazel@upjs.sk

Supervisor: Prof. Dr. Yaroslav Bazeľ, DrSc.
Email: yaroslav.bazel@upjs.sk

Professional requirements/criteria for the candidate:

- PhD. degree in Analytical Chemistry
- experience in spectral and separation (microextraction) methods
- active scientific activity: at least 5 publications in Q1 and Q2 category journals registered in WoS or Scopus database, participation in scientific conferences, foreign internship

TOPIC 5

Workplace: Faculty of Science, Institute of Chemistry, Department of Analytical Chemistry

Topic: Development of new miniaturized solid-phase extraction methods for analysis of environmental and food samples: synthesis of new and use of conventional sorbents

Annotation: One of the current and important trends in contemporary analytical chemistry is the development of new procedures in accordance with the requirements of green analytical chemistry. There are several different ways to improve the "greenness" of analytical procedures. Among which include, for example miniaturization of analytical techniques, i.e. the development of procedures that would allow obtaining a high-quality analytical result using a significantly smaller amount of reagents, replacing commonly used dangerous chemicals with safer ones, and automation. The topic is devoted to the first two of the above-mentioned ways. The development of miniaturized solid phase extraction (μ-SPE) methods for the determination of analytes in environmental and food samples is a current task in analytical chemistry. The research includes the development of new and/or improvement of existing μ-SPE techniques for the concentration and separation of target analytes using known sorbents as well as the synthesis of new sorbents based on LDH (layered double hydroxides) in order to improve their analytical characteristics. The developed methods will be verified by the analysis of real samples. μ-SPE methods can significantly reduce and sometimes completely eliminate the use of organic solvents during analysis. That is why these techniques are considered very attractive from the point of view of green analytical chemistry and at the same time enable the development of robust and highly competitive analytical methods. It is necessary to emphasize the high publication and citation potential of similar research in Q1-Q2 category journals. Modification of the surface of sorbents using various types of green solvents, use of various types of porous/fibrous materials as sorbents (e.g. nonwoven material of disposable medical masks), or synthesis of new types of sorbents (e.g. LDH) makes the scope of application of μ-SPE methods in analysis almost unlimited.

Host professor: prof. Dr. Yaroslav Bazeľ, DrSc.
Email: yaroslav.bazel@upjs.sk

Supervisor: prof. Mgr. Vasiľ Andruch, DSc.
Email: vasil.andruch@upjs.sk

Professional requirements/criteria for the candidate:

- Experience in green analytical chemistry
- Experience in microextraction methods, including: DSPE, MEPS, μ-SPEed, PT-μ SPE, etc.
- Experience with spectrometric techniques
- Experience in student supervision
- Adequate publication activity in the field

TOPIC 6

Workplace: Faculty of Science, Institute of Chemistry, Department of Physical Chemistry

Topic: Functional Coatings for Controlled Degradation of Absorbable Metals

Annotation: This project focuses on the development and electrochemical evaluation of functional surface coatings for absorbable metals intended for biomedical applications, particularly temporary implants. The main goal is to tailor degradation rates and improve biocompatibility through surface modifications. Emphasis will be placed on understanding the electrochemical behavior of coated materials and optimizing coating properties to ensure predictable and safe metal resorption in physiological environments.

Host professor: prof. RNDr. Renáta Oriňaková, DrSc.
Email: renata.orinakova@upjs.sk

Supervisor: prof. RNDr. Renáta Oriňaková, DrSc.
Email: renata.orinakova@upjs.sk

Professional requirements/criteria for the candidate:

- PhD in a Physical chemistry or related field
- demonstrated experience in metal-based material research
- solid understanding of chemical principles, including material structure, properties, and composition
- solid understanding and experience with electrochemical methods (linear sweep voltammetry, cyclic voltammetry, electrochemical impedance spectroscopy, e.g.)
- proficiency in experimental design and characterization techniques, such as spectroscopy and microscopy
- strong analytical skills and ability to interpret complex data
- excellent problem-solving abilities to tackle material chemistry-related challenges and optimize processes
- effective communication and collaboration skills to work within multidisciplinary teams

TOPIC 7

Workplace: Faculty of Science, Institute of Mathematics, Department of Discrete Mathematics

Topic: Aggregation by operators of nonadditive and nonlinear analysis

Annotation: Data aggregation (the process of combining multiple values into a single representative value) has taken on an entirely new dimension with the advent of computing technology. With technological advancements, it becomes increasingly essential to develop advanced aggregation methods that can effectively address the challenges posed by the growing dynamism of information. Modern approaches no longer rely solely on basic arithmetic operations; instead, they employ sophisticated nonlinear and nonadditive methods, such as OWA operators and the Choquet integral. These techniques enable a more precise capture of interactions and subtle nuances in data, which is critically important in fields such as image processing, cybernetic analysis, economic modelling, and risk management. Research

conducted at Faculty of Science of Pavol Jozef Šafárik University in Košice confirms that the use of non-additive and nonlinear aggregation significantly improves edge detection, inpainting, and noise reduction in digital images. Such enhancements have direct potential applications in systems for autonomous control, medical diagnostics, and computer vision in general. The aim of the project is to build upon previous research and continue the development of advanced nonadditive and nonlinear aggregation operators, including their software implementation and experimental validation, with the goal of more effectively modelling complex and nonlinear interactions among data elements. Such an interdisciplinary methodology not only provides significant theoretical and educational benefits but also offers concrete innovative solutions that enhance the accuracy and adaptability of systems working with complex data structures.

The applicant's role in this project will be to:

- Develop the theoretical aspects of nonlinear aggregation operators;
- Design and implement new aggregation techniques and evaluate their effectiveness in image processing tasks, data classification, and other data science applications;
- Present the achieved results at international conferences.

Host professor: prof. RNDr. Tomáš Madaras, PhD.
Email: tomas.madaras@upjs.sk

Supervisor: doc. Mgr. Jozef Kiseľák, PhD.
Email: jozef.kiselak@upjs.sk

Professional requirements/criteria for the candidate:

- completed doctoral studies in Mathematics
- at least three published articles in international journals indexed in the Web of Science Master Journal List and Scopus, including at least one with full (100%) sole authorship
- active involvement in scientific projects with active presentation at international forums
- advanced programming skills and relevant experience in data aggregation within the field of computer vision, including data analysis

TOPIC 8

Workplace: Faculty of Law, Department of Labour Law and Social and Security Law

Topic: Artificial Intelligence in Eployment Relations

Annotation: Artificial intelligence is becoming an integral part of everyday life, including in the field of labour relations. The objective of the postdoctoral research is to conduct a thorough, detailed, and comparative analysis of the impact of artificial intelligence on the existing legal framework (both at the national and global levels), and to assess the need for modification of standard legal institutes within labour law. Equally, the research activity should focus on examining the implications of integrating artificial intelligence into the labour law environment

in correlation with the potential threat to employee protection, particularly (though not exclusively) with regard to compliance with the principle of equal treatment.

Host professor: prof. JUDr. Peter Molnár, PhD.
Email: peter.molnar@upjs.sk

Supervisor: assist. prof. Marcel Dolobáč, PhD.
Email: marcel.dolobac@upjs.sk

Professional requirements/criteria for the candidate:

- completed second-level degree in Law
- completed third-level degree in Law/Labour Law or a related field
- language skills – English at a minimum level of C1
- scientific and publication activity in the field of Labour Law

TOPIC 9

Workplace: Faculty of Law, Department of Constitutional and Administrative Law
Topic: Judicial power and constitutional principles of justice

Annotation: The principles of justice find their content expression in the Constitution of the Slovak Republic either at a general level, as basic principles on which the judicial power is based. The second aspect is their specific expression in the form of specific procedural principles. The importance of constitutional principles is increasing, as they represent one of the basic criteria within the decision-making processes in the judiciary. The judiciary continues to be a fundamental part of the rule of law, adequate interpretation and application of constitutional principles is a prerequisite for its correct application. The research is focused both on the analysis of the judicial power in the Slovak Republic, as well as on the mapping and critical analysis of the constitutional principles of justice, including their impact on citizens' rights in order to improve application practice.
Host professor: prof. JUDr. Gabriela Dobrovičová, CSc.
Email: gabriela.dobrovicova@upjs.sk

Supervisor: doc. JUDr. Alena Krunková, PhD.
Email: alena.krunkova@upjs.sk

Professional requirements/criteria for the candidate: third-degree university education in the field of law

TOPIC 10

Workplace: Faculty of Law, Department of Constitutional Law and Administrative Law

Topic: Possibilities of using artificial intelligence in the field of prevention and repression of environmental offences

Annotation: The scale, scope and complexity of today's technological advances undoubtedly affect all areas of our daily lives. The field of environmental protection is no exception, where the development of information and communication tools (especially artificial intelligence) is making a significant contribution to achieving long-term environmental sustainability. However, in addition to eco-innovation, this area also raises the question of the possibility of using artificial intelligence in decision-making processes on environmental offences. In connection with the above, the research within the postdoctoral fellowship should be limited to the examination of legal possibilities of using artificial intelligence in decision-making processes in the field of prevention and repression of environmental offences, while using a comparison with other countries, taking into account the legal requirements for enabling such automation of decision-making processes in public administration in the Slovak Republic in terms of guaranteeing the principles of legality (including the protection of fundamental rights and freedoms), as well as defining the obstacles preventing the use of this tool and the formulation of appropriate legal solutions minimizing, respectively, the use of this tool in the field of prevention and repression of environmental violations. The aim of the proposal is to define and define the legal basis for the application of the legal remedies, in particular those which would eliminate the impact of these obstacles.

Host professor: prof. JUDr. Sergej Romža, PhD.
Email: sergej.romza@upjs.sk

Supervisor: doc. JUDr. Radomír Jakab, PhD.
Email: radomir.jakab@upjs.sk

Professional requirements/criteria for the candidate:

- higher education degree III in law
- publications related to the topic, including at least 2 publications in WoS/Scopus (acceptance is sufficient)
- recognition of the results of research activities by an external institution or university authorities
- active participation in scientific conferences
- experience in solving research projects
- contribution to the development of the university by participating in the development activities of the university/faculty or by participating in university/faculty bodies
- active knowledge of at least 1 world language

TOPIC 11

Workplace: Faculty of Law, Department of History of State and Law

Topic: Development and parallels of restorative justice and their legacy for modern criminal law

Annotation: Restorative justice is a process that aims to reduce injustice. It aims to strengthen justice and reduce crime. In order to achieve this, it seeks to bring together all the parties involved - that is, the victim who has been harmed, the offender who has caused the harm in question, and the community in which the harm has been caused. Restorative justice in its modern understanding and meaning, however, did not appear on the scene until the end of the last century. However, the various ideological concepts, principles, elements or starting points

of restorative justice have been present in our past since the earliest times and can be seen in the development of (criminal) law and its institutes. The aim of the research is a systematic analysis of the historical-legal foundations and individual elements of restorative justice in the past - with a subsequent identification of their (possible) legacy in the criminal policy of the state and modern criminal law. Thus, the research will contribute to the understanding of the investigated historical issue of the development of restorative justice and, in a broader sense, of contemporary justice and criminal policy - since the development of individual institutions (and more so of public policies) is one of the determinants that also influence their future development.

Host professor: prof. JUDr. Gabriela Dobrovičová, CSc.
Email: gabriela.dobrovicova@upjs.sk

Supervisor: doc. JUDr. Miroslav Fico, PhD.
Email: miroslav.fico@upjs.sk

Professional requirements/criteria for the candidate:

- achieved PhD. degree of university study in the field of law
- publishing activities registered in professional databases WoS, SCOPUS and ERIH+
- publishing activities in domestic and foreign scientific and professional journals and proceedings not registered in prestigious databases
- experience in solving scientific research projects
- completing study stays
- teaching practice
- active knowledge of at least 1 world language

TOPIC 12

Workplace: Faculty of Public Administration, Department of Public Policy and Theory of Public Administration

Topic: Disinformation and public policy

Annotation: Digital transformation brings several positives for the entire society, especially in the form of increased quality, efficiency, transparency, openness of provided public services. Digital spreading of content is also associated with current threats in the form of disinformation. Disinformation aimed at spreading false content and influencing the process of public policy making results in higher requirements for the resilience of public bodies and the entire public administration. The postdoc research will be focused on the analysis of the origins and reasons for the emergence of disinformation, identifying the reasons why the population trusts disinformation, proposing options for dealing with disinformation in connection with public policy making at the central and local level. The topic contributes to a broader international scientific elaboration of the topics of public policy, disinformation, fake news, resilience of public administration and others.
Host professor: doc. Ing. Silvia Ručinská, PhD., university professor
Email: silvia.rucinska@upjs.sk

Supervisor: doc. Ing. Silvia Ručinská, PhD., university professor

Email: silvia.rucinska@upjs.sk

Professional requirements/criteria for the candidate:

- PhD. in relevant discipline
- international publications focused on the post-doc topic published in scientific journals
- ability to conduct autonomous quality research at a post-doctoral level
- spoken and written English language
- previous experience with scientific projects in the position of principal investigator or participant is welcome

TOPIC 13

Workplace: Faculty of Arts, Department of Psychology

Topic: Attitudes to uncertainty and work outcomes – burnout and engagement

Annotation: Previous research has highlighted the role of attitudes towards uncertainty in a wide range of work outcomes, including, in addition to objective outcomes, mental health, with two variables indicative of work experience - work engagement and burnout symptoms - being no exceptions. However, the results to date are based on the use of quantitative methods, which, while allowing for the identification of smaller effects, may neglect important details regarding relationship dynamics or individual differences. This topic aims to help fill this gap by combining quantitative and qualitative approaches to detect the complex and arguably reciprocal relationship between attitudes towards uncertainty on the one hand and work engagement and burnout symptoms on the other. In addition to classical questionnaire methods, an analysis of workers' statements will be used to track cognitive, motivational and emotional aspects of work, in addition to the variables mentioned above, where it will be possible to examine the temporal sequence of the onset of overload and the possible subsequent burnout syndrome, taking these aspects into account.

Host professor: prof. PhDr. Margita Mesárošová, CSc.
Email: margita.mesarosova@upjs.sk

Supervisor: assoc. prof. Mgr. Ing. Jozef Bavoľár, PhD.
Email: jozef.bavolar@upjs.sk

Professional requirements/criteria for the candidate:
Completed third-level university education in the field of social psychology and work psychology, or psychology. Publications in the field of psychology.

TOPIC 14

Workplace: Faculty of Arts, Department of Slovak Studies, Slavonic Philologies, and Communication

Topic: Trauma and its artistic grasp in contemporary Slovak prose

Annotation: Mapping authorial strategies and narrative procedures when modelling the teme

of trauma; taking into account axiological criteria when considering the originality of individual authorial poetics.

Host professor: doc. Marián Milčák, PhD.
Email: marian.milcak@upjs.sk

Supervisor: prof. PhDr. Marián Andričík, PhD.
Email: marian.andricik@upjs.sk

Professional requirements/criteria for the candidate:

- completed third level of university
- adequate publication activity in the field

TOPIC 15
Workplace: Faculty of Arts, Department of British and American Studies

Topic: Food in cultural diplomacy and intercultural communication

Annotation: The research aims to investigate the phenomenon of food and its function as a means and tool of cultural diplomacy and intercultural communication. It focuses on the discourse of media communication of both original and new media in a comparative aspect in the contexts of Anglophone cultures and cultures of the researcher's choice. The theoretical foundations are in postmillennial paradigms, and the methodological starting points are in discourse analysis, semiotic analysis, content analysis, and others suitable for the given type of primary material.

Host professor: prof. PaedDr. Lívia Körtvélyessy PhD.
Email: livia.kortvelyessy@upjs.sk

Supervisor: Dr. h. c. prof. Mgr. Slávka Tomaščíková, PhD.
Email: slavka.tomascikova@upjs.sk

Professional requirements/criteria for the candidate:

- completed doctoral studies in philology, cultural studies, food studies
- knowledge of the English language at level C1