

## LAM SEMINAR SERIES

Laboratory for Advanced Materials (LAM) is inviting you to attend series of lectures organized by the laboratory as part of our outreach program with the goal to communicate to a broader scientific community, students as well as general public significant recent advances in the field of materials science and at the boundaries of materials science, chemistry, physics and biology. The lectures will feature prominent scientists from Slovakia and abroad, from academia and industry, who are performing research at the frontier of these areas. To make the lectures informative and appealing to non-experts, students as well as specialists, the lectures will be typically divided into two parts. In the first part, aimed primarily at non-experts, the presenter will provide a brief tutorial of the basic principles relevant to the research topic discussed and, where applicable, provide an overview of potential practical applications. In the second part, the presenter will discuss recent advances from his/her laboratory. We are looking forward to seeing you!

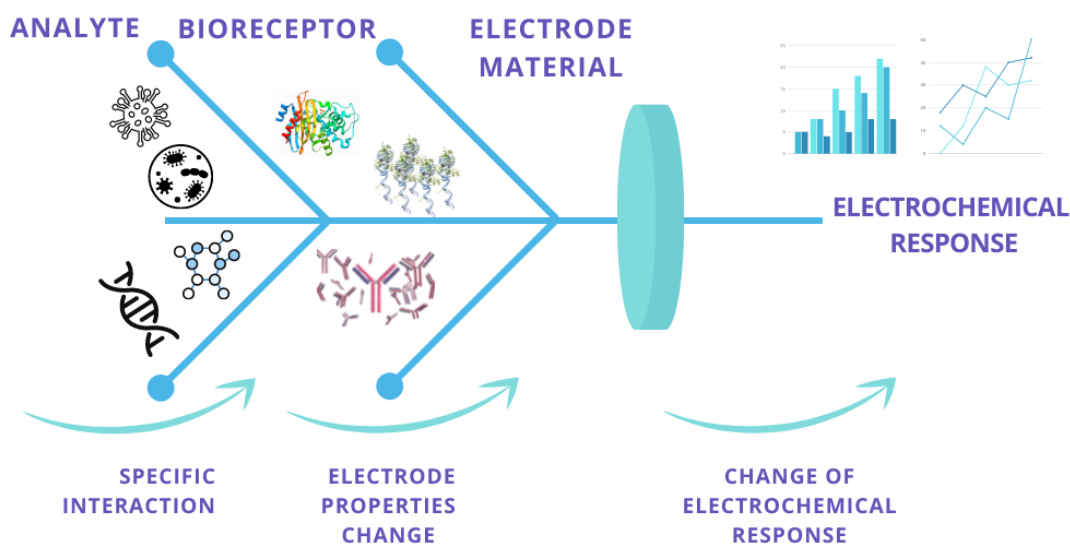
April 21, 10:00, Presentation Center AMOS, Faculty of Natural Sciences, Comenius University

## Electrochemical biosensors

Prof. Renáta Oriňaková, DrSc.

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Biosensors are currently an invaluable tool for the analysis of samples, especially in the medicine, pharmacology, clinical biochemistry, biotechnological and chemical processes, environmental analysis, and food quality estimation. Biosensor applications are expanding rapidly due to the growing demand for fast and accurate quality or quantity control and detection of very low concentrations of substances. Electrochemical biosensors are among the oldest and most widespread catalytic sensor devices and are based on conversion of biochemical processes, such as the reaction between the enzyme and the substrate, or the antigen-antibody interaction, on electrical signals. The most common electrochemical sensors are enzymatic sensors, nanomaterial-based sensors, immunosensors, DNA sensors, and aptasensors. The main advantages of electrochemical sensors are simple construction of the measuring system, low costs, excellent sensitivity, and specificity. In addition, these systems can be integrated into miniaturized analytical devices (lab on chip), which represent excellent analytical platforms for the point of care or on-site analysis, which fully replace commercial laboratory instruments for in vitro diagnostics. Electrochemical biosensors have been of greater interest in the recent decades than other analytical techniques such as chromatography, spectrophotometry, fluorescence, migration techniques and flow systems. The use of different nanomaterials in biosensing has enabled faster detection and its reproducibility in a much better way due to the unique properties of nanomaterials. I will first introduce the basic principles of biosensors, especially electrochemical biosensors, and their possible applications. In the second part of my talk, I will discuss the research on electrochemical sensors in our laboratory.



## Prof. RNDr. Renáta Oriňaková, DrSc.

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**Prof. Renáta Oriňaková**, is vice-dean for research and development at the Faculty of Science and head of the Department of Physical Chemistry at Institute of Chemistry, Faculty of Science, Pavol Jozef Šafárik University (UPJŠ) in Košice and she is president of scientific group for Physical Chemistry and Electrochemistry of Slovak Chemical Society in Košice. From 2019 she participates as an Expert in the Working Group 1 - New and Emerging Battery Technologies of the ETIP Batteries Europe, an Expert in Working Group 4 - Cell Design and Manufacturing of Batteries European Partnership Association (PEPA) and representative of UPJŠ in BATTERY 2030+ platform. She is member of Bureau of Slovak Battery Alliance (SBaA) (since 2019), member of Bureau of National Hydrogen Association of Slovakia (NVAS) (since 2020), member of Executive Board of European Chemical Society (EuChemS) (since 2021) and national representative of the Physical and Biophysical Chemistry Division (I) of IUPAC for the terms 2020-2021 and 2022-2023. She possesses a long-time experience in the field of electrochemical production of functional coatings onto compact and particulate substrates and evaluation of physico-chemical properties of prepared materials. She deals with electrochemical deposition of functional nanostructured materials for analytical applications, sensors, electrocatalysis, and biomedicine, as well as with production of biodegradable materials for orthopaedic applications. She was a leader or researcher in many Slovak and foreign projects. She systematically works with students within the frame of student scientific work and is supervisor of 27 bachelor students, 25 diploma students, and 11 doctorands. She published her scientific results as an author of above 130 CC publications with citation response of more than 2000 SCI citations. The Literary Fund awarded her the Award for scientific and technical literature in 2015 and the Slovak Chemical Society awarded her the medal for creative contribution in active work in scientific section of the society in 2017.

### Selected Representative Publications:

1. I. Šišoláková, J. Hovancová, R. Oriňaková, A. Oriňak, L. Trnková, I. Trísková, Z. Farka, M. Pastucha, J. Radoňak, Electrochemical determination of insulin at CuNPs/chitosan-MWCNTs and CoNPs/chitosan-MWCNTs modified screen-printed carbon electrodes: *Journal of Electroanalytical Chemistry*. 860 (2020) 113861.
2. I. Šišoláková, J. Hovancová, R. Oriňaková, A. Oriňak, L. Trnková, D. Rueda García, J. Radoňak, Influence of a polymer membrane on the electrochemical determination of insulin in nanomodified screen printed carbon electrodes, *Bioelectrochemistry*. 130 (2019) 107326.
3. R. Oriňaková, R. Gorejová, Z. Orságová Kráľová, A. Oriňak, I. Shepa, J. Hovancová, A. Kovalčíková, Z. Lukáčová Bujňáková, N. Király, M. Kaňuchová, M. Baláž, M. Strečková, M. Kupková, M. Hrubovčáková, F. Kaľavský, M. Oriňak, Influence of Albumin Interaction on Corrosion Resistance of Sintered Iron Biomaterials with Polyethyleneimine Coating. *Applied Surface Science* 509 (2020) 145379.
4. M. Strečková, E. Múdra, R. Oriňaková, L. Markusova-Bučková; M. Šebek; A. Kovalčíková; T. Sopčák; V. Girman; Z. Danková; M. Mičušík; J. Dusza: Nickel and nickel phosphide nanoparticles embedded in electrospun carbon fibers as favourable electrocatalysts for hydrogen evolution. *Chemical Engineering Journal* 303 (2016) 167-181.
5. M. Strečková, R. Oriňaková, J. Hovancová, L. Kobera, J. Brus, A.B. Hungria, V. Girman, E. Múdra, M. Hečková, M. Podobová, A. Kovalčíková, J. Dusza, Fibrous Electrocatalytic Materials Based on Carbon/Copper /Copper phosphides for Effective Hydrogen Evolution. *Applied Surface Science* 479 (2019) 70-76.