28th Young Investigators' Seminar

on Analytical Chemistry

YISAC 2023

BOOK OF ABSTRACTS

June 25th - 28th, 2023.

Organized by:

University of Belgrade - Faculty of Chemistry

Printed by: **PLANETA PRINT**

Publication year: **2023.**

ISBN-97886-7220-121-5

About YISAC

Young Investigators' Seminar on Analytical Chemistry (YISAC), is the traditional scientific meeting, organized yearly by one of the participating institutions. It is intended to be an international conference for young researchers in a rather advanced state of their study, usually post-graduate, such as MSc or Ph.D. students together with their supervisors. The main goal of the YISAC seminar is to prepare young investigators for their future scientific life (representation of their own research achievements, attendance of international symposia, project proposals).

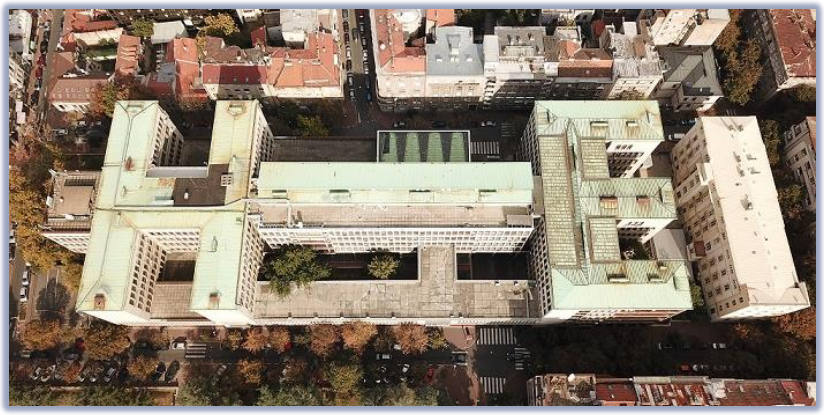
YISAC is focused on analytical chemistry and its peripheral areas.

The scientific programme of Seminar is based on oral presentations only (approximately 15 minutes) followed by a discussion (approximately 5 minutes). Depending of the field of analytical chemistry, the Seminar is divided into individual sessions chaired by a student.

All participants are involved in cultural and social programme of the Seminar.

Each YISAC event include a conference dinner (for all participants) and a supervisor's dinner, where - at the supervisors' dinner - the next venue of the seminar is determined, followed by discussion of current scientific pending problems.

There are no conference fees.



University of Belgrade - Faculty of Chemistry is hosting the Seminar this year.

Welcome!

About organizers and sponsors of YISAC 2023

The Faculty of Chemistry, University of Belgrade (FCUB) is an internationally renowned, high-quality center for scientific research and high education, which encompasses studies at BSc, MSc, PhD and postdoctoral level, and represents one of the most important and prestigious institutions in Serbian research area and society. Research activities are conducted in several areas, such as chemistry of natural products, environmental protection and remediation, development and application of new analytical methods, computational chemistry, food chemistry, biochemistry, biotechnology and material science. In total, FCUB has 148 research laboratories including a well-established IT center. In addition to the national RTD projects, FCUB has extensive experience in coordination and management of international projects including EU FP7, TEMPUS IV, NATO, ANSO, HORIZON 2020, HORIZON EUROPE and NIH projects.

FCUB comprise groups of researchers active in drug design, synthesis, natural products isolation and characterization, analysis and structural determination as well as testing of activity of selected compounds, food and molecular biotechnology groups and miscellaneous groups like chemical education and theoretical chemistry.

The Department of Analytical Chemistry of the Faculty of Chemistry of the University of Belgrade was founded in 1971, at the same time as the other Departments that still exist within the Faculty of Chemistry. The first head of the Department was Professor Willim Weigand. Since then, the head of the Department has been replaced by prof. Tomislav Janjić, prof. Tibor Pastor, prof. Gordana Milovanović, prof. Lidija Pfendt, prof. Marija Todorović, prof. Živoslav Tešić and prof. Snezana Nikolić-Mandić. The Department of Analytical Chemistry currently has 31 members, of which 16 are teaching and 15 are non-teaching staff. The head of the department is prof. Dušanka Milojković Opsenica. Analytical chemistry as a scientific discipline is as old as chemistry itself. It is interesting that the first chemical expert work published in Serbia in 1843 was related to the qualitative analysis of water. The content of certain substances was then described with "a lot", "a lot", "a little"... At the end of the 19th and the beginning of the 20th century, analytical chemistry was dealt with, among others, by Sima Lozanić (he analyzed drinking and mineral waters, the tailings in the mercury mine on Avala, the Sokobanj and Jelica meteorites), Marko Leko (analyzed drinking water), Milorad Jovičić (analyzed chrome minerals), and in the lectures of Mihail Rašković, the first professor of chemistry at the Lyceum, analytical chemistry was also represented.

After World War II, the first professor of chemistry at the Faculty of Philosophy was Svetozar Jovanović, who together with Momir Jovanović laid the foundations of qualitative chemical analysis. After them, the qualitative chemical analysis was taken over by Tomislav Janjić, and the quantitative by Vilim Vajgand, at one time both professors at the Department of Analytical Chemistry of the Faculty of Chemistry of the University of Belgrade, who are considered the founders of almost all scientific fields of analytical chemistry in Serbia.

Today, the Department of Analytical Chemistry represents a modern and dynamic environment in which, through educational and scientific-research activities, trends in a large number of areas of analytical chemistry, such as food and natural product analysis, identification of bioactive compounds, electrochemistry, sensors, development of new materials, application and development of analytical methods in the examination of physico-chemical parameters of both compounds of environmental importance and biologically active compounds, drug analysis, chemometrics and advanced data processing (pattern recognition, classification, experimental design and optimization) are fully followed. The Department of Analytical Chemistry is dedicated to the continuous improvement of its teachers and associates and has numerous collaborations with prestigious scientific and research institutions in the country and the world.

Vinča Institute of Nuclear Sciences is regarded as Serbia's leading scientific institute in fundamental and applied research, owing to its size, scientific productivity, international reputation in research, and the quality of its scientific personnel and research facilities. It is unique in the multidisciplinary nature of its scientific capacities, with a unique infrastructure for the most ambitious research projects of strategic significance for the Republic of Serbia.

Since its foundation, the Institute has contributed that Yugoslavia, along with Serbia, has been included in the first five nuclear powers for knowledge and scientific achievements in the first two decades after the second world war. The work on nuclear research brought together experts from a broad range of related scientific fields which helps building knowledge and expertise throughout the following years.

The result of these activities has made a direct contribution to the national economic development encompass major areas of health, defense, industry and education. The following fundamental pillar in area of industrial and technological production were established: Electronic industry Niš, Department of Technical Physics, Faculty of Electrical Engineering in Belgrade, Faculty of Physical Chemistry, INEP Institute, ITNMS Institute, Mihajlo Pupin Institute, Institute of Physics, Belgrade. The first computers in our country were created at the Vinca Institute. Two Presidents of the Serbian Academy of Sciences and Arts came from the Vinca Institute. More than 1000 patents and technological solutions has been granted to the Institute.

Vinča Institute is a member of the University of Belgrade and has been actively involved in the conducting of basic, postgraduate and doctoral studies. Over the past seventy years, more than 1000 Ph.D. thesis have been made at the Institute. Each year University of Belgrade promote between 20 and 30 our students to Ph.D. researchers and many students from Universities all around Serbia do their Ph.D. studies in Vinca. In this way, the scientific staff of the Institute significantly contributes to improving the quality of teaching of the University of Belgrade and actively participates in the process of knowledge exchange in science-education model in Serbia.

Today, the Institute employs 311 researchers, and 210 Ph.D. students working on over a hundred national and international projects, as well as in international scientific research collaborations in which the Republic of Serbia is a member.

With extensive international scientific cooperation Vinča Institute promotes good will, strengthens political image of Republic of Serbia, helps civil society and private business through projects that bear tangible results.

Through the gates of the Vinča Institute annually passes over 1000 students and students, who participate in the special educational programs of the Institute, tailored to the needs of the age to which they belong. Through these education programs, young people acquire basic concepts about the science and its methodological principles, as well as basic knowledge in areas of special interest. It has been shown that these education programs for young have a significant impact on increasing number of students pursing a higher education and boosting national economical development.

The basic activities of the **Institute of Chemistry, Technology and Metallurgy (ICTM)** are fundamental and applied multidisciplinary scientific research and design and development of technological processes in the following areas: Chemistry and Chemical Technology, Organic Chemistry, Electrochemistry, Catalysis, Microelectronic Technologies, Macromolecular and Polymer Materials, Biochemistry and Biotechnology, Materials Science, Metallurgy of Powders and Sintered Materials, Instrumental Analysis, Chemical Engineering, Nanoscience and Nanotechnology, Micro-Electromechanical Systems (MEMS), Sensor, Optoelectronics, Plasmonics, Semiconductor Technologies, Magnetic Materials and Magnetism, Metals and Metal Alloys, Environmental Protection and Remediation

ICTM is equipped with advanced tools for fabrication and characterization in all the areas listed above. The Institute has about 200 researchers (150 Ph.D.), mainly chemists, physico-chemists, engineers of chemical technology, electro, and mechanical engineers.

Activities of the Institute are carried out in six specialized research departments: Department of Chemistry, Department of Electrochemistry, Department of Microelectronic Technologies, Department of Catalysis and Chemical Engineering, Department of Materials and Metallurgy, and Department of Ecology and Technoeconomics.

Activities of the Department of Chemistry cover scientific and applied research in organic chemistry, biochemistry and biotechnology, biomacromolecules, chemistry of synthetic polymers, environmental chemistry, and theoretical and computational chemistry.

Department of Electrochemistry deals with fundamental scientific research in the fields of electrochemistry and electrochemical engineering: kinetics of electrode processes, electrochemistry of halogens and their compounds, electroorganic reactions, electrochemistry of double-layer, adsorption of organic compounds, corrosion and corrosion protection, mass transfer in electrochemical systems, electrode materials, metal deposition, electroanalytical chemistry and electrochemical sensors, electrometallurgy, etc.

Department of Microelectronic Technologies deals with multidisciplinary research in the fields of sensors, microelectromechanical systems (MEMS), nanoscience and nanotechnology, photonics and plasmonics, as well as semiconductor science and technology. Researches start from the fundamental concepts and theoretical research and ends up with constructed devices or systems.

Department of Catalysis and Chemical Engineering is a unique national research institution in the field of catalysis and chemical engineering. Department covers the entire spectrum of activities in the field of catalysis, catalytic processes and chemical engineering, from basic research and development of new technologies, to their application in the industry.

Department of Materials and Metallurgy doing research in the field of metallurgy of powder and sintered composite materials. The department offers services in the

scientific research in the field of powder metallurgy, development of technological processes for the production and application of powder, composite and other special materials, as well as high-quality components for special purpose materials.

Department of Ecology and Technoeconomics is a scientific, research and consulting unit of ICTM, specialized in the areas of engineering and market management in process industries, designing and engineering of process technologies, and laboratory research and testing.

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In April 2021, the company Analysis Adria d.o.o. was founded, based in Ljubljana, with the aim of greater engagement, better business in the region and market expansion.

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Fabrication of bismuth-oxychloride supported carbon paste electrode for sensitive and selective Quinine sensing

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Quinine is a natural white crystalline cinchona alkaloid that belongs to the aryl amino alcohol group of drugs, and it has antipyretic (fever reducing), antimalarial, analgesic, anti-inflammatory properties and a bitter taste. Today, quinine is considered as the best antimalarial drug since it is chiefly used in the treatment of falciparum malaria resistant to other antimalarials. Quinine is preferred where the disease has become highly resistant to other antimalarial drugs [1]. Quinine has a low therapeutic index, and it is potentially toxic and causes several side effects including nausea, blurred vision, diarrhea, abdominal pain, headache, fever, renal failure and asthma [2]. Since quinine is widely used as a bittering agent in tonic type drinks, a sensitive and discriminatory system for the discovery of quinine is essential for human health.

In this work, a modified bismuth-oxychloride (BiOCl) carbon paste electrode was prepared for the detection of quinine. BiOCl nanoparticles were synthesized by the chemical coprecipitation method. The electrochemical properties of quinine at this electrode were investigated by cyclic voltammetry (CV), square wave voltammetry (SWV), and differential pulse voltammetry (DPV). In addition, electrochemical impedance spectroscopy (EIS), inductively coupled plasma–optical emission spectrometry (ICP-OES), transmission and scanning electron microscopy (TEM and SEM) and X-ray diffraction (XRD) were used to characterize the synthesized materials. The prepared electrode showed better electrocatalytic response than the bare carbon paste electrode. After square wave voltammetry (SWV) optimization, the electrode showed a wide linear working range from 20 to 200 μM at pH 6 of Britton–Robinson buffer solution (BRBS) as the supporting electrolyte. The excellent selectivity of the proposed method, with good repeatability and reproducibility, strongly suggests a potential application of the method for the determination of quinine in pharmaceuticals. The practicality with good recoveries indicates that the morphology of the materials is closely related to other parameters, which in turn suggests that the developed approach can provide a cost effective, rapid, selective, and sensitive method for quinine monitoring.

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