

INSTITUTE OF TECHNICAL SCIENCES OF SASA
MATERIALS RESEARCH SOCIETY OF SERBIA

Programme and the Book of Abstracts

**TWENTY-FIRST YOUNG RESEARCHERS' CONFERENCE
MATERIALS SCIENCE AND ENGINEERING**

Belgrade, November 29 – December 1, 2023



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MATERIALS SCIENCE AND ENGINEERING**

November 29 – December 1, 2023, Belgrade, Serbia

Program and the Book of Abstracts

**Materials Research Society of Serbia
&
Institute of Technical Sciences of SASA**

2023

Book title:

Twenty-First Young Researchers' Conference - Materials Science and Engineering:
Program and the Book of Abstracts

Publisher:

Institute of Technical Sciences of SASA
Knez Mihailova 35/IV, 11000 Belgrade, Serbia
Tel: +381-11-2636994, 2185263, <http://www.itn.sanu.ac.rs>

Conference organizers:

Materials Research Society of Serbia, Belgrade, Serbia
Institute of Technical Sciences of SASA, Belgrade, Serbia

Editor:

Dr. Smilja Marković

Technical Editor:

Aleksandra Stojičić and Dr. Ivana Dinić

Cover page: Smilja Marković

Cover: Nebojša Labus

Printing:

Gama digital centar
Autoput No. 6, 11070 Belgrade, Serbia
Tel: +381-11-6306992, 6306962
<http://www.gdc.rs>

Publication year: 2023

Print-run:

120 copies

CIP - Каталогизација у публикацији

Народна библиотека Србије, Београд

66.017/.018(048)

YOUNG Researchers Conference Materials Sciences and Engineering (21 ; 2023 ; Beograd)

Program ; and the Book of abstracts / Twenty-first Young Researchers' Conference Materials Science and Engineering, November 29 – December 1, 2023, Belgrade, Serbia ; [organizers] Materials Research Society of Serbia & Institute of Technical Sciences of SASA ; [editor Smilja Marković]. - Belgrade : Institute of Technical Sciences of SASA, 2023 (Belgrade : Gama digital centar). - XX, 99 str. ; 23 cm

Tiraž 120. - Registar.

ISBN 978-86-80321-38-7

a) Наука о материјалима -- Апстракти б) Технички материјали -- Апстракти

COBISS.SR-ID 130053385

Aim of the Conference

Main aim of the conference is to enable young researchers (post-graduate, master or doctoral student, or a PhD holder younger than 35) working in the field of materials science and engineering, to meet their colleagues and exchange experiences about their research.

Topics

Biomaterials
Environmental science
Materials for high-technology applications
Materials for new generation solar cells
Nanostructured materials
New synthesis and processing methods
Theoretical modelling of materials

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Katarina Aleksić, Marko Jelić, Rauany Cristina Lopes Francisco, Tamara Matić, Nina Tomić.

Results of the Conference

Beside printed «Program and the Book of Abstracts», which is disseminated to all conference participants, selected and awarded peer-reviewed papers will be published in journal “Tehnika – Novi Materijali”. The best presented papers, suggested by Session Chairpersons and selected by Awards Committee, will be proclaimed at the Closing Ceremony. Part of the award is free-of-charge conference fee at YUCOMAT 2024.

Sponsors



ANALYSIS
LABORATORY EQUIPMENT

Acknowledgement

The editor and the publisher of the Book of abstracts are grateful to the Ministry of Science, Technological Development and Innovation of the Republic of Serbia for its financial support of this book and The Twenty-First Young Researchers’ Conference - Materials Sciences and Engineering, held in Belgrade, Serbia.

Programme
Twenty-First Young Researchers Conference
Materials Science and Engineering

Wednesday, November 29, 2023

09.00 – 09.30 Opening Ceremony

09.30 – 11.15 1st Session – Biomaterials I

Chairpersons: Prof. Dr. Bojana Obradović and Katarzyna Pastuszak

09.30 – 09.45 Dental cements based on α -tricalcium phosphate and boron nitride: Synthesis, mechanical and antibacterial properties and bioactivity

Ivana Šarić¹, Tamara Vlajić-Tovilović², Đorđe Veljović¹

¹Faculty of Technology and Metallurgy, University of Belgrade, Serbia, ²School of Dental Medicine, University of Belgrade, Serbia

09.45 – 10.00 Development of macroporous bioceramic materials based on multi-ion doped calcium-hydroxyapatite coated with chitosan

Teodora Jakovljević¹, Jelena Stanisavljević¹, Tamara Matić¹, Julijana Tadić², Đorđe Veljović¹

¹University of Belgrade, Faculty of Technology and Metallurgy, Belgrade, Serbia, ²Vinča Institute of Nuclear Science, University of Belgrade, Serbia

10.00 – 10.15 Synthesis of nanoparticles based on RuBisCO protein derived from pumpkin leaves for the controlled release of vitamin B12

Dora B. Mikašinović, Jelena R. Mijalković, Zorica D. Knežević-Jugović

University of Belgrade, Faculty of Technology and Metallurgy, Karnegijeva 4, 11020 Belgrade, Serbia

10.15 – 10.30 Starch aerogels impregnated using supercritical CO₂: Application in controlled release of biologically active compounds

Filip Koldžić, Stoja Milovanović, Ivana Lukić, Melina Kalagasidis Krušić

University of Belgrade – Faculty of Technology and Metallurgy

10.30 – 10.45 Evaluation of the anti-inflammatory potential of *Paeonia tenuifolia* L. petal extract

Natalija Čutović¹, Tatjana Marković¹, Tamara Carević², Dejan Stojković², Branko Bugarski³, Aleksandra A. Jovanović⁴

¹*Institute for Medicinal Plants Research “Dr Josif Pančić”, Tadeuša Košćuška 1, 11000 Belgrade, Serbia,* ²*Department of Plant Physiology, Institute for Biological Research “Siniša Stanković”—National Institute of Republic of Serbia, University of Belgrade, Bulevar Despota Stefana 142, 11000 Belgrade, Serbia,* ³*Faculty of Technology and Metallurgy, University of Belgrade, Karnegijeva 4, 11000 Belgrade, Serbia,* ⁴*Institute for the Application of Nuclear Energy INEP, University of Belgrade, Banatska 31b, Zemun, 11080 Belgrade, Serbia*

10.45 – 11.00 Comparison of model bacterial membranes of selected *Legionella* species

Małgorzata Jurak¹, Katarzyna Pastuszak¹, Agnieszka Ewa Wiącek¹, Bożena Kowalczyk², Jacek Tarasiuk², Marta Palusińska-Szyszt²

¹*Department of Interfacial Phenomena, Institute of Chemical Sciences, Faculty of Chemistry, Maria Curie-Skłodowska University, Maria Curie-Skłodowska Sq. 3, 20-031 Lublin, Poland,*

²*Department of Genetics and Microbiology, Institute of Biological Sciences, Faculty of Biology and Biotechnology, Maria Curie-Skłodowska University, Akademicka 19, 20-033 Lublin, Poland*

11.00 – 11.15 Study on interactions between the LL-37 peptide and model bacterial membranes

Katarzyna Pastuszak¹, Małgorzata Jurak¹, Agnieszka Ewa Wiącek¹, Bożena Kowalczyk², Jacek Tarasiuk², Marta Palusińska-Szyszt²

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²*Department of Genetics and Microbiology, Institute of Biological Sciences, Faculty of Biology and Biotechnology, Maria Curie-Skłodowska University, Akademicka 19, 20-033 Lublin, Poland*

11.15 – 11.30 Break

11.30 – 13.00 2nd Session – Biomaterials II

Chairpersons: Dr. Ivana Drvenica and Nina Tomić

11.30 – 11.45 Activity of resveratrol nanobelt-like particles against *Pseudomonas aeruginosa* biofilms

Nina Tomić¹, Nenad Filipović¹, Dragana Mitić Čulafić², Tea Ganić², Sergey Klyagin³, Alexander Osmolovskiy³, Magdalena M. Stevanović¹

¹*Group for Biomedical Engineering and Nanobiotechnology, Institute of Technical Sciences of SAsA, Belgrade, Serbia, Knez Mihailova 35/IV 11000 Belgrade, Serbia,* ²*University of Belgrade – Faculty of Biology; Studentski trg 16, Belgrade, Serbia,* ³*Department of Microbiology, Faculty of Biology, Lomonosov Moscow State University; Russia 119234, Moscow, Leninskie gory, 1, building 12*

11.45 – 12.00 Cultivation of bone cells from different sources in a biomimetic 3D *in vitro* bone model based on alginate scaffolds and a perfusion bioreactor

Ivana Banicevic¹, Mia Milosevic^{1,2}, Jelena Petrovic^{1,2}, Ksenia Menshikh³, Milena Milivojevic⁴, Milena Stevanovic⁴, Radmila Jankovic⁵, Andrea Cochis³, Elena Della Bella⁶, Jasmina Stojkovska¹, Martin Stoddart⁶, Lia Rimondini³, Bojana Obradovic¹

¹University of Belgrade, Faculty of Technology and Metallurgy, Belgrade, Serbia, ²Innovation Center of the Faculty of Technology and Metallurgy, Belgrade, Serbia, ³Center for Translational Research on Autoimmune and Allergic Diseases–CAAD, Università del Piemonte Orientale, Italy, ⁴University of Belgrade, Institute of Molecular Genetics and Genetic Engineering, Belgrade, Serbia, ⁵University of Belgrade, School of Medicine, Belgrade, Serbia, ⁶AO Research Institute Davos, Davos, Switzerland

12.00 – 12.15 Tuneable alginate hydrogel microfibers to support 3D cultures of cancer cells requiring different culture media

Jelena Petrović^{1,2}, Jasmina Stojkovska¹, Miodrag Dragoj³, Milica Pešić³, Milena Milivojević⁴, Luka Bojić⁴, Milena Stevanović^{4,5}, Radmila Janković⁶, Bojana Obradović¹

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12.15 – 12.30 Influence of synthesized calcium phosphate-based nanomaterial on proliferation of dental pulp stem cells in various *in vitro* conditions

Milica Tomić¹, Sanja Stojanović^{1,2}, Nenad Ignjatović³, Stevo Najman^{1,2}

¹University of Niš, Faculty of Medicine, Scientific Research Center for Biomedicine, Department for Cell and Tissue Engineering, 18000 Niš, Serbia, ²University of Niš, Faculty of Medicine, Department of Biology and Human Genetics, 18000 Niš, Serbia, ³Institute of Technical Sciences of the Serbian Academy of Science and Arts, 11000 Belgrade, Serbia

12.30 – 12.45 Comparative analysis of subcutaneous tissue reaction to different collagen membranes with or without addition of blood

Milena Radenković Stošić¹, Sanja Stojanović^{1,2}, Mike Barbeck³, Stevo Najman^{1,2}

¹University of Niš, Faculty of Medicine, Scientific Research Center for Biomedicine, Department for Cell and Tissue Engineering, 18000 Niš, Serbia, ²University of Niš, Faculty of Medicine, Department of Biology and Human Genetics, 18000 Niš, Serbia, ³Clinic and Policlinic for Dermatology and Venereology, University Medical Center Rostock, 18057 Rostock, Germany

12.45 – 13.00 Study of the properties of oxidized cellulose plus bioglass as a new bioink for application in regenerative medicine

Rauany Cristina Lopes¹, Mônica Rosas Costa Iemma¹, Luiz Henrique Montezor¹, André Capaldo Amaral¹, Lidija Mančić², Eliane Trovatti¹

¹University of Araraquara - UNIARA, Rua Carlos Gomes, 1217, CEP: 14801-340, Araraquara, SP, Brazil, ²Institute of Technical Sciences of SASA, P.O. Box 377, 11000 Belgrade, Serbia

13.00 – 14.00 Lunch break

14.00 – 15.30 3rd Session – Biomaterials III

Chairpersons: Prof. Dr. Đorđe Veljović and Milica Marković

14.00 – 14.15 Nanofabrication and characterisation of magnetic Fe₃O₄ nanostructures for potential environmental and biomedical applications

Dušan Milojkov¹, Ana Mraković², Gvozden Jovanović¹, Nikola Vuković¹, Mladen Bugarčić¹, Anja Antanasković¹, Vukosava Živković-Radovanović³

¹Institute for Technology of Nuclear and other Mineral Raw Materials, 11000 Belgrade, Serbia, ²Vinca Institute for Nuclear Science, University of Belgrade, 11351 Belgrade, Serbia, ³Faculty of Chemistry, University of Belgrade, 11158 Belgrade, Serbia

14.15 – 14.30 Peroxidase-like activity of chitosan modified magnetic nanoparticles

Iryna Khmara, Iryna Antal, Alena Jurikova, Martina Kubovcikova, Vlasta Zavisova, Martina Koneracka

Institute of Experimental Physics, SAS, Watsonova 47, Kosice, Slovakia

14.30 – 14.45 Towards new approaches for Ultraviolet sterilization of MXenes

Yuliia Varava^{1,2}, Volodymyr Deineka^{1,3}, Valeriia Korniienko¹, Kateryna Diedkova^{1,3}, Viktoriia Korniienko^{1,3}, Veronika Zahorodna⁴, Oleksiy Gogotsi⁴, Maksym Pogorielov^{1,3}

¹Sumy State University, Sumy, Ukraine, ²Silesian University of Technology, Gliwice, Poland, ³University of Latvia, Riga, Latvia; ⁴Materials Research Center LTD, Kyiv, Ukraine

14.45 – 15.00 Atomic and molecular spectroscopic analysis of chemically treated pig shoulder bone: possible application in forensics

Milica Marković, Miroslav Kuzmanović, Dušan Dimić

University of Belgrade, Faculty of Physical Chemistry, Studentski trg 12-16, 11000 Belgrade, Serbia

15.00 – 15.15 Application of polylactide (PLA) biomaterial in various fields of medicine

Zorana Z. Stojsavljević^{1,2}, Slobodanka P. Galović², Katarina Lj. Đorđević²

University of Belgrade, ¹Faculty of Biomedical Engineering and Technologies, Belgrade, Serbia, ²Institute for Nuclear Sciences Vinča, Laboratory for radiation physics and chemistry, Belgrade, Serbia

15.15 – 15.30 The material for the treatment of periapical granulomas

Kuzenko Yevhen, Roman Moskalenko, Kuzenko Olena

Department of Pathology, Sumy State University, Sumy, Ukraine

15.30 – 15.45 Break

15.45 – 17.15 4th Session – Environmental Materials I

Chairpersons: Prof. Dr. Ljiljana Damjanović-Vasilčić and Danijela Smiljanić

15.45 – 16.00 Bentonite modified with cationic surfactant as promising adsorbent for carbamazepine

Danijela Smiljanić, Aleksandra Daković, Milena Obradović, Milica Ožegović, Marija Marković

Institute for Technology of Nuclear and Other Mineral Raw Materials, Franše d' Eperu 86

16.00 – 16.15 Assisted phytostabilization of Pb-contaminated soil using brushite-metakaolin geopolymer materials and *Festuca rubra*

Dunja Djukić¹, Tomica Mišljenović¹, Gordana Andrejić², Uroš Aleksić², Ksenija Jakovljević¹, Miljana Mirković³

¹University of Belgrade, Faculty of Biology, Belgrade, Serbia, ²Department of Agrochemistry and Radioecology, Institute for the Application of Nuclear Energy, University of Belgrade, Zemun, Serbia, ³Department of Materials, "Vinča" Institute of Nuclear Sciences-National Institute of the Republic of Serbia, University of Belgrade, Belgrade, Serbia

16.15 – 16.30 Improvement of sorption properties of natural clay pyrophyllite by ultrasonic treatment

Katarina Tošić, Anđela Mitrović Rajić, Sanja Milošević Govedarović, Sara Mijaković, Ana Vujačić Nikezić, Jasmina Grbović Novaković, Bojana Paskaš Mamula

Centre of Excellence for Hydrogen and Renewable Energy, Vinča Institute of Nuclear Sciences - National Institute of the Republic of Serbia, University of Belgrade, POB 522, Belgrade, Serbia

16.30 – 16.45 The impact of thermal treatment on spent coffee grounds for chlorpyrifos removal from water

Vedran Milanković¹, Tamara Tasić¹, Snežana Brković¹, Igor Pašti², Tamara Lazarević-Pašti¹

¹Laboratory of Physical Chemistry, Vinča Institute of Nuclear Sciences – National Institute of the Republic of Serbia, University of Belgrade, Belgrade, Serbia, ²Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia

16.45 – 17.00 Applying carbon materials derived from cellulose for the removal of malathion and chlorpyrifos in food processing

Tamara Tasić¹, Vedran Milanković¹, Igor Pašti², Tamara Lazarević-Pašti¹

¹Laboratory of Physical Chemistry, Vinča Institute of Nuclear Sciences – National Institute of the Republic of Serbia, University of Belgrade, Belgrade, Serbia, ²Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia

17.00 – 17.15 Quality control of gas flow proportional counter for beta spectrometric determination of ⁹⁰Sr

Nataša Sarap¹, Stefana Dejković², Marija Janković¹, Jelena Krneta Nikolić¹, Vojislav Stanić¹, Milica Rajačić¹

¹University of Belgrade, Vinča Institute of Nuclear Sciences, National Institute of the Republic of Serbia, Radiation and Environmental Protection Department, Mike Petrovića Alasa 12-14, 11001 Belgrade, ²University of Belgrade, Faculty of Physical Chemistry, Studentski trg 12-16, 11000 Belgrade, Serbia

17.15 – 17.30 Break

17.30 – 18.45 5th Session – Environmental Materials II

Chairpersons: Dr. Smilja Marković and Miomir Krsmanović

17.30 – 17.45 Application of thin-layer chromatography in the assessment of lipophilicity of chloroacetamide derivatives'

Dragana Mekić, Đendi Vaštag, Suzana Apostolov

University of Novi Sad, Faculty of Sciences, Department of Chemistry, Biochemistry and Environmental Protection, Novi Sad, Serbia

17.45 – 18.00 Microplastics in urban soils of Belgrade: Abundance and potential sources

Ivana Mikavica¹, Dragana Ranđelović¹, Miloš Ilić², Milena Obradović¹, Jovica Stojanović¹, Jelena Mutić²

¹Institute for Technology of Nuclear and other Mineral Raw materials, Boulevard Franchet d'Esperey 86, Belgrade, Serbia, ²University of Belgrade, Faculty of Chemistry, Studentski trg 12 - 16, P. O. Box 51, 11158, Belgrade, Serbia

18.00 – 18.15 Microbial degradation of terephthalic acid as a PET-derived compound

Natalija Petronijević¹, Marija Lješević², Branka Lončarević², Kristina Joksimović², Gordana Gojgić-Cvijović², Vladimir Bešković¹, Jasmina Nikodinović-Runić³

¹University of Belgrade, Faculty of Chemistry, ²University of Belgrade, Institute of Chemistry, Technology and Metallurgy, ³University of Belgrade, Institute of Molecular Genetics and Genetic Engineering

18.15 – 18.30 Immobilization of nickel ions into stable crystal structures as a promising way for their removal from wastewater

Miomir Krsmanović¹, Aleksandar Popović², Željko Radovanović³, Smilja Marković⁴, Mia Omerašević¹

¹Department of Materials, Vinča Institute of Nuclear Sciences, National Institute of the Republic of Serbia, University of Belgrade, Mike Petrovića Alasa 12-14, Belgrade, Serbia,

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Belgrade, Karnegijeva 4, Belgrade, Serbia, ⁴Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Knez Mihailova 35/IV, Belgrade, Serbia

18.30 – 18.45 Particularities of the isolation of rare earth elements from mechanochemically modified brown coals

Lidiya I. Yudina^{1,2}, Tatiana S. Skripkina², Svetlana S. Shatskaya², Uliana E. Nikiforova²
¹*Novosibirsk state university, Faculty of natural sciences, Novosibirsk, Russia,* ²*Institute of solid state chemistry an mechanochemistry, Novosibirsk, Russia*

Thursday, November 30, 2023

09.00 – 11.00 6th Session – Theoretical Modeling of Materials

Chairpersons: Dr. Marko Opačić and Kristina Stevanović

09.00 – 09.15 Quinuclidine thiosemicarbazone crystal structure determination: Quantum insights via Hirshfeld atom refinement and intermolecular interaction energies

Milica G. Bogdanović¹, Vidak N. Raičević², Marko V. Rodić¹
¹*University of Novi Sad, Faculty of Sciences, Novi Sad, Serbia,* ²*University of Novi Sad, Faculty of Medicine, Novi Sad, Serbia*

09.15 – 09.30 Computational modeling vs. experimental analyses of the energetic performance of pyrotechnic mixtures and explosives

Jelena Mojsilović¹, Mladen Timotijević¹, Mirjana Krstović^{1,2}, Jelena Petković-Cvetković¹, Bojana Fidanovski^{1,2}, Danica Bajić^{1,2}
¹*Military Technical Institute, Belgrade, Serbia,* ²*Military Academy, Belgrade, Serbia*

09.30 – 09.45 Composite PBX explosives with different polymer binders

Mirjana Krstović^{1,2}, Danica Bajić^{1,2}, Mladen Timotijević¹, Jelena Mojsilović¹, Slavica Terzić¹
¹*Military Technical Institute, Belgrade, Serbia,* ²*Military Academy, University of Defense, Belgrade, Serbia*

09.45 – 10.00 Modelling the detonation pressure of phlegmatized explosives in EXPLO5

Mladen Timotijević, Danica M. Bajić, Slavica Terzić
Military Technical Institute, Belgrade, Serbia

10.00 – 10.15 QSAR and machine learning models of redox potentials of some organic pigments

Kristina Stevanović¹, Jelena Maksimović², Jelena Senčanski³, Maja Pagnacco⁴, Milan Senčanski⁵

¹*Vinča Institute of Nuclear Sciences, Belgrade, Serbia,* ²*Faculty of Physical Chemistry, Belgrade, Serbia,* ³*Institute for General and Physical Chemistry, Belgrade, Serbia,* ⁴*Institute of Chemistry, Technology and Metallurgy, Belgrade, Serbia,* ⁵*Institute of Molecular Genetics and Genetic Engineering, Belgrade, Serbia*

10.15 – 10.30 The photogenerated excess carriers influence on the photoacoustic signal of a narrow bandgap semiconductor

Milica A. Dragaš^{1,2}, Slobodanka P. Galović³, Katarina Lj. Đorđević³

¹*Faculty of Physics, University of Belgrade, 12 Studentski trg, 11001 Belgrade, Serbia,*

²*Faculty of Philosophy, University of East Sarajevo, 1 Alekse Santica, 71420 Pale, Bosnia and Herzegovina,* ³*Vinča Institute of Nuclear Sciences, National Institute of the Republic of Serbia, University of Belgrade, 12-14 Mike Petrovica Alasa, 11351 Vinča, Belgrade, Serbia*

10.30 – 10.45 Density functional theory calculation of the optical properties of graphene quantum dots

Tatjana Agatonović Jovin, Biljana Todorović Marković, Zoran Marković

Vinča Institute of Nuclear Sciences – National Institute of the Republic of Serbia, University of Belgrade, P.O. Box 522, 11001 Belgrade, Serbia

10.45 – 11.00 Oxygen-terminated Ti₃C₂ MXene as an excitonic insulator

Nilesh Kumar, František Karlický

Department of Physics, Faculty of Science, University of Ostrava, 30. dubna 22, 701 03 Ostrava, Czech Republic

11.00 – 11.15 Break

11.15 – 12.45 7th Session – Nanostructured Materials I

Chairpersons: Dr. Dragana Jugović and Katarina Aleksić

11.15 – 11.30 Hydrogen storage properties of MgH₂-Ni system

Milica Prvulović¹, Bojana Babić¹, Nenad Filipović², Željko Mravik¹, Sanja Milošević Govedarović¹, Zorana Sekulić³, Igor Milanović¹

¹*Vinča Institute of Nuclear Sciences, National Institute of Republic of Serbia, Centre of Excellence for Renewable and Hydrogen Energy, The University of Belgrade, POB 522, 11000 Belgrade, Republic of Serbia,* ²*Institute of Technical Sciences of SASA, Knez Mihajlova 35/IV, 11000 Belgrade, Republic of Serbia,* ³*Ministry of Capital Investments, The Government of Montenegro, Directorate for Energy and Energy Efficiency, Podgorica, Montenegro*

11.30 – 11.45 Temperature dependence of electric properties of GO and GO/WPA films on interdigital electrodes

Željko Mravik¹, Milica Pejčić², Marija Grujičić², Jelena Rmuš Mravik¹, Miša Stević³, Zoran Stević^{4,5}, Zoran Jovanović¹

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11.45 – 12.00 Electrochemically exfoliated graphene as support of platinum nanoparticles for methanol oxidation reaction and hydrogen evolution reaction

Jelena P. Georgijević, Irina Srejić, Mirjana Novaković, Lazar Rakočević, Jelena Potočnik, Aleksandar Maksić

Vinča Institute of Nuclear Sciences – National Institute of the Republic of Serbia, University of Belgrade, P.O. Box 522, Belgrade, 11001, Serbia

12.00 – 12.15 ZnO@RuO₂ composites: Cost-effective trifunctional electrocatalysts for enhanced OER, HER, and ORR activities in water electrolysis

Katarina Aleksić¹, Ivana Stojković Simatović², Smilja Marković¹

¹Institute of Technical Sciences of SASA, Belgrade, Serbia, ²Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia

12.15 – 12.30 Investigating the influence of hydrothermal treatment on oxygen functional groups in graphene oxide-based nanocomposites

Milica Pejčić¹, Željko Mravik¹, Danica Bajuk-Bogdanović², Marija Grujičić¹, Jelena Rmuš Mravik¹, Sonja Jovanović¹, Zoran Jovanović¹

¹Laboratory of Physics, Vinča Institute of Nuclear Sciences – National Institute of the Republic of Serbia, University of Belgrade, Belgrade, Serbia, ²Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia

12.30 – 12.45 Enhanced electrochemical detection of gallic acid using modified glassy carbon electrodes with Zn/Ga-doped cobalt ferrite

Marija Grujičić¹, Marko Jelić¹, Ivana Stojković Simatović², Danica Bajuk Bogdanović², Darija Petković¹, Zoran Jovanović¹, Sonja Jovanović¹

¹Laboratory of Physics, Vinča Institute of Nuclear Sciences – National institute of the Republic of Serbia, University of Belgrade, Belgrade, Serbia, ²Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia

12.45 – 13.45 Lunch break

13.45 – 15.15 8th Session – Nanostructured Materials II
Chairpersons: Dr. Ana Stanković and Tijana Stamenković

13.45 – 14.00 Yb³⁺/Tm³⁺ doped SrGd₂O₄ as photoluminescent and photocatalytic material

Tijana Stamenković¹, Marjan Randelović², Ivana Dinić³, Lidija Mančić³, Vesna Lojpur¹
¹*Department of Atomic Physics, Vinča Institute of Nuclear Sciences, National Institute of the Republic of Serbia, P.O. Box 522, 11001 Belgrade, University of Belgrade, Serbia,* ²*Faculty of Science and Mathematics, University of Niš, Niš, Serbia,* ³*Institute of Technical Science of SASA, Knez-Mihailova 35/4, Belgrade, Serbia*

14.00 – 14.15 Physicochemical characterization of mechanochemically activated pyrophyllite/Ag composites

Sara Mijaković, Jasmina Grbović Novaković, Katarina Tošić, Anđela Mitrović Rajić, Bojana Paskaš Mamula, Ana Vujačić Nikezić

Centre of Excellence for Renewable and Hydrogen Energy, “Vinča” Institute of Nuclear Sciences, National Institute of Republic of Serbia, University of Belgrade, POB 522, 11000 Belgrade

14.15 – 14.30 Measurement of EMI shielding performance of graphene oxide – silver nanoparticles composites

Anđela Stefanović^{1,2}, Dejan Kepić¹, Svetlana Jovanović Vučetić¹, Kamel Haddadi³, Biljana Todorović Marković¹

¹*Vinča Institute of Nuclear Sciences - National Institute of the Republic of Serbia, University of Belgrade P.O. Box 522, 11000 Belgrade, Serbia,* ²*Faculty of Chemistry, University of Belgrade, Studentski trg 12-16, 11158, Belgrade, Serbia,* ³*University of Lille, CNRS, Centrale Lille, University Polytechnique Hauts-de-France, UMR 8520-IEMN, F-59000 Lille, France*

14.30 – 14.45 Plasmon induced enhancement of photoinduced antibacterial activity of graphene quantum dots

Slađana Dorontić, Svetlana Jovanović, Biljana Todorović Marković

„Vinča”-Institute of Nuclear Sciences - National Institute of the Republic of Serbia, University of Belgrade P.O. Box 522, 11000 Belgrade, Serbia

14.45 – 15.00 Innovative modifications of graphene quantum dots for improved photodynamic therapy in antibacterial treatment

Mila Milenković, Slađana Dorontić, Biljana Todorović Marković, Svetlana Jovanović

Vinča Institute of Nuclear Sciences – National Institute of the Republic of Serbia, University of Belgrade, P.O. Box 522, 11000 Belgrade, Serbia

15.00 – 15.15 Enhanced photocatalytic performance of BaTiO₃/MoO₃/Ag ternary heterostructure

Kevin V. Alex^{1,2}, Jose P. B. Silva³, K. Kamakshi⁴, K. C. Sekhar¹

¹*Department of Physics, School of Basic and Applied Sciences, Central University of Tamil Nadu, Thiruvavur, 610-005, India,* ²*International & Inter University Centre for Nanoscience & Nanotechnology, Mahatma Gandhi University, Kottayam, 686-560, India,* ³*Physics Center of Minho and Porto Universities (CF-UM-UP), University of Minho, Campus de Gualtar, 4710-057 Braga, Portugal,* ⁴*Department of Science and Humanities, Indian Institute of Information Technology, Thiruchirapalli, 620-012, India*

15.15 – 15.30 Break

15.30– 17.15 9th Session – Nanostructured Materials III

Chairpersons: Dr. Ivana Dinić and Marko Jelić

15.30 – 15.45 Thin film deposition of multilayers on silicon substrate laser pre-patterned

Nevena Božinović, Suzana Petrović, Mirjana Novaković, Vladimir Rajić

Vinča Institute of Nuclear Sciences – National Institute of the Republic of Serbia, University of Belgrade, P.O. Box 522, Belgrade, 11001, Serbia

15.45 – 16.00 UV protection with novel porous organosilica nanoparticles

Aleksandra Pavlović¹, Nikola Knežević¹, Irena Miler¹, Mihailo Rabasović²

¹Institute BioSense, University of Novi Sad, Serbia, ²Institute of Physics, Belgrade

16.00 – 16.15 Photoelectrochemical water oxidation properties of bismuth vanadate photoanode irradiated by swift heavy ions

Marko Jelić¹, Ekaterina Korneeva², Nikita Kirilkin², Tatiana Vershinina², Oleg Orelovich², Vladimir Skuratov², Zoran Jovanović¹, Sonja Jovanović¹

¹Laboratory of Physics, Vinča Institute of Nuclear Sciences – National Institute of the Republic of Serbia, University of Belgrade, Belgrade, Serbia, ²Joint Institute for Nuclear Research, Dubna, Russia

16.15 – 16.30 Improvement of Au-poly(N-isopropylacrylamide) hydrogel nanocomposites: Single-layer vs. bi-layered systems

Nikolina Nikolić, Jelena Spasojević, Una Stamenović, Vesna Vodnik, Ivana Vukoje, Zorica Kačarević-Popović, Aleksandra Radosavljević

Vinča Institute of Nuclear Sciences, National Institute of the Republic of Serbia, University of Belgrade, Belgrade, Serbia

16.30 – 16.45 Radiological and structural analysis of aluminosilicate materials incorporated with samarium (III)-oxide

Sanja Knežević¹, Miloš Nenadović², Jelena Potočnik², Danilo Kisić², Milica Rajačić³, Snežana Nenadović¹, Marija Ivanović¹

¹Department of Materials, Vinča Institute of Nuclear Sciences, National Institute of the Republic of Serbia, University of Belgrade, Mike Petrović Alasa 12-14, Belgrade, Serbia, ²Department of Atomic Physics, Vinča Institute of Nuclear Sciences, National Institute of the Republic of Serbia, University of Belgrade, Mike Petrović Alasa 12-14, Belgrade, Serbia, ³Department of Radiation and Environmental Protection, Vinča Institute of Nuclear Sciences, National Institute of the Republic of Serbia, University of Belgrade, Mike Petrović Alasa 12-14, Belgrade, Serbia

16.45 – 17.00 Comparison of the conventional and green microemulsion synthesis of the manganese oxide nanoparticles

Tatjana Baljak¹, Stéphane Pronier², Celine Fontaine², Ranka Šatara¹, Radojka Jandrić¹, Slađana Četojević¹, Smiljana Paraš¹, Suzana Gotovac Atlagić¹

¹University of Banja Luka, Faculty of Natural Sciences, Chemistry Department, Mladena Stojanovića 2, 78000, Banja Luka, Republic of Srpska, Bosnia and Herzegovina, ²Université de Poitiers, Institut de Chimie des Milieux et Matériaux de Poitiers (IC2MP), 86073 Poitiers Cedex 9, France

17.00 – 17.15 Preparation of dispersion strengthened nanocomposite with Al₂O₃ and MgO particles by spark plasma sintering

František Kromka¹, Juraj Szabó¹, Ondrej Milkovič¹, Katarína Ďurišínová¹, Nebojša Labus²

¹Slovak Academy of Sciences, Institute of Materials Research, Košice, Slovak Republic, ²Institute of Technical Sciences of SASA, Belgrade, Serbia

Friday, December 1, 2023

09.00 – 10.30 10th Session – New Synthesis and Processing Methods I

Chairpersons: Dr. Sonja Jovanović and Dr. Konrad Terpilowski

09.00 – 09.15 Properties of polymer/MXene nanocomposite films

Ivan Pešić¹, Sanja Ostojić², Miloš Petrović³, Dana Vasiljević Radović¹, Milena Rašljić Rafajilović¹, Vesna Radojević³, Marija V. Pergal¹

¹University of Belgrade, Institute of Chemistry, Technology and Metallurgy, Njegoseva 12, 11000, Belgrade, Serbia, ²Institute of General and Physical Chemistry, University of Belgrade, Studentski trg 12-16, 11000, Belgrade, Serbia, ³Faculty of Technology and Metallurgy, University of Belgrade, Karnegijeva 4, 11000 Belgrade, Serbia

09.15 – 09.30 “Green” synthesis of silver nanoparticles and their biosafety

Konrad Terpilowski¹, K. Dybkova², O. Goncharuk^{2,3}, L. Rieznichenko², T. Gruzina², S. Dybkova^{2,3}

¹Maria Curie-Skłodowska University, Poland, ²F.D. Ovcharenko Institute of biocolloidal chemistry of NAS of Ukraine, 42 Vernadskogo Ave., Kyiv 03142, Ukraine, ³Institute of Agrophysics, Polish Academy of Sciences, Doświadczalna 4, 20-290 Lublin, Poland

09.30 – 09.45 PLD growth of strontium titanate thin films on SrO-deoxidized and rGO-buffered Si(001) substrate

Darija Petković¹, Hsin Chia-Ho², Urška Trstenjak², Janez Kovač³, Damjan Vengust², Matjaž Spreitzer², Zoran Jovanović¹

¹Laboratory of Physics, Vinča Institute of Nuclear Sciences – National Institute of the Republic of Serbia, Belgrade, Serbia, ²Advanced Materials Department, Jožef Stefan Institute, Ljubljana, Slovenia, ³Department of Surface Engineering, Jožef Stefan Institute, Ljubljana, Slovenia

09.45 – 10.00 Study of abnormal grain growth in cold-rolled AA5182 Al-Mg alloy

M. Ghulam Isaq Khan¹, Filip Rajković², Miljana Popović¹, Dejan Prelević², Aleksandar Čitić³, Tamara Radetić¹

¹Faculty of Technology & Metallurgy, University of Belgrade, Serbia, ²Faculty of Mining & Geology, University of Belgrade, Serbia, ³Military-Technical Institute, Belgrade, Serbia

10.00 – 10.15 Analysis of the change in structural parameters of mechanically alloyed Cu composite materials using different milling methods

Marko Simić¹, Emilija Nidžović¹, Željko Radovanović², Jovana Ružić¹

¹Department of Materials, “Vinča” Institute of Nuclear Sciences - National Institute of the Republic of Serbia, University of Belgrade, ²Faculty of Technology and Metallurgy, University of Belgrade

10.15 – 10.30 Synthesis and high-temperature / high-pressure exposure of compositionally complex rock-salt-type transitional metal (carbo)nitrides

Dharma Teja Teppala¹, Shrikant Bhat², Leonard Keil¹, Jan Bernauer¹, Johannes Peter³, Hans-Joachim Kleebe³, Emanuel Ionescu^{1,4}

¹Institute for Material Science, Technical University of Darmstadt, 64287 Darmstadt, Germany, ²Photon Science, DESY, 22607 Hamburg, Germany, ³Institute for Applied Geosciences, Technical University of Darmstadt, 64287 Darmstadt, Germany, ⁴Fraunhofer IWKS, Brentanostrasse 2a, 63755 Alzenau, Germany

10.30 – 10.45 Break

10.45 – 12.15 11th Session – New Synthesis and Processing Methods II
Chairpersons: Dr. Miloš Milović and Katarina Rondović

10.45 – 11.00 Metabolic insights through nondestructive monitoring: A case study on *Vriesea carinata*

Sara V. Ristić, Anđelija N. Mladenović, Gorana D. Madžarević, Marija M. Petković Benazzouz, Katarina M. Miletić

Faculty of Physics, University of Belgrade, Belgrade, Serbia

11.00 – 11.15 Continuous monitoring of leaf optical properties for the early pathogen detection in sweet chestnut

Anđelija N. Mladenović, Gorana D. Madžarević, Sara V. Ristić, Marija M. Petković Benazzouz, Katarina M. Miletić

Faculty of Physics, University of Belgrade, Belgrade, Serbia

11.15 – 11.30 Real-time detection of early signs of Mg and N deficiency in hydroponically grown *Ocimum basilicum*: An innovative optical approach with nutrient recovery insights

Gorana D. Madžarević, Anđelija N. Mladenović, Sara V. Ristić, Marija M. Petković Benazzouz, Katarina M. Miletić

Faculty of Physics, University of Belgrade, Belgrade, Serbia

11.30 – 11.45 Generating mesoporosity in zeolite 13X by applying mild alkaline treatment with urea solution

Katarina Rondović¹, Vladislav Rac², Vesna Rakić², Igor Pašti¹, Ljiljana Damjanović-Vasilic¹
¹University of Belgrade, Faculty of Physical Chemistry, Belgrade, Serbia, ²University of Belgrade, Faculty of Agriculture, Belgrade, Serbia

11.45 – 12.00 A fast and efficient synthesis of gamma rays dosimeters based on metalophthalocyanines

Daliborka Odoabaša¹, Bojana Vasiljević², Dragana Marinković²
¹Faculty of Physical Chemistry, University of Belgrade, Studentski trg 12-16, 11000 Belgrade, Serbia, ²Vinča Institute of Nuclear Sciences, National Institute of the Republic of Serbia, University of Belgrade, P. O. Box 522, 11000 Belgrade, Serbia

12.00 – 12.15 The influence of the pre-deformation and post-deformation process on hardness and microstructure of the the EN AW-7075 aluminum alloy

Avram S. Kovačević
University of Belgrade, Technical faculty in Bor, Bor, Serbia

12.15 – 13.00 Lunch break

**13.00 – 14.30 12th Session – Materials for High-technology Application I
Chairpersons: Dr. Zoran Jovanović and Ljubinka Vasić**

13.00 – 13.15 Utilization of carbon fiber in the context of microbial fuel cell systems

Kristina Joksimović¹, Aleksandra Žerađanin¹, Branka Lončarević¹, Marija Lješević¹, Danijela Randjelović¹, Vladimir Beškoski²
¹University of Belgrade, Institute for chemistry, metallurgy and technology, National Institute of the Republic of Serbia, Njegoševa 12, Belgrade, ²University of Belgrade, Faculty of chemistry, Studentski trg 12-16, Belgrade, Serbia

13.15 – 13.30 Polycrystalline nickel modified with rhodium as an effective electrocatalyst for hydrogen-based energy conversion technologies

Ljubinka Vasić, Nikola Tričković, Zaharije Bošković, Aleksandar Z. Jovanović, Igor A. Pašti
University of Belgrade – Faculty of Physical Chemistry, Belgrade, Serbia

13.30 – 13.45 Perspective of Ni-Sn modified Ni foams in industrial scale alkaline water electrolysis

Jelena Gojčić¹, Aleksandar Petričević¹, Mila Krstajić Pajić¹, Thomas Rauscher², Christian Immanuel Bernaecker², Vladimir Jović³
¹University of Belgrade, Faculty of Technology and Metallurgy, Karnegijeva 4, 11000 Belgrade, Serbia, ²Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM, Branch Lab Dresden, Winterbergstraße 28, 01277 Dresden, Germany,

³*University of Belgrade, Institute for Multidisciplinary Research, Kneza Višeslava 1, 11030 Belgrade, Serbia*

13.45 – 14.00 Ni-MoO₂ as electrocatalyst for hydrogen evolution reaction

A. Petricevic¹, Jelena Gojic¹, Mila Krstajic Pajic¹, T. Rauscher², Christian Immanuel Bernaecker², Vladimir Jovic³

¹*University of Belgrade, Faculty of Technology and Metallurgy, Karnegijeva 4, 11000*

Belgrade, Serbia, ²*Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM, Branch Lab Dresden, Winterbergstraße 28, 01277 Dresden, Germany,*

³*University of Belgrade, Institute for Multidisciplinary Research, Kneza Višeslava 1, 11030 Belgrade, Serbia*

14.00 – 14.15 The influence of ZnCl₂ on the capacitance of hydrothermally synthesized vine shoots-derived carbon

Minea Kapidžić¹, Jana Mišurović¹, Veselinka Grudić¹, Milica Vujković²

¹*University of Montenegro – Faculty of Metallurgy and Technology, Cetinjski put bb, 81000 Podgorica, Montenegro,* ²*University of Belgrade – Faculty of Physical Chemistry, Studentski trg 12-16, 11158, Belgrade, Serbia*

14.15 – 14.30 Hydrothermal carbonization of olive mill waste to electrode materials

Sonja Kastratović¹, Minea Kapidžić¹, Danilo Marković¹, Veselinka Grudić¹, Milica

Vujković², Jana Mišurović¹

¹*University of Montenegro, Faculty of Metallurgy and Technology, Cetinjski put 2, 81000,*

Podgorica, Montenegro, ²*University of Belgrade – Faculty of Physical Chemistry, Studentski trg 12-16, 11158, Belgrade, Serbia*

14.30 – 14.45 Break

14.45 – 16.15 13th Session – Materials for High-technology Application II

Chairpersons: Dr. Marina Vuković and Natalia Majewska

14.45 – 15.00 Environmentally friendly cell with a rechargeable CF/AgCl-PPy cathode

Aleksandra S. Popović, Branimir N. Grgur

TMF, University of Belgrade, Serbia, Karnegijeva 4

15.00 – 15.15 The effect of homogenization conditions on microstructure and recrystallization behavior of AA5182 alloy

Aleksandar Ćitić¹, Miljana Popović², Tamara Radetić², Muhamad Ghulam Isaq Khan²

¹*Military-technical Institute, Belgrade, Serbia,* ²*Faculty of Technology and Metallurgy, University of Belgrade, Serbia*

15.15 – 15.30 Geopolymerisation of the kaolin from Bosnia and Herzegovina: Synthesis, characterization and potential application in high-tech ceramics

Marija Stojaković¹, Sunčica Sukur¹, Elvir Babajić², Esad Salčin³, Zvezdana Sandić¹, Ferenc Madai⁴, Viktor Madai⁴ and Suzana Gotovac Atlagić¹

¹University of Banja Luka, Faculty of Natural Sciences and Mathematics, Mladena Stojanovića 2, 78 000 Banja Luka, Bosnia and Herzegovina, ²University of Tuzla, Faculty of Mining, Geology and Civil Engineering, Univerzitetska 2, Tuzla 75000, Bosnia and Herzegovina, ³Ministry of Energy and Mining of Republic of Srpska, Trg Republike Srpske 1, 78 000 Banja Luka, Bosnia and Herzegovina, ⁴University of Miskolc, Institute of Mineralogy and Geology, H-3515 Miskolc Egyetemváros, Hungary

15.30 – 15.45 Dependence of alumina/ascorbate oxidase biosensor electrocatalytic activity on alumina type

Barbara Ramadan¹, Sonja Novaković¹, Miloš Mojović¹, Zorica Mojović²

¹University of Belgrade Faculty of Physical Chemistry, Studentski trg 12-16, Belgrade, Republic of Serbia, ²University of Belgrade – Institute of Chemistry, Technology and Metallurgy, Department of Catalysis and Chemical Engineering, Njegoševa 12, Belgrade, Republic of Serbia

15.45 – 16.00 Influence of chemical and mechanical pressure on luminescence properties of Cr³⁺-activated near-infrared phosphors

Natalia Majewska¹, Ru-Shi Liu², Sebastian Mahlik^{1,3}

¹Institute of Experimental Physics, Faculty of Mathematics, Physics and Informatics, University of Gdansk, Wita Stwosza 57, 80-308 Gdansk, Poland, ²Department of Chemistry, National Taiwan University, Taipei 106, Taiwan, ³International Centre for Theory of Quantum Technologies (ICTQT), University of Gdansk, 80-308 Gdańsk, Poland

16.00 – 16.15 Utilizing absorption spectroscopy for investigating radiochromic films in radiation dosimetry

Stevan Pecić¹, Miloš Vičić¹, Ivan Belča¹, Ljubomir Kurij², Strahinja Stojadinović³, Slobodan Dević⁴

¹Faculty of Physics, Belgrade, Serbia, ²University Clinical Center of Serbia, Belgrade, Serbia, ³University of Texas Southwestern Medical Center, Dallas TX, USA, ⁴McGill University, Montreal, Canada

16.15 – 16.30 Break

16.30 – 17.45 14th Session – Materials for High-technology Application III and Materials for New Generation Solar Cells

Chairpersons: Dr. Vuk Radmilović and Dr. Lazar Rakočević

16.30 – 16.45 Characterization and hydrogen evolution on Pt/nanoplatelets

Lazar Rakočević¹, Jelena Golubović², Vladimir Rajić¹, Svetlana Štrbac²

¹INN Vinca, Laboratory of Atomic Physics, University of Belgrade, Serbia, Mike Alasa 12-14, 11001 Belgrade, Serbia, ²Institute of Chemistry, Technology and Metallurgy, Department of Electrochemistry, University of Belgrade, Njegoševa 12, 11000 Belgrade, Serbia

16.45 – 17.00 Investigation of varied dip-coating methods for the deposition of TiO₂ blocking layer of the photoanode of Dye-Sensitized Solar Cells

Evgenija Milinković, Vladislav Jovanov and Katarina Cvetanović

Department of Microelectronic Technologies, Institute of Chemistry Technology and Metallurgy, National Institute of the Republic of Serbia, University of Belgrade, Njegoseva 12, 11000 Belgrade, Serbia

17.00 – 17.15 Spin-coated TiO₂ thin films: Fabrication and characterization study

Nastasija Conic^{1,2}, Evgenija Milinkovic³, Vladislav Jovanov³, Jovana Gojanovic¹

¹University of Belgrade, School of Electrical Engineering, Bulevar kralja Aleksandra 73, 11120 Belgrade, Serbia, ²University of Belgrade, Faculty of Physics, Studentski trg 12, 11001 Belgrade, Serbia, ³University of Belgrade, Institute of Chemistry, Technology and Metallurgy, Department of Microelectronic Technologies, Njegoševa 12, 11000 Belgrade, Serbia

17.15 – 17.30 Metal complexes as potential new materials for dye-sensitized solar cells – Synthesis and characterization of Zn(II) complex with asymmetric Schiff base of 2,6-diacetylpyridine

Marijana S. Kostić, Vukadin M. Leovac, Milica G. Bogdanović, Marko V. Rodić, Mirjana M. Radanović

University of Novi Sad, Faculty of Sciences, Novi Sad, Serbia

17.30 – 17.45 The analysis of roof-integrated PV plant with the possible usage of battery energy storage system

Đorđe Jovanović¹, Branislav Milenković²

¹Mathematical Institute of SASA, Department of Computer Sciences, Kneza Mihaila 36, Belgrade, Faculty of Applied Sciences, Department of Mechanical Engineering, Dušana Popovića 22a, Niš

18.00 Closing Ceremony

4-6

Quality control of gas flow proportional counter for beta spectrometric determination of ^{90}Sr

Nataša Sarap¹, Stefana Dejković², Marija Janković¹, Jelena Krneta Nikolić¹,
Vojislav Stanić¹, Milica Rajačić¹

¹*University of Belgrade, Vinča Institute of Nuclear Sciences, National Institute of the Republic of Serbia, Radiation and Environmental Protection Department, Belgrade, Serbia*

²*University of Belgrade, Faculty of Physical Chemistry, Belgrade, Serbia*

In the Radiation and Environmental Protection Department, Vinča Institute of Nuclear Sciences, the validated radiochemical analytical method for ^{90}Sr determination in environmental samples is used. The Laboratory for Radiation Measurements within mentioned Department is accredited according to ISO/IEC 17025. The activity of ^{90}Sr is determined indirectly, by beta counting of its daughter product ^{90}Y , and after established radioactive equilibrium during 18 days from the moment of ^{90}Y radiochemical separation. Beta spectrometry by gas flow proportional counter Thermo Eberline FHT 770T is used for detection of ^{90}Sr activity in investigated samples. In order to assure the reliability of the measurement results in accordance with Standard ISO/IEC 17025:2017, quality assurance and quality control (QA/QC) corresponding procedures need to be applied. For this purpose, activities ought to be planned in a systematic manner as described in the quality control documentation. The efficiency calibration of the detection system needs to be performed in a proper manner. The calibration of the detector for beta counting is performed using the Sr-90 certified radioactive standard point source (9031-OL-335/11, produced by Czech Metrology Institute) which is traceable to Bureau International des Poids et Mesures (BIPM). As low-level measurements require strict QA/QC requests, the accuracy and reproducibility of measurement systems must be verified periodically. A regular internal quality control of the gas flow proportional counter is performed once a week. Quality control activities include the background measurement and checking of efficiency using adequate radioactive standard source. The measurement values are recorded and verified if they are within the acceptance limits. The obtained results together with acceptance limits during the period of 3 months are graphically presented in control charts. The acceptance limits are set to be $\pm 2\sigma$ and $\pm 3\sigma$ in relation to the calculated mean value and standard deviation. The results of QC verification within $\pm 2\sigma$ are considered to be satisfactory, those within $\pm 3\sigma$ are warning, while those that exceeding $\pm 3\sigma$ indicate that there is a problem with the measurement system. Consequently, the analysis of causes and design, as well as the application of corrective measures is needed.