TWENTY-SECOND YOUNG RESEARCHERS' CONFERENCE

MATERIALS SCIENCE AND ENGINEERING

December 4 – 6, 2024, Belgrade, Serbia

Program and the Book of Abstracts

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

2024

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

Publisher:
Institute of Technical Sciences of SASA
Kneza Mihaila 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: Dr. Smilja Marković
Cover photo: Dr. Nebojša Labus

Printing:
Gama digital centar
Otona Župančića No. 19, 11070 Belgrade, Serbia
Tel: +381-63 8616734
http://www.gdc.rs

Publication year: 2024

Print-run:
120 copies

CIP - Каталогизација у публикацији

Народна библиотека Србије, Београд

66.017/.018(048)

YOUNG Researchers Conference Materials Sciences and Engineering (22 ; 2024 ; Beograd)
Program ; and the Book of abstracts / Twenty-Second Young Researchers' Conference Materials Science and Engineering, December 4 – 6, 2024, Belgrade, Serbia ; [organizers] Materials Research Society of Serbia & Institute of Technical Sciences of SASA ; [editor Smilja Marković]. - Belgrade : Institute of Technical Sciences of SASA, 2024 (Belgrade : Gama digital centar). - XXII, 89 str. ; 23 cm
Tiraž 120. - Registar.

ISBN 978-86-80321-39-4

a) Наука о материјалима -- Апстракти b) Технички материјали -- Апстракти
COBISS.SR-ID 157262345

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

Scientific and Organizing Committee

Milan Radovanović	Technical Faculty in Bor, Serbia
Vladimir Rajić	Institute of Nuclear Sciences "Vinča", Belgrade, Serbia
Julietta Rau	Institute of the Structure of Matter of the Italian National Research Council (ISM-CNR), Rome, Italy
Ana Stanković	Institute of Technical Sciences of SASA, Belgrade, Serbia
Boban Stojanović	Faculty of Sciences, Kragujevac, Serbia
Ivana Stojković Simatović	Faculty of Physical Chemistry, Belgrade, Serbia
Srečo Škapin	Institute Jožef Stefan, Ljubljana, Slovenia
Konrad Terpiłowski	Department of Interfacial Phenomena, Institute of Chemical Sciences, Faculty of Chemistry, Maria Curie-Skłodowska University in Lublin, Poland
Vuk Uskoković	TardigradeNano, Irvine, CA, USA
Rastko Vasilić	Faculty of Physics, Belgrade, Serbia
Ljiljana Veselinović	Institute of Technical Sciences of SASA, Belgrade, Serbia

Conference Secretary

Aleksandra Stojičić	Institute of Technical Sciences of SASA, Belgrade, Serbia

Conference Technical Committee

Katarina Aleksić, Marija Grujičić, Marko Jelić, Tamara Matić, Željko Mravik, Ana Nastasić, Milica Pejčić, Miljana Piljević, Jelena Rmuš-Mravik, 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 2025.

Sponsors

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-Second Young Researchers' Conference - Materials Sciences and Engineering, held in Belgrade, Serbia.

Programme
Twenty-Second Young Researchers Conference
Materials Science and Engineering

Wednesday, December 4th, 2024

09.15 – 09.30 Opening Ceremony
Dr. Ivana Dinić, Dr. Sonja Jovanović, Prof. Dr. Đorđe Veljović, Vice-presidents of 22YRC Sientific committee

09.30 – 11.15 1st Session – Biomaterials I
Chairpersons: Dr. Ivana Drvenica and Ivana Banićević

09.30 – 09.45 Chemical engineering aspects of a perfusion-based 3D *in vitro* osteosarcoma model
Ivana Banicevic[1], Milena Milivojevic[2], Radmila Jankovic[3], Jasmina Stojkovska[1], Bojana Obradovic[1]
[1]University of Belgrade, Faculty of Technology and Metallurgy, Belgrade, Serbia, [2]University of Belgrade, Institute of Molecular Genetics and Genetic Engineering, Belgrade, Serbia, [3]University of Belgrade, Faculty of Medicine, Belgrade, Serbia

09.45 – 10.00 Doxorubicin application in a 3D osteosarcoma cell culture model
Marija Pavlović[1], Ivana Banićević[1], Milena Milivojević[2], Jasmina Stojkovska[1], Bojana Obradović[1]
[1]University of Belgrade, Faculty of Technology and Metallurgy, Belgrade, Serbia, [2]University of Belgrade, Institute of Molecular Genetics and Genetic Engineering, Belgrade, Serbia

10.00 – 10.15 Comparison of the effects of combined doxorubicin and quercetin treatment on 2D and 3D osteosarcoma model systems
Luka Bojić[1], Jelena Pejić[1], Jasmina Stojkovska[2], Aleksandra Medić[1], Marija Schwirtlich[1], Isidora Petrović[1], Milena Milivojević[1]
[1]University of Belgrade, Institute of Molecular Genetics and Genetic Engineering, Belgrade, Serbia, [2]University of Belgrade, Faculty of Technology and Metallurgy, Belgrade, Serbia

10.15 – 10.30 Towards optimized 3D cancer cell cultures in alginate-based microfibers

Jelena Petrović[1,2], Miodrag Dragoj[3], Milica Pešić[3], Luka Bojić[4], Milena Milivojević[4], Radmila Janković[5], Bojana Obradović[1], Jasmina Stojkovska[1]
[1]University of Belgrade, Faculty of Technology and Metallurgy, Belgrade, Serbia, [2]Innovation Center of the Faculty of Technology and Metallurgy, Belgrade, Serbia, [3]University of Belgrade, Institute for Biological Research "Siniša Stanković" - National Institute of the Republic of Serbia, Belgrade, Serbia, [4]University of Belgrade, Institute of Molecular Genetics and Genetic Engineering, Belgrade, Serbia, [5]University of Belgrade, Faculty of Medicine, Belgrade, Serbia

10.30 – 10.45 Exploring the potential of human placental tissue as a bioink in 3D bioprinting for use in soft tissue engineering applications

Dragana Aleksandrović[1], Hristina Obradović[1], Ivana Gazikalović[2], Ivana Okić Đorđević[1], Slavko Mojsilović[1], Bojana Balanč[2], Aleksandar Janev[3], Zorica Knežević-Jugović[4], Mateja Erdani Kreft[3], Aleksandra Jauković[1]
[1]Group for Hematology and Stem Cells, Institute for Medical Research, National Institute of Republic of Serbia, University of Belgrade, Belgrade, Serbia, [2]Innovation Center, Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia, [3] Institute of Cell Biology, Faculty of Medicine, University of Ljubljana, Ljubljana, Slovenia, [4]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade

10.45 – 11.00 Prospective chitosan-based pharmaceutical delivery system for cancer treatment

Anais Morgane Le Masson[1], Jovana Zvicer[2], Rossella Sesia [1], Sara Ferraris[1], Marco Sangermano[1], Bojana Obradovic[2], Silvia Spriano[1], Jasmina Stojkovska[2]
[1]Politecnico di Torino, Dipartimento di Scienza Applicata e Tecnologia, Torino, Italy, [2]University of Belgrade, Faculty of Technology and Metallurgy, Belgrade, Serbia

11.00 – 11.15 Influence of different manufacturing techniques and tissue origin on tissue response to collagen membranes of the same species origin

Milena Radenković Stošić[1], Sanja Stojanović[1,2], Mike Barbeck[3,4], Ole Jung[4], Stevo Najman[1,2]
[1]University of Niš, Faculty of Medicine, Scientific Research Center for Biomedicine, Department for Cell and Tissue Engineering, 18000 Niš, Serbia, [2]University of Niš, Faculty of Medicine, Department of Biology and Human Genetics, 18000 Niš, Serbia, [3]BerlinAnalytix GmbH, Berlin, Germany, [4]Clinic and Policlinic for Dermatology and Venereology, University Medical Center Rostock, Rostock, Germany

11.15 – 11.30 Break

11.30 – 13.15 2nd Session – Biomaterials II
Chairpersons: Prof. Dr. Bojana Obradović and Katarzyna Pastuszak

11.30 – 11.45 Nanoencapsulation of parthenolide based on bio-ionic liquids and polymer for advanced drug delivery systems
Dajana Lazarević[1], Jelena Jovanović[1], Catherine Charcosset[2], Tatjana Trtić Petrović[1]
[1]Vinča Institute of Nuclear Sciences – National Institute of the Republic of Serbia, University of Belgrade, Belgrade, Serbia, [2]Univ Claude Bernard Lyon 1, CNRS, UMR 5007, CPE, Lab Automat & Genie Proc, Villeurbanne, France

11.45 – 12.00 Synthesis and biological evaluation of sulfhydroxamic acid derivatives as potential dual COX-2 and 5-LOX inhibitors
Jelena Bošković[1], Vladimir Dobričić[1], Otilija Keta[2], Lela Korićanac[2], Jelena Žakula[2], Olivera Čudina[1]
[1]Department of Pharmaceutical Chemistry, University of Belgrade – Faculty of Pharmacy, Vojvode Stepe 450, 11000 Belgrade, Serbia, [2]Vinča Institute of Nuclear Sciences, National Institute of the Republic of Serbia, University of Belgrade, Mike Petrovića Alasa 12-14, 11351 Vinča, Belgrade, Serbia

12.00 – 12.15 3D Printing of Biocomposite Scaffolds based on Interpenetrated Network and Multi-Doped Mesoporous Bioactive Glass for Bone Tissue Engineering
Teodora Jakovljević[1], Tamara Matić[1], Vukašin Ugrinović[2], Miloš Papić[3], Djordje Janaćković[1], Rada Petrović[1], Biljana Ljujić[3], Djordje Veljović[1]
[1]University of Belgrade, Faculty of Technology and Metallurgy, Belgrade, Serbia, [2]Innovation Center of the Faculty of Technology and Metallurgy Ltd, Belgrade, Serbia, [3]University of Kragujevac, Faculty of Medical Sciences, Kragujevac, Serbia

12.15 – 12.30 Pro-Osteogenic Properties of Titanium-Based Scaffold Combined with SHED-Derived EVs Embedded in Collagen
Marija Milivojević[1], Maja Kosanović[2], Sergej Tomić[2], Marina Bekić[2], Miodrag Čolić[3], Đorđe Janaćković[1,4]
[1]Inovation Center of The Faculty of Technology and Metallurgy, Belgrade, Serbia, [2]Institute for the Application of Nuclear Energy, INEP, Belgrade, Serbia, [3]Serbian Academy of Sciences and Arts, Belgrade, Serbia, [4]Faculty of Technology and Metallurgy, Belgrade, Serbia

12.30 – 12.45 Nanocomposite based on resveratrol and selenium for bioglass scaffold coating

Nina Tomić[1], Nenad Filipović[1], Maja Kuzmanović[1], Dragana Mitić Ćulafić[2], Aldo R. Boccaccini[3], Magdalena M. Stevanović[1]

[1]Group for Biomedical Engineering and Nanobiotechnology, Institute of Technical Sciences of SASA, Knez Mihailova 35/IV 11000 Belgrade, Serbia, [2]Department of Microbiology, University of Belgrade - Faculty of Biology, Studentski trg 16, Belgrade, Serbia, [3]Institute of Biomaterials, Department of Materials Science and Engineering, University of Erlangen-Nuremberg, Erlangen, Germany

12.45 – 13.00 Synthesis and characterization of $NaGd_{0.8}Yb_{0.17}Er_{0.03}F_4$ nanoparticles for selective *in vitro* labeling of cancer cells

Miljana Piljevic[1], Ivana Dinic[2], Marta Bukumira[1], Mihailo D. Rabasovic[1], Aleksandar J. Krmpot[1], Milos Lazarevic[3], and Lidija Mancic[2]

[1]Photonic Center, Institute of Physics Belgrade, University of Belgrade, Pregrevica 118, Zemun, 11080, Belgrade, Serbia, [2]Institute of Technical Sciences of SASA, Kneza Mihaila St. 35, 11000, Belgrade, Serbia, [3]School of Dental Medicine, University of Belgrade, dr Subotica 8, 11000, Belgrade, Serbia

13.00 – 13.15 Study of the LL-37 peptide effect on physicochemical properties of *Legionella dumoffii* model membranes

Katarzyna Pastuszak[1], Małgorzata Jurak[1], Bożena Kowalczyk[2], Marta Palusińska-Szysz[2]

[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

13.15 – 14.00 Lunch break

14.00 – 16.00 3rd Session – Biomaterials III
Chairpersons: Prof. Dr. Đorđe Veljović and Zoran Bobić

14.00 – 14.15 Effect of tannic acid (TA) on increasing urea-formaldehyde (UF) adhesive performance

Tamara Tešić[1], Milica Rančić[1], Danica Bajuk Bogdanović[2], Ivana Gavrilović Grmuša[1]

[1]University of Belgrade, Faculty of Forestry, Kneza Višeslava 1, Belgrade, Serbia, [2]University of Belgrade, Faculty of Physical Chemistry, Studentski trg 12-16, Belgrade, Serbia

14.15 – 14.30 Production and Characterization of Chromium Nanoparticles for Applications in Biomedicine

Sara Lukač[1], Vladimir Rajić[2], Zoran Stojanović[1], Magdalena Stevanović[1]
[1]Group for Biomedical Engineering and Nanobiotechnology, Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Kneza Mihaila 35/IV, 11000 Belgrade, Serbia, [2]Department of Atomics Physics, Vinča Institute of Nuclear Sciences, National Institute of the Republic of Serbia, University of Belgrade, Mike Petrovića Alasa 12-14, 11000 Belgrade, Serbia

14.30 – 14.45 Fabrication and characterization of transdermal patches for transdermal drug delivery

CANCELED

Kolawole S. Dada
Chemical Engineering Center, ITMO University, Saint Petersburg, Rusia Federation

14.45 – 15.00 Fourier transform infrared spectroscopy as a tool for chemical analysis of nanoliposomes with aloe leaf extract

CANCELED

Lidija Mlađenović[1], Milena Milošević[2], Ana Plećić[1], Sandra Rakin[1], Marija Gnjatović[1], Diana Dapulović[1], Aleksandra Jovanović[1]
[1]Institute for the Application of Nuclear Energy INEP, University of Belgrade, Banatska 31b, 11080 Belgrade, Serbia, [2]Institute of Chemistry, Technology and Metallurgy, National Institute of the Republic of Serbia, University of Belgrade, Njegoševa 12, Belgrade, Serbia

15.00 – 15.15 Protein extraction from *Daucus carota* L. root: optimization of extraction solvent and procedure

CANCELED

Sandra Rakin[1], Ana Plećić[1], Branislava Bartalović[2], Mirjana Vukosavljev[2], Marija Gnjatović[1], Diana Dapulović[1], Aleksandra Jovanović[1]
[1]Institute for the Application of Nuclear Energy INEP, University of Belgrade, Banatska 31b, 11080 Belgrade, Serbia, [2]Institute BioSense, Member of the University of Novi Sad, Dr Zorana Djindjića 1, 21000 Novi Sad, Serbia

15.15 – 15.30 Computer Vision Algorithms for Detection and Tracking of *Artemia salina* in Toxicity Assessment Tests

Nikola Stanojević[1,2], Nina Tomić[2], Miloš Tomić[2], Magdalena Stevanović[2], Marko Mišić[1], Zoran Stojanović[2]
[1]University of Belgrade - School of Electrical Engineering, Belgrade, Serbia, [2]Institute of Technical Sciences of SASA, Knez Mihailova 35/IV 11000 Belgrade, Serbia

15.30 – 15.45 Influence of Growth Defects on Corosion of Coated Metal Biomaterials

Zoran Bobić[1], Lazar Kovačević[1], Vladimir Terek[1], Aljaž Drnovšek[1,2], Attila Csík[3], Peter Rodič[2], Pal Terek[1]
[1]*University of Novi Sad, Faculty of Technical sciences, Novi Sad, Serbia,* [2]*Jožef Stefan Institute, Ljubljana, Slovenija,* [3]*Institute for Nuclear Research, Debrecen, Hungary*

CANCELED

15.45 – 16.00 Advancements in Intraocular Lenses Design and Manufecturing: Evaluating Optical Clarity and Performance Standards

Ana Mirić[1], Nevena Milivojević Dimitrijević[1], Strahinja Milenković[1], Dalibor Nikolić[1], Vukašin Slavković[2], Nenad Grujović[2], Marko Živanović[1,3], Nenad Filipović[2,3]
[1]*Institute for Information Technologies, University of Kragujevac, Jovana Cvijića bb, 34000 Kragujevac, Serbia,* [2]*Faculty of Engineering, University of Kragujevac, Sestre Janjić 6, 34000 Kragujevac, Serbia,* [3]*BioIRC - Bioengineering Research and Development Center, University of Kragujevac, Prvoslava Stojanovića 6, 34000 Kragujevac, Serbia*

16.00 – 16.15 Break

16.15 – 18.15 4th Session – Environmental Materials
Chairpersons: Prof. Dr. Ljiljana Damjanović-Vasilić and Ana Nastasić

16.15 – 16.30 Precious Metal Ions Sorption on the Impregnated Sorbent

Karolina Zinkowska, Grzegorz Wójcik
Department of Inorganic Chemistry, Institute of Chemical Sciences, Faculty of Chemistry, Maria Curie-Skłodowska University, Maria Curie-Skłodowska Sq. 2, 20-031 Lublin, Poland

16.30 – 16.45 Ag(I) coordination polymers as high-performance photocatalysts for degradation of organic dyes in water

Predrag Ristić[1], Veljko Đokić[2], Jasminka Popović[3], Nenad Filipović[4], Tamara Todorović[1]
[1]*University of Belgrade - Faculty of Chemistry, Studentski trg 12-16, Belgrade, Serbia,* [2]*Innovation Center of Faculty of Technology and Metallurgy, University of Belgrade, Karnegijeva 4, Belgrade, Serbia,* [3]*Institute Ruđer Bošković, Bijenička cesta 54, Zagreb, Croatia,* [4]*University of Belgrade - Faculty of Agriculture, Nemanjina 6, Belgrade, Serbia*

16.45 – 17.00 Attractiveness of wild *Helianthus* species inflorescences in drought conditions

Milica Aleksić[1], Nada Grahovac[1], Sandra Cvejić[1], Dragana Miladinović[1], Aleksandra Radanović[1], Olivera Lazić[2], Jelena Jocković[1]
[1]*Institut of Field and Vegetable Crops, Maksima Gorkog 30, Novi Sad, Serbia,* [2]*Faculty of Technical Sciences, University of Novi Sad, Novi Sad, Serbia*

17.00 – 17.15 Novel trimetallic ZIF materials as visible light harvesting photocatalysts

Andrej Milivojac[1], Jovana Araškov[2], Veljko Đokić[3], Aleksandar Višnjevac[4], Jasminka Popović[4], Nenad Filipović[5], Tamara Todorović[2]
[1]*Innovative Centre of the Faculty of Chemistry, Studentski trg 12-16, Belgrade, Serbia,* [2]*University of Belgrade - Faculty of Chemistry, Studentski trg 12-16, Belgrade, Serbia,* [3]*Innovation Center of Faculty of Technology and Metallurgy, University of Belgrade, Karnegijeva 4, Belgrade, Serbia,* [4]*Institute Ruđer Bošković, Bijenička cesta 54, Zagreb, Croatia,* [5]*University of Belgrade - Faculty of Agriculture, Nemanjina 6, Belgrade, Serbia*

17.15 – 17.30 Influence of the graphene oxide content in the ZnO/GO composite on the selectivity and sensitivity of the electrode for detecting diclofenac in water

CANCELED

Ana Nastasić[1], Kristina Savanin Krstajić[2], Marijana Kraljić Roković[3], Smilja Marković[2], Ivana Stojković Simatović[1]
[1]*Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia,* [2]*Institute of Technical Sciences of SASA, Belgrade, Serbia,* [3]*Faculty of Chemical Engineering and Technology, University of Zagreb, Zagreb, Croatia*

17.30 – 17.45 Surface modifications of zero-valent iron nanoparticles for environmental applications

CANCELED

Viktorie Víchová[1], Jana Křížek Čuborová[1], Josef Kašík[1], Jan Filip[1]
[1]*Czech Advanced Technology and Research Institute, Regional Centre of Advanced Technologies and Materials, Palacký University Olomouc, Šlechtitelů 27, 783 71 Olomouc, the Czech Republic,* [2]*Department of Experimental Physics, Faculty of Science, Palacký University Olomouc, 17. listopadu 1192/12, 771 46 Olomouc, the Czech Republic*

17.45 – 18.00 The utilization of hazelnut shells for efficient removal of BR18 azo dye: A comparative study of raw and modified adsorbents

Naji Agilee[1], Tijana Spasojević[2], Milica Delić[1], Đorđe Ogrizović[1], Isabel Gria[1], Nevena Prlainović[1], Maja Đolić[1]

[1]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia, [2]Innovation Center of Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia

18.00 – 18.15 Assessment of thiocarbohydrazones' lipophilicity and ecotoxicity
Dragana Mekić, Đenđi Vaštag, Gorana Mrđan, Borko Matijević, Suzana Apostolov
University of Novi Sad, Faculty of Sciences, Department of Chemistry, Biochemistry and Environmental Protection, Novi Sad, 21000, Serbia

Thursday, December 5th, 2024

09.30 – 11.00 5th Session – Theoretical Modeling of Materials
Chairpersons: Prof. Dr. Konrad Terpiłowski and Nilesh Kumar

09.30 – 09.45 DFT Insights into Boron-Doped Graphene: Tuning Metal Interaction through Boron Content and Surface Oxidation
Nikola Veličković, Ana S. Dobrota
University of Belgrade – Faculty of Physical Chemistry, Belgrade, Serbia

09.45 – 10.00 Excitons, optical spectra, and electronic properties of semiconducting Hf-based MXenes CANCELED
Nilesh Kumar, Miroslav Kolos, Sitangshu Bhattacharya and František Karlický
Department of Physics, Faculty of Science, University of Ostrava, Ostrava, Czech Republic

10.00 – 10.15 Factors influencing the prices of artificial fertilizers
Aleksandra Kowalska[1], Mateusz Hałka[1], Anna Budzyńska[1], Mariusz Kicia[1], Konrad Terpiłowski[2]
[1]Institute of Economics and Finance, Maria Curie-Skłodowska University, pl. Marii Curie-Skłodowskiej 5, Lublin, 20-031, Poland, [2]Institute of Chemical Sciences, Maria Curie-Skłodowska University, pl. Marii Curie-Skłodowskiej 2, Lublin, 20-031, Poland

10.15 – 10.45 Establishing Serbian Reproducibility Network (announcing the activities supported by the TIER2 Award for a Establishing Reproducibility Network)
Matija Zlatar[1], Bojana Gavrilović[2], Ljiljana Radosavljević[2], Ivana Dinić[3], Milica Ševkušić[3], Marijana Petković[4], Obrad Vučkovac[4], Stanislava Stanojević[5], Irena

Nježić[5], Nadica Miljković[6], Aleksandra Lazić[7], Ljiljana Lazarević Valerjev[7], Milica Ninković[8], Biljana Glišić[9]
[1]University of Belgrade - Institute of Chemistry, Technology and Metallurgy - National Institute of Republic of Serbia, Belgrade, Serbia, [2]Institute for Vegetable Crops, Smederevska Palanka, Serbia, [3]Institute of Technical Sciences of SASA, Belgrade, Serbia, [4]University of Belgrade - Vinča Institute of Nuclear Sciences - National Institute of the Republic of Serbia, Belgrade, Serbia, [5]Institute of Virology, Vaccines and Sera "Torlak" (TORLAK), Belgrade, Serbia, [6]University of Belgrade - School of Electrical Engineering, Belgrade, Serbia, [7]University of Belgrade - Faculty of Philosophy and LIRA Lab (LIRA Lab), Belgrade, Serbia, [8]University of Belgrade - Institute for Medical Research - National Institute of the Republic of Serbia, Belgrade, Serrbia, [9]Faculty of Science, University of Kragujevac, Kragujevac, Serbia

10.45 – 11.00 Vendor presentation
Tevus d.o.o / Sympatec GmbH and Edinburgh instruments (Peđa Srejić)
Tevus d.o.o, Velisava Vulovića 20, 11000 Belgrade, Serbia

11.00 – 11.15 Break

11.15 – 13.00 6th Session – Nanostructured Materials I
Chairpersons: Dr. Sonja Jovanović and Tea Belojica

11.15 – 11.30 Preparation of heterostructured Au@FeOx nanoparticles: Structural and magnetic properties
Farzane Talaee Shoar[1], Pierfrancesco Maltoni[2], Gianni Barucca, Davide Peddis[2], Gaspare Varvaro[3]
[1]Università Politecnica delle Marche, Ancona, Italy, [2]Università di Genova, Genova, Italy, [3]CNR, Roma, Italy

11.30 – 11.45 Study of crystal phases and temperature dependence of $InSiTe_3$
T. Belojica[1], J. Blagojević[1], S. Djurđić Mijin[1,2], A. Šolajić[1], J. Pešić[1], B. Višić[1], V. Damljanović[1], M. O. Ogunbunmi[3], S. Bobev[3,4], Yu Liu[4], C. Petrovic[4,5,6], Z.V. Popović[7], A. Milosavljević[1], N. Lazarević[1]
[1]Center for Solid State Physics and New Materials, Institute of Physics Belgrade, University of Belgrade, Pregrevica 118, 11080 Belgrade, Serbia, [2]Departamento de Fisica de Materiales, Facultad de Ciencias,Universidad Autonoma de Madrid, 28049 Madrid, Spain, [3]Department of Chemistry and Biochemistry, University of Delaware, Newark, Delaware 19716, U.S.A., [4]Condensed Matter Physics and Materials Science Department, Brookhaven National Laboratory, Upton, NY 11973-5000, USA, [5]Shanghai Advanced Research in Physical Sciences (SHARPS),

Shanghai 201203, China, [6]Department of Nuclear and Plasma Physics, Vinca Institute of Nuclear Sciences, University of Belgrade, Belgrade 11001, Serbia, [7]Serbian Academy of Sciences and Arts, Knez Mihailova 35, 11000 Belgrade, Serbia

11.45 – 12.00 Characterization of the macro- and microstructure of the flux-cored nanocomposites wires deposited on the cast Ni-based superalloy

Łukasz Rakoczy[1], Lechosław Tuz[1], Michał Urbańczyk[2], Dawid Kozień[3], Rafał Cygan[4]
[1]AGH University of Kraków, Faculty of Metals Engineering and Industrial Computer Science, al. Mickiewicza 30, 30-059 Kraków, Poland, [2]Łukasiewicz Research Network-Upper Silesia Institute of Technology, Poland, [3]AGH University of Krakow, Faculty of Materials Science and Ceramics, al. Mickiewicza 30, 30-059 Kraków, Poland, [4]Consolidated Precision Products, ul. Hetmańska 120, 35-078 Rzeszów, Poland

12.00 – 12.15 Impact of Silver Nanoparticles (AgNPs) on the Piezoelectric Properties of Electrospun PVDF Nanomats

Strahinja Milenković[1,2], Katarina Virijević[1,2], Živana Jovanović Pešić[2], Nenad Grujović[2], Fatima Živić[2]
[1]Institute for Information Technologies, University of Kragujevac, Jovana Cvijića bb, 34000 Kragujevac, Serbia, [2]Faculty of Engineering, University of Kragujevac, Sestre Janjić 6, 34000 Kragujevac, Serbia

12.15 – 12.30 Mechanochemical synthesis and characterization of composite systems MgH_2 – Tm (Tm = Ti, Cr and V) for application in hydrogen energy

Ana Kanjevac[1], Igor Milanovic[2], Slavica Maletic[3]
[1]Center for Solid State Physics and New materials, Institute of Physics Belgrade, University of Belgrade, Pregrevica 118, 11080 Belgrade, Serbia, [2]Center of Excellence for Hydrogen and Renewable Energy, Laboratory of Physics, Vinča Institute of Nuclear Sciences, University of Belgrade, P.O. Box 522, 11000 Belgrade, Serbia, [3]Faculty of Physics, University of Belgrade, Belgrade, Serbia

12.30 – 12.45 Sustainable approach to recycling end-of-life NdFeB permanent magnets

Ayda Ghary Haghighat[1,2,3], Arooj Ramzan[1], Alexander Omelyanchik[1,2], Gaspare Varvaro[2], Sawssen Slimani[1,2], Davide Peddis[1,2]
[1]Università degli Studi di Genova, Dipartimento di Chimica e Chimica Industriale, nM^2 -Lab, Via Dodecaneso 31, 1-16146 Genova, Italy, [2]CNR, Istituto di Struttura della Materia, nM^2-Lab, Monterotondo Scalo (Roma), 00015, Italy, [3]Università degli Studi Roma Tre, Dipartimento di Scienze, Via Ostiense 159, 00146 Rome, Italy

12.45 – 13.00 Aging time and wettability of PDMS based magnetic nanocomposites
Ibtissame Sidane[1], Davide Peddis[1,2], Stefano Alberti[1], Sawssen Slimani[1,2]
[1]Department of Chemistry and Industrial Chemistry (DCCI), University of Genova, Genova (GE), Italy, [2]Institute of Structure of Matter (ISM), National Research Council (CNR), Roma (RM), Italy

13.00 – 14.00 Lunch break

14.00 – 16.00 7th Session – Nanostructured Materials II
Chairpersons: Dr. Lidija Mančić and Marija Grujičić

14.00 – 14.15 UV irradiation influence on fumitory extract-loaded liposomes
CANCELED
Rabija Ahmoda[1], Andrea Pavković[2], Milena Milošević[3], Aleksandar Marinković[1], Aleksandra Jovanović[2]
[1]Faculty of Technology and Metallurgy, University of Belgrade, Karnegijeva 4, 11000 Belgrade, Serbia, [2]Institute for the Application of Nuclear Energy INEP, University of Belgrade, Banatska 31b, 11080 Belgrade, Serbia, [3]Institute of Chemistry, Technology and Metallurgy, National Institute of the Republic of Serbia, University of Belgrade, Njegoševa 12, Belgrade, Serbia

14.15 – 14.30 Influence of the high-temperature preheating on the decrease in liquation cracking susceptibility
Małgorzata Grudzień-Rakoczy[1], Łukasz Rakoczy[2], Wacław Oleksy[1], Konrad Chrzan[1], Krzysztof Jaśkowiec[1], Rafał Cygan[3]
[1]Łukasiewicz Research Network-Kraków Institute of Technology, ul. Zakopiańska 73, 30-418 Kraków, Poland, [2]AGH University of Kraków, Faculty of Metals Engineering and Industrial Computer Science, al. Mickiewicza 30, 30-059 Kraków, Poland, [3]Consolidated Precision Products, ul. Hetmańska 120, 35-078 Rzeszów, Poland

14.30 – 14.45 Synthesis and characterization of high coercitivity ε-Fe_2O_3 nanoparticles via sol-gel process from akaganeite precursors
Marko Đošić, Ana Mraković, Marin Tadić
Laboratory of Theoretical and Condensed Matter Physics, Vinča Institute of Nuclear Sciences-National Institute of the Republic of Serbia, University of Belgrade, Belgrade, Serbia

14.45 – 15.00 Storage stability of the liposomal system with encapsulated *Vaccinium myrtillus* extract
CANCELED
Muna Rajab Elferjane[1], Aleksandar Marinković[1], Aleksandra Jovanović[3]

[1]Faculty of Nursing and Health Sciences, University of Misurata, Alshowahda Park, 3rd Ring Road, 2478 Misurata, Libya, [2]Faculty of Technology and Metallurgy, University of Belgrade, Karnegijeva 4, 11000 Belgrade, Serbia, [3]Institute for the Application of Nuclear Energy INEP, University of Belgrade, Banatska 31b, 11080 Belgrade, Serbia

15.00 – 15.15 Synthesis of dense boride-based composites through reactive sintering using boron carbide and the Ti-Si intermetallic system

Dawid Kozień[1], Zbigniew Pędzich[1], David Salamon[2], Daniel Valasek[2], Peter Tatarko[3], Michal Hičák[3], Ondrej Hanzel[3], Paweł Nieroda[4], Katarzyna Pasiut[1], Leszek Chlubny[1]
[1]Department of Ceramics and Refractory Materials, AGH University of Krakow, 30 Mickiewicza Av., 30-059 Krakow, Poland, [2]Central European Institute of Technology, Brno University of Technology, Purkyňova 464/118, 61200 Brno, Czech Republik, [3]Department of Ceramics, Institute of Inorganic Chemistry, Slovak Academy of Sciences, 9 Dúbravská cesta, 845 36 Bratislava, Slovakia, [4]Department of Inorganic Chemistry, AGH University of Krakow, 30 Mickiewicza Av., 30-059 Krakow, Poland

15.15 – 15.30 Radical scavenging activity of silymarin encapsulated in liposomal vesicles: Impact of UV irradiation and lyophilization

CANCELED

Amjed Karkad[1,2], Milena Milošević[3], Andrea Pirković[4], Aleksandar Marinković[2], Aleksandra Jovanović[4]
[1]Elmergib University, Faculty of Medical Technology, Msallata, Libya, [2]Faculty of Technology and Metallurgy, University of Belgrade, Karnegijeva 4, 11000 Belgrade, Serbia, [3]Institute of Chemistry, Technology and Metallurgy, National Institute of the Republic of Serbia, University of Belgrade, Njegoševa 12, Belgrade, Serbia, [4]Institute for the Application of Nuclear Energy INEP, University of Belgrade, Banatska 31b, 11080 Belgrade, Serbia

15.30 – 15.45 Preparation and applications of calcium phosphate nanoparticles in pre-malignant and oral cancer treatment

Evelina Herendija[1], Milica Jakšić Karišik[2], Jelena Milašin[2], Miloš Lazarević[2], Nenad Ignjatović[3]
[1]University of Belgrade, Multidisciplinary PhD Studies, Studentski Trg 1, 11000 Belgrade, Serbia, [2]University of Belgrade, Implant-Research Center, School of Dental Medicine, Dr Subotica 8, 11000 Belgrade, Serbia, [3]Institute of Technical Sciences of SASA, Knez Mihailova 35/IV, 11000 Belgrade, Serbia

15.45 – 16.00 A step towards sustainable approach to grow nanocrystalline diamond film: characterization and perspectives for bioapplications
Arvind K. Bhakta[1], Abdoulaye Siby[1], Sarah Al Zeibak[1], Joel Jeevan[1], Khaled Hassouni[1], Souad Ammar[2], Fabien Bénédic[1], Swaminathan Prasanna[1]
[1]Université Sorbonne Paris Nord, LSPM-CNRS, Villetaneuse, France, [2]Université Paris Cité, CNRS, ITODYS, Paris, France

16.00 – 16.15 Break

16.15– 18.15 8th Session – Nanostructured Materials III
Chairpersons: Dr. Zoran Jovanović and Iva Dimitrievska

16.15 – 16.30 Electrochemical sensors based on polymer/nanocomposite-modified carbon and gold screen-printed electrodes for monitoring doxorubicin
Iva Dimitrievska[1], Katarina Aleksić[2], Perica Paunović[1], Smilja Marković[2], Anita Grozdanov[1]
[1]Ss, Cyril and Methodius University in Skopje, Faculty of Technology and Metallurgy, Rugjer Boshkovikj 16, Skopje, 1000, North Macedonia, [2]Institute of Technical Sciences of SASA, Belgrade, Serbia

16.30 – 16.45 Development of Electrochemical Sensors for Diclofenac Monitoring: A Study of ZnO/BTS Composites
Katarina Aleksić[1], Jakša Perić[2], Ana Stanković[1], Ivana Stojković Simatović[2], Smilja Marković[1]
[1]Institute of Technical Sciences of SASA, Belgrade, Serbia, [2]University of Belgrade - Faculty of Physical Chemistry, Belgrade, Serbia

16.45 – 17.00 Nitrogen-doped PtNi decorated binary metal oxides for ORR and OER
Dušan Mladenović[1], Yasemin Aykut[2], Ayşe B. Yurtcan[2], Gulin S.P. Soylu[3], Diogo M.F. Santos[4], Šćepan Miljanić[1], Biljana Šljukić[1,4]
[1]University of Belgrade, Faculty of Physical Chemistry, Studentski trg 12-16, 11158 Belgrade, Serbia, [2]Department of Chemical Engineering, Atatürk University, Erzurum, Turkey, [3]Faculty of Engineering, Chemical Engineering Department, Istanbul University-Cerrahpasa, 34320, Avcilar, Istanbul, Turkey, [4]Center of Physics and Engineering of Advanced Materials, Laboratory for Physics of Materials and Emerging Technologies, Chemical Engineering Department, Instituto Superior Técnico, Universidade de Lisboa, 1049-001 Lisbon, Portugal

17.00 – 17.15 Harnessing graphene oxide nanoparticles to combat neurodegeneration: Insights from advanced molecular dynamics

Budimir S. Ilić
University of Niš, Faculty of Medicine, Department of Chemistry, Niš, Serbia

CANCELED

17.15 – 17.30 Effect of metal atoms doping on magnetism in talc - 2D natural material

Ayan Khasiyeva, Andrijana Solajic, Jelena Pesic
Laboratory for 2D materials, Center for Solid State Physics and New Materials, Institute of Physics Belgrade, University of Belgrade

17.30 – 17.45 Photoactive polyurethane nanocomposites on the basis of Carbon Quantum Dots

Ana Marković, Biljana M. Todorović Marković, Zoran M. Marković
Vinča Institute of Nuclear Sciences, National Institute of the Republic of Serbia, University of Belgrade, Mike Alasa 12-14, 11001 Belgrade, Serbia

17.45 – 18.00 Investigation of electronic properties of 1T and 2H phases of 2D GaS

Lenka Filipović, Andrijana Šolajić, Jelena Pešić
Laboratory for 2D Materials, Center for Solid State Physics and New Materials, Institute of Physics Belgrade, University of Belgrade, Pregrevica 118, 11080 Belgrade, Serbia

18.00 – 18.15 Vibrational properties of doped 2*H*-$TaSe_{2-x}S_x$ samples investigated by Raman spectroscopy

Jovan Blagojević[1], Sanja Djurdjić Mijin[1,2], Jonas Bekaert[3], Marko Opačić[1], Yu Liu[4,5], Milorad V. Milošević[3], Čedomir Petrović[4,6,7], Zoran Popović[8], Nenad Lazarević[1]
[1]Institute of Physics, University of Belgrade, Pregrevica 118, 11080 Belgrade, Serbia, [2]Departamento de Física de Materiales, Facultad de Ciencias, Universidad Autónoma de Madrid, 28049 Madrid, Spain, [3]Department of Physics & NANOlab Center of Excellence, University of Antwerp, Groenenborgerlaan 171, B-2020 Antwerp, Belgium, [4]Condensed Matter Physics and Materials Science Department, Brookhaven National Laboratory, Upton, NY 11973-5000, USA, [5]Center for Correlated Matter and School of Physics, Zhejiang University, Hangzhou 310058, People's Republic of China, [6]Shanghai Key Laboratory of Material Frontiers Research in Extreme Environments (MFree), Shanghai Advanced Research in Physical Sciences (SHARPS), Pudong, Shanghai 201203, China, [7]Department of Nuclear and Plasma Physics, Vinca Institute of Nuclear Sciences, University of Belgrade, Belgrade 11001, Serbia, [8]Serbian Academy of Sciences and Arts, Knez Mihailova 35, 11000 Belgrade, Serbia

Friday, December 6th, 2024

09.00 – 11.00 9th Session – New Synthesis and Processing Methods
Chairpersons: Dr. Marina Vuković and Milica Bogdanović

09.00 – 09.15 Investigation of Elemental Composition and Diffusion in Laser-Modified Ti/Cu/Ti Systems via Scanning Transmission Electron Microscopy
Nevena D. Božinović, Suzana M. Petrović, Mirjana M. Novaković
Vinca Institute of Nuclear Sciences – National Institute of the Republic of Serbia, University of Belgrade, P.O. Box 522, Belgrade, 11001, Serbia

09.15 – 09.30 Quinuclidinone thiosemicarbazone hydrate: Insights into crystal structure from an energetic perspective
Milica G. Bogdanović[1], Vidak N. Raičević[2], Guido J. Reiss[3], Marko V. Rodić[1]
[1]University of Novi Sad, Faculty of Sciences, Novi Sad, Serbia, [2]University of Novi Sad, Faculty of Medicine, Novi Sad, Serbia, [3]Institute for Inorganic Chemistry, Heinrich-Heine-University Düsseldorf, Düsseldorf, Germany

09.30 – 09.45 Real-Time Optical Analysis for Monitoring Plant Adaptability Under Simulated Light Shifts
Teodora Tara Komazec[1], Sara V. Ristić[1], Dejan A. Jeremić[2], Marija M. Petković Benazzouz[1], Katarina M. Miletić[1]
[1]Faculty of Physics, [2]Innovation Center of the Faculty of Chemistry, University of Belgrade, Belgrade, Serbia

09.45 – 10.00 Synthesis and crystal structure of new Zn(II) complex with Schiff bases
Dominik Triska[1], Paul Thomashausen[1], Nikola Radnović[2], Marijana S. Kostić[2], Mirjana M. Radanović[2]
[1]University of Applied Sciences Merseburg - Department of Engineering and Natural Sciences, Merseburg, Germany, [2]University of Novi Sad - Faculty of Sciences, Novi Sad, Serbia

10.00 – 10.15 The influence of HIPS surface yellowing phenomenon on its properties
Benita Malinowska[1,2], Michał Chodkowski[3], Konrad Terpiłowski[2]
[1]Polska Korporacja Recyklingu sp. z o.o., Lublin, Poland, [2]Maria Curie-Sklodowska University, Department of Interfacial Phenomena, Lublin, Poland, [3]Lublin University of Technology, Department of Technology and Polymer Processing, Poland

10.15 – 10.30 Enhancing Hydrogen Evolution Reaction: Structural Insights of Ni-MoO_x Coatings Electrodeposited on porous Ni foil
A. Petricevic[1], J. Gojgic[1], M. Krstajic Pajic[2], N. Elezovic[1], V. Jovic[1]
[1]University of Belgrade, Institute for Multidisciplinary Research, Belgrade, Serbia, [2]University of Belgrade, Faculty of Technology and Metallurgy, Belgrade, Serbia

10.30 – 10.45 Cyclodextrin Applications: Towards Emerging Trends in Green Extractions of Bioactive Natural Compounds
Milica Radan, Snežana Kuzmanović Nedeljković, Jelena Živković, Teodora Janković, Zorica Lazarević, Dubravka Bigović, Katarina Šavikin
Institute for Medicinal Plants Research "Dr. Josif Pančić", Tadeuša Košćuška 1, 11000 Belgrade, Serbia

10.45 – 11.00 Archaeometric analysis of Ottoman-period pottery excavated at the Belgrade fortress
Petar Marjanović[1], Vesna Bikić[2], Ljiljana Damjanović-Vasilić[1]
[1]University of Belgrade - Faculty of Physical Chemistry, Belgrade, Serbia, [2]Institute of Archaeology, Belgrade, Serbia

11.00 – 11.15 Break

11.15 – 13.00 11th Session – Materials for New Generation Solar Cells and Materials for High-technology Application I
Chairpersons: Dr. Vuk Radmilović and Jovan Lukić

11.15 – 11.30 Stability of Halogen Bonded Perovskite Solar Cells
Jovan Lukic[1,2], Vuk V. Radmilovic[1], Jovana V. Milic[2]
[1]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia, [2]Adolphe Merkle Institute, University of Fribourg, Fribourg, Switzerland

11.30 – 11.45 Stabilizing $FAPbI_3$ Perovskite Against UV and Moisture Degradation: The Role of Polyionic Additives in Preventing Phase Transitions
Barbara Ramadani[1], Vladimir Rajić[1], Miloš Milović[1], Daniele Mantione[2], Milutin Ivanović[1]
[1]Vinca Institute of Nuclear Sciences – National Institute of the Republic of Serbia, University of Belgrade, P.O. Box 522, Belgrade, 11001, Serbia, [2]Ikerbasque, Basque Foundation for Science, 48013 Bilbao, Spain

11.45 – 12.00 Motion study of Ag-Ag_2S/TiO_2 hybrid nanoparticles as novel light-driven nanomotors

Danijela Danilović[1], Dušan K. Božanić[1], Jelena Pajović[2], Gustavo A. Garcia[3], Laurent Nahon[3], Tijana Marić[4], Vladimir Djoković[1]
[1]Center of Excellence for Photoconversion, "Vinča" Institute of Nuclear Sciences - National Institute of the Republic of Serbia, University of Belgrade, Serbia, P.O. Box 522, 11001 Belgrade, Serbia, [2]Faculty of Physics, University of Belgrade, Studentski trg 12, 11001 Belgrade, Serbia, [3]Synchrotron SOLEIL, l'Orme des Merisiers, St. Aubin, BP48, 91192 Gif sur Yvette Cedex, France, [4]Department of Health Technology, Technical University of Denmark, Kgs Lyngby,2800 Denmark

12.00 – 12.15 The Influence of Nickel-Osmium Interaction on the Kinetics of Hydrogen and Oxygen Evolution in Alkaline Medium

Z. Bošković, N. Tričković, A. Z. Jovanović
University of Belgrade – Faculty of Physical Chemistry, Studentski trg 12-16, 11000 Belgrade, Serbia

12.15 – 12.30 Enhanced Supercapacitor Performance of GO-based Nanocomposite with WPA and PTCDA

Milica Pejčić, Željko Mravik, Marko Jelić, Marija Grujičić, Jelena Rmuš Mravik, Darija Petković, Sonja Jovanović, Zoran Jovanović
Laboratory of Physics, Vinča Institute of Nuclear Sciences – National Institute of the Republic of Serbia, University of Belgrade, Belgrade, Serbia

12.30 – 12.45 Development of a Co/Zn-Ferrite Molecularly Imprinted Polymers for Gallic Acid in Plant Extracts, Wine and Herbal Supplements

Marija Grujičić[1], Seyda Yayla[2,3], Milica Pejčić[1], Ahmet Cetinkaya[4], M. Mesud Hurkul[2], Sibel A. Ozkan[3], Sonja Jovanović[1]
[1]Laboratory of Physics, Vinca Institute of Nuclear Sciences – National Institute of the Republic of Serbia, University of Belgrade, Belgrade, Serbia, [2]Department of Pharmaceutical Botany, Faculty of Pharmacy, Ankara University, Ankara, Turkey, [3]Graduate School of Health Sciences, Faculty of Pharmacy, Ankara University, Ankara, Turkey, [4]Department of Analytical Chemistry, Faculty of Pharmacy, Ankara University, Ankara Turkey

12.45 – 13.00 Characterization and evaluation of mechanical properties of glass and carbon/glass reinforced hybrid composite tubes

CANCELED

Tanja Milošević, Jelena Galović, Jelena Geržetić, Sladjan Grga, Slavko Mijatov, Tihomir Kovačević, Saša Brzić
Military Technical Institute, Ratka Resanovića 1, Belgrade, Serbia

13.00 – 14.00 Lunch break

14.00 – 16.00 12th Session – Materials for High-technology Application II
Chairpersons: Dr. Dragana Jugović and Dr. Nikola Zdolšek

14.00 – 14.15 PLD growth of STO thin film on silicon photocathode as protective layer for photoelectrochemical hydrogen evolution reaction
Darija Petković[1], Hsin-Chia Ho[2], Janez Kovač[3], Matjaž Spreitzer[2], Urška Trstenjak[2], Damjan Vengust[2], Zoran Jovanović[1]
[1]Laboratory of Physics, Vinča Institute of Nuclear Sciences – National Institute of the Republic of Serbia, Belgrade, Serbia, [2]Advanced Materials Department, Jožef Stefan Institute, Ljubljana, Slovenia, [3]Department of Surface Engineering, Jožef Stefan Institute, Ljubljana, Slovenia

14.15 – 14.30 Carbon fiber reinforced EPDM-based thermal insulators for solid rocket motors application: Effect of carbon fiber content on dynamic-mechanical and thermal properties CANCELED
Milica Ivković, Jelena Gržetić, Jela Galović, Slađan Grga, Slavko Mijatov, Irina Ulanova, Tihomir Kovačević
Military Technical Institute, Ratka Resanovića 1, Belgrade, Serbia

14.30 – 14.45 Exploring the Potential of Ionic Liquids to Inhibit Dendrite Growth in Zinc-Ion Batteries CANCELED
Nikola Zdolšek[1,2], Grgur Mihajlović[2], Aleksandra Dimitrijević[1], Marijana Kraljić Roković[2]
[1]Departament of Physical Chemistry, "Vinča" Institute of Nuclear Sciences – National Institute of the Republic of Serbia, University of Belgrade, Belgrade, Serbia, [2]Faculty of Chemical Engineering and Technology, University of Zagreb, Zagreb, Croatia

14.45 – 15.00 Defect Engineering and Hole Formation in the Swift Heavy Ion Irradiated Thin Films of Bismuth Vanadate: Impact on Oxygen Evolution Reaction for Solar Water Splitting
Marko Jelić[1], Zoran Jovanović[1], Ekaterina Korneeva[2], Nina Daneu[3], Suraj Gupta[3], Jacques O'Connell[4], Tatiana Vershinina[2], Nikita Kirilkin[2], Oleg Orelovich[2], Ivana Stojković Simatović[5], Vladimir Skuratov[2,6,7], Sonja Jovanović[1]
[1]Laboratory of Physics, Vinča Institute of Nuclear Sciences – National Institute of the Republic of Serbia, University of Belgrade, Belgrade, Serbia, [2]Joint Institute for Nuclear Research, Dubna, Russia, [3]Advanced Materials Department, Jožef Stefan Institute, Ljubljana, Slovenia, [4]Nelson Mandela University, Port Elizabeth, South Africa, [5]University of Belgrade – Faculty of Physical Chemistry, Belgrade, Serbia,

[6]National Research Nuclear University MEPhI, Kashirskoe Shosse, 31, 115409, Moscow, Russia, [7]Dubna State University, Universitetskaya St., 19, 141982, Dubna, Russia

15.00 – 15.15 Influence of Filling System Design on Tensile Strength in Aluminum Sand Castings
Marko Zagoričnik, Lazar Kovačević, Vladimir Terek, Zoran Bobić, Pal Terek, Milan Pećanac, Branko Škorić
University of Novi Sad, Faculty of Technical Sciences, Novi Sad, Serbia

15.15 – 15.30 Tribological testing of multilayer TiAlSiN coating deposited on IN100 and X15CrNiSi25-22 steel at high temperatures
Vladimir Terek[1], Lazar Kovačević[1], Aljaž Drnovšek[2], Miha Čekada[2], Zoran Bobić[1], Marko Zagoričnik[1], Pal Terek[1]
[1]University of Novi Sad, Faculty of Technical Sciences, Novi Sad, Serbia, [2]Jožef Stefan Institute, Ljubljana, Slovenia

15.30 – 15.45 Environmentally less harmful sample preparation techniques for HPLC analysis of organic components in gunpowders
Teodora Stančić[1], Mirjana Krstović[1,2], Bojana Fidanovski[1,2], Danica Bajić[1,2]
[1]Military Technical Institute, Belgrade, Serbia, [2]University of Defense, Military Academy, Belgrade, Serbia

15.45 – 16.00 Evaluating thermal effects of thermobaric composite explosives in controlled conditions
Mirjana Krstović[1,2], Teodora Stančić[1], Danica Bajić[1,2]
[1]Military Technical Institute, Belgrade, Serbia, [2]University of Defense, Military Academy, Belgrade, Serbia

16.00 Closing Ceremony

1-1

Chemical engineering aspects of a perfusion-based 3D *in vitro* osteosarcoma model

Ivana Banicevic[1], Milena Milivojevic[2], Radmila Jankovic[3], Jasmina Stojkovska[1], Bojana Obradovic[1]

[1]*University of Belgrade, Faculty of Technology and Metallurgy, Belgrade, Serbia*
[2]*University of Belgrade, Institute of Molecular Genetics and Genetic Engineering, Belgrade, Serbia*
[3]*University of Belgrade, Faculty of Medicine, Belgrade, Serbia*

Osteosarcoma is an aggressive primary bone cancer affecting 4-5 per million people. Dominantly utilised models in osteosarcoma research, including cell monolayers and animals, have limited accuracy in evaluating drug efficiency as less than 10% of drug candidates reach the market. In contrast, 3D in vitro models being physiologically relevant hold great promise to advance anticancer drug discovery. Our aim was to characterize in more depth previously established 3D in vitro osteosarcoma model based on scaffolds and a perfusion bioreactor by integrating a chemical engineering approach with standard biological methods of characterization. Murine osteosarcoma K7M2-wt cells were seeded onto macroporous composite scaffolds (2 wt.% alginate, 2 wt.% hydroxyapatite) at the density $15x10^6$ cells/cm3 of scaffold volume. Cells were then cultivated for 7 days in a "3D Perfuse" bioreactor (Innovation Center of Faculty of Technology and Metallurgy, Belgrade, Serbia) under a continuous medium flow of 0.27 ml/min (corresponding to the medium velocity of 40 μm/s), while static cultures served as a control. Biological assays indicated that perfusion conditions positively affected cell metabolic activity and expression of other cancer cell hallmarks such as cellular self-aggregation into spheroid-like forms and extracellular matrix secretion. Cell aggregates (n ~ 300) were quantitatively characterised in terms of their size, shape and number demonstrating that aggregates were more numerous, more uniformly distributed throughout the scaffold volume and were slightly larger under perfusion conditions compared to those in static cultures (140 μm vs. 116 μm in diameter). Additionally, under perfusion, aggregates had a more irregular shape which could be attributed to the presence of shear stresses (estimated as ~2 mPa on average). Following the chemical engineering approach, the mass transport of oxygen and nutrients was modelled under static and perfusion conditions and then correlated with spheroid distribution across the scaffold. Overall, the chemical engineering perspective provided a comprehensive insight into the 3D model features, highlighting the advantages of perfusion cultures.

1-2

Doxorubicin application in a 3D osteosarcoma cell culture model

Marija Pavlović[1], Ivana Banićević[1], Milena Milivojević[2], Jasmina Stojkovska[1], Bojana Obradović[1]

[1]*University of Belgrade, Faculty of Technology and Metallurgy, Belgrade, Serbia*
[2]*University of Belgrade, Institute of Molecular Genetics and Genetic Engineering, Belgrade, Serbia*

The most common primary malignant bone tumor that predominantly affects children and adolescents is osteosarcoma. Comprehensive osteosarcoma treatment involves neoadjuvant multi-agent chemotherapy followed by surgical resection and adjuvant multi-agent chemotherapy. Unfortunately, this complex treatment is insufficiently effective, as the tumor recurs in over 40 % of cases. The development of new drugs for osteosarcoma is a complex and slow process due to various limitations of preclinical drug evaluation methods. One potential solution is to develop three-dimensional (3D) systems that replicate key *in vivo* physiological conditions, using biomaterials as extracellular matrices and biomimetic bioreactors to ensure efficient mass transport and adequate biophysical signals. This study aimed to evaluate a previously developed 3D culture model for osteosarcoma cells based on macroporous composite scaffolds (2 wt.% alginate and 2 wt.% hydroxyapatite) in conjunction with a perfusion bioreactor for anticancer drug screening. Murine osteosarcoma cells (K7M2-wt) were seeded onto the scaffolds ($15x10^6$ cells cm^{-3} of scaffold volume) and cultivated under static conditions for one day. Two experimental studies were performed using the anticancer drug doxorubicin. In the first study, following the static cultivation, doxorubicin (1 μg cm^{-3} of culture medium) was applied for 1 day in a "3D Perfuse" bioreactor (Innovation Center of Faculty of Technology and Metallurgy, Belgrade, Serbia) at a flow rate of 0.27 cm^3 min^{-1}, corresponding to the superficial velocity of 40 μm s^{-1}. In the second study, after the 1-day static cultivation, cell seeded scaffolds were cultivated for 7 days under the same continuous flow conditions, which allowed spontaneous formation of spheroid-like structures. Next, doxorubicin was applied in the same manner as in the first study. The cultivated scaffolds in both studies were then assessed regarding the cell metabolic activity using the MTT (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) assay. The obtained results indicated lower sensitivity of cells cultured in the 3D environment to the tested drug as compared to those in 2D in agreement with chemotherapy resistance observed in patients.

1-3

Comparison of the effects of combined doxorubicin and quercetin treatment on 2D and 3D osteosarcoma model systems

Luka Bojić[1], Jelena Pejić[1], Jasmina Stojkovska[2], Aleksandra Medić[1], Marija Schwirtlich[1], Isidora Petrović[1], Milena Milivojević[1]

[1]*University of Belgrade, Institute of Molecular Genetics and Genetic Engineering, Belgrade, Serbia*
[2]*University of Belgrade, Faculty of Technology and Metallurgy, Belgrade, Serbia*

Osteosarcoma (OS) is a highly aggressive bone tumor primarily affecting pediatric patients, with a 5-year survival rate of 66.5%. Standard treatments include surgical resection, chemotherapy, and radiation for tumors that cannot be surgically removed. Literature data has shown that quercetin, a plant pigment with known anti-tumor effects, could enhance chemotherapeutic effect of doxorubicin on cancer cells. In this study we have investigated the effects of the combined treatment with doxorubicin, a commonly used chemotherapeutic, and quercetin, on human osteosarcoma cell line, SAOS-2 cultured in 2D and 3D model systems. SAOS-2 (8 x 10^6 cells/ml) immobilized in alginate microbeads (~ 1 mm in diameter) showed enhanced viability for up to 21 days after immobilization. In addition, cells were treated with 1 µg/ml Doxo and 5 µM Quer, as well as with each compound separately. Following treatment, we assessed cell viability, morphology, and the expression of genes. Our results have shown that the combined treatment statistically significantly decreased the viability of SAOS-2 cells cultured in 2D and 3D conditions compared to cells treated with doxorubicin. We analyzed the expression of genes associated with poor prognosis in patients such as pluripotency genes, an OS marker, and a resistance-related gene. Collectively our results show different responses to the combined treatment depending on the model system used. The combined treatment substantially reduced cell viability in 2D and 3D models and decreased expression of genes associated with poor prognosis compared to doxorubicin alone in 3D models. We can hypothesize that microenvironment-based mechanisms modulate cell sensitivity to therapy and increase resistance to treatment of osteosarcoma cells cultured in 3D condition. Further research is needed to investigate quercetin's possible role in tumor treatment.

1-4

Towards optimized 3D cancer cell cultures in alginate-based microfibers

Jelena Petrović[1,2], Miodrag Dragoj[3], Milica Pešić[3], Luka Bojić[4], Milena Milivojević[4], Radmila Janković[5], Bojana Obradović[1], Jasmina Stojkovska[1]

[1]*University of Belgrade, Faculty of Technology and Metallurgy, Belgrade, Serbia*
[2]*Innovation Center of the Faculty of Technology and Metallurgy, Belgrade, Serbia*
[3]*University of Belgrade, Institute for Biological Research "Siniša Stanković" - National Institute of the Republic of Serbia, Belgrade, Serbia*
[4]*University of Belgrade, Institute of Molecular Genetics and Genetic Engineering, Belgrade, Serbia*
[5]*University of Belgrade, Faculty of Medicine, Belgrade, Serbia*

In recent years, the importance of three-dimensional (3D) models in cancer research has been increasingly recognized, as they better mimic the *in vivo* tumor microenvironment. However, each cancer is unique and requires a specific 3D model that can accommodate its needs. The aim of this study was to develop and optimize a simple, tunable 3D model based on alginate microfibers that can support cultures of diverse cancer cell types. Microfibers with immobilized cells were produced by manual extrusion of cell-alginate suspensions (4×10^6 cells/ml, 1.6-2.8 wt% Na-alginate) into a gelling bath containing Ca^{2+} or Ba^{2+} ions for alginate gelation. The procedure was optimized regarding the microfiber composition suited to osteosarcoma cells K7M2-wt (i.e., Ca-alginate with or without 2 wt% HAP) or non-small-cell lung cancer cells NCI-H460 (i.e., Ba-alginate) as well as regarding the needle gauge (22- 25 G), extrusion velocity and gelation time (1-15 min). Live/dead staining of cells revealed that while the needle size and gelation time did not significantly influence cell viability, extrusion velocity can have adverse effects on the cells. To valuate this finding, hydrodynamic shear stresses were calculated, being 2.4-fold higher at high extrusion velocity compared to that at medium velocity. Additionally, the concentrations of Na-alginate and Ba^{2+} were shown to affect the NCI-H460 cell viability so that 2 wt.% Na-alginate and 45 mM Ba^{2+} yielded optimal results. 3D cultures of the immobilized cells in optimal microfibers for up to 21 days demonstrated that the model supports cell viability and proliferation. Treatments with 0.25-20 μM doxorubicin or 0.5-50 μM cisplatin showed that 3D cultured cells exhibit higher resistance to anticancer drugs compared to traditional 2D cultures, consistent with increased resistance in patients. Efficient transport of doxorubicin in microfibers was confirmed by mathematical modeling. Overall, the results demonstrate the potential of the proposed 3D model for use in cancer research.

1-5

Exploring the potential of human placental tissue as a bioink in 3D bioprinting for use in soft tissue engineering applications

Dragana Aleksandrović[1], Hristina Obradović[1], Ivana Gazikalović[2], Ivana Okić Đorđević[1], Slavko Mojsilović[1], Bojana Balanč[2], Aleksandar Janev[3], Zorica Knežević-Jugović[4], Mateja Erdani Kreft[3], Aleksandra Jauković[1]

[1]Group for Hematology and Stem Cells, Institute for Medical Research, National Institute of Republic of Serbia, University of Belgrade, Belgrade, Serbia
[2]Innovation Center, Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia
[3]Institute of Cell Biology, Faculty of Medicine, University of Ljubljana, Ljubljana, Slovenia
[4]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia

Despite their safety, current breast reconstruction techniques post-mastectomy carries complication risks and do not reduce recurrence rates. Tissue engineering now emphasizes scaffold development for regeneration, and amniotic membrane (hAM) of the human placenta has shown promise in skin and cornea repair with demonstrated antitumor properties. This study aims to develop a 3D bioprintable material using hAM homogenate (hAM-h) to retain its regenerative and antitumor effects over extended period of time.

Homogenates were prepared according to previously established protocol and then characterized with flow cytometry, tensiometer, viscometer and zetasizer. Alginates of different viscosities were mixed with hAM-h to make a biomaterial for extrusion 3D bioprinting on Cellink BioX bioprinter. Printed bioscaffolds were crosslinked with $CaCl_2$ and then characterized for their compressive strength and swelling ability. Results showed that hAM-h samples contained high levels of growth factors (Angiopoietin-2, EGF, FGF, HGF) and other cytokines. Physical properties (density, surface tension, viscosity) were consistent across samples, with an average particle size of 192.1 ± 24.95 nm and a polydispersity index > 0.5, indicating heterogeneity of the sample. All samples had a negative surface charge (< -30 mV), suggesting moderate stability. Compression tests revealed that highALG-hAM-h bioscaffolds required more force for 70% deformation than lowALG-hAM-h bioscaffolds and showed an increase in weight over time, while lowALG-hAM-h decreased.

This research provides valuable findings for preparing printable biomaterial based on hAM homogenate showing its potential suitability for use in soft tissue engineering applications.

Acknowledgements: This research was supported by the Science Fund of the Republic of Serbia, grant No 11073, AmnioPrintCare.

1-6

Prospective chitosan-based pharmaceutical delivery system for cancer treatment

Anais Morgane Le Masson[1], Jovana Zvicer[2], Rossella Sesia[1], Sara Ferraris[1], Marco Sangermano[1], Bojana Obradovic[2], Silvia Spriano[1], Jasmina Stojkovska[2]

[1]*Politecnico di Torino, Dipartimento di Scienza Applicata e Tecnologia, Torino, Italy*
[2]*University of Belgrade, Faculty of Technology and Metallurgy, Belgrade, Serbia*

Cancer remains one of the leading causes of death worldwide, and chemotherapy is the most common treatment for it. Unfortunately, cancer chemotherapy is only partially effective and often faces challenges such as systemic drug administration, non-localized effects, high toxicity, side effects, and drug resistance. One possible solution to overcome these issues is to create systems for controlled, sustainable, and local delivery of compounds with antioxidant and anticancer activities, using biocompatible hydrogels. Therefore, the aim of this study was to develop a delivery system based on methacrylate chitosan hydrogels with embedded green tea polyphenols (GTP) or tannic acid (TA). The methacrylate chitosan hydrogels were prepared by UV-curing a 1.5% wt. methacrylate chitosan and 2% wt. photoinitiator solution, followed by air drying. Then, the dry hydrogels were functionalized by swelling in a 5 mg cm^3 TA or GTP solution for 3 h. The presence of polyphenols was confirmed in all functionalized hydrogels by UV–Vis spectroscopy and the Folin–Ciocalteu assay. The release of the polyphenols from the hydrogels was investigated over 7 days under in vitro-like conditions, with a continuous flow of culture medium in a perfusion bioreactor at a superficial medium velocity of 200 μm/s, corresponding to blood velocities in capillaries (150–250 μm/s), while samples under static conditions served as controls. In addition, the biomechanical properties of the hydrogels were evaluated in a bioreactor with dynamic compression and medium perfusion (at 10% strain and a loading rate of 337.5 μm/s). The anticancer effects of the released polyphenols were assessed on murine osteosarcoma K7M2-wt cells. Overall, the results have shown the potential of chitosan-based hydrogels with embedded polyphenols as a drug delivery system for cancer treatment.

1-7

Influence of different manufacturing techniques and tissue origin on tissue response to collagen membranes of the same species origin

Milena Radenković Stošić[1], Sanja Stojanović[1,2], Mike Barbeck[3,4], Ole Jung[4], Stevo Najman[1,2]

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

Collagen membranes for Guided Bone Regeneration (GBR) can be derived from different species and diverse tissue compartments and obtained through various manufacturing processes, which lead to different physicochemical and biological properties. The aim of this study was to provide a comparative overview of subcutaneous tissue response to three porcine collagen membranes obtained from different tissue compartments and produced via various manufacturing techniques. We examined three different collagen membranes: native membrane derived from the porcine pericardium, native membrane derived from the porcine peritoneum, and sugar-crosslinked membrane derived from the porcine tendon in subcutaneous implantation model in rats. The histochemical, histomorphometrical and immunohistochemical methods were used to evaluate the comparative tissue response to examined collagen membranes 10, 30 and 60 days after implantation. The tendon-derived collagen membrane, showed a lack of integration with the surrounding tissue and required more time for degradation compared to native collagen membranes derived from porcine peritoneum and pericardium. This membrane was found to be an unsuitable environment for cell infiltration from the surrounding tissue, most likely due to the specific manufacturing process, which involved cross-linking with sugar. Other membranes showed good integration and enabled cell infiltration. The results suggest that all three collagen membranes are suitable for use in GBR, while the sugar-crosslinked membrane could serve as a barrier membrane only, similar to non-resorbable alternatives.

Acknowledgement: This study was supported by the Ministry of Science, Technological Development and Innovations of the Republic of Serbia (Contracts No. 451-03-66/2024-03/200113 and 451-03-65/2024-03/200113).

2-1

Nanoencapsulation of parthenolide based on bio-ionic liquids and polymer for advanced drug delivery systems

Dajana Lazarević[1], Jelena Jovanović[1], Catherine Charcosset[2], Tatjana Trtić Petrović[1]

[1]*Vinča Institute of Nuclear Sciences – National Institute of the Republic of Serbia, University of Belgrade, Belgrade, Serbia*
[2]*Univ Claude Bernard Lyon 1, CNR, UMR 5007, CPE, Lab Automat & Genie Proc, Villeurbanne, France*

Parthenolide, a sesquiterpene lactonefound naturally in *Tanacetum parthenium* L. Bip. (also known as feverfew), has received a lot of attention for its application as a potential anticancer agent. Parthenolide has anti-inflammatory, antioxidant, and pro-apoptotic characteristics, making it a good choice for cancer treatment. Its anticancer benefits stem from its capacity to block nuclear factor-kappa B (NF-κB) signaling, a pathway linked to tumor development. Furthermore, parthenolide targets cancer stem cells and controls oxidative stress pathways, which increases its therapeutic potential. Despite its potential anticancer benefits, parthenolide has significant limitations in therapeutic application due to its low bioavailability due to poor water solubility. To overcome these limitations, strategies like as nanoencapsulation, bioenhancers, and chemical modification are being explored to improve its stability and clinical effectiveness. In this study, we developed aqueous biphasic systems (ABS) using two bio-based ionic liquids, cholinium lactate and cholinium bitartrate, in combination with a reverse block copolymer (Pluronic 17R4). Parthenolide was dissolved in the ABS through ultrasonic treatment, followed by centrifugation to facilitate phase separation. This process formed a polymer-rich phase containing parthenolide-loaded micelles, as well as an ionic liquid phase that could be reused for future ABS formulations. The parthenolide-enriched polymer phase was then tested further to evaluate its potential as effictive drug delivery system. Our findings show high encapsulation efficiency and significant drug loading capacity. The parthenolide-loaded micelles exhibited an average size between 100 and 200 nm and a low polydispersity index, indicating that they could be suitable for drug delivery applications. To confirm these findings, the micelles were morphologically characterized using transmission electron microscopy.

2-2

Synthesis and biological evaluation of sulfhydroxamic acid derivatives as potential dual COX-2 and 5-LOX inhibitors

Jelena Bošković[1], Vladimir Dobričić[1], Otilija Keta[2], Lela Korićanac[2], Jelena Žakula[2], Olivera Čudina[1]

[1]Department of Pharmaceutical Chemistry, University of Belgrade – Faculty of Pharmacy, Vojvode Stepe 450, 11000 Belgrade, Serbia
[2]Vinča Institute of Nuclear Sciences, National Institute of the Republic of Serbia, University of Belgrade, Mike Petrovića Alasa 12-14, 11351 Vinča, Belgrade, Serbia

Inhibiting COX-2 and 5-LOX enzymes is a rational and innovative approach for developing more effective and safer anti-inflammatory medications. Compounds 14, 15, 16, 17, 18 and 19 (sulfhydroxamic acid derivatives) were synthesized as potential dual COX-2 and 5-LOX inhibitors, as they showed good predicted COX-2 and 5-LOX inhibitory activities according to previously published 3D-QSAR and molecular docking studies. The dual inhibitory activity was tested using in vitro fluorometric inhibitory screening assays. Compound 18 demonstrated a weak inhibitory effect on COX-2 at a concentration of 10 μM (15.24%), whereas compounds 15 and 17 exhibited more significant inhibitory activity against 5-LOX at the same concentration (44.74% and 41.86%, respectively). The obtained results point to potential utility of compounds 15 and 17 in treating inflammatory conditions marked by excessive leukotriene production due to the 5-LOX enzyme. The cytotoxicity of six synthesized sulfhydroxamic acid derivatives was assessed using MTT assay, on three cancer cell lines (HCT 116, HT-29, and BxPC-3) as well as one healthy cell line (MRC-5). Three of these compounds (14, 17 and 18) exhibited IC_{50} values exceeding 100 μM across all tested cell lines, while compounds 15, 16 and 19 displayed mild cytotoxic effects. To assess passive gastrointestinal absorption, biopartitioning micellar chromatography (BMC) and parallel artificial membrane permeability assay (PAMPA) were employed. All tested compounds are expected to have lower passive gastrointestinal absorption compared to commercially available standards (indomethacin, flurbiprofen, diclofenac, and zileuton). The further chemical modifications or alternative application routes should be explored.

2-3

3D Printing of Biocomposite Scaffolds based on Interpenetrated Network and Multi-Doped Mesoporous Bioactive Glass for Bone Tissue Engineering

Teodora Jakovljević[1], Tamara Matić[1], Vukašin Ugrinović[2], Miloš Papić[3], Djordje Janaćković[1], Rada Petrović[1], Biljana Ljujić[3], Djordje Veljović[1]

[1]*University of Belgrade, Faculty of Technology and Metallurgy, Belgrade, Serbia*
[2]*Innovation Center of the Faculty of Technology and Metallurgy Ltd, Belgrade Serbia*
[3]*University of Kragujevac, Faculty of Medical Sciences, Kragujevac, Serbia*

Integrating 3D printing with biocomposite materials, such as polymers and bioactive glass particles, provides innovative solutions for bone tissue engineering. This approach enables the design of macroporous scaffolds with tailored compositions that closely mimic natural bone structures, enhancing their physical, chemical, and biological properties. The aim of this study was to synthesize multi-ion-doped mesoporous bioactive glass nanoparticles (MMBGNs) to serve as fillers in 3D-printed biocomposite scaffolds based on poly(methacrylic acid) (PMAA), poly(ethylene glycol) diacrylate (PEGDA), and gelatin. MMBGNs were synthesized using a modified microemulsion-assisted sol-gel technique, with the nominal composition of 70% SiO_2, 20% CaO, 3% MgO, 5% SrO, 1% CuO, and 1% ZnO [mol.%]. Characterization of MMBGNs, involving ICP-OES, XRD and FESEM, verified the dopant composition, amorphous nature and nanoscale size of the particles, as well as the ion release profiles from MMBGNs. *In vitro* biocompatibility studies showed non-toxicity of MMBGNs to mouse bone marrow-derived mesenchymal stem cells (mBM-MSCs), as demonstrated by MTT and apoptosis assays. MMBGNs were used as fillers in the polymer matrix to fabricate biocomposite scaffolds using mask stereolithography (mSLA). The printed structures, composed of 39.4% PMAA, 29.6% PEGDA, 1.4% gelatin, and 1% MMBGNs [wt.%], were analyzed for printability, microstructure, and mechanical properties, resulting in optimal printing parameters, uniform particle distribution and suitable mechanical properties of scaffolds. This research showed that combining advanced materials with modern 3D printing techniques enables the creation of scaffolds with enhanced properties, thereby advancing their applications in regenerative medicine.

Acknowledgement: This research was funded by the Science Fund of Republic of Serbia #GRANT No.7470 – HyBioComBone and by Ministry of Science, Technological Development and Innovations, Republic of Serbia (No. 451-03-65/2024-03/200135, 451-03-66/2024-03/200287).

2-4

Pro-Osteogenic Properties of Titanium-Based Scaffold Combined with SHED-Derived EVs Embedded in Collagen

Marija Milivojević[1], Maja Kosanović[2], Sergej Tomić[2], Marina Bekić[2], Miodrag Čolić[3], Đorđe Janaćković[1,4]

[1]Inovation Center of The Faculty of Technology and Metallurgy, Belgrade, Serbia
[2]Institute for the Application of Nuclear Energy, INEP, Belgrade, Serbia
[3]Serbian Academy of Sciences, Belgrade, Serbia
[4]Faculty of Technology and Metallurgy, Belgrade, Serbia

Biomaterials for the restoration of large bone defects, such as 3D Ti-based scaffolds, have good mechanical properties; however, they do not induce bone regeneration. The aim of this study was to encapsulate extracellular vesicles (EVs) derived from stem cells from human exfoliated deciduous teeth (SHED cells) in a 3D-printed Ti_6Al_4V scaffold and analyze their combined osteogenic potential. SHED cells were isolated from deciduous teeth, and their MSC properties were characterized using fluorescence-activated cell sorting (FACS). EVs were isolated from SHED-conditioned media using differential ultracentrifugation, and characterized with SEM, TEM, NTA, and ONI. The size distribution, morphology, and presence of tetraspanin markers CD9, CD63, and CD81 confirmed successful isolation of SHED-EVs. EVs were further encapsulated in collagen hydrogel, and their release rate was analyzed using fluorescence-based NTA. In the first three weeks, around 50% of EVs were released from collagen in PBS. Ti6Al4V scaffolds were coated with graded silicate glasses and HAP powder doped with silver. Their cytocompatibility was tested on SHED cells, showing a higher cell metabolic rate in coated samples compared to bare Ti. The osteogenic induction of EVs + Ti scaffold was tested on SHED cells, and gene expression was analyzed using qRT-PCR. Both RUNX-2 and BMP-2 genes were upregulated after 10 days of treatment, indicating pro-osteogenic properties of material filled with SHED-EVs. EV-loaded Ti_6Al_4V scaffold shows potential for bone regeneration applications in large defects.

Acknowledgement: This research was funded by the Science Fund of Republic of Serbia #GRANT No.7470 – HyBioComBone and by Ministry of Science, Technological Development and Innovations, Republic of Serbia (No. 451-03-65/2024-03/200135, 451-03-66/2024-03/200287).

2-5

Nanocomposite based on resveratrol and selenium for bioglass scaffold coating

Nina Tomić[1], Nenad Filipović[1], Maja Kuzmanović[1], Dragana Mitić Ćulafić[2], Aldo R. Boccaccini[3], Magdalena M. Stevanović[1]

[1]Group for Biomedical Engineering and Nanobiotechnology, Institute of Technical Sciences of SASA, Knez Mihailova 35/IV 11000 Belgrade, Serbia
[2]Department of Microbiology, University of Belgrade - Faculty of Biology, Studentski trg 16, Belgrade, Serbia
[3]Institute of Biomaterials, Department of Materials Science and Engineering, University of Erlangen-Nuremberg, Erlangen, Germany

The need for multifunctional materials in tissue engineering has created interest in nature-derived compounds in this field of research. The plant compounds, such as resveratrol, or metalloids such as selenium, have shown various biological activities, especially in different nano-forms. This has suggested their potential for use as components in biomaterials. Previously, we synthesized resveratrol nanobelt-like particles (ResNPs) and a composite material comprised of ResNPs and selenium nanoparticles. Furthermore, the obtained composite showed high antioxidative and antibacterial potential of nontoxic concentrations. In this research, we used it for coating of bioglass scaffolds. 45S5 Bioglass® scaffolds, prepared by foam replica method. They were coated using the rotary evaporator and dried at ambient temperature. Then, scaffolds were observed by using optical microscopy under wide spectrum and polarization light, before grinding them to obtain powders for the Fourier transform infrared spectroscopy (FTIR) analysis. The microscopy images showed intensive colorization of the scaffolds, originating from the selenium nanoparticles. Due to their larger size, individual ResNPs were visible, showing uniform coating of the struts of the scaffold. There was no closing of the pores of the scaffolds, indicating that the intended spatial function was maintained. Furthermore, the peaks originating from the composite were seen along with the bioglass-characteristic peaks, in the FTIR spectrums.

2-6

Synthesis and characterization of $NaGd_{0.8}Yb_{0.17}Er_{0.03}F_4$ nanoparticles for selective *in vitro* labeling of cancer cells

Miljana Piljevic[1], Ivana Dinic[2], Marta Bukumira[1], Mihailo D. Rabasovic[1], Aleksandar J. Krmpot[1], Milos Lazarevic[3], Lidija Mancic[2]

[1]*Photonic Center, Institute of Physics Belgrade, University of Belgrade, Pregrevica 118, Zemun, 11080, Belgrade, Serbia*
[2]*Institute of Technical Sciences of SASA, Kneza Mihaila St. 35, 11000, Belgrade, Serbia*
[3]*School of Dental Medicine, University of Belgrade, dr Subotica 8, 11000, Belgrade, Serbia*

Lanthanide-doped up-conversion nanoparticles (UCNPs) represent a new class of contrast agents that show a significant potential in biomedical science for detection of cancer in early stages. These nanoparticles have the ability to emit visible or ultraviolet light upon excitation by near-infrared light, which enables noninvasive deep tissue imaging. This research presents synthesis of $NaGd_{0.8}Yb_{0.17}Er_{0.03}F_4$ UCNPs for selective labeling of oral squamous carcinoma cells. Nanoparticles were prepared through solvothermal synthesis in the presence of chitosan, a ligand which ensures UCNPs biocompatibility and enables further conjugation of selected antibodies. X-ray powder diffraction showed that majority of UCNPs crystallize in cubic structure, *s.g. Fm3m*, followed by low content of hexagonal-phased nanoparticles (~4 wt%). Scanning and transmission electron microscopy revealed that the obtained nanoparticles are cubic in shape and photoluminescence spectra indicated the double green emissions ($^2H_{11/2}$, $^4S_{3/2}\rightarrow{}^4I_{15/2}$) and a red emission ($^4F_{9/2}\rightarrow{}^4I_{15/2}$). Presence of protonated amino ligands at UCNPs surface, confirmed by Fourier transform infrared spectroscopy and X-ray photo spectroscopy, enabled UCNPs conjugation with anti-human CD44 antibodies (already labeled with fluorescein isothiocyanate - FITC), and their use for selective labeling of cancer cells. Commercially available SCC–25 (ATCC®, CRL–1628™) cancer cell line was used after magnetic-activated cell sorting of sub-populations of cells, $CD44^-$ and $CD44^+$. For the visualization of cells incubated with conjugated UCNPs, Nonlinear Laser Scanning Microscopy was used, with Ti:Sapphire laser as a light source, which operates in femto-second (fs) pulse mode or continuous wave (CW) mode; fs mode at 730 nm and at 800 nm was used for unlabeled cell imaging and the excitation of FITC respectively, while CW mode at 980 nm was used for the excitation of UCNPs. Upon 980 nm laser irradiation, it was shown that $NaGd_{0.8}Yb_{0.17}Er_{0.03}F_4$ UCNPs conjugated with CD44 antibodies were selectively attached only to $CD44^+$ sub-population of cells, while their presence was not detected on $CD44^-$ sub-population of cells. Since CD44 antigen has potential to identify tumorigenic cancer stem cells, using the UCNPs conjugated with anti-human CD44 antibodies enables detection of early-stage cancer.

2-7

Study of the LL-37 peptide effect on physicochemical properties of *Legionella dumoffii* model membranes

Katarzyna Pastuszak[1], Małgorzata Jurak[1], Bożena Kowalczyk[2], Marta Palusińska-Szysz[2]

[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

Of the more than 71 identified and described species of *Legionella* bacteria, over 30 are capable of causing community-acquired pneumonia. One of the species, known to be responsible for severe and rapidly progressive form of Legionnaires' disease is *L. dumoffii*. The ability of bacteria to infect the human body largely depends on the composition of the cell's outer layer, built primarily of phospholipids. The mutual proportions of individual phospholipid classes can change under the influence of factors such as the exogenous choline presence in the bacterial environment, which affects the resistance of bacteria to antibiotics. Therefore, new medicinal substances that could be effective in combating legionellosis are sought. One of the approaches is the use of antimicrobial peptides (AMP), such as human cathelicidin LL-37. The presented studies aimed to determine the physicochemical properties of model bacterial membranes composed of phospholipids isolated from *L. dumoffii* bacteria grown on the medium without (PL-choline) or with (PL+choline) the addition of choline. Moreover, the influence of the LL-37 peptide on the model membranes' properties was determined. For these purposes, the Langmuir monolayer technique and coupled techniques were employed. PL+choline monolayers, containing more phosphatidylcholine (PC) and less phosphatidylethanolamine (PE) than PL-choline mixtures, were shown to be more condensed. The LL-37 addition caused a decrease in molecular packing and ordering. This effect was similar for both analyzed phospholipid monolayers, due to the constant percentage of anionic cardiolipin (CL) in PL+choline and PL-choline, which determined the interactions of the peptide with model *L. dumoffii* membranes to a great extent.

3-1

Effect of tannic acid (TA) on increasing urea-formaldehyde (UF) adhesive performance

Tamara Tešić[1], Milica Rančić[1], Danica Bajuk Bogdanović[2], Ivana Gavrilović Grmuša[1]

[1]University of Belgrade, Faculty of Forestry, Kneza Višeslava 1, Belgrade, Serbia
[2]University of Belgrade - Faculty of Physical Chemistry, Studentski trg 12-16, Belgrade, Serbia

Tannic acid (TA) has been widely studied in recent years as a promising component of biomaterials due to its unique properties. The aim of this study was to evaluate the potential of the use of tannic acid in formulation of urea-formaldehyde (UF) wood adhesive to determine if it is possible to obtain, a so called, bio-based and sustainable alternative to the conventional adhesive. TA-based UF (TA-UF) resins, with three different concentrations of tannic acid (1, 3, and 5%) were prepared, and adhesive properties were tested and compared with properties of pure UF. Testing of tensile shear strength showed that the addition of a higher concentration of tannic acid in UF adhesive formulation increases its adhesive and mechanical performances compared to pure UF adhesive. Based on the results, it was concluded that TA-UF resins could be successfully applied as an environmentally friendly, bio-based wood adhesive.

3-2

Production and Characterization of Chromium Nanoparticles for Applications in Biomedicine

Sara Lukač[1], Vladimir Rajić[2], Zoran Stojanović[1], Magdalena Stevanović[1]

[1]Group for Biomedical Engineering and Nanobiotechnology, Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Kneza Mihaila 35/IV, 11000 Belgrade, Serbia
[2]Department of Atomics Physics, Vinča Institute of Nuclear Sciences, National Institute of the Republic of Serbia, University of Belgrade, Mike Petrovića Alasa 12-14, 11000 Belgrade, Serbia

Recent advancements in bionanomaterials research highlight their potential applications in medical and pharmaceutical fields. This study focuses on synthesizing and characterizing chromium nanoparticles (CrNPs) for biomedical use, particularly exploring their structural and morphological properties. Chromium, an essential trace element, shows promise in reducing oxidative stress and exhibits antimicrobial potential. With the high surface-to-volume ratio and nano-antioxidant biocompatibility, CrNPs could offer enhanced health benefits. Chromium nanoparticles were synthesized using a chemical reduction method with chromium nitrate as the precursor and ascorbic acid as the reducing agent. Comprehensive characterization was conducted using FTIR, UV-VIS, optical, and scanning electron microscopy.

3-3

Fabrication and characterization of transdermal patches for transdermal drug delivery

Kolawole s Dada

Chemical Engineering Center, ITMO University, Saint Petersburg, Rusia Federation

Transdermal drug delivery has gained popularity as a non-invasive method for controlled drug release compared to traditional delivery routes. Transdermal patches have emerged as a promising platform for delivering a variety of drugs due to their ease of use. The objective of this research was to create and characterize transdermal patches using various compositions and ratios of hyaluronic acid and zinc oxide nanoparticles. A micro molding technique was utilized to fabricate the patches which were subsequently characterized using Optical microscopy, FTIR, TGA and tensile strength testing. The study found that the mechanical strength and dissolution properties of the patches were influenced by the hyaluronic acid and zinc oxide nanoparticle ratios used in the fabrication process. Moreover, the patches demonstrated controlled filler dispersion in the polymer matrix which effectively prohibits active bacteria during invitro assay. The results suggest that transdermal patches can be tailored to meet specific requirements for drug delivery applications using different compositions and ratios of hyaluronic acid and zinc oxide nanoparticles. This development has the potential to improve treatment outcomes and patient compliance in various therapeutic areas.

In the course of this work, polymer composite films were created based on hyaluronic acid with a molecular weight of 100 kDa in the concentration range of 0.5 - 3 wt.% and a zinc oxide fraction of 0.1 - 0.3 wt.% with NP size of 10nm. The synthesis of the polymer film was carried out in a Petri dish with preliminary dispersion of ZnO nanoparticles on a magnetic stirrer for 3 hours and an ultrasonic stirrer for 45 minutes. The drying time of the resulting films was 7 days at room temperature. The possibility of improving the quality of polymer film based on HA due to the inclusion of ZnO nanoparticles has been investigated. Nanoparticles can significantly improve the functioning of these transdermal patches making them more suitable for drug delivery.

3-4

Fourier transform infrared spectroscopy as a tool for chemical analysis of nanoliposomes with aloe leaf extract

Lidija Mladenović[1], Milena Milošević[2], Ana Plećić[1], Sandra Rakin[1], Marija Gnjatović[1], Diana Lupulović[1], Aleksandra Jovanović[1]

[1]*Institute for the Application of Nuclear Energy INEP, University of Belgrade, Banatska 31b, 11080 Belgrade, Serbia*
[2]*Institute of Chemistry, Technology and Metallurgy, National Institute of the Republic of Serbia, University of Belgrade, Njegoševa 12, Belgrade, Serbia*

Aloe or *Aloe vera* (L.) Burm.f. (Asphodelaceae family) has been known and used for centuries for its health, beauty, medicinal, and skin care potential. The plant contains 75 potentially active constituents: enzymes, sugars, lignin, saponins, anthraquinones, salicylic acid, amino acids, vitamins, and minerals. *A. vera* possesses healing, anti-inflammatory, antiseptic, laxative, antiviral, immunostimulant, moisturizing, anti-aging, and antitumor properties. With the aim to protect its bioactives from degradation and contribute to control release technology, as well as the development of better-quality formulations, aloe extract was encapsulated in liposomes. Encapsulation is defined as a process that entraps substances, particularly thermosensitive or bioactive compounds in liquid extract into a shell of wall material or matrix to produce particles with different sizes, ranging from nanometres to millimeter scale Fourier transform infrared (FT-IR) spectroscopy is used to get insights into the occurrence of interaction between extract compounds and phospholipids, as well as changes in the obtained liposomes caused by UV irradiation. One of the most dominant peaks of the FT-IR spectra of aloe leaf extracts-loaded liposomes is at 2922 cm^{-1} (asymmetric stretching vibration in the CH_3 groups). The dominant mode at 1735 cm^{-1} represents the stretching vibrations of the C=O functional group. The bands at 1240 and 1171 cm^{-1} correspond to the symmetric and asymmetric stretching of the PO_2^- functional groups, respectively, whereas the peak at 1055 cm^{-1} is related to the C-O-P-O-C stretching. The bands at 968 and 923 cm^{-1} are associated with the symmetric and asymmetric stretching of the C–N bonds, respectively. At the same time, the mode at 721 cm^{-1} corresponds to the C-N symmetric stretching of choline. Since the FT-IR spectra of the liposomes with aloe leaf extract almost exclusively showed peaks originating from the carrier, *i.e.*, phospholipids, this can be the indication for efficient encapsulation of bioactive compounds from the extract. Furthermore, UV irradiation did not cause chemical changes in the liposomes with extract that can be visible in the FT-IR spectra.

3-5

Protein extraction from *Daucus carota* L. root: Optimization of extraction solvent and procedure

Sandra Rakin[1], Ana Plećić[1], Brankica Kartalović[2], Mirjana Vukosavljev[2], Marija Gnjatović[1], Diana Lupulović[1], Aleksandra Jovanović[1]

[1]*Institute for the Application of Nuclear Energy INEP, University of Belgrade, Banatska 31b, 11080 Belgrade, Serbia*
[2]*Institute BioSense, Member of the University of Novi Sad, Dr Zorana Djindjića 1, 21000 Novi Sad, Serbia*

Daucus carota L. (carrot) is a member of the Apiaceae family that traditionally has been recognized for its diuretic, carminative and antiseptic activities, and employed in the treatment of urinary calculus, cystitis, gout, prostatitis and cancer. Additionally, it is used because of nutraceutical and health benefits, and due to the presence of phenolic compounds, carotenoids, and ascorbic acid possesses antioxidant, anti-aging, anti-inflammatory, and anti-proliferative activities. The anti-freeze proteins from *D. carota* can be successfully extracted and are more suitable for industrial applications as cryoprotectant or in modifying ice crystals in frozen food. Thus, in the present research, protein extraction from *D. carota* root was performed *via* varying extraction mediums (water, 30% ethanol and extraction buffer) and extraction techniques (heat- and ultrasound-assisted procedures). The total protein content values varied in a range of 5.21 to 8.76 mg albumin equivalent (AE)/g of fresh plant material, achieving the highest yields in the following extracts: extraction buffer and HAE ≥ water and HAE ≥ water and UAE. Since the protein extract can be further used for food products, the choice of solvent was an essential step. Ethanol carrot extracts showed significantly lower protein content. In all samples, the type of extraction solvent significantly affected the protein yield. On the other hand, only in the case of the extraction buffer, the high temperature provided the extract with a statistically significantly higher protein yield in comparison to the UAE parallel. Namely, the extraction procedure did not have a significant influence on the protein concentration of the water and ethanol extracts, while in the case of extraction buffer, the high temperature provided the extract with a statistically significantly higher protein content (8.76±0.89 mg AE/g) compared to the parallel obtained by ultrasound waves (6.33±0.54 mg AE/g). Future experiments can be focused on the investigation of individual target proteins of *D. carota* and their potential implementation in food and functional food products.

3-6

Computer Vision Algorithms for Detection and Tracking of *Artemia salina* in Toxicity Assessment Tests

Nikola Stanojević[1,2], Nina Tomić[2], Miloš Tomić[2], Magdalena Stevanović[2], Marko Mišić[1], Zoran Stojanović[2]

[1]*University of Belgrade - School of Electrical Engineering, Belgrade, Serbia*
[2]*Institute of Technical Sciences of SASA, Knez Mihailova 35/IV 11000 Belgrade, Serbia*

The accurate assessment of behavior and survival of *Artemia salina* (brine shrimp), a common indicator organism, plays a critical role in environmental toxicity assessments, offering insights into the impact of various substances on aquatic ecosystems. Traditional methods for assessing the behavioral responses of *A. salina* are often labor-intensive and lack real-time capabilities, limiting the scalability and efficiency of toxicity testing. This paper presents a novel application of computer vision algorithms designed specifically for automated detection and tracking of *A. salina* in real-time, enabling a robust and scalable approach for assessing toxicity. Two approaches were tested in the detection and tracking system: a neural network-based method using the YOLO algorithm and a simpler background subtraction technique. YOLO's deep learning framework provided high accuracy in detecting and identifying individual organisms, while background subtraction offered an efficient alternative for tracking movement in controlled environments. Evaluation of the two models reveals that high-quality imaging systems enable a more flexible and robust solution for tracking, while lower-quality imaging systems, when paired with controlled environmental conditions, allow for an efficient, albeit less flexible, alternative with almost the same performance as much expensive variant. This work provides a valuable tool for environmental monitoring, enabling high-throughput and objective analysis of aquatic organism responses to toxic substances.

3-7

Influence of Growth Defects on Corosion of Coated Metal Biomaterials

Zoran Bobić[1], Lazar Kovačević[1], Vladimir Terek[1], Aljaž Drnovšek[2], Attila Csík[3], Peter Rodič[2], Pal Terek[1]

[1]*University of Novi Sad, Faculty of Technical sciences, Novi Sad, Serbia*
[2]*Jožef Stefan Institute, Ljubljana, Slovenija*
[3]*Institute for Nuclear Research, Debrecen, Hungary*

Surgical steel and titanium alloys are widely utilized in orthopaedic implants. Despite their widespread use, these materials are susceptible to corrosion in biological environments, potentially releasing toxic ions that may trigger allergic reactions and lead to implant failure. Physical vapor deposition (PVD) coatings have the potential to enhance both the bioactivity and corrosion resistance of these alloys. However, the ion penetrable growth defects in PVD coatings can diminish their corrosion protection effectiveness. Previous studies showed inconsistencies in influence of defect density and its size on impedance reduction. Most investigations primarily assess PVD defect density and average size over small areas, qualitatively evaluating their impact on impedance. This approach does not reliably determine the influence of PVD defects on corrosion protection. To clarify the effect of PVD defects on corrosion protection, corrosion tests and surface topography measurements were conducted on the same, predefined, areas using a specially designed sample holder. Surface topography and electrochemical impedance spectroscopy (EIS) measurements in phosphate-buffered saline (PBS) were performed using a 3D tactile Hommelwerke profilometer and a FilmSens device, respectively. Surface image analysis and defect characterization were conducted using SPIP software. A neural network model utilizing available Python libraries for model development, feature importance, and partial dependence analysis were employed to analyse the correlation between the defect distribution parameters and impedance at 0.01 Hz. The trained neural network achieved an R^2 value of approximately 0.93 for both training and test datasets. Feature and partial dependence analyses identified hole-like defects as having a predominant influence on the changes of impedance, while the protrusion defects did not show a pronounced impact. To enhance corrosion protection, it is essential to reduce the number and size of hole-like defects in PVD coatings. Thus, optimizing deposition parameters to minimize the formation of such defects is crucial for achieving high corrosion resistance in PVD coatings.

3-8

Advancements in Intraocular Lenses Design and Manufecturing: Evaluating Optical Clarity and Performance Standards

Ana Mirić[1], Nevena Milivojević Dimitrijević[1], Strahinja Milenković[1], Dalibor Nikolić[1], Vukašin Slavković[2], Nenad Grujović[2], Marko Živanović[1,3], Nenad Filipović[2,3]

[1]*Institute for Information Technologies, University of Kragujevac, Jovana Cvijića bb, 34000 Kragujevac, Serbia*
[2]*Faculty of Engineering, University of Kragujevac, Sestre Janjić 6, 34000 Kragujevac, Serbia*
[3]*BioIRC - Bioengineering Research and Development Center, University of Kragujevac, Prvoslava Stojanovića 6, 34000 Kragujevac, Serbia*

Cataract is the most common cause of blindness in the world. It is manifests as clouding of the crystalline lens, which occurs as a result of the disruption of biochemical processes during aging. The only effective treatment for cataracts is surgical intervention. Although it is a routine operation, complications are possible. During surgery, the crystalline lens can be damaged, and it can be replaced with an implant, an intraocular lens (IOL). The main role of the IOL is to establish optical focus. An ideal intraocular lens provides the patient with good vision for a long period of time. Today, IOLs generally contain a chromophore that blocks UV light to prevent retinal damage and damage from increased oxidative stress. We designed our lens in SolidWorks® Premium 2022 SP0.0 CAD software. It is designed as a one-piece, biconcave lens, with two components: optics and haptics. In the software Chitubox V1.7.0, the preparation for printing the mold was done. The mold was printed on a Creality LD-006 3D printer, using the mask stereolithography (mSLA) technique. Photopolymer in the form of resin used for printing is Creality resin LCD Dental Cast. We used polydimethylsiloxane (PDMS) to make the IOL. PDMS has good optical properties because it shows high resistance to exposure to sunlight, it is stable and biocompatible, which gives it the possibility of application in biomedicine. The pre-polymer and the cross-linking agent were mixed, after which it was poured into the mold. The cast lens was left in the oven, at an elevated temperature, to harden. Optical transmittance intensity was determined using Multiskan SkyHigh UV/VIS. Absorbance was measured at a certain wavelength. Our lens showed low optical transmittance for UV light. In the visible spectrum, the lens showed a significant increase in transmission, while there were no changes at wavelengths above the visible spectrum.

4-1

Precious Metal Ions Sorption on the Impregnated Sorbent

Karolina Zinkowska, Grzegorz Wójcik

Department of Inorganic Chemistry, Institute of Chemical Sciences, Faculty of Chemistry, Maria Curie-Skłodowska University, Maria Curie-Skłodowska Sq. 2, 20-031 Lublin, Poland

The amount of Waste Electrical and Electronic Equipment (WEEE) is increasing year by year. Precious metals such as gold, palladium, platinum, and rhodium are among the valuable raw materials that can be recovered from WEEE. According to the E-Waste Global Monitor, 54 million tonnes of e-waste were generated in 2019. Only 17% of this amount was collected and recycled. Almost 45 million tonnes were dumped in landfills. The total metal content that could be recovered from them was worth $57 billion. In 2022, 22% of the 62 million tonnes of e-waste was recycled. The estimated amount of precious metals in this e-waste was 1.6 million kilograms, of which only 300,000 kilograms (about 20%) were recovered. Greater amounts of precious metals can be obtained from secondary resources, such as WEEE than from natural sources. Therefore, it is so important to explore new methods of recovering precious metals from secondary resources, that are efficient but also environmentally friendly. A promising way to recover precious metals from WEEE is by sorption on solvent-impregnated resins. It does not require large energy inputs or generate large amounts of chemical waste and pollution like other methods. In the research, an impregnation method without the use of toxic organic solvents was used. A crosslinked divinylbenzene (DVB) adsorbent resin was used as the matrix and impregnated with an ionic liquid – trioctylmethylammonium chloride ($C_{25}H_{54}NCl$). To examine and characterize the impregnated sorbent, scanning electron microscopy (SEM) and low-temperature nitrogen adsorption measurements using an accelerated surface area and porosimetry system have been used. The prepared solvent-impregnated resin was used to study the sorption of precious metal ions: Au(III), Pd(II), Pt(IV), and Rh(III) from chloride model solutions, and a real solution obtained after leaching a spent RAM module. The precious metal ions concentration after sorption was determined by inductively coupled plasma–optical emission spectrometry (ICP-OES). The spectral lines were: 242.794 nm for Au(III); 340.458 nm for Pd(II); 214.424 nm for Pt(IV); 343.488 nm for Rh(III). The results show that Au(III), Pd(II) and Pt(IV) ions were sorbed with high efficiency on the impregnated resin, while at the same time Rh(III) ions were separated remaining in the solution.

4-2

Ag(I) coordination polymers as high-performance photocatalysts for degradation of organic dyes in water

Predrag Ristić[1], Veljko Đokić[2], Jasminka Popović[3], Nenad Filipović[4], Tamara Todorović[1]

[1]University of Belgrade - Faculty of Chemistry, Studentski trg 12-16, Belgrade, Serbia
[2]Innovation Center of Faculty of Technology and Metallurgy, University of Belgrade, Karnegijeva 4, Belgrade, Serbia
[3]Institute Ruđer Bošković, Bijenička cesta 54, Zagreb, Croatia
[4]University of Belgrade - Faculty of Agriculture, Nemanjina 6, Belgrade, Serbia

The quality of surface water is rapidly declining due to the continuous release of pollutants, with the widespread use of organic dyes in printing and dyeing industries posing significant environmental and health risks. This paper presents the synthesis and characterization of three novel Ag(I)-based coordination polymers and their application in the photocatalytic degradation of Mordant 9 blue (MB9). The coordination polymers, synthesized by the direct method using $AgSbF_6$ and $AgCF_3SO_3$ as starting salts and thiomorpholine-4-carbonitrile (L1) and piperazine-1,4-dicarbonitrile (L2) as ligands, were obtained in single-crystal form. Their structures were solved using single-crystal X-ray diffraction analysis, while phase purity was confirmed by powder X-ray diffraction analysis. Solid-state UV-Vis reflectance measurements revealed their semiconductor nature. Photocatalytic degradation experiments of MB9 under UV light were conducted in water, demonstrating that the prepared Ag(I) coordination polymers exhibit a superior photodegradation capability. This capability was found to be significantly better than that of TiO_2, a well-known standard, highlighting the practical potential of this solution.

4-3

Attractiveness of wild *Helianthus* species inflorescences in drought conditions

Milica Aleksić[1], Nada Grahovac[1], Sandra Cvejić[1], Dragana Miladinović[1], Aleksandra Radanović[1], Olivera Lazić[2], Jelena Jocković[1]

[1]*Institut of Field and Vegetable Crops Maksima Gorkog 30 Novi Sad*
[2]*Faculty of Technical Sciences, University of Novi Sad, Novi Sad, Serbia*

Drought is a significant abiotic stress affecting sunflower development, particularly during critical phases such as flowering and seed filling, leading to reduced yield and lower oil and protein content in seeds. Wild sunflower species are valuable genetic material for developing drought-resistant genotypes. This study aims to analyze the impact of drought stress on various aspects of wild sunflower species, including the morphological parameters of fruit, the percentage of dry matter in tubular and ray flowers, and the quality of nectar of wild sunflower species *H. annuus, H, argophyllus, H. debilis, H. neglectus, H. nivelus, H. petiolaris* and *H. praecox*. The research aimed to assess how drought influenced their development and their mechanisms of adaptation. Our finding revealed that fructose, glucose, and sucrose are present in the nectar of all seven species, fructose being most dominant, with *H. annnus* and *H. argophyllus* exhibiting the highest sugar content and largest diameter of inflorescence disc, enhancing their attractiveness to pollinators, and energy accumulation, which results in better reproducibility of plant in dry conditions. In contrast, *H. praecox*, and *H. nivelus* showed low sugar content and smaller diametar of inflorescence disc, but demonstrated superior moisture retention in its tubular and ray flowers suggesting better water retention and resouce accumulation, giving the plant an advantage for survival in conditions with limited resources and moisture. Research shows that high sugar accumulation in nectar and moisture content in tubular and ray flowers are vital for survival and reproduction in dry conditions. Studying the adaptive strategies of wild sunflowers in response to drought enhances our understanding of how plants can adjust to such conditions. This knowledge can be applied to develop new, drought-tolerant hybrid varieties, preserve ecosystems, and promote sustainable agriculture.

Acknowledgment: This work is supported by the Ministry of Education, Science and Technological Development of Republic of Serbia, grant number 451-03-66/2024-03/200032, by the Science Fund of the Republic of Serbia, through IDEAS project "Creating climate smart sunflower for future challenges" (SMARTSUN) grant number 7732457, Project HelEx, grand number 101081974, funded by EC.

4-4

Novel trimetallic ZIF materials as visible light harvesting photocatalysts

Andrej Milivojac[1], Jovana Araškov[2], Veljko Đokić[3], Aleksandar Višnjevac[4], Jasminka Popović[4], Nenad Filipović[5], Tamara Todorović[2]

[1]Innovative Centre of the Faculty of Chemistry, Studentski trg 12-16, Belgrade, Serbia
[2]University of Belgrade - Faculty of Chemistry, Studentski trg 12-16, Belgrade, Serbia
[3]Innovation Center of Faculty of Technology and Metallurgy, University of Belgrade, Karnegijeva 4, Belgrade, Serbia
[4]Institute Ruđer Bošković, Bijenička cesta 54, Zagreb, Croatia
[5]University of Belgrade - Faculty of Agriculture, Nemanjina 6, Belgrade, Serbia

Among light-driven photocatalysts, a subgroup of metal-organic frameworks composed of metal ions and imidazolate linkers, known as zeolitic imidazolate frameworks (ZIFs), have shown great promise for practical application in photocatalytic wastewater remediation. This paper presents the synthesis and characterization of novel trimetallic ZIFs with partially substituted Zn(II) tetrahedral sites by Cu(II) and Co(II) ions in sodalite-type ZIF-8 structure. The materials were synthesized by two synthetic techniques: the traditional solvothermal method using a varying linker and metal salts ratio in DMF and the reaction-diffusion framework method using a hydrogel agar medium. The structure, morphology and composition of novel Co,Cu doped ZIF-8 materials were investigated using powder X-ray diffraction analysis, energy-dispersive X-ray analysis with scanning electron microscope (EDS-SEM), UV-Vis and IR spectroscopy in the solid state and inductively coupled plasma mass spectrometry (ICP-MS) of digested material samples. The photocatalytic properties of these materials were explored by examining the extent of mordant blue 9 dye degradation under visible light irradiation without using H_2O_2.

Acknowledgments: This work has received funding from the European Union's Horizon Europe Widening Participation program under grant agreement No 101059534 (PFAStwin).

4-5

Influence of the graphene oxide content in the ZnO/GO composite on the selectivity and sensitivity of the electrode for detecting diclofenac in water

Ana Nastasić[1], Kristina Gočanin[1], Katarina Aleksić[2], Marijana Kraljić Roković[3], Slavilja Marković[2], Ivana Stojković Simatović[1]

[1]*Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia*
[2]*Institute of Technical Sciences of SASA, Belgrade, Serbia*
[3]*Faculty of Chemical Engineering and Technology, University of Zagreb, Zagreb, Croatia*

Diclofenac (DCF) is one of the most commonly used pharmaceuticals today. Due to its high consumption, DCF ends up in ecosystems and watercourses, where it becomes a pollutant, endangering the living world. Effective monitoring of contaminant concentrations in water is crucial for ensuring water quality, which can be achieved through electroanalytical methods. The performance of an electrochemical method is critically determined by the surface characteristics of the working electrode. Therefore, composites were designed to modify the surface of the working electrode to improve its properties. In this study, we propose zinc oxide/graphene oxide (ZnO/GO) composites with different weight percentages of GO relative to ZnO (0.005%, 0.01%, and 0.05%) to examine the influence of GO content on the characteristics of the electrode for the detection of DCF in water. The physicochemical characteristics of the materials were examined by X-ray diffraction analysis, Raman spectroscopy, and FESEM imaging. The materials were then combined with the carbon additive, distilled water, and ethanol into an ink to modify the glassy carbon electrode. After *In Situ* electrochemical reduction of GO, the obtained electrodes were tested for the oxidation of DCF in a neutral electrolyte (0.1 M phosphate buffer) by cyclic voltammetry (CV). CVs showed an irreversible anodic peak originating from the oxidation of DCF, as well as anodic and cathodic peaks originating from the oxidation/reduction of the decomposition product of the oxidized form of DCF. Parameters such as limit of detection (LOD), limit of quantification (LOQ), dynamic range, and sensitivity were evaluated. The measurements indicated that all electrodes are selective for DCF. The proposed materials are suitable for further investigation in the field of electrochemical detection of pharmaceuticals in aqueous electrolytes.

4-6

Surface modifications of zero-valent iron nanoparticles for environmental applications

Viktorie Víchová[1,2], Jana Křížek Oborná[1], Josef Kašlík[1], Jan Filip[1]

[1]Czech Advanced Technology and Research Institute, Regional Centre of Advanced Technologies and Materials, Palacký University Olomouc, Šlechtitelů 27, 783 71 Olomouc, the Czech Republic
[2]Department of Experimental Physics, Faculty of Science, Palacký University Olomouc, 17. listopadu 1192/12, 771 46 Olomouc, the Czech Republic

Zero-valent iron nanoparticles (nZVI) are highly promising for environmental remediation due to their exceptional reactivity, magnetic properties, and large specific surface area. They are widely employed in the removal of contaminants, including chlorinated ethenes or heavy metals. Surface modifications are employed to further enhance their remediation efficacy. In this contribution, two different types of surface modification of nZVI are presented: oxide and sulfide shells. Passivation with an iron (hydro)oxide shell enhances the safety of handling and storing nZVI by mitigating its natural pyrophoricity while preserving reactivity beneath the protective oxide layer. Their reactivity can be restored by the activation process. Another type of modification is creating a thin shell made of iron sulfides (Fe_xS) covering an iron core (S-nZVI). This enhancement leads to increased hydrophobicity and electron transfer from the core resulting in increased reactivity of nZVI. However, the Fe_xS shell is amorphous. S-nZVI nanoparticles with crystalline Fe_xS shell can be achieved through a tempering procedure. We present a detailed characterization of these modified materials and assess their reactivity in the removal of hexavalent chromium, demonstrating the potential for enhanced environmental application of surface-modified nZVI.

4-7

The utilization of hazelnut shells for efficient removal of BR18 azo dye: A comparative study of raw and modified adsorbents

Naji Agilee[1], Tijana Spasojević[2], Milica Delić[1], Đorđe Ogrizović[1], Isabel Gria[1], Nevena Prlainović[1], Maja Đolić[1]

[1]*Faculty of Technology and Metallurgy University of Belgrade*
[2]*Innovation Center of Faculty of Technology and Metallurgy University of Belgrade*

The textile industry is considered one of the bigest industries globally, but it is also a significant source of environmental pollution, releasing dyes, hazardous metals, and chemicals into wastewater. Among these, azo dyes form the largest group of commercial dyes, representing a substantial environmental concern due to their stable molecular structures. Biowaste offers a sustainable, cost-effective solution for adsorbing pollutants like heavy metals and organic compounds. Hazelnut shells (HS), a by-product of the food industry, are widely available and possess properties that make them ideal for adsorptive applications. This study explores the modification of raw hazelnut shells with citric acid ($C_6H_8O_7$) to increase their surface negative charge, thereby enhancing their capacity to adsorb cationic dyes such as Basic Red 18 (BR18). Structural characterization of modified (MHS) and raw hazelnut shells (RHS) was conducted using optical microscopy, ATR-FTIR spectroscopy, XRD, and XRF analysis. Adsorption performance was optimized across various conditions, including initial pH, adsorbent dosage, temperature, and initial dey concentration. The efficiency of BR18 removal onto MHS and RHS was found to be 84.7% and 78.4%, respectively, under optimal conditions (C_0=100mg/L, t=85 min and pH 3.6). The isotherm experimental data showed that the Freundlich and Temkin isotherms are the most suitable model for MHS and RHS adsorption, respectively. The maximum adsorption capacities were 80.65 mg/g and 62.11mg/g for the MHS and RHS, respectively. Kinetic studies indicated that the adsorption for both tasted materials followed pseudo-second-order model. Thermodynamic analysis confirmed the adsorption process as spontaneous and endothermic. This research presents modified hazelnut shells as an innovative, eco-friendly adsorbent for removing BR18 dye from aqueous solutions, highlighting a promising application for biowaste in water treatment.

4-8

Assessment of thiocarbohydrazones' lipophilicity and ecotoxicity

Dragana Mekić, Đenđi Vaštag, Gorana Mrđan, Borko Matijević, Suzana Apostolov

University of Novi Sad, Faculty of Sciences, Department of Chemistry, Biochemistry and Environmental Protection, Novi Sad, 21000, Serbia

Thiocarbohydrazones are important organic compounds due to their remarkable biological properties, such as antimicrobial, antifungal, antibacterial, antitumor, antiviral, and antioxidant. Early phases of research of new compounds' biological potential includes assessment of their lipophilicity and ecotoxicity properties. In this study, firstly, the predictors of lipophilicity and ecotoxicity properties of thiocarbohydrazones were calculated by using software programs. The next step was to assess lipophilicity by using reversed-phase thin-layer chromatography in mixtures of water and two organic modifiers, separately. The chromatographically obtained parameters (R_M^0 and m) were correlated with the software-derived values of the standard measure of lipophilicity (log$P$), as well as with the selected ecotoxicity parameters by applying linear regression analysis. All obtained results indicate that the chromatographic parameters, R_M^0 and m, can be reliably used to describe lipophilicity and ecotoxicity properties, i.e. as descriptors of the biological activity of the studied thiocarbohydrazone derivatives.

5-1

DFT Insights into Boron-Doped Graphene: Tuning Metal Interaction through Boron Content and Surface Oxidation

Nikola Veličković, Ana S. Dobrota

University of Belgrade – Faculty of Physical Chemistry, Belgrade, Serbia

The development of next-generation metal-ion batteries demands advanced electrode materials with high capacity, fast charge-discharge rates, and long cycle life. Boron-doped graphene (BG) has emerged as a promising candidate for use in these batteries due to its electronic properties, structural stability, and enhanced electrochemical performance. Pristine graphene interacts rather weakly with most metals. Doping graphene with B induces a change in the electronic structure, and a dent in the π electronic cloud of ideal graphene, making it more reactive. Using Density Functional Theory (DFT) calculations, we show, on atomic level, how the presence of boron changes the reactivity of graphene towards some metals of interest in novel batteries, including Mg and Zn. We also explore its reactivity towards Cu and Pt, which are quite interesting from the point of view of electrocatalysis and single atom catalysts. We investigate the role of the concentration of boron in strengthening these graphene-metal interactions. Additionally, we take into accound the possible (and probable) oxidation of BG, and analyze how the presence of O-containing groups further modifies the reactivity of the material towards the species of interest.

Acknowledgement: A.S.D. acknowledges the support of the "For Women in Science" National Programme in Serbia.

5-2

Excitons, optical spectra, and electronic properties of semiconducting Hf-based MXenes

Nilesh Kumar, Miroslav Kolos, Sitangshu Bhattacharya, František Karlický

Department of Physics, Faculty of Science, University of Ostrava, Ostrava, Czech Republic

Semiconducting MXenes are an intriguing two-dimensional (2D) material class with promising electronic and optoelectronic properties. Here, we focused on recently prepared Hf-based MXenes, namely, $Hf_3C_2O_2$ and Hf_2CO_2. Using the first-principles calculation and excited state corrections, we proved their dynamical stability, reconciled their semiconducting behavior, and obtained fundamental gaps by using the many-body GW method (indirect 1.1 and 2.2 eV; direct 1.4 and 3.3 eV). Using the Bethe–Salpeter equation, we subsequently provided optical gaps (0.9 and 2.7 eV, respectively), exciton binding energies, absorption spectra, and other properties of excitons in both Hf-based MXenes. The indirect character of both 2D materials further allowed for a significant decrease of excitation energies by considering indirect excitons with exciton momentum along the Γ-M path in the Brillouin zone. The first bright excitons are strongly delocalized in real space while contributed by only a limited number of electron–hole pairs around the M point in the k-space from the valence and conduction band. A diverse range of excitonic states in $Hf_3C_2O_2$ MXene lead to a 4% and 13% absorptance for the first and second peaks in the infrared region of absorption spectra, respectively. In contrast, a prominent 28% absorptance peak in the visible region appears in Hf_2CO_2 MXene. Results from radiative lifetime calculations indicate the promising potential of these materials in optoelectric devices requiring sustained and efficient exciton behavior.

5-3

Factors influencing the prices of artificial fertilizers

Aleksandra Kowalska[1], Mateusz Hałka[1], Anna Budzyńska[1], Mariusz Kicia[1], Konrad Terpiłowski[2]

[1]Institute of Economics and Finance, Maria Curie-Skłodowska University, pl. Marii Curie-Skłodowskiej 5, Lublin, 20-031, Poland
[2]Institute of Chemical Sciences, Maria Curie-Skłodowska University, pl. Marii Curie-Skłodowskiej 2, Lublin, 20-031, Poland

The aim of this study is to explore the impact of the main determinants on the rapid increase in fertilizer prices in Poland and to foresee the consequences of this situation regarding sustainable policy developments. We developed linear regression models for N, P, and K fertilizers to show the direction of influence of explaining variables and make a decomposition of the fertilizer price increases. The models illustrate that four major factors were responsible for the fertilizer price increases in Poland in 2020–2022, i.e., wheat, gas, GHGE allowance prices, and domestic production volumes. These factors explained the variation in the price of fertilizers concerned with different strengths. There were also other impacts associated with the 'black swans' occurrence (the COVID-19 pandemic and the war in Ukraine). High mineral fertilizer prices provide an opportunity to revise agricultural policy and legislation, taking into account environmental concerns and the latest technological developments. Fertilizer management practices are at the center of a triangle of critical objectives that track the progress toward sustainable agricultural systems, such as (1) an increase in farm incomes, (2) environmental protection, and (3) food and nutrition security. We recommend adjusting the set of explaining variables in the models (i.e., wheat/corn price) to the specificities of the domestic agri-food system. This study provides important guidance for agricultural policymaking, emphasizing the need to integrate sustainable fertilizer management practices to achieve synergies between economic growth, environmental protection, and food security. Such an approach can support the long-term development of agriculture in Poland and contribute to the economic and environmental stability of the agricultural sector.

5-4

Establishing serbian reproducibility network

Matija Zlatar[1], Bojana Gavrilović[2], Ljiljana Radosavljević[2], Ivana Dinić[3], Milica Ševkušić[3], Marijana Petković[4], Obrad Vučkovac[4], Stanislava Stanojević[5], Irena Nježić[5], Nadica Miljković[6], Aleksandra Lazić[7], Ljiljana Lazarević Valerjev[7], Milica Ninković[8], Biljana Glišić[9]

[1]University of Belgrade - Institute of Chemistry, Technology and Metallurgy - National Institute of Republic of Serbia, Belgrade, Serbia, [2]Institute for Vegetable Crops, Smederevska Palanka, Serbia, [3]Institute of Technical Sciences of SASA, Belgrade, Serbia, [4]University of Belgrade - Vinča Institute of Nuclear Sciences - National Institute of the Republic of Serbia, Belgrade, Serbia, [5]Institute of Virology, Vaccines and Sera "Torlak" (TORLAK), Belgrade, Serbia, [6]University of Belgrade - School of Electrical Engineering, Belgrade, Serbia, [7]University of Belgrade - Faculty of Philosophy and LIRA Lab (LIRA Lab), Belgrade, Serbia, [8]University of Belgrade - Institute for Medical Research - National Institute of the Republic of Serbia, Belgrade, Serrbia, [9]Faculty of Science, University of Kragujevac, Kragujevac, Serbia

The Serbian Reproducibility Network (RS-RN) aims to foster a cultural shift within the Serbian research community by prioritizing reproducibility, open science and research integrity. Leveraging existing initiatives, research groups, and individuals, the RS-RN seeks to promote rigorous research practices, interdisciplinary collaboration, and trust in science. Currently comprising nine institutions, the consortium focuses on integrating open science, reproducibility, and inclusive policies into institutions and education. With a vision for transparent, ethical, and rigorous research, the RS-RN plans to organize conferences, workshops, and online platforms to promote these principles. With an aspiration to become a national hub for advocating high-quality research, the RS-RN aims to improve both research methodologies and the overall research environment. By building capacity for change within the research ecosystem and offering relevant training, the network will facilitate discussions among scientists and various stakeholders. It will also strengthen connections with international reproducibility networks to ensure global collaboration.

Acknowledgments: The Serbian Reproducibility Network received seed money through the 'TIER2 Award for Establishing a Reproducibility Network'. TIER2 is funded by the European Union's Horizon Europe research and innovation programme under grant agreement No 101094817.

6-1

Preparation of heterostructured Au@FeOx nanoparticles: structural and magnetic properties

Farzane Talaee Shoar[1], Pierfrancesco Maltoni[2], Gianni Barucca[1], Davide Peddis[2], Gaspare Varvaro[3]

[1]Università Politecnica delle Marche, Ancona, Italy
[2]Università di Genova, Genova, Italy
[3]CNR, Roma, Italy

Over the past decade, nanostructured 3d transition-metal spinel ferrites MFe_2O_4 ($M = Fe^{2+}$, Co^{2+}, Ni^{2+}, Mn^{2+}, etc.) have been studied extensively as an important class of nanomaterials for both fundamental studies and technological applications (e.g., energy, catalysts, biomedicine, sensing and information storage) due to the large variety and tunability of their physical properties. While the rational synthesis of spinel ferrites with controlled size and morphology has long been pursued to customize their chemico-physical properties, heterostructures involving transition metal oxides with other materials has emerged as a significant current focus. This is due to their unique electronic, magnetic, optical and catalytic properties which can be finely controlled by changing the nature of components, their relative size, or by tuning the interface interactions. Recent focus has been on noble metals (e.g., gold) combined with iron oxides in nanoparticle heterostructures and the heterojunction between these two components in which the material properties at both sides close to the interface are modified from those in the bulk. This could be caused by many factors, including surface reconstruction around the junction, lattice mismatch-induced crystal strain, and electron interaction/transfer across the interface. Au-FeOx heterostructures with various architectures, such as core/shell and dimer configurations, have been synthesized using chemical methods designed to suppress homogeneous nucleation of FeOx and favor heterogeneous growth on Au seeds. Despite their demonstrated potential, the process remains not fully understood. Here, we present a general strategy for engineering binary hybrid nanoparticles (Au-FeOx) through spontaneous epitaxial nucleation and growth of the FeOx component onto Au nanoparticles in high-temperature organic solutions and investigate their morpho structural and magnetic properties.

6-2

Study of crystal phases and temperature dependence of $InSiTe_3$

T. Belojica[1], J. Blagojević[1], S. Djurđić Mijin[1,2], A. Šolajić[1], J. Pešić[1], B. Višić[1], V. Damljanović[1], M. O. Ogunbunmi[3], S. Bobev[3,4], Yu Liu[4], C. Petrovic[4,5,6], Z.V. Popović[7], A. Milosavljević[1], N. Lazarević[1]

[1]Center for Solid State Physics and New Materials, Institute of Physics Belgrade, University of Belgrade, Pregrevica 118, 11080 Belgrade, Serbia, [2]Departamento de Fisica de Materiales, Facultad de Ciencias,Universidad Autonoma de Madrid, 28049 Madrid, Spain, [3]Department of Chemistry and Biochemistry, University of Delaware, Newark, Delaware 19716, U.S.A., [4]Condensed Matter Physics and Materials Science Department, Brookhaven National Laboratory, Upton, NY 11973-5000, USA, [5]Shanghai Advanced Research in Physical Sciences (SHARPS), Shanghai 201203, China, [6]Department of Nuclear and Plasma Physics, Vinca Institute of Nuclear Sciences, University of Belgrade, Belgrade 11001, Serbia, [7]Serbian Academy of Sciences and Arts, Knez Mihailova 35, 11000 Belgrade, Serbia

In recent years, quasi-low-dimensional materials have attracted significant attention due to their distinctive properties and possible applications in nanoeletronics and spintronics. The material of a specific interest within this group is $InSiTe_3$. Unlike related compounds, such as $CrSiTe_3$ and $CrGeTe_3$, research results $InSiTe_3$ are limited, most likely due to the unclear nature of its crystal structure. Detailed experimental and theoretical investigation was conducted to determine the crystal structure of $InSiTe_3$. Inelastic light scattering experiment performed on the $InSiTe_3$ reveals presence of six ($3A_{1g} + 3E_g$) out of eight and seven ($5A_g + 2E_g$) out of ten Raman active modes for proposed $P\bar{3}1m$ and $P\bar{3}$ space groups, respectively. These findings suggest a coexistence of two trigonal crystal phases: a high symmetry one corresponding to $P\bar{3}1m$ and athe lower symmetry one that corresponds to $P\bar{3}$ space group. Additional exitations were detected in parallel scattering configuration; two broad features in the gap of PDOS that can be a consequence of to two-phonon processes and a third one, at about 500 cm^{-1} that might indicate local symmetry breaking at nano scale. Temperature dependent measurements from 80 K to 300 K show monotonous decrease in energy and increase in linewidth up to 200 K at which point discontinuities appear across all analyzed modes. However, this anomaly overcomes the scope of this research and remains an open question.

6-3

Characterization of the macro- and microstructure of the flux-cored nanocomposites wires deposited on the cast Ni-based superalloy

Łukasz Rakoczy[1], Lechosław Tuz[1], Michał Urbańczyk[2], Dawid Kozień[3], Rafał Cygan[4]

[1]AGH University of Kraków, Faculty of Metals Engineering and Industrial Computer Science, al. Mickiewicza 30, 30-059 Kraków, Poland
[2]Łukasiewicz Research Network-Upper Silesia Institute of Technology, Poland
[3]AGH University of Krakow, Faculty of Materials Science and Ceramics, al. Mickiewicza 30, 30-059 Kraków, Poland
[4]Consolidated Precision Products, ul. Hetmańska 120, 35-078 Rzeszów, Poland

The γ' precipitates-strengthened Ni-based superalloys are prone to hot solidification cracking in the weld and liquation cracking in the heat-affected zone. Filler metals with the identical chemical composition are not usually recommended. Then, alloys with a low volume fraction of intermetallic phases and carbides are preferred. It includes Alloy 625 Ni-based superalloy, which is widely used in fields such as aerospace and supercritical water reactors owing to its high oxidation resistance and excellent corrosion resistance. However, due to its relatively low hardness and wear resistance, the application of Alloy 625 is limited in areas with severe abrasion and corrosion like tip-blade repair. This became an impulse for research on metal matrix composites (MMCs), which tend to be an important direction in filler metals development. In this work powder mixtures Alloy 625+WC were used for fabrication of flux-cored wires and then deposited using robotic station on the surface of cast Ni-based superalloy. The microstructure, chemical composition, phase constitution, and microhardness of the deposited ex-situ composites were investigated by non-destructive (visual, penetration, radiography testings) and also destructive techniques: light microscopy, scanning electron microscopy, energy-dispersive X-ray spectroscopy, and Vickers microhardness measurements. High metallurgical of clad layers without critical defects like hot cracking was observed. The microscopy observation showed that the clad layers are characterized by typical cellular-dendritic microstructure with an irregular distribution of primary precipitates.

Acknowledgments: The authors gratefully acknowledge the funding by National Centre for Research and Development, Poland, under grant LIDER XIII – Development of the manufacturing and deposition technology of metal-ceramic nanocomposite coatings for the structural reconstruction of heat-resistant nickel-based superalloys (Project no. 0036/L-13/2022).

6-4

Impact of Silver Nanoparticles (AgNPs) on the Piezoelectric Properties of Electrospun PVDF Nanomats

Strahinja Milenković[1,2], Katarina Virijević[1,2], Živana Jovanović Pešić[2], Nenad Grujović[2], Fatima Živić[2]

[1]Institute for Information Technologies, University of Kragujevac, Jovana Cvijića bb, 34000 Kragujevac, Serbia
[2]Faculty of Engineering, University of Kragujevac, Sestre Janjić 6, 34 000 Kragujevac, Serbia

Poly(vinylidene fluoride) (PVDF) is a polymer widely recognized for its biocompatibility, mechanical resilience, and piezoelectric properties - largely dependent on its β-phase content. This β-phase content can be enhanced through methods such as electrical poling and mechanical stretching, both of which occur during the electrospinning process. Given the antibacterial properties of silver, combining silver nanoparticles (AgNPs) with biocompatible PVDF offers promising applications in biomedical composite fabrication. This study investigates the impact of AgNPs on the β-phase content of PVDF in electrospun nanomats, analyzed through Fourier transform infrared (FTIR) spectroscopy. A comparison between PVDF fabricated by electrospinning and the casting method revealed that electrospinning significantly increased the β-phase fraction. Additionally, incorporating AgNPs (at concentrations of 0.1% and 0.3% w/w) into electrospun fibers further enhanced the β-phase fraction; however, with further concentration increase (0.5% w/w), a reduction in β-phase was observed.

6-5

Mechanochemical synthesis and characterization of composite systems MgH_2 – Tm (Tm = Ti, Cr and V) for application in hydrogen energy

Ana Kanjevac[1], Igor Milanovic[2], Slavica Maletic[3]

[1]Center for Solid State Physics and New materials, Institute of Physics Belgrade, University of Belgrade, Pregrevica 118, 11080 Belgrade, Serbia
[2]Center of Excellence for Hydrogen and Renewable Energy, Laboratory of Physics, Vinča Institute of Nuclear Sciences, University of Belgrade, P.O. Box 522, 11000 Belgrade, Serbia
[3]Faculty of Physics, University of Belgrade, Belgrade, Serbia

The need for cleaner and renewable energy sources has led to increased research into hydrogen energy storage methods. Magnesium hydride is a particularly promising storage material due to its high gravimetric hydrogen storage capacity of 7.6 wt.%, natural abundance, low cost, and light weight. However, its high stability results in slow sorption kinetics and requires high temperatures for hydrogen desorption. To address these challenges, this study explores the mechanochemical synthesis of magnesium hydride with transition metals Ti, V, and Cr. The desorption properties of the samples were measured using temperature-programmed desorption (TPD), with additional microstructural characterization conducted using scanning electron microscopy (SEM), X-ray diffraction (XRD), and laser particle size analysis. Results indicate that milling the samples for 15 minutes reduces particle size, promotes the formation of the orthorhombic γ-MgH_2 phase, and enhances the catalytic effect of the additive metals on desorption properties. However, further increases in milling time (to 30 and 45 minutes) lead to the formation of larger agglomerates, which partially weaken the catalytic effect of the transition metals. In summary, milling MgH_2 with Ti, V, and Cr additives results in significantly lower desorption temperatures, reduced activation energies, and improved desorption kinetics compared to unmilled magnesium hydride.

6-6

Sustainable approach to recycling end-of-life NdFeB permanent magnets

Ayda Ghary Haghighat[1,2,3], Arooj Ramzan[1], Alexander Omelyanchik[1,2], Gaspare Varvaro[2], Sawssen Slimani[1,2], Davide Peddis[1,2]

[1]Università degli Studi di Genova, Dipartimento di Chimica e Chimica Industriale, nM² - Lab, Via Dodecaneso 31, 1-16146 Genova, Italy
[2]CNR, Istituto di Struttura della Materia, nM² -Lab, Monterotondo Scalo (Roma), 00015, Italy
[3]Università degli Studi Roma Tre, Dipartimento di Scienze, Via Ostiense 159, 00146 Rome, Italy

Permanent magnets (PMs) are used in a diverse array of applications, such as computer hard drives, wind turbines, sensors, electric and hybrid vehicle motors, and microphones. NdFeB PMs possess one of the highest BH_{max} (≈512 kJ/m³) making them the most cost-effective magnets in the market. However, nearly 90% of rare-earth elements are sourced from China, resulting in supply chain shortages and price volatility. Here we focus on recycling the end-of-life (EoL) magnets as a sustainable approach that addresses resource scarcity and environmental concerns. To achieve this goal, powders of EoL-NdFeB-PMs were prepared by hydrogen decrepitation process at different times and temperatures, followed by ball milling under different rotational speeds and milling durations. A depth investigation of the correlation between the structural and magnetic properties of the produced powders was performed using X-ray diffraction (XRD), and vibrating sample magnetometer (VSM), respectively. According to the results, the hydrogen-treated powder, obtained at 550 °C for 1h after ball-milling at 1200 RMP for 4h, exhibited the highest magnetic properties compared to other samples. Specifically, the coercivity after ball milling increased from ~0.21 to 0.44 T, while maintaining a high saturation magnetization above 90 Am^2/kg. As future perspectives, particular attention will be devoted to Mössbauer study, that allows to investigate the local hyperfine structure of the produced materials.

Acknowlagements: This work was supported by Minestro dell'Universita e della Ricerca, program ERANET Cofund ERA-MIN3, project Rendering 3D (No. JTC-2021_207) and by ICO-FALK foundation (project ReCREATE).

6-7

Aging time and wettability of PDMS based magnetic nanocomposites

Ibtissame Sidane[1], Davide Peddis[1,2], Stefano Alberti[1], Sawssen Slimani[1,2]

[1]*Department of Chemistry and Industrial Chemistry (DCCI), University of Genova, Genova (GE), Italy*
[2]*Institute of Structure of Matter (ISM), National Research Council (CNR), Roma (RM), Italy*

In recent years, there has been growing interest in polymer-based magnetic nanocomposites (PMNCs), a class of multifunctional materials with enhanced physical-chemical properties suitable for various applications, including biomedicine and environmental fields. In this study, we report the investigation on 10 nm $CoFe_2O_4$ (CFO) and $CoFe_2O_4$ coated with oleic acid (CFO@OA), embedded in a PDMS (poly(dimethylsiloxane)) matrix. CFO nanoparticles were prepared via co-precipitation method, then coated with oleic acid ligand. PDMS-based magnetic nanocomposites were synthetized by the electrospinning technique using the CFO@OA nanoparticles. A full characterization was performed using a combination of morpho-structural techniques (X-ray diffraction, XRD), Fourier Transform Infrared Spectroscopy (FTIR), Thermogravimetric Analysis (TGA), Dynamic Light Scattering (DLS), and magnetic measurements (Vibrating Sample Magnetometer, VSM) to provide detailed understanding of the physical-chemical properties of the samples. Interestingly, the incorporation of magnetic CFO@OA sample within the PDMS matrix strongly influence the aging time of the polymer (i.e., reduction from 72 h to 24 h). Additionally, the dispersion of the magnetic particles within the PDMS affects its wettability. Under a magnetic field, contact angle measurements show that the hydrophobicity of PDMS (typically characterized by a high contact angle) decreases with increasing concentrations of CFO@OA particles, dropping from 146° to 123° at higher particle concentrations. These results highlight how the combination of materials with different properties may eventually lead to the appearance of new characteristics, which offer a starting point into designing advanced nanocomposites for various applications.

7-1

UV irradiation influence on fumitory extract-loaded liposomes

Rabija Ahmoda[1], Andrea Pirković[2], Milena Milošević[3], Aleksandar Marinković[1], Aleksandra Jovanović[2]

[1]*Faculty of Technology and Metallurgy, University of Belgrade, Karnegijeva 4, 11000 Belgrade, Serbia*
[2]*Institute for the Application of Nuclear Energy INEP, University of Belgrade, Banatska 31b, 11080 Belgrade, Serbia*
[3]*Institute of Chemistry, Technology and Metallurgy, National Institute of the Republic of Serbia, University of Belgrade, Njegoševa 12, Belgrade, Serbia*

Fumaria officinalis L. (fumitory, Fumariaceae family) is a scrambling annual plant, disturbed and cultivated throughout Europe. The biological activities of the plant can be attributed to the high content of polyphenols and alkaloids. However, the application of the mentioned compounds is limited due to their poor water solubility, intestinal resorption, and low bioavailability. Liposomal vesicles, as non-toxic, biodegradable, and biocompatible carriers, can provide controlled delivery of bioactive components, their protection from degradation, and improved bioavailability. The liposomal bilayer is an appropriate carrier for covering the unpleasant taste of numerous polyphenols and alkaloids. The present study aimed to characterize fumitory extract-loaded liposomal vesicles after UV irradiation *via* the determination of encapsulation efficiency, size, polydispersity index (PDI), zeta potential, mobility, and conductivity. The encapsulation efficiency was the same before and after UV irradiation (>69%). Since the liposomes contain only phospholipids (without sterols), the liposomal bilayer was more rigid and prevented the leakage of encapsulated compounds, *i.e.*, provided a higher encapsulation efficiency. Particle size and PDI of the UV-irradiated liposomes with fumitory extract were 294.2±4.1 nm and 0.387±0.011, respectively. The zeta potential after UV irradiation was -5.51±0.4 mV. The obtained PDI value indicates the existence of a non-uniform system. A negative zeta potential value is related to the organization of phospholipids, whereas a low value suggests that the liposomal suspension is not electrostatically stabilized. Mobility and conductivity of the obtained liposomal particles were -0.429±0.012 µmcm/Vs and 0.468±0.005 mS/cm, respectively. All mentioned parameters were not significantly different compared to the non-treated sample. Since UV irradiation did not cause significant changes in all mentioned parameters of fumitory extract-loaded liposomes, it can be employed as a sterilization step in the preparation of liposomes for potential application in foods, functional foods, dermo-cosmetics, and pharmaceutics.

7-2

Influence of the high-temperature preheating on the decrease in liquation cracking susceptibility

Małgorzata Grudzień-Rakoczy[1], Łukasz Rakoczy[2], Wacław Oleksy[1], Konrad Chrzan[1], Krzysztof Jaśkowiec[1], Rafał Cygan[3]

[1]Łukasiewicz Research Network-Kraków Institute of Technology, ul. Zakopiańska 73, 30-418 Kraków, Poland
[2]AGH University of Kraków, Faculty of Metals Engineering and Industrial Computer Science, al. Mickiewicza 30, 30-059 Kraków, Poland
[3]Consolidated Precision Products, ul. Hetmańska 120, 35-078 Rzeszów, Poland

Ni-based superalloys are crucial for manufacturing jet engines components, such as blades and vanes, because of their exceptional strength and resistance to oxidation and hot corrosion. Repairing serviced components is often more cost-effective than replacing them outright. However, the alloy's tendency to liquation cracking challenges this process. This work focused on analyzing the effects of high-temperature preheating on the improvement of the cast Ni-based superalloy's resistance to liquation cracking in a heat-affected zone (HAZ). The clad layers were manually deposited via Gas Tungsten Arc Welding (GTAW) using three filler materials: Inconel 617, Inconel 625, and Inconel 718. Samples were taken from the joints for microstructure examination using light microscopy, scanning electron microscopy, transmission electron microscopy and X-ray dispersive spectroscopy. In the joints prepared without preheating, single local microcracks were revealed in the HAZ due to constitutional liquation of mainly secondary γ' precipitates, with a contribution of minor phases was observed. Applying a preheating step prior to cladding with GTAW eliminates liquation cracks through intensified γ' precipitate dissolving, thermal stress reduction and microcrack self-healing with a liquid eutectic.

Acknowlagements: The authors gratefully acknowledge the funding by National Centre for Research and Development, Poland, under grant LIDER XIII 0147/L-13/2022 (Development of a technology for the regeneration of precise castings of nickel superalloys intended for use in the aviation industry).

7-3

Synthesis and characterization of high coercitivity ε-Fe_2O_3 nanoparticles via sol-gel process from akaganeite precursors

Marko Đošić, Ana Mraković, Marin Tadić

Laboratory of Theoretical and Condensed Matter Physics, Vinča Institute of Nuclear Sciences-National Institute of the Republic of Serbia, University of Belgrade, Belgrade, Serbia

The ε-phase of ferric oxide remains a subject of significant interest due to its distinctive structural and magnetic properties, which offer promising potential for a range of technological and applications. Despite extensive research over the past decades, this polymorph continues to pose challenges, particularly due to its thermodynamic metastability and the complexities involved in its synthesis. Most studies have emphasized developing cost effective synthesis routes to obtain this phase, with focus on exploiting its hard magnetic properties for applications such as high-density magnetic storage and advanced permanent magnets. In this work, we present a synthesis strategy for producing hard-magnetic ε-Fe_2O_3 using akaganeite (β-FeOOH) nanorods as precursors. Our approach combines forced hydrolysis with the sol-gel-method, enabling formation of ε-Fe_2O_3 particles embedded in a SiO_2 matrix. The synthesized ε-Fe_2O_3 exibits high coercitivity (H_C~ 16 kOe), positioning it among the highest reported values for this phase. Structural and morphological characterization was done using Furier-Transform Infrared Spectroscopy (FTIR), X-Ray Powder Diffraction (XRPD) and Transmission Electron Microscopy (TEM). Particle size was estimated using the Scherrer equation and cross-validated with direct TEM measurements, providing insights into the growth mechanism and particle size distribution. These preliminary findings contribute to a deeper understanding of the synthesis-structure-property relationships in ε-Fe_2O_3 and suggest new pathways for obtaining its magnetic performance in applied technologies.

7-4

Storage stability of the liposomal system with encapsulated *Vaccinium myrtillus* extract

Muna Rajab Elferjane[1,2], Aleksandar Marinković[2], Aleksandra Jovanović[3]

[1]*Faculty of Nursing and Health Sciences, University of Misurata, Alshowahda Park, 3rd Ring Road, 2478 Misurata, Libya*
[2]*Faculty of Technology and Metallurgy, University of Belgrade, Karnegijeva 4, 11000 Belgrade, Serbia*
[3]*Institute for the Application of Nuclear Energy INEP, University of Belgrade, Banatska 31b, 11080 Belgrade, Serbia*

Vaccinium myrtillus L. (bilberry, Ericaceae family) is a perennial deciduous shrub that grows in the mountains and forests of Europe. Its fruits and leaves show significant economic importance due to their application in different food, functional food, pharmaceutical, cosmetic, and healthcare products. Bilberry leaves contain valuable components, such as phenolic acids, flavonoids, procyanidins, anthocyanins, fatty acids, and dietary fibers. The mentioned compounds possess various biological potentials, including antioxidant, anti-inflammatory, antimicrobial, regenerative, astringent, lipid-lowering, and anti-diabetic properties. With the aim of improving storage stability, biodistribution, and bioavailability, as well as providing controlled and prolonged release of bioactive compounds, *V. myrtillus* extract was encapsulated in the liposomal vesicles and their storage stability and stability after UV irradiation were monitored. The presented study aimed to improve storage stability and bioavailability and provide prolonged release of bioactive components of Vaccinium myrtillus extract. Thus, the extract was encapsulated in the liposomal vesicles and their storage stability and stability after UV irradiation were monitored. Vesicle size, polydispersity index (PDI), and zeta potential were determined using photon correlation spectroscopy in the 60-day storage study. The liposome size varied in a narrow range during 60 days at 4 °C. PDI values were between 0.294 and 0.338 (for the non-treated sample) and 0.249 and 0.437 (for the UV-irradiated sample). The zeta potential was -5.02 mV on the 1st day and -9.16 mV on the 60th day for non-treated liposomes, while for UV-irritated, the zeta potential amounted to -3.93 mV on the 1st day and -8.22 mV on the 60th day. In both types of the sample, there was no significant change in the vesicle size during storage, while the zeta potential (absolute value) increased. Additionally, the PDI value increased in the UV-irradiated liposomes. The beneficial effects of bioactive principles from bilberry leaf on human health highlight the application of liposomes as a carrier for its extract and their potential implementation in food, functional food, pharmaceutical, and cosmetic formulations.

7-5

Synthesis of dense boride-based composites through reactive sintering using boron carbide and the Ti-Si intermetallic system

Dawid Kozień[1], Zbigniew Pędzich[1], David Salamon[2], Daniel Valasek[2], Peter Tatarko[3], Michal Hičák[3], Ondrej Hanzel[3], Paweł Nieroda[4], Katarzyna Pasiut[1], Leszek Chlubny[1]

[1]Department of Ceramics and Refractory Materials, AGH University of Krakow, 30 Mickiewicza Av., 30-059 Krakow, Poland
[2]Central European Institute of Technology, Brno University of Technology, Purkyňova 464/118, 61200 Brno, Czech Republik
[3]Department of Ceramics, Institute of Inorganic Chemistry, Slovak Academy of Sciences, 9 Dúbravská cesta, 845 36 Bratislava, Slovakia
[4]Department of Inorganic Chemistry, AGH University of Krakow, 30 Mickiewicza Av., 30-059 Krakow, Poland

The development of composites based on boron carbide (B_4C) has attracted considerable interest due to their exceptional physical and chemical properties. This study utilized B_4C, carbon, and intermetallic compounds from a Ti-Si system to create a composite containing more than 99% TiB_2, TiC, and SiC. Three methods were used for densification: pressureless sintering (PS), hot-pressing (HP), and spark plasma sintering (SPS). The consolidation temperatures varied among the methods: PS 1650-1750 °C, HP 1500-1550 °C, and SPS 1400-1450 °C, respectively. However, the combination of intermetallic phases such as TiSi, $TiSi_2$, and Ti_5Si_3 with appropriate molar proportions of B_4C and C resulted in dense composite materials with very simple phase compositions. This process led to the elimination of free carbon from the final material composition, which was an unexpected outcome, particularly when using a commercial boron carbide B_4C substrate that typically contains graphite. The high-temperature refractory TiB_2-TiC-SiC composite exhibited high mechanical strength and fracture toughness. The chemical reaction that occurred during sintering was highly effective, with almost 99% of the initial phases decomposing and allowing the formation of new TiB_2 and SiC phases, which were well-densified at relatively low temperatures. The TiC phase was formed only when no boron was present in the system during sintering. Therefore, when Ti_5Si_3 was added, a small amount of the TiC phase was formed, provided that there was a significant amount of Ti in the system and a lack of boron.

Acknowledgments: This research was supported by a grant from the National Center for Research and Development (LIDER XIII; Grant No. 0024/L-13/2022).

7-6

Radical scavenging activity of silymarin encapsulated in liposomal vesicles: impact of UV irradiation and lyophilization

Amjed Karkad[1,2], Milena Milošević[3], Andrea Pirković[4], Aleksandar Marinković[2], Aleksandra Jovanović[4]

[1]Elmergib University, Faculty of Medical Technology, Msallata, Libya
[2]Faculty of Technology and Metallurgy, University of Belgrade, Karnegijeva 4, 11000 Belgrade, Serbia
[3]Institute of Chemistry, Technology and Metallurgy, National Institute of the Republic of Serbia, University of Belgrade, Njegoševa 12, Belgrade, Serbia
[4]Institute for the Application of Nuclear Energy INEP, University of Belgrade, Banatska 31b, 11080 Belgrade, Serbia

Silymarin exhibits plenty of bioactivities that can promote human health and well-being. Silymarin has also been observed to prevent skin cancer and aging. Nevertheless, silymarin is poorly soluble and possesses lower bioavailability, thus, its application is quite limited. Liposomes can increase the stability of encapsulated sensitive compounds and the bioavailability of poorly hydrosoluble components. Concerning potential implementation in food, cosmetic, or pharmaceutical industries, liposomal sterilization, such as UV irradiation, remains a real challenge because of the carriers' particular sensitivity and physicochemical alterations. Lyophilization provides dried products with active compounds that are stable over a long period, due to the prevention of hydrolytic and oxidative degradation which can occur in the water surrounding. However, the lyophilization process can result in significant modifications of the liposomes, thus its effect should be examined as well. With the aim to investigate the radical scavenging activity of silymarin-loaded liposomes after different technological processes (UV irradiation and lyophilization), DPPH and ABTS assays were used. According to the results of the DPPH method, the antioxidant capacity of pure silymarin was 84.03%, while it was lower after the encapsulation in liposomes; 81.[illegible]% after the formulation, 81.15% after UV irradiation, and 79.85% after lyophilization. The anti-ABTS potential was 3.04 µmol Trolox equivalent (TE)/mL for silymarin, 1.68 µmol TE/mL after the liposome preparation, 1.52 µmol TE/mL after UV irradiation, and 2.02 µmol TE/mL after lyophilization. UV irradiation did not cause significant changes in the antioxidant potential of liposomes, while ABTS scavenging activity was higher after lyophilization. Considering that the two used antioxidant assays are based on different reactions, the obtained data provide good insight into the overall antioxidant activity of silymarin-loaded liposomes.

7-7

Preparation and applications of calcium phosphate nanoparticles in pre-malignant and oral cancer treatment

Evelina Herendija[1], Milica Jakšić Karišik[2], Jelena Milašin[2], Miloš Lazarević[2], Nenad Ignjatović[3]

[1]*University of Belgrade, Multidisciplinary PhD Studies, Studentski Trg 1, 11000 Belgrade, Serbia*
[2]*University of Belgrade, Implant-Research Center, School of Dental Medicine, Dr Subotica 8, 11000 Belgrade, Serbia*
[3]*Institute of Technical Sciences of SASA, Knez Mihailova 35/IV, 11000 Belgrade, Serbia*

Calcium phosphate nanoparticles (nCPs) have gained significant attention recently in the realm of application in anti-cancer treatment. This study focuses on the preparation, characterization and *in vitro* invastigation of nCPs, highlighting their biocompatibility, possible mechanisms of action and therapeutic efficacy towards pre-malignant (DOK) and malignant oral squamous cell carcinoma (OSCC) cell lines. Morphological features, particle size distribution and identification of surface groups of newly synthesized nCPs were examined through different techniques (SEM, PSD, FTIR). The bioactivity of nCPs were evaluated, demonstrating their efficacy as a potent anti-cancer agent. The results indicated significant reduction of cell viability, associated with nCPs selective cytotoxicity, dose-dependent cellular uptake and cell cycle arrest in pre-malignant and malignant cells. Our study revealed that nCPs induced apoptosis through mitochondrial pathways, as testified by changes in gene expression associated with apoptosis and cell proliferation. Additionally, nCPs were effective in inhibiting cell migration and invasion, suggesting their potential in metastases prevention. Our findings support the further development of nCPs as a promising platform for oral cancer treatment, justifying their future investigation and potential clinical applications in oncology.

7-8

A step towards sustainable approach to grow nanocrystalline diamond film: characterization and perspectives for bioapplications

Arvind K. Bhakta[1], Abdoulaye Siby[1], Sarah Al Zeibak[1], Joel Jeevan[1], Khaled Hassouni[1], Souad Ammar[2], Fabien Bénédic[1], Swaminathan Prasanna[1]

[1]Université Sorbonne Paris Nord, LSPM-CNRS, Villetaneuse, France
[2]Université Paris Cité, CNRS, ITODYS, Paris, France

In the present work, we have demonstrated a self-sustained growth of nanocrystalline diamond films by using gas phase nucleated nanodiamonds produced from a microwave (MW) torch as seeds. The carbon nanostructures were collected directly on a silicon substrate placed downstream of the MW microplasma torch. The otained materials were characterized using different techniques such as XPS, SEM, AFM, Raman and TEM. The nanostructures were found to be composed of agglomerates of nanodiamond particles of size around <20 nm among other phases such as graphite and amorphous carbon. Through the process of sonification, these carbon nanostructures were completely transferred on an isopropanol solution, which was first concentrated and then deposited by drop casting on a clean silicon wafer. It was possible to grow NCD films of 17 ± 2 nm in thickness (measured using the interferometer) on the seeded Si substrate in a distributed antenna array (DAA) microwave plasma reactor. The NCD films were homogeneous and of high quality, confirmed by SEM and Raman, respectively. Further work will focus on optimization of the homemade plasma torch, the seed coating process as well as the DAA reactor in order to obtain highly crystalline and thick NCD film. Alternatively, we are working towards directly using the torch to pretreat the substrate before growing the NCD films in the DAA reactor, thereby eliminating the complexities of maintaining stable colloidal solution of nanodiamonds and uniform coating on the substrate. Moreover, the entire process does not require additional gases or chemicals apart from that necessary for growing diamond in conventional CVD reactor. This work with ability to produce diamond films by a self-consistent and economical methodology opens up a future perspective of novel technology based on the principle of sustainability, allowing for growing NCD on curved or non-planar surfaces encountered in applications such as bio-implants.

8-1

Electrochemical sensors based on polymer/nanocomposite-modified carbon and gold screen-printed electrodes for monitoring doxorubicin

Iva Dimitrievska[1], Katarina Aleksić[2], Perica Paunović[1], Smilja Marković[2], Anita Grozdanov[1]

[1]Ss, Cyril and Methodius University in Skopje, Faculty of Technology and Metallurgy, Rugjer Boshkovikj 16, Skopje, 1000, North Macedonia
[2]Institute of Technical Sciences of SASA, Belgrade, Serbia

Researchers are continuously improving the development of screen-printed electrode (SPE)-based sensors, resulting in electrochemical devices with superior analytical performance, accuracy, and broader applications, particularly effective for sensitive and rapid drug detection. The combination of different materials (carbon nanomaterials, metals, polymers, etc.) used for surface modification has greatly enhanced the electroanalytical capabilities of these sensors and their overall performance. Our research involves modifying carbon and gold screen-printed electrodes using a polymer-based nanocomposite conductive ink as a performance enhancer. The modified electrodes were tested to detect low concentrations of a widely used anticancer drug - doxorubicin (DOX). The main component of the synthesized conductive ink is a composite material composed of reduced graphene oxide and 0.5 wt.% Au nanoparticles (rGO + 0.5 wt.% Au NPs) embedded into a Nafion matrix. The electrochemical measurements were conducted using cyclic voltammetry in 25 mL 0.1 M phosphate buffer saline (pH 7.0) by adding DOX by adding DOX in a portion of 10 to 90 μL (Ebewe a.d, 2 mg/mL). The modified carbon SPE showed a superior electrochemical response with higher sensitivity (0.219), a lower limit of detection (10.391 μM) and quantification (34.637 μM), and higher electrical conductivity compared to the modified gold SPE and commercial ones, making it a more effective option for sensitive drug detection.

8-2

Development of Electrochemical Sensors for Diclofenac Monitoring: A Study of ZnO/BTS Composites

Katarina Aleksić[1], Jakša Perić[2], Ana Stanković[1], Ivana Stojković Simatović[2], Smilja Marković[1]

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

Electrochemical sensors (ECS) are increasingly recognized for their exceptional ability to detect and monitor environmental pollutants, offering distinct advantages over traditional analytical methods. By modifying bare electrodes, the key performance attributes of ECS such as selectivity, sensitivity, response time, and portability can be significantly enhanced. Researchers have explored a variety of materials, including noble metals, metal oxides, polymers, and various carbon-based substances, to optimize these sensors for improved analytical performance. This advancement is especially crucial for detecting diclofenac, a widely used anti-inflammatory drug known to pose risks to aquatic ecosystems and human health. In this context, zinc oxide and barium titanate stannate (ZnO/BTS) composites were synthesized through microwave processing of a precipitate to modify the electrode and test its effectiveness as an electrochemical sensor for diclofenac (DCF) detection. Cyclic voltammetry (CV) was employed for the electrochemical quantification of DCF in a three-electrode system consisting of a glassy carbon electrode as the working electrode, a saturated calomel electrode (SCE) as the reference electrode, and a platinum foil as the counter electrode. The ink was prepared by mixing 10 mg of synthesized particles (ZnO/BT, ZnO/BTS5, and ZnO/BTS10) with 1.5 mg of carbon black, 40 µL of 5% Nafion solution, 225 µL of ethanol, and 225 µL of water. CV measurements were conducted in 25 mL of phosphate buffer (0.1 M, pH 7.0), with incremental additions of diclofenac infusion solution (75 mg DCF / 3 mL, Galenika a.d.) ranging from 1 µL to a final volume of 12 µL. All measurements were performed within a potential range of 0.2 to 1 V vs. SCE, at a scan rate of 20 $mV \cdot s^{-1}$.

Acknowledgments: The authors KA, AS, ISS, and SM acknowledge the financial support from the Science Fund of the Republic of Serbia, The Program PRISMA, #7377, Water pollutants detection by ZnO-modified electrochemical sensors: From computational modeling via electrochemical testing to real system application – WaPoDe.

8-3

Nitrogen-doped PtNi decorated binary metal oxides for ORR and OER

Dušan Mladenović[1], Yasemin Aykut[2], Ayşe B. Yurtcan[2], Gulin S.P. Soylu[3], Diogo M.F. Santos[4], Šćepan Miljanić[1], Biljana Šljukić[1,4]

[1]University of Belgrade, Faculty of Physical Chemistry, Studentski trg 12-16, 11158 Belgrade, Serbia
[2]Department of Chemical Engineering, Atatürk University, Erzurum, Turkey
[3]Faculty of Engineering, Chemical Engineering Department, Istanbul University-Cerrahpasa, 34320, Avcilar, Istanbul, Turkey
[4]Center of Physics and Engineering of Advanced Materials, Laboratory for Physics of Materials and Emerging Technologies, Chemical Engineering Department, Instituto Superior Técnico, Universidade de Lisboa, 1049-001 Lisbon, Portugal

The increase in energy demand around the globe has inspired scientists to search for a sustainable energy source to be used in the future years. Many proposed alternatives use electrochemical devices for energy storage and conversion, and many of these devices are based on oxygen reduction (ORR) and evolution (OER) reactions. However, one of the main setbacks of these systems is the sluggish kinetics of the ORR and OER which prevents their widespread application. In this work, we synthesised nitrogen-doped binary Mn_2O_3-NiO which was then decorated with Pt, Ni and PtNi alloy via the microwave-assisted polyol method and tested the materials' catalytic performance for ORR and OER. Materials were synthesised in three BMO to N ratios (1:1, 1:2, and 2:1) and tested in a three-electrode electrochemical cell. As the best-performing bifunctional material decorated with PtNi alloy stands out the PtNi/Mn_2O_3-NiO-N (1:2) which has a BMO to N ratio of 1:2. This material showed the smallest value of $\Delta E = E_{10,\,OER} - E_{1/2,\,ORR}$, of 0.96 V. In the ORR potential region, the material reached a diffusion-limited current density of -2.94 mA cm^{-2} with the 3.38 e^- exchanged in the elementary step indicating mainly four-electron reduction. In the OER regime, a benchmark current density of 10 mA cm^{-2} was achieved at an overpotential of 0.50 V. Further investigation will include testing in real-life unitised regenerative fuel cells as well as improving the long-term stability of the material.

8-4

Harnessing graphene oxide nanoparticles to combat neurodegeneration: Insights from advanced molecular dynamics

Budimir S. Ilić

University of Niš, Faculty of Medicine, Department of Chemistry, Niš, Serbia

The aggregation of α-synuclein (α-syn) into toxic oligomeric and fibrillar structures is a hallmark of Parkinson's disease pathology. Graphene oxide nanoparticles (GONPs) have recently emerged as promising modulators capable of disrupting these pathological aggregates. In this study, 100 ns molecular dynamics simulations were conducted to investigate interactions between monomeric α-syn and a GONP, focusing on the potential of GONP to prevent aggregation. Findings reveal that the GONP establishes stabilizing interactions with critical α-syn residues, including Gly51, Val52, Ala53, Thr54, Ala56, Glu61, Val66, Val74, Ala76, Val77, and Ala90, primarily through hydrogen bonding and hydrophobic contacts involving the carboxyl and hydroxyl groups on the graphene oxide surface. These interactions effectively interfere with β-sheet formation, an essential step for α-syn oligomerization and fibrillization. These findings provide novel, residue-level insights into the interaction dynamics between graphene oxide and α-syn, revealing opportunities to disrupt neurodegenerative aggregation mechanisms. This residue-specific understanding lays the groundwork for future developments in graphene oxide-based nanomaterials, aimed at targeted neuroprotection against Parkinson's disease.

Acknowledgments: This work was supported by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia (Contract No. 451-03-65/2024-03/200113).

8-5

Effect of metal atoms doping on magnetism in talc - 2D natural material

Ayan Khasiyeva, Andrijana Solajic, Jelena Pesic

Laboratory for 2D materials, Center for Solid State Physics and New Materials, Institute of Physics Belgrade, University of Belgrade

2D materials with intrinsic magnetic properties enable opportunities for many technological applications, including in the fields of spintronics, data storage, and magnetoelectronics. However, most of the known magnetic 2D materials suffer from a lack of ambient stability. This makes the usage of natural 2D materials, such as talc, advantageous when it comes to stability. Talc is a mineral found abundantly in nature with the chemical formula $Mg_3Si_4O_{10}(OH)_2$. It belongs to the group of phyllosilicates. In nature, iron-rich phyllosilicates, such as minnesotaite (iron-rich talc) and annite, are present, which inspires the search for similarly magnetic materials. A single layer of talc consists of $[MgO_4(OH)_2]$ octahedra in between parallel sheets of tetrahedral $[Si_2O_5]$. Monolayers of talc can be obtained through processes of chemical vapour deposition or mechanical and liquid phase exfoliation. While talc is naturally non-magnetic, doping by substitution of the Mg cation for those of ferromagnetic metals allows for magnetic properties to be exhibited.

In this research, we use computational techniques based on density functional theory, as implemented in the Quantum Espresso software package, in order to analyse the stability and electronic properties of metal doped talc. Talc possesses two inequivalent Mg substitution sites. Cell optimizations were performed for Fe, Ni, Co substitutions, with the goal of finding the most energetically favourable structure for both of the distinct substitution sites. After optimization, band structures were calculated and magnetic moments were compared in all possible candidates. Air-stable natural 2D materials with long-range magnetic ordering at room temperature would represent a major breakthrough in the field of advanced technologies, for applications such as magnetoresistant tunnelling junctions and magnetooptic devices. Metal-doped talc would represent a novel material that would not only exhibit magnetism in low dimension, but also remain stable in ambient conditions and ecologically friendly.

8-6

Photoactive polyurethane nanocomposites on the basis of Carbon Quantum Dots

Ana Marković, Biljana M. Todorović Marković, Zoran M. Marković

Vinča Institute of Nuclear Sciences, National Institute of the Republic of Serbia, University of Belgrade, Mike Alasa 12-14, 11001 Belgrade, Serbia

In this work we will present development of photoactive polyurethane nanocomposites on the basis of carbon quantum dots for biomedical applications. Nicotinamide Carbon Quantum Dots (NACQDs) were synthesized using hydrothermal method. Synthesis of polymer nanocomposites is based on encapsulation NACQDs in polyurethane (PU) during swelling-shrinking process. Characterization of NACQD nanoparticles and NACQDs/PU nanocomposites was performed by microscopic and spectroscopic methods. Amplitude Modulated Frequency Modulated (AFM) measurements revealed that average diameter of NACQD nanoparticles is about 60 nm and Young's modulus is 1.5 TPa. Chemical characterization disclosed following characteristic bonds: C-N, C-O, C=O, C-OH, C-H and C-C. NACQDs/PU nanocomposites are highly potent producers of Reactive Oxygen Species (singlet oxygen and hydroxyl radicals).

8-7

Investigation of electronic properties of 1T and 2H phases of 2D GaS

Lenka Filipović, Andrijana Šolajić, Jelena Pešić

Laboratory for 2D Materials, Center for Solid State Physics and New Materials, Institute of Physics Belgrade, University of Belgrade, Pregrevica 118, 11080 Belgrade, Serbia

Two-dimensional materials offer unique electronic, optical, and mechanical properties, making them ideal candidates for next-generation technologies in electronics, energy storage, and sensing applications. Gallium sulfide (GaS) is a layered, two-dimensional material belonging to the group-III metal chalcogenides. In its monolayer form, GaS exhibits a hexagonal structure and notable electronic and optoelectronic properties. It has a wide bandgap, making it suitable for applications in optoelectronics, such as photodetectors, light-emitting devices, and potential uses in flexible and transparent electronics. Due to its stability and tunable properties, GaS is a focus of research for next-generation semiconductor technology. This study emphasizes potential of 2D GaS in advanced technological application. The main motivation of the research is investigation of the solid-solid phase transition (2H->1T) in two-dimensional GaS and possibility of inducing this phase transition by application of the mechanical strain. Research consists of detail computational analysis of crystal structures and properties of 1T and 2H phases of GaS, using formalism based on Density Functional Theory. Our calculations demostrate energetical stability of both phases with 2H phase being more stabile. We study electronic proprerties presenting band structures and electronic DOS and dielectric function for both phases. Density functional theory calculations are based on plane waves basis and pseudopotential as implemented in Quantum Espresso software package. Calculations are employing the PBE exchange-correlation functional and PAW pseudopotentials. For accurate treatment of interlayer interactions, the Van der Waals interactions is treated using the Grimme-D2 correction. The results of this study enhance understanding of structural properties and highlight the potential to induce solid-solid phase transitions, paving the way for new applications based on phase-switching effects.

8-8

Vibrational properties of doped 2*H*-$TaSe_{2-x}S_x$ samples investigated by Raman spectroscopy

Jovan Blagojević[1], Sanja Djurdjić Mijin[1, 2], Jonas Bekaert[3], Marko Opačić[1], Yu Liu[4, 5], Milorad V. Milošević[3], Čedomir Petrović[4, 6, 7], Zoran Popović[8], Nenad Lazarević[1]

[1]Institute of Physics, University of Belgrade, Pregrevica 118, 11080 Belgrade, Serbia; [2]Departamento de Física de Materiales, Facultad de Ciencias, Universidad Autónoma de Madrid, 28049 Madrid, Spain; [3]Department of Physics & NANOlab Center of Excellence, University of Antwerp, Groenenborgerlaan 171, B-2020 Antwerp, Belgium; [4]Condensed Matter Physics and Materials Science Department, Brookhaven National Laboratory, Upton, NY 11973-5000, USA; [5]Center for Correlated Matter and School of Physics, Zhejiang University, Hangzhou 310058, People's Republic of China; [6]Shanghai Key Laboratory of Material Frontiers Research in Extreme Environments (MFree), Shanghai Advanced Research in Physical Sciences (SHARPS), Pudong, Shanghai 201203, China; [7]Department of Nuclear and Plasma Physics, Vinca Institute of Nuclear Sciences, University of Belgrade, Belgrade 11001, Serbia; [8]Serbian Academy of Sciences and Arts, Knez Mihailova 35, 11000 Belgrade, Serbia

Recent research has highlighted transition metal dichalcogenides (TMDs) for their fascinating electronic and quantum properties. These materials are unique in that their phase transitions can be finely tuned through pressure, doping, or layer thickness, making them ideal for investigating phenomena such as charge ordering, spin-orbit coupling, and potential topological phases. This adaptability creates exciting opportunities for advancements in quantum materials and device technologies. Notably, experiments have demonstrated the coexistence of superconductivity (SC) and charge density waves (CDWs) with findings in 2H-$TaSe_{2-x}S_x$ suggesting that disorder promotes SC while suppressing the CDW phase. In this study, we used Raman spectroscopy and density functional theory to explore the vibrational properties of 2H-$TaSe_{2-x}S_x$ ($0 \leq x \leq 2$) single crystals. In undoped samples, two symmetry predicted Raman modes and a prominent two-phonon feature linked to strong electron-phonon coupling (EPC) were observed. Doping with sulfur atoms leads to the appearance of additional peaks due to crystallographic disorder. The evolution of E_{2g}^2 mode Fano parameter and the persistence of the two-phonon structure suggest that disorder has negligible effect on EPC. This study offers valuable insights into the lattice properties, the influence of crystallographic disorder on Raman spectra and its interplay with EPC in 2H-$TaSe_{2-x}S_x$ compounds.

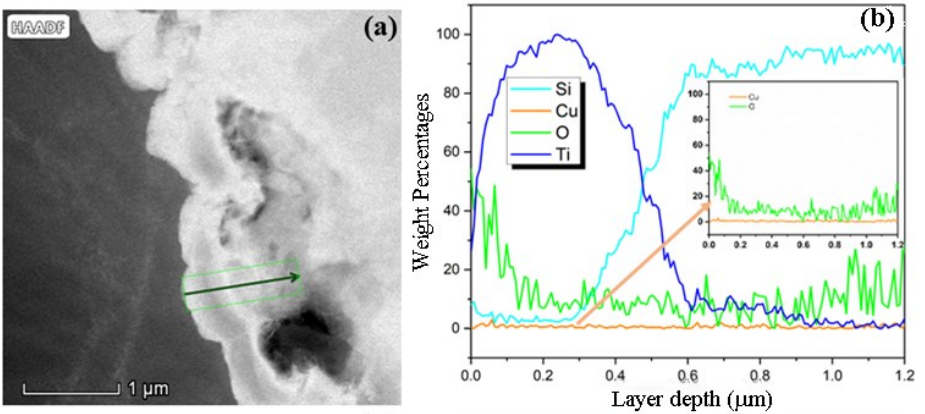
9-1

Investigation of Elemental Composition and Diffusion in Laser-Modified Ti/Cu/Ti Systems via Scanning Transmission Electron Microscopy

Nevena D. Božinović, Suzana M. Petrović, Mirjana M. Novaković

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

The elemental composition of the modified Ti/Cu/Ti system was analyzed using scanning transmission electron microscopy combined with energy dispersive X-ray (EDX) analysis, confirming previously reported results from TEM and HR-TEM studies. The figure bellow presents a STEM/HAADF micrograph of a laser-modified Ti/Cu/Ti layer taken in the dark field, (a) and the relative concentration profiles of the elements (b) corresponding to the sample area marked with a green line in the HAADF image. The profiles of the individual elements (titanium-blue, copper-orange, oxygen-green and silicon-turquoise color) clearly show that, due to laser radiation, atom diffusion and mixing occurred between the deposited titanium layers and the sub-surface copper layer, as well as at the interface with the Si substrate. As a result of the enhanced diffusion, copper is no longer confined to the sub-surface region but is uniformly distributed throughout the layer with a concentration of approximately 2 wt. % (see the inset in the figure (b)).



STEM-HAADF micrograph of a 400 nm thick Ti/Cu/Ti laser-patterned thin film, along with corresponding EDX elemental maps.

.

9-2

Quinuclidinone thiosemicarbazone hydrate: Insights into crystal structure from an energetic perspective

Milica G. Bogdanović[1], Vidak N. Raičević[2], Guido J. Reiss[3], Marko V. Rodić[1]

[1]University of Novi Sad, Faculty of Sciences, Novi Sad, Serbia
[2]University of Novi Sad, Faculty of Medicine, Novi Sad, Serbia
[3]Institute for Inorganic Chemistry, Heinrich-Heine-University Düsseldorf, Düsseldorf, Germany

The hydrate form of quinuclidinone thiosemicarbazone was synthesized following established procedures and successfully isolated in pure form. The compound crystallizes in the orthorhombic $P2_12_12_1$ space group, with the asymmetric unit containing one organic molecule (A) and one water molecule (W). During the refinement process, both the conventional independent atom model (IAM) and quantum crystallographic method Hirshfeld atom refinement (HAR) were used. HAR provided notable improvements in both geometry and refinement statistics, particularly for hydrogen atoms, which were refined with anisotropic displacement parameters and without constraints. Interaction energies between the nearest neighbors of A and W molecules in the crystal structure were calculated using the hybrid method in *CrystalExplorer* as well as DFT with a def2-TZVP basis set and M06-2X functional. Seven interactions with energies stronger than −10 kJ mol^{-1} were identified. The strongest interaction is found between molecules A and A, mediated through two hydrogen bonds (N–H···N and N–H···S) with a total energy of −39 kJ mol^{-1}. The second strongest interaction in the crystal structure, with E = −30 kJ mol^{-1}, occurs between A and W molecules, via N–H···O. Weaker interactions (−25 kJ mol^{-1} and −22 kJ mol^{-1}) are also mediated by hydrogen bonds (O–H···N and O–H···S) between W and A. All these interactions are primarily influenced by electrostatic energy contributions, indicating that hydrogen bonds play a critical role in both the geometric arrangement and energetic stabilization of the crystal packing. Additionally, three weaker interactions occur between A molecules, with approximately equal contributions from electrostatic and dispersion components to the total energy.

Acknowledgement: This research was supported by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia (Grants No. 451-03-66/2024-03/ 200125 & 451-03-65/2024-03/200125), and German–Serbian joint scientific co-operation project: Application of quantum- crystallographic methods in extended routine X-ray structural analysis of small molecules (Grant No. 337-00-253/2023-05/12).

9-3

Real-Time Optical Analysis for Monitoring Plant Adaptability Under Simulated Light Shifts

Teodora Tara Komazec[1], Sara V. Ristić[1], Dejan A. Jeremić[2],
Marija M. Petković Benazzouz[1], Katarina M. Miletić[1]

[1]*Faculty of Physics, University of Belgrade, Belgrade, Serbia*
[2]*Innovation Center of the Faculty of Chemistry, University of Belgrade, Belgrade, Serbia*

Understanding the adaptive responses of plants to increased light intensity is crucial for advancing environmental resilience, sustainable management and increasing acclimatization. This study aimed to simulate a sudden shift in light intensity, mimicking natural disturbances affecting plant communities. Specifically, the response of one woody species, native to the Balkan region and cultivated under controlled laboratory conditions, was observed. The seedlings were grown from seeds, in soil collected from their natural habitats, providing realistic growth conditions. Watering was modeled after natural precipitation levels. Circadian rhythms were recorded using a nondestructive optical method (NOM), which is well-suited for long-term monitoring of plants without causing damage, and the data were compared with common photosynthetic performance measurements, including photosynthetic efficiency, obtained via complementary methods to establish correlations. Results obtained employing the NOM method tracked changes of the circadian rhythm in real-time, most notably its amplitude and characteristic peaks after exposure to high light intensity induced stress. These discrepancies in amplitude and peaks between healthy and distressed circadian rhythms indicate adaptive behaviours including adjustments in photosynthetic activity, altered timing of physiological processes and decreased nutritient uptake efficiency. Such adaptive responses reflect distinct mechanisms to cope with light overexposure. NOM provides a comprehensive approach for assessing plant health and acclimatory responses, offering continuous and non-destructive long-term monitoring and unique insights into adaptive processes which surpass traditional methods. Future studies will include multiple species for comparative analysis, broadening the generalizability of the results and exploring distinct aspects of plant adaptability, such as species-specific light stress tolerance and recovery mechanisms.

9-4

Synthesis and crystal structure of new Zn(II) complex with Schiff bases

Dominik Triska[1], Paul Thomashausen[1], Nikola Radnović[2], Marijana S. Kostić[2], Mirjana M. Radanović[2]

[1]University of Applied Sciences Merseburg - Department of Engineering and Natural Sciences, Merseburg, Germany
[2]University of Novi Sad - Faculty of Sciences, Novi Sad, Serbia

Schiff bases, a class of compounds formed by the condensation of amines with aldehydes or ketones, have attracted significant attention due to their versatile coordination properties and potential applications in fields like catalysis, material science, and medicinal chemistry. These compounds often contain aromatic rings which may carry additional functional groups influencing their chemical reactivity and metal-binding capabilities. In this work, we present the synthesis and structural characterization of two novel Zn(II) complexes with condensated DAPB (2,6-diacetylpyridine-bis(hydrazone)) with two different aldehydes of the coordination formulas $[Zn(L^1)Cl_2]\cdot MeOH$ and $[Zn(L^2)Cl_2]$. The complexes were obtained by the reaction of $ZnCl_2$ with DAPB and 2,3-dihydroxybenzaldehyde (L^1) or 2,5-dihydroxybenzaldehyde (L^2) in a 1:1:2 molar ratio. For $[Zn(L^1)Cl_2]\cdot MeOH$, the resulting solution was yellow. After 4 days yellow crystals were obtained. For $[Zn(L^2)Cl_2]$, the resulting solution turned from yellow to orange-red after 6 days, and red crystals were filtered out. Both complexes are stable in air and high temperatures (melting point: > 250 °C). The characterization was performed with IR and molar conductivity. The structures were confirmed by XRD. The asymmetric unit of $[Zn(L^1)Cl_2]\cdot MeOH$ comprises one Zn(II), two chloride ligands, one L^1-ligand, and one methanol molecule. In this structure, the zinc ion is situated in a deformed square-pyramidal environment (τ_5 = 0.39) of three nitrogen atoms of the chelating ligand and two chloride ligands. For the second complex $[Zn(L^2)Cl_2]$, the asymmetric unit consists of one-half of the ligand and one chloride atom. The zinc ion is situated in a similar environment (τ_5 = 0.46) of three nitrogen atoms of the chelating ligand and two chloride ligands.

Acknowledgments: The authors gratefully acknowledge the financial support of the Ministry of Science, Technological Development and Innovation of the Republic of Serbia (Grants No. 451-03-66/2024-03/ 200125 & 451-03-65/2024-03/200125) and EURABridge DAAD HAW project.

9-5

The influence of HIPS surface yellowing phenomenon on its properties

Benita Malinowska[1,2], Michał Chodkowski[3], Konrad Terpiłowski[2]

[1]Polska Korporacja Recyklingu sp. z o.o., Lublin, Poland
[2]Maria Curie-Sklodowska University, Department of Interfacial Phenomena, Lublin, Poland
[3]Lublin University of Technology, Department of Technology and Polymer Processing, Poland

This research investigates the relationship between yellowed HIPS plastic (as a result of UV radiation) and its changes in mechanical, rheological, surface and optical properties. HIPS, in the form of about 2 cm flakes, was obtained from recyled refrigeration equipment. Three 1kg samples (white, semi-yellow and yellow flakes) were prepared. Then, this samples were analysed by ATR-FTIR (absorbances), optical colorimeter (L, a and b parameters), contact angle meter (wettability) and plastometer (MFR parameter). What is more, the mechanical properties tests were performed (Charpy impact test, tensile strength, Shore hardness and Vicat softening point). The aim of this study is to determine the differences in properties of yellowed HIPS (surface degraded by UV radiation) and white HIPS which could bring important informations for recycling industry.

Acknowledgement:
DWD/6/0413/2022.

9-6

Enhancing Hydrogen Evolution Reaction: Structural Insights of Ni-MoO_x Coatings Electrodeposited on porous Ni foil

A. Petricevic[1], J. Gojgic[1], M. Krstajic Pajic[2], N. Elezovic[1], V. Jovic[1]

[1]*University of Belgrade, Institute for Multidisciplinary Research, Belgrade, Serbia*
[2]*University of Belgrade, Faculty of Technology and Metallurgy, Belgrade, Serbia*

As global concerns about pollution from fossil fuel energy conversion have increased transition to cleaner energy sources is imperative. Hydrogen Evolution Reaction (HER) has been considered as a pivotal process for sustainable energy conversion and the development of efficient electrocatalysts has become crucial for enhancing its performance. This research has built upon our prior investigations where porous nickel foam served as substrate for high-effective catalyst composed of Mo oxides embedded in nickel. Main focus was on optimization of electrodeposition under hydrodynamic conditions of those coatings onto even more complex substrate such as porous Ni foil. With the aim of boosting the activity toward HER following deposition parameters were varied: current density, concentration of MoO_x particles, electrolyte flow and mixing rate, and substrate porosity. Detailed study of structural and electrochemical properties was conducted in order to deepen the understanding of the reaction mechanism. Important values of HER were gained through investigations executed in industrial like conditions (30% KOH, 70 °C) in H-cell with plan to continue in zero-gap flow electrolyzer. In addition, surface structure analysis was performed (SEM/EDS) as well as analysis of structure in depth of the coating (cross-section). The best performing samples demonstrated notably improved activity with overpotential of *-108* mV at current density of *-1000* mA cm^{-2}, offering a pathway for the development of efficient, non-precious metal catalyst for sustainable hydrogen production.

Acknowledgements: This work was supported by the Federal Ministry of Education and Research–Germany, through the WBC2019 call–project NOVATRODES 01DS21010, and by the Ministry of Science, Technological Development, and Innovation of the Republic of Serbia (Contract No. 451-03-65/2024-03/200135 and 451-03-66/2024-03/200053).

9-7

Cyclodextrin Applications: Towards Emerging Trends in Green Extractions of Bioactive Natural Compounds

Milica Radan, Snežana Kuzmanović Nedeljković, Jelena Živković, Teodora Janković, Zorica Lazarević, Dubravka Bigović, Katarina Šavikin

Institute for Medicinal Plants Research "Dr. Josif Pančić", Tadeuša Košćuška 1, 11000 Belgrade, Serbia

In recent years, there has been an increasing demand for safer, cheaper, and more eco-friendly alternatives to toxic organic solvents. Cyclodextrin-based extractions represent an emerging "green" technology of great potential to enhance stability, solubility, and therefore bioavailability of poorly dissolved bioactive compounds. Polyphenolic compounds are receiving increasing attention due to their widespread distribution in plants and their numerous benefits to human health. The use of excipients, such as hydroxypropyl-β-cyclodextrin (HP-β-CD), in the production of polyphenolic-rich extracts from buckwheat herb (*Fagopyrum esculentum* Moench) could become a promising strategy for the extraction of target compounds. The application of mathematical and statistical methods, including response surface methodology (RSM) and artificial neural networks (ANN), in optimizing green extraction procedures represents an attractive approach for implementing environmentally responsible and sustainable extraction practices. By enabling a comprehensive influence analysis of each variable, the created and validated models allowed the estimation of the extraction parameters for the maximal recovery of bioactives and their further reliable predictions. Cyclodextrins showed not only positive impact on the extraction efficiency of polyphenolic compounds from buckwheat, but also on their stability after exposure to stress conditions. The unique conical cylinder shape of HP-β-CD facilitates the formation of inclusion complexes through host-guest interactions, including hydrogen bonding and hydrophobic interactions. The application of cyclodextrins in green extraction processes opens up new perspectives for more effective exploitation of natural plant resources and broader use in the food and pharmaceutical industries.

9-8

Archaeometric analysis of Ottoman-period pottery excavated at the Belgrade fortress

Petar Marjanović[1], Vesna Bikić[2], Ljiljana Damjanović-Vasilić[1]

[1]University of Belgrade-Faculty of Physical Chemistry, Belgrade, Serbia,
[2]Institute of Archaeology, Belgrade, Serbia

Archaeomertric analysis of pottery finds provides the information about their composition and microstructure. When put in an archaeological context, this information is crucial to estimate the technological process and development of craftsmanship at the time, adding an important contribution to archaeological and historical research. This work presents multianalytical analysis of the Ottoman-period glazed pottery shards found at the Belgrade Fortress, in an archaeological context from the early 18th century, in order to provide insight to the mineralogical and chemical composition and production technology. The ten pottery shards of cooking pots and two bowls, which have coloured glaze on one side, were analysed using optical microscopy, X-ray powder diffraction (XRPD), Fourier transform infrared (FTIR) spectroscopy and X-ray fluorescence (XRF) spectroscopy. Optical micrographs revealed that shards were from coarse-grained pottery. The diffractograms show presence of quartz and feldspars in all investigated samples, whereas high-temperature silicate mineral diopside was identified in 4 samples and gehlenite in one sample. Additionally, calcite was detected in two samples and muscovite was identified in two samples. FTIR spectra of all examined samples are dominated by a broad band originating from the Si-O stretching vibrations at about 1084 cm^{-1} and a characteristic doublet of quartz at 779 and 797 cm^{-1}. Calcite was detected in FTIR spectra of eight samples. Qualitative EDXRF spectroscopy has shown similar composition of ceramic body of all investigated shards. The following elements have been detected: Ca, Fe, Ni, Cu, Pb, Rb, Sr and Zr. Based on the obtained results, all ten pottery shards have similar mineralogical and elemental composition, indicating similar production technology. The intensity of Pb signals in XRF spectra of glazes of all samples was significantly higher compared to XRF spectra of ceramic body, indicating that lead-base glazes were used for pottery production. Presence of Cu in the glaze could explain the dark green/black colour, while Fe was the main colorant in the case of red/brown glaze.

10-1

Stability of Halogen Bonded Perovskite Solar Cells

Jovan Lukic[1,2], Vuk V. Radmilovic[1], Jovana V. Milic[2]

[1]*Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia*
[2]*Adolphe Merkle Institute, University of Fribourg, Fribourg, Switzerland*

Hybrid metal halide perovskites have emerged as promising materials for photovoltaics in the past decade. Despite achieving high solar-to-electric power conversion efficiencies and possessing excellent optoelectronic properties, these materials face significant stability challenges under operational conditions. A major contributor to these instabilities is ion migration occurring at the interfaces with charge transport layers. To mitigate this issue, researchers have focused on interfacial engineering, employing supramolecular modulators that utilize halogen bonding (XB). Metal oxides, commonly used as charge transport layers in hybrid perovskite solar cells, are particularly amenable to XB, which can enhance operational stability. XB influences hydrophobicity, ion migration, and charge transfer, thereby affecting the photovoltaic performance. In our study, we introduced 1,4-diiodotetrafluorobenzene (TFDIB) as an XB agent at the TiO_2 interface in perovskite solar cells. We employed various techniques, including scanning electron microscopy, X-ray diffraction, UV-visible absorption, photoluminescence spectroscopy, and X-ray and ultraviolet photoelectron spectroscopy, to investigate the structural and optoelectronic properties and identify interfacial changes resulting from XB modulation. Our findings demonstrate enhanced operational stability in perovskite solar cells, showcasing a versatile supramolecular approach for improving hybrid photovoltaics.

10-2

Stabilizing $FAPbI_3$ Perovskite Against UV and Moisture Degradation: The Role of Polyionic Additives in Preventing Phase Transitions

Barbara Ramadani[1], Vladimir Rajić[1], Miloš Milović[1], Daniele Mantione[2], Milutin Ivanović[1]

[1]Vinca Institute of Nuclear Sciences – National Institute of the Republic of Serbia, University of Belgrade, P.O. Box 522, Belgrade, 11001, Serbia
[2]Ikerbasque, Basque Foundation for Science, 48013 Bilbao, Spain

Formamidinium lead iodide ($FAPbI_3$), a perovskite with notable photovoltaic potential, has emerged as a highly efficient solar absorber. However, its long-term stability under conditions such as UV irradiation and moisture exposure remains a significant obstacle, impacting its viability for scalable solar cell applications due to degradation products and morphological changes that compromise efficiency. This study explores the degradation pathways of pristine $FAPbI_3$ and assesses the stabilizing effects of two polyionic additives, PolyTFSI Li and PolyTFSI Imidazolium, under UV and moisture exposure. Chemical and structural changes were characterized through X-ray photoelectron spectroscopy (XPS) and X-ray diffraction (XRD), while morphological alterations were observed using scanning electron microscopy (SEM), with degradation kinetics monitored via UV-VIS spectroscopy. Pristine $FAPbI_3$ displayed rapid degradation within 45 minutes at 65% humidity, whereas the polyionic additives extended stability to 75 and 115 minutes, respectively. The formation of the delta-phase perovskite was indicated by UV-VIS and confirmed by XRD in degraded samples. SEM revealed substantial morphological degradation in pure $FAPbI_3$, while samples treated with PolyTFSI Imidazolium exhibited minimal morphological changes, with stable color and structure. Extended UV exposure studies further underscored the stabilizing effects of the additives, which mitigated optical and morphological degradation in contrast to the complete degradation observed in pristine $FAPbI_3$.

10-3

Motion study of Ag-Ag_2S/TiO_2 hybrid nanoparticles as novel light-driven nanomotors

Danijela Danilović[1], Dušan K. Božanić[1], Jelena Pajović[2], Gustavo A. Garcia[3], Laurent Nahon[3], Tijana Marić[4], Vladimir Djoković[1]

[1]Center of Excellence for Photoconversion, "Vinča" Institute of Nuclear Sciences - National Institute of the Republic of Serbia, University of Belgrade, Serbia, P.O. Box 522, 11001 Belgrade, Serbia
[2]Faculty of Physics, University of Belgrade, Studentski trg 12, 11001 Belgrade, Serbia
[3]Synchrotron SOLEIL, l'Orme des Merisiers, St. Aubin, BP48, 91192 Gif sur Yvette Cedex, France
[4]Department of Health Technology, Technical University of Denmark, Kgs Lyngby, 2800 Denmark

In recent years, there has been a growing interest in the development of micro/nano motors (MNMs), hybrid systems that exhibit controlled movement in fluids, responding to various external stimuli such as thermal, light, magnetic, etc. The light-driven MNMs are composed of photoactive materials that enable the conversion of electromagnetic energy into mechanical motion. In this study, we synthesized Ag-Ag_2S Janus nanoparticles and coupled them to the TiO_2 nanospheres and investigated the propulsion of obtained hybrid nanosystem in a liquid medium under visible and NIR light. To understand photoinduced movement of the hybrid nanosystem upon NIR light illumination, we performed synchrotron radiation vacuum ultraviolet photoelectron spectroscopy (SR VUV PES) using the velocity map imaging (VMI) technique. SR VUV PES offered valuable information about the valence level alignment of the components and potential hybrid states.

10-4

The Influence of Nickel-Osmium Interaction on the Kinetics of Hydrogen and Oxygen Evolution in Alkaline Medium

Z. Bošković, N. Tričković, A. Z. Jovanović

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

This study focuses on the development and comprehensive analysis of innovative electrocatalysts, specifically a nickel surface modified with osmium, for energy conversion applications. This work emphasizes enhancing the hydrogen evolution reaction (HER) and the oxygen evolution reaction (OER) in alkaline environments. Modified polycrystalline nickel electrodes were prepared via facile galvanic displacement from a highly concentrated acidic solution of osmium. For this research, we used various electrolyte solutions, different electrolyte concentrations, and varying deposition times and concentrations of the solutions used for galvanic exchange to conduct a detailed and comprehensive analysis of the catalytic system for HER and OER. Overall, the modified nickel surface with osmium shows better results than pure nickel. However, despite the improvements, the high cost of osmium makes it impractical to apply this type of catalyst in the hydrogen and oxygen production industry. Additionally, as the concentration of osmium increases in the solutions used for galvanic exchange, the activity of the catalyst decreases. This phenomenon was investigated using scanning electron microscopy (SEM), and we observed the formation of clusters that are weakly bound to the electrode surface. With higher concentrations, the clusters that form on the surface become larger, making them easier to detach from the electrode and reducing its activity.

Acknowledgement: This work was supported by the NATO SPS programme through the project "Osmosis-Assisted Seawater Electrolysis for Green Offshore Hydrogen Production - SeaCAT", G6230

10-5

Enhanced Supercapacitor Performance of GO-based Nanocomposite with WPA and PTCDA

Milica Pejčić, Željko Mravik, Marko Jelić, Marija Grujičić, Jelena Rmuš Mravik, Darija Petković, Sonja Jovanović, Zoran Jovanović

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

One approach to developing supercapacitors involves arranging nanomaterials hierarchically, either as individual components or as nanocomposites. This study examined how hydrothermal treatment (HTT) affects the oxygen functional groups in nanocomposites made from graphene oxide (GO), 12-tungstophosphoric acid (WPA), and 3,4,9,10-perylenetetracarboxylic dianhydride (PTCDA). The materials underwent hydrothermal treatment for 1, 4, 8, and 12 hours at 180 °C. The hierarchical ordering of materials was noticed after 8h HTT. The results of temperature-programmed desorption (TPD) method showed that WPA do not influence the amount of desorbed groups, while PTCDA leads to significant increase of desorbed groups (up to 30%). Also, it can be concluded that part of PTCDA remains not integrated into the GO network based on characteristic peaks in TPD spectra. Cyclic voltammetry (CV) was performed for the initial materials and their composites after 8h HTT. The obtained results indicate enhancement of electrochemical charge storage properties that can be related to hierarchical ordering and the amount of functional groups on the surface of nanocomposite. This research provides fresh insights into the interactions among GO, WPA, and PTCDA, that are valuable for advancing electrochemical supercapacitor development.

Acknowledgement: This research was supported by the Science Fund of the Republic of Serbia, grant No. 6706, Low-dimensional nanomaterials for energy storage and sensing applications: Innovation through synergy of action – ASPIRE (Grant no. 451–03-66/2024–03/200017).

10-6

Development of a Co/Zn-Ferrite Molecularly Imprinted Polymers for Gallic Acid in Plant Extracts, Wine and Herbal Supplements

Marija Grujičić[1], Seyda Yayla[2,3], Milica Pejčić[1], Ahmet Cetinkaya[4], M. Mesud Hurkul[2], Sibel A. Ozkan[3], Sonja Jovanović[1]

[1]*Laboratory of Physics, Vinca Institute of Nuclear Sciences – National Institute of the Republic of Serbia, University of Belgrade, Belgrade, Serbia*
[2]*Department of Pharmaceutical Botany, Faculty of Pharmacy, Ankara University, Ankara, Turkey*
[3]*Graduate School of Health Sciences, Faculty of Pharmacy, Ankara University, Ankara, Turkey*
[4]*Department of Analytical Chemistry, Faculty of Pharmacy, Ankara University, Ankara, Turkey*

In this study, we developed a novel molecularly imprinted polymer (MIP)-based sensor for the electrochemical determination of gallic acid (GA) in plant extracts, wine and herbal supplements. To enhance the active surface area and porosity of the glassy carbon electrode (GCE), we incorporated cobalt-zinc-ferrite (CFO_Zn_DHCA) nanoparticles, which are sphere-like in shape and size of 5±1 nm. The functional monomer selected for this study was 3-aminophenyl boronic acid (3-APBA). The polymerization process involved the use of other MIP components: ethylene glycol dimethacrylate (EGDMA) as a cross-linking agent, 2-hydroxyethyl methacrylate (HEMA) as the basic monomer, and 2-methyl propiophenone as the initiator. We conducted morphological and electrochemical characterizations of the GA/CFO_Zn_DHCA/3-APBA@MIP-GCE sensor using scanning electron microscopy (SEM), cyclic voltammetry (CV), and electrochemical impedance spectroscopy (EIS). The linear range for GAL determination (in 5.0 mM $[Fe(CN)_6]^{3-/4-}$) was found to be 1.0×10^{-13} M to 1.0×10^{-12} M, with a limit of detection (LOD) and limit of quantification (LOQ) calculated at 1.29×10^{-14} M and 4.29×10^{-14} M, respectively. As a result of this study, the developed MIP-based electrochemical sensor demonstrated high specificity, selectivity, and sensitivity for detecting of GA.

Acknowledgement: This research was supported by the Science Fund of the Republic of Serbia, grant No. 6706, Low-dimensional nanomaterials for energy storage and sensing applications: Innovation through synergy of action – ASPIRE. This research is also based upon work from short-term scientific mission (STSM) of COST Action CA22131, LUCES─Supramolecular Luminescent Chemosensors for Environmental Security

10-7

Characterization and evaluation of mechanical properties of glass and carbon/glass reinforced hybrid composite tubes

Tanja Milošević, Jela Galović, Jelena Gržetić, Slađan Grga, Slavko Mijatov, Tihomir Kovačević, Saša Brzić

Military Technical Institute, Ratka Resanovića 1, Belgrade, Serbia

The goal of this paper is development and characterization of reinforced polyester thermal protective materials (TPM) for solid rocket motors application. Polyester-based TPMs reinforced with carbon (CF/C) and glass fibers in (non)woven form were fabricated by wet filament winding technology. This study examined effects of structural composition (CF/GF fibers content) and winding parameters (radial/helicoidal) on physical, mechanical and termal properties. The axial tensile properties were determined, as well as response of the material to the internal hydraulic pressure of the TPM tubes. It has been shown that the tensile strength of hybrid CF/GF-reinforced TPM is improved compared to the GF-reinforced TPM, due to significantly better tensile properties of roving CFs. As expected, the presence of woven GF and CF reinforcement, circumferentially oriented, increases the circumference strength of the composite TPMs. CFs provided better axial tensile properties of the composite material, while GF provide greater circumferential strength for the TPM.

Acknowledgements: This work was supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia (Contract No 451-03-66/2024-03/200325.

11-1

PLD growth of STO thin film on silicon photocathode as protective layer for photoelectrochemical hydrogen evolution reaction

Darija Petković[1], Hsin-Chia Ho[2], Janez Kovač[3], Matjaž Spreitzer[2], Urška Trstenjak[2], Damjan Vengust[2], Zoran Jovanović[1]

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

Silicon (Si) is regarded as promising material for photoelectrochemical (PEC) devices, thanks to its cost-effectiveness, well-established manufacturing procedures and impressive theoretical photovoltage and saturation current density. Developing Si-based PEC devices has proven to be challenging due to silicon's high susceptibility to (photo)corrosion under PEC conditions. To effectively tackle this issue, it is essential to have a protective layer that safeguards against corrosion while also ensuring optimal charge transfer within the photoelectrode. In this study, high-quality $SrTiO_3$ (STO) thin film was grown on p-Si substrate, utilizing reduced graphene oxide (rGO) as an interfacial layer. The thin STO film, approximately 10 nm thick, was deposited via pulsed laser deposition (PLD) on both rGO-buffered and bare Si substrates to investigate the impact of epitaxy and interfacial properties on the PEC performance. The sample with epitaxial STO layer, grown on rGO-buffered Si, displayed a lower onset potential in comparison to its non-epitaxial counterparts. Results of linear sweep voltammetry and chronoamperometry have shown that the epitaxially protected photocathode exhibited superior performance in comparison to the non-epitaxial ones. This emphasizes the critical role of well-defined interfaces. The high-quality epitaxial STO layer with a smooth surface and sub-nano roughness was pivotal in shielding the underlying p-Si substrate from corrosion. On the other hand, the non-epitaxial sample showed PEC performance comparable to that of bare Si substrate due to the formation of pinholes. This study introduces an innovative method for creating a protective layer over the photoelectrode substrate, ensuring optimal efficiency and long-term stability in PEC devices.

Acknowledgement. This research was supported by the Science Fund of the Republic of Serbia, grant No. 6706, Low-dimensional nanomaterials for energy storage and sensing applications: Innovation through synergy of action – ASPIRE.

11-2

Carbon fiber reinforced EPDM-based thermal insulators for solid rocket motors application: Effect of carbon fiber content on dynamic-mechanical and thermal properties

Milica Ivković, Jelena Gržetić, Jela Galović, Slađan Grga, Slavko Mijatov, Irina Ulanova, Tihomir Kovačević

Military Technical Institute, Ratka Resanovića 1, Belgrade, Serbia

The effect of varying compositions of carbon fibers (CF, 5 and 10 Phr) in chopped and milled forms (various ratio of 3.0 mm and 0.1 mm fibers' lent, respectively) on mechanical properties of EPDM-based thermal insulators (EPDM-TI) were examined. Formulation of EPDM-TI contained ammonium polyphosphate and melamine as flame retardant/intumescent system, and sulphur-based crosslinking system. To investigate the mechanical properties such as tensile strength, elongation, hardness, and brittleness temperature, morphological properties and ablation rate four samples with different formulations were developed and tested. The results indicated that formulation containing the highest amount of 0.1 mm milled carbon fibers (9/1Phr ratio of milled/chopped CF) has the most improved mechanical properties (11.5 MPa tensile strength, and satisfied brittleness at -25 °C) compared with those of the 1/1Phr ratio of milled/chopped CF. The hardness and elongation have been slightly decreased, fulfilling the ablation requirement for solid rocket motors and the requirement of aging of EPDM-TI.

Acknowledgements: This work was supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia Contract No. 451-03-66/2024-03/200325.

11-3

Exploring the Potential of Ionic Liquids to Inhibit Dendrite Growth in Zinc-Ion Batteries

Nikola Zdolšek[1,2], Grgur Mihalinec[2], Aleksandra Dimitrijević[1], Marijana Kraljić Roković[2]

[1]*Department of Physical Chemistry, "Vinča" Institute of Nuclear Sciences – National Institute of the Republic of Serbia, University of Belgrade, Belgrade, Serbia*
[2]*Faculty of Chemical Engineering and Technology, University of Zagreb, Zagreb, Croatia*

Dendrite formation is a significant challenge in all types of zinc-ion batteries, impacting their safety, efficiency, and long-term stability. Zinc-ion batteries (ZIBs) are promising energy storage systems due to their low cost, environmental friendliness, and high theoretical energy density. However, like other metal-based batteries, zinc-based systems suffer from dendrite formation, which can cause short-circuiting, capacity loss and eventual battery failure. Therefore, dendrite inhibiton is crutial for further delevelopment of all kind of Zn-ion batteires. In this sence, several aproaches have been implemented. One of the most popular apprach is introducing the additives into electrolytes. Frequently used additives consist of polymers, organic molecules and metal ions. In this research we used different ionic liqudis (ILs) as additives in 1M $ZnSO_4$ electrolyte to prevent Zn dendrite growth. Dendrite formations was investigated in standard 1M $ZnSO_4$ electrolyte and in electrolyte containing 1-butyl-3-methylimidazolium tetrafluoroborate [BMIM][BF4], 1-butyl-3-methylimidazolium salicylate [BMIM][Sal], choline lactate [Ch][Lac], choline acetate [Ch][Ac], choline saccharinate [Ch][Sac] and choline salicylate [Ch][Sal]. The percentage of ionic liquids in 1M $ZnSO_4$ was 2-5%. It was concluded that ILs can inhibit dendrite growth. The inhibition of dendrite growth follows the order: [Ch][Sac]>[Ch][Ac]>[BMIM][BF4]>[Ch][Lac]>[BMIM][Sal]>[Ch][Sal]. According to this choline saccharinate has the most promising potential for application as additive in Zn-ion batteries, short-circuiting occurred after 112 hours of cycling at 10 mA cm^{-2}, 2.5 mAh cm^{-2}.

Acknowledgment: This research has been supported by NATO Science for Peace Multi-Year Project ″High Energy Calcium - Oxygen Batteries″ G-5910, NATO SPS G5910 and Croatian science foundation HRZZ (MOBDOL-2023-12).

11-4

Defect Engineering and Hole Formation in the Swift Heavy Ion Irradiated Thin Films of Bismuth Vanadate: Impact on Oxygen Evolution Reaction for Solar Water Splitting

Marko Jelić[1], Zoran Jovanović[1], Ekaterina Korneeva[2], Nina Daneu[3], Suraj Gupta[3], Jacques O'Connell[4], Tatiana Vershinina[2], Nikita Kirilkin[2], Oleg Orelovich[2], Ivana Stojković Simatović[5], Vladimir Skuratov[2,6,7], Sonja Jovanović[1]

[1]*Laboratory of Physics, Vinča Institute of Nuclear Sciences – National Institute of the Republic of Serbia, University of Belgrade, Belgrade, Serbia*
[2]*Joint Institute for Nuclear Research, Dubna, Russia*
[3]*Advanced Materials Department, Jožef Stefan Institute, Ljubljana, Slovenia*
[4]*Nelson Mandela University, Port Elizabeth, South Africa*
[5]*University of Belgrade – Faculty of Physical Chemistry, Belgrade, Serbia*
[6]*National Research Nuclear University MEPhI, Kashirskoe Shosse, 31, 115409, Moscow, Russia*
[7]*Dubna State University, Universitetskaya St., 19, 141982, Dubna, Russia*

Swift heavy ion (SHI) irradiation, using Xe ions with 150 MeV energy and fluences in the range $5 \times 10^9 – 5 \times 10^{11}$ ions cm^{-2} is explored as a method to manipulate defect structures in hydrothermally synthesized monoclinic $BiVO_4$ (BVO) thin films, aiming to understand its impact on photoelectrochemical (PEC) oxygen evolution reaction (OER). Our findings show that irradiation induces various structural and electronic modifications together with the formation of bismuth-rich hillocks above oxygen-depleted ion tracks. After 1-hour-long chronoamperometry treatment of SHI irradiated samples, formation of nanoscale holes with varying dimensions, reaching 30 nm in width and 200 nm in depth, aligned along ion tracks, is observed. The formation of different types of holes is linked to defect formation, localized stresses and chemical changes that follow SHI irradiation and PEC treatment. Such morphological changes are correlated to photocurrent density increases of up to 58.6 % and 25.2 % for lower fluence irradiated samples of 5×10^9 and 1×10^{10} ions cm^{-2}, and considerable and irreversible deterioration of BVO properties for high fluence irrradiated samples. This study opens an new routes for morpho-structural manipulation, other material incorporation, and helps in the advancement of the fundamental understanding of SHI-induced phenomena in the BVO films.

Acknowledgment: This research was supported by the Science Fund of the Republic of Serbia, grant No. 6706, "*Low-dimensional nanomaterials for energy storage and sensing applications: Innovation through synergy of action – ASPIRE*".

11-5

Influence of Filling System Design on Tensile Strength in Aluminum Sand Castings

Marko Zagoričnik, Lazar Kovačević, Vladimir Terek, Zoran Bobić, Pal Terek, Milan Pećanac, Branko Škorić

University of Novi Sad, Faculty of Technical Sciences,

Aluminium alloy castings are widely used in today's industry due to their low density, high corrosion resistance, strength, and ductility. The quality of castings can be negatively affected by defects such as inclusions, porosity, dissolved hydrogen, and bifilms. This research focuses on the effect of bifilms. The high reactivity of aluminium alloys causes the surface of the melt to quickly form an oxide layer. If this layer is removed, a new oxide forms immediately. These layers can become entrained into the melt. Due to their inert nature, oxides do not merge but instead remain crumpled and compressed by the surrounding liquid. Entrainment defects greatly reduce mechanical properties and create potential leak paths after the part is machined. Although bifilms can form throughout the melting process during charging, melting, stirring, and degassing—they can slowly float to the surface and be removed. The final moment when bifilm formation occurs during pouring, within the filling system, and inside the part. This is another reason why filling system design is very important. In this study, the effects of turbulent vs. quiescent filling of Al castings in sand moulds were evaluated. The turbulence was controlled by the filling system design. A top-gated system was chosen to produce turbulent filling. The design included a 300 mm free fall height for the melt to produce the maximum possible bifilm damage. The filling system was oversized to increase air entrainment. A bottom-gated system with an offset weir basin, stopper rod, and undercut was used to produce a quiescent filling of the mold. The dimensions were calculated to create a naturally pressurized system. The sprue was tapered to prevent air entrainment, and the runner cross-section was decreased after every gate. The filling system includes radii at critical turns, as well as a surge control system, to prevent excessive speeds at the beginning of the pour and to prevent the initial melt from entering the casting. The turbulence caused by the filling system was verified using computer simulation in Magmasoft software. The simulations confirmed significant splashing and air entrainment in the top gated system, compared to the other. A total of 48 probes were cast. The castings were machined to standard dimensions and tolerances for tensile testing. The bottom-gated system was found to be a better configuration compared to top gating, yielding higher mean ultimate tensile strength.

11-6

Tribological testing of multilayer TiAlSiN coating deposited on IN100 and X15CrNiSi25-22 steel at high temperatures

Vladimir Terek[1], Lazar Kovačević[1], Aljaž Drnovšek[2], Miha Čekada[2], Zoran Bobić[1], Marko Zagoričnik[1], Pal Terek[1]

[1]University of Novi Sad, Faculty of Technical Sciences, Novi Sad, Serbia
[2]Jožef Stefan Institute, Ljubljana, Slovenia

Contemporary TiAlSiN coatings are recently being widely used on industrial level to protect tools used for cutting, forming, hot extrusion or high pressure die casting. These coatings are typically tested on hot-work tool steel and cemented carbide (WC-Co), both of which experience oxidation issues at 600 °C and 700 °C, respectively. Therefore, to evaluate the full potential of these coatings, heat resistant materials were chosen as substrates for tribo-testing. In this study, multilayer TiAlSiN coating was deposited on superalloy IN100 and heat resistant steel (EN X15CrNiSi25-22), using an industrial magnetron sputtering unit. The tribological testing of the coating was performed at room temperature (RT), 500, 600, 700 and 800 °C, against Al_2O_3 counterball, using high temperature pin-on-disk tribometer. After the tribological tests, the wear tracks were evaluated using confocal microscopy (CFM), stylus profilometry, and scanning electron microscopy (SEM) equipped with energy dispersive spectroscopy (EDS). The oxidation of none of the substrates was observed, even at 800 °C. The coating on both substrates displayed combination of abrasive and adhesive wear mechanism at both room and high temperatures. After the tribo-tests, CFM and SEM analyses revealed randomly scattered needle-like protrusions on the surface of the coating deposited on IN100. These protrusions were more wear resistant than the rest of the coating, and worn material accumulated on them. This resulted in slighly lower coefficient of friction on coating deposited on IN100, due to formation of glaze layer inside the wear track. Even though the same coating is deposited on both substrates, the wear rate of the coating deposited on IN100 is significantly lower than on steel, for both room and high temperatures. However, when IN100 was used as a substrate, the counterballs were much more worn. The cause for this behavior are hard protrusions on which the counterball was sliding. These protrusions originate from the carbides contained in the substrate on which the coatings often grow epitaxially, resulting in extraordinary properties of the coating. They protected the coating and worn down the counterball. The opposite can be seen for the coating on steel substrate, which is without protrusions. Additionally, due to decrease of mechanical properties of this substrate, the coating's wear rate constantly increased with increase in testing temperature.

11-7

Environmentally less harmful sample preparation techniques for HPLC analysis of organic components in gunpowders

Teodora Stančić[1], Mirjana Krstović[1,2], Bojana Fidanovski[1,2], Danica Bajić[1,2]

[1]Military Technical Institute, Belgrade, Serbia
[2]University of Defense, Military Academy, Belgrade, Serbia

Gunpowders are classified as propellant energetic materials, which, after their production, are stored for extended periods under warehouse conditions. A long period of storage can result in chemical aging, which, without adequate monitoring, may cause their spontaneous combustion and accidents. The control system involves sufficient oversight of the amount of organic constituents, particularly stabilizers, which serve to reduce chemical degradation. The high-pressure liquid chromatography method enhances the identification and quantification of the desired organic compounds. The preparation of gunpowder samples requires the application of substantial quantities of harmful organic solvents and demands considerable time for completion. The current national standard mandates the application of a substantial quantity of harmful dichloromethane (80 ml per sample/per test run), although the present NATO standards (AOP 48 Ed.2) define acetonitrile as an appropriate solvent, although in larger volumes (250 ml per sample/ per test run). This research investigates possibilities to reduce the required volume of extraction solvent, the duration of preparation and analysis, and the effects of their changes on the repeatability of the results. The purpose of this research is to minimize the needed solvent, i.e. to decrease the quantity of resulting chemical waste contaminated with explosives, thus decreasing the exposure of laboratory personnel to fumes and reducing processing time, all while preserving the reliability of results and ensuring the safety of stored gunpowder in warehouses. Preliminary results obtained for a selected group of samples indicate that it is possible to reduce the amount of solvent used without affecting the reproducibility of the resulting data.

Acknowledgement: This research was supported by the Ministry of science, technological development and innovations (Serbia), Contract No. 451-03-66/2024-03/200325, and University of Defense, Military Academy, Proj. No. VA-TT/1/22-24.

11-8

Evaluating thermal effects of thermobaric composite explosives in controlled conditions

Mirjana Krstović[1,2], Teodora Stančić[1], Danica Bajić[1,2]

[1]Military Technical Institute, Belgrade, Serbia
[2]University of Defense, Military Academy, Belgrade, Serbia

Composite explosives of thermobaric effect represent a specific category of energetic materials frequently used for military applications, which integrate the effects of a shock wave and thermal energy to incapacitate the target entirely. When produced in form of cast-cured polymer bonded explosives, PBX, these explosives contain a significant amount of metal powder in their formulation, which fails to combust fully during detonation; instead, it ignites while the remaining of the post-detonation combustion process with participation of atmospheric oxygen. The most trustworthy information regarding the thermal impact of thermobaric explosives on targets can be obtained from field tests, which are complex, necessitate advanced equipment, and require numerous personnel. This form of data collecting also has considerable negative effects on the environment, as well as safety issues.

This research considers the application of calorimetry as an instrumental method for assessing the thermal effect of these composite explosives. This method allows for the monitoring of the impact of individual components on the thermal effect using a minimal sample size, in controlled conditions. For the selected thermobaric composite explosive formulations based on nitramines, polymer binder, oxidizer and metal powders, energetic potential was determined in isoperibolic calorimeter in various atmospheres. Obtaining these results facilitates the optimization of the composite explosives formulations towards desired effects.

Acknowledgement: This research was supported by the Ministry of science, technological development and innovations (Serbia), Contract No. 451-03-66/2024-03/200325, and University of Defense, Military Academy, Proj. No. VA-TT/1/22-24.

Author Index

Grga, Slađan		72, 74
Gria, Isabel		29
Grozdanov, Anita		50
Grudzień-Rakoczy, Małgorzata	malgorzata.grudzien@kit.lukasiewicz.gov.pl	43
Grujičić, Marija	marija.grujicic@vin.bg.ac.rs	70, 71
Grujović, Nenad		22, 38
Gržetić, Jelena	jrusmirovic@tmf.bg.ac.rs	72 ,74
Gupta, Suraj		76
Haghighat, Ayda Ghary		40
Hałka, Mateusz		33
Hanzel, Ondrej		46
Hassouni, Khaled		49
Herendija, Evelina	nherendija@yahoo.com	48
Hičák, Michal		46
Ho, Hsin-Chia		73
Ignjatović, Nenad	nenad.ignjatovic@itn.sanu.ac.rs	48
Ilić, Budimir S.	budimir.ilic@medfak.ni.ac.rs	53
Ivanović, Milutin		67
Ivković, Milica		74
Jakovljević, Teodora	tjakovljevic2000@gmail.com	10
Jakšić Karišik, Milica		48
Janaćković, Djordje		10,11
Janev, Aleksandar		5
Jankovic, Radmila		1,4
Janković, Teodora		64
Jaśkowiec, Krzysztof		43
Jauković, Aleksandra		5
Jeevan, Joel		49
Jelić, Marko	marko.jelic@vin.bg.ac.rs	70, 76
Jeremić, Dejan A.		60
Jocković, Jelena		25
Jovanović Pešić, Živana		38
Jovanović, A. Z.		69
Jovanović, Aleksandra		18 ,19, 42, 45, 47
Jovanović, Jelena		8
Jovanović, Sonja	sonja.jovanovic@vinca.rs	70 ,71 ,76
Jovanović, Zoran	zoran.jovanovic@vinca.rs	70, 73, 76
Jovic, V.		63
Jung, Ole		7
Jurak, Małgorzata		14
Kanjevac, Ana	kanje@ipb.ac.rs	39
Karkad, Amjed		47

Karlický, František		32
Kartalović, Brankica		17, 19
Kašlík, Josef		28
Keta, Otilija		9
Khasiyeva, Ayan	ayan@ipb.ac.rs	54
Kicia, Mariusz		33
Kirilkin, Nikita		76
Knežević-Jugović, Zorica		5
Kolos, Miroslav		32
Komazec, Teodora Tara	teodora00k@gmail.com	60
Korićanac, Lela		9
Korneeva, Ekaterina		76
Kosanović, Maja		11
Kostić, Marijana S.		61
Kovač, Janez		73
Kovačević, Lazar		21, 77, 78
Kovačević, Tihomir		72, 74
Kowalczyk, Bożena		14
Kowalska, Aleksandra		33
Kozień, Dawid	kozien@agh.edu.pl	37, 46
Kraljić Roković, Marijana		27, 75
Křížek Oborná, Jana		28
Krmpot, Aleksandar J.		13
Krstajic Pajic, M.		63
Krstović, Mirjana	mbkrstovic@gmail.com	79, 80
Kumar, Nilesh	nkbaheri@gmail.com	32
Kuzmanović Nedeljković, Snežana		64
Kuzmanović, Maja	maja.jovic@itn.sanu.ac.rs	12
Lazarević Valerjev, Ljiljana		34
Lazarević, Dajana	dajana.lazarevic@vin.bg.ac.rs	8
Lazarević, Miloš		13, 48
Lazarević, Nenad		36, 57
Lazarević, Zorica		64
Lazić, Aleksandra		34
Lazić, Olivera		25
Le Masson, Anais Morgane	anaismorgane.lemasson@studenti.polito.it	6
Liu, Yu		36, 57
Lukač, Sara	sara.lukac@itn.sanu.ac.rs	16
Lukic, Jovan	jovlukic@tmf.bg.ac.rs	66
Lupulović, Diana		18 ,19
Ljujić, Biljana		10
Maletic, Slavica		39
Malinowska, Benita	benita.malinowska@gmail.com	62
Maltoni, Pierfrancesco		35
Mancic, Lidija	lidija.mancic@itn.sanu.ac.rs	13

Mantione, Daniele		67
Marić, Tijana		68
Marinković, Aleksandar		42, 45, 47
Marković, Ana	ana.markovic@vin.bg.ac.rs	55
Marković, Smilja	smilja.markovic@itn.sanu.ac.rs	27, 50, 51
Marković, Zoran M.		55
Marjanović, Petar	20200011@student.ffh.bg.ac.rs	65
Matić, Tamara		10
Matijević, Borko		30
Medić, Aleksandra		3
Mekić, Dragana	dragana.mekic@dh.uns.ac.rs	30
Mesud Hurkul, M.		71
Mihalinec, Grgur		75
Mijatov, Slavko		72, 74
Miladinović, Dragana		25
Milanovic, Igor		39
Milašin, Jelena		48
Milenković, Strahinja	strahinja.milenkovic@kg.ac.rs	22, 38
Miletić, Katarina		60
Milic, Jovana V.		66
Milivojac, Andrej	andrejm@chem.bg.ac.rs	26
Milivojevic, Milena		1, 2, 3, 4
Milivojević Dimitrijević, Nevena		22
Milivojević, Marija	mmilivojevic@tmf.bg.ac.rs	11
Milosavljević, A		36
Milošević, Milena		18, 42, 47
Milošević, Milorad V.		57
Milošević, Tanja	tanjamilosevic993@gmail.com	72
Milović, Miloš		67
Miljanić, Šćepan		52
Miljković, Nadica		34
Mirić, Ana	anamiric53@gmail.com	22
Mišić, Marko		20
Mitić Ćulafić, Dragana		12
Mladenović, Dušan	dusan.mladenovic@ffh.bg.ac.rs	52
Mlađenović, Lidija	lidija98.mladjenovic@gmail.com	18
Mojsilović, Slavko		5
Mraković, Ana		44
Mravik, Željko	mravik@vin.bg.ac.rs	70
Mrđan, Gorana		30
Nahon, Laurent		68
Najman, Stevo		7
Nastasić, Ana	ana.nastasic8@gmail.com	27
Nieroda, Paweł		46
Nikolić, Dalibor		22
Ninković, Milica		34

Novaković, Mirjana M.		58
Nježić, Irena		34
Obradovic, Bojana	bojana@tmf.bg.ac.rs	1, 2 ,4, 6
Obradović, Hristina		5
O'Connell, Jacques		76
Ogrizović, Đorđe		29
Ogunbunmi, M. O.		36
Okić Đorđević, Ivana		5
Oleksy, Wacław		43
Omelyanchik, Alexander		40
Opačić, Marko	mopacic@ipb.ac.rs	57
Orelovich, Oleg		76
Ozkan, Sibel A.		71
Pajović, Jelena		68
Palusińska-Szysz, Marta		14
Papić, Miloš		10
Pasiut, Katarzyna		46
Pastuszak, Katarzyna	katarzyna.pastuszak2@mail.umcs.pl	14
Paunović, Perica		50
Pavlovic, Marija	marija27pavlovic@gmail.com	2
Pećanac, Milan		77
Peddis, Davide		35, 40, 41
Pędzich, Zbigniew		46
Pejčić, Milica	milica.pejcic@vin.bg.ac.rs	70 ,71
Pejić, Jelena		3
Perić, Jakša		51
Pešić, Jelena		36, 54, 56
Pešić, Milica		4
Petković Benazzouz, Marija M.		60
Petković, Darija	darija.petkovic@vin.bg.ac.rs	70, 73
Petković, Marijana		34
Petricevic, A.	apetricevic@tmf.bg.ac.rs	63
Petrović, Čedomir		36, 57
Petrović, Isidora		3
Petrović, Jelena	jelenapetrovic.co@gmail.com	4
Petrović, Suzana M.		58
Piljevic, Miljana	miljana@ipb.ac.rs	13
Pirković, Andrea		42, 47
Plećić, Ana	ana.plecic@inep.co.rs	18, 19
Popović, Jasminka		24, 26
Popović, Z.V.		36
Popović, Zoran		57
Prasanna, Swaminathan		49
Prlainović, Nevena		29

Rabasovic, Mihailo D.		13
Rada Petrović		10
Radan, Milica	mradan@mocbilja.rs	64
Radanović, Aleksandra		25
Radanović, Mirjana M.		61
Radenković Stošić, Milena	milena1390nis@gmail.com	7
Radmilovic, Vuk V.	vukradmilovic@tmf.bg.ac.rs	66
Radnović, Nikola		61
Radosavljević, Ljiljana		34
Raičević, Vidak N.		59
Rajab Elferjane, Muna		45
Rajić, Vladimir	vladimir.rajic@vinca.rs	16, 67
Rakin, Sandra	sandra.rakin@inep.co.rs	18, 19
Rakoczy, Łukasz	lrakoczy@agh.edu.pl	37, 43
Ramadani, Barbara	barbara.ramadani@vin.bg.ac.rs	67
Ramzan, Arooj	arooj.ramzan@edu.unige.it	40
Rančić, Milica		15
Reiss, Guido J.		59
Ristić, Predrag	predrag@chem.bg.ac.rs	24
Ristić, Sara V.		60
Rmuš Mravik, Jelena		70
Rodič, Peter		21
Rodić, Marko V.		59
Salamon, David		46
Sangermano, Marco		6
Santos, Diogo M.F.		52
Schwirtlich, Marija		3
Sesia, Rossella		6
Siby, Abdoulaye		49
Sidane, Ibtissame	ibtissame.sidane@edu.unige.it	41
Skuratov, Vladimir		76
Slavković, Vukašin		22
Slimani, Sawssen		40, 41
Soylu, Gulin S.P.		52
Spasojević, Tijana	tstanisic@tmf.bg.ac.rs	29
Spreitzer, Matjaž		73
Spriano, Silvia		6
Stančić, Teodora	teodorastancic@gmail.com	79, 80
Stanković, Ana	ana.stankovic@itn.sanu.ac.rs	51
Stanojevic, Nikola	stanojevic.nikola00@gmail.com	20
Stanojević, Stanislava		34
Stevanović, Magdalena M.		12, 16 ,20
Stojanović, Sanja	sanja.stojanovic@medfak.ni.ac.rs	7
Stojanović, Zoran	zoran.stojanovic@itn.sanu.ac.rs	16, 20
Stojković Simatović, Ivana	ivana@ffh.bg.ac.rs	27, 51, 76
Stojkovska, Jasmina	jstojkovska@tmf.bg.ac.rs	1, 2 ,3, 4, 6

Šavikin, Katarina		64
Ševkušić, Milica		34
Škorić, Branko		77
Šljukić, Biljana	biljka@ffh.bg.ac.rs	52
Šolajić, A		36
Šolajić, Andrijana		54, 56
Tadić, Marin		44
Talaee Shoar, Farzane	farzane44talaee@gmail.com	35
Tatarko, Peter		46
Terek, Pal		21, 77, 78
Terek, Vladimir	vladimirterek@uns.ac.rs	21 ,77 ,78
Terpiłowski, Konrad	terpil@umcs.pl	33, 62
Tešić, Tamara	student.tamaratesic2262002@sfb.bg.ac.rs	15
Thomashausen, Paul		61
Todorović Marković, Biljana M.		55
Todorović, Tamara		24, 26
Tomić, Miloš	milos.tomic@itn.sanu.ac.rs	20
Tomić, Nina	nina.tomic@itn.sanu.ac.rs	12, 20
Tomić, Sergej		11
Tričković, N.		69
Triska, Dominik	dominik.triska@stud.hs-merseburg.de	61
Trstenjak, Urška		73
Trtić Petrović, Tatjana		8
Tuz, Lechosław		37
Ugrinović, Vukašin		10
Ulanova, Irina		74
Urbańczyk, Michał		37
Valasek, Daniel		46
Varvaro, Gaspare		35
Varvaro, Gaspare		40
Vaštag, Đenđi		30
Veličković, Nikola		31
Veljović, Djordje	djveljovic@tmf.bg.ac.rs	10
Vengust, Damjan		73
Vershinina, Tatiana		76
Víchová, Viktorie	viktorie.vichova@upol.cz	28
Virijević, Katarina		38
Višić, B.		36
Višnjevac, Aleksandar		26
Vučkovac, Obrad		34
Vukosavljev, Mirjana		19
Wójcik, Grzegorz		23