

FIRST INTERNATIONAL
CONFERENCE ON ELECTRON
MICROSCOPY
OF NANOSTRUCTURES

ELMINA 2018

ПРВА МЕЂУНАРОДНА
КОНФЕРЕНЦИЈА О
ЕЛЕКТРОНСКОЈ МИКРОСКОПИЈИ
НАНОСТРУКТУРА



August 27-29, 2018, Belgrade, Serbia
27-29. август 2018. Београд, Србија

FIRST INTERNATIONAL CONFERENCE

ELMINA  2018

PROGRAM



BOOK OF ABSTRACTS

Rectorate of the University of Belgrade, Belgrade, Serbia

August 27-29, 2018

<http://elmina.tmf.bg.ac.rs>

Organized by:

Serbian Academy of Sciences and Arts and Faculty of Technology and Metallurgy,
University of Belgrade

Endorsed by:

European Microscopy Society and Federation of European Materials Societies

At the beginning we wish you all welcome to Belgrade and ELMINA2018 International Conference organized by the Serbian Academy of Sciences and Arts and the Faculty of Technology and Metallurgy, University of Belgrade. We are delighted to have such a distinguished lineup of plenary speakers who have agreed to accept an invitation from the Serbian Academy of Sciences and Arts to come to the first in a series of electron microscopy conferences: Electron Microscopy of Nanostructures, ELMINA2018. We will consider making it an annual event in Belgrade, due to this year's overwhelming response of invited speakers and young researchers. The scope of ELMINA2018 will be focused on electron microscopy, which provides structural, chemical and electronic information at atomic scale, applied to nanoscience and nanotechnology (physics, chemistry, materials science, earth and life sciences), as well as advances in experimental and theoretical approaches, essential for interpretation of experimental data and research guidance. It will highlight recent progress in instrumentation, imaging and data analysis, large data set handling, as well as time and environment dependent processes. The scientific program contains the following topics:

- Instrumentation and New Methods
- Diffraction and Crystallography
- HRTEM and Electron Holography
- Analytical Microscopy (EDS and EELS)
- Nanoscience and Nanotechnology
- Life Sciences

To put this Conference in proper perspective, we would like to remind you that everything related to nanoscience and nanotechnology started 30 to 40 years ago as a long term objective, and even then it was obvious that transmission electron microscopy (TEM) must play an important role, as it was the only method capable of analyzing objects at the nanometer scale. The reason was very simple - at that time, an electron microscope was the only instrument capable of detecting the location of atoms, making it today possible to control synthesis of objects at the nanoscale with atomic precision. Electron microscopy is also one of the most important drivers of development and innovation in the fields of nanoscience and nanotechnology relevant for many areas of research such as biology, medicine, physics, chemistry, etc. We are very proud that a large number of contributions came from young researchers and students which was one of the most important objectives of ELMINA2018, and which indicates the importance of electron microscopy in various research fields. We are happy to present this book, comprising of the Conference program and abstracts, which will be presented at ELMINA2018 International Conference. We wish you all a wonderful and enjoyable stay in Belgrade.

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ORGANIZERS

SERBIAN ACADEMY OF SCIENCES AND ARTS

Knez Mihailova 35, 11000 Belgrade, Serbia

Phone: +381 11 2027200 / <https://www.sanu.ac.rs/>

FACULTY OF TECHNOLOGY AND METALLURGY, UNIVERSITY OF BELGRADE

Karnegijeva 4, 11000 Belgrade, Serbia

Phone: +381 11 3370425 / <https://www.tmf.bg.ac.rs/>

ELMINA 2018

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GENERAL INFORMATION

DATE AND VENUE: The conference will be held August 27-29, 2018 at the Rectorate of the University of Belgrade, Studentski Trg 1, 11000 Belgrade, Serbia with the beginning at 8:30 AM on August 27th, 2018, in the Solemn Hall.

REGISTRATION: At the registration desk, located on the ground floor hall of the conference venue. Registration desk working hours are: Sunday, August 26th, from 16:00 to 18:00, Monday, August 27th, from 08:00 to 18:30, Tuesday, August 28th, from 08:00 to 13:00, Wednesday, August 29th, from 08:00 to 11:00. Registered participants will receive a nametag and a conference bag.

INSTRUCTIONS FOR AUTHORS: The conference will feature plenary sessions and poster sessions as well as vendor presentations during lunch breaks. Presentations during plenary sessions will last 30 minutes each, including discussion. Standard and hands-free microphones will be on site. No A-V equipment will be provided for any poster presentations. Poster presenters must remain at their poster on their assigned day during the required poster session. Each poster will be allocated a 130 cm high and 95 cm wide (130X95) display area.

CONFERENCE AWARDS: Poster presentations will be reviewed according to the following criteria: (a) relevance to a specific symposium, (b) scientific content, quality and innovative proposals, (c) clarity of the text, and (d) compliance with the format. During the conference, the best three (3) posters, selected by a poster award committee, will receive awards.



PROGRAM

*First International Conference: "Electron Microscopy of Nanostructures",
ELMINA 2018, August 27 – 29, Belgrade, SERBIA*

Sunday, August 26, Ground Floor Hall

19:00-21:00 Welcome Reception for Invited Plenary Speakers

Monday, August 27, Main Lecture Hall

8:30-9:00

Opening Ceremony

Velimir Radmilović, Conference Chair
Vladimir Kostić, President of Serbian Academy of Sciences and Arts
Vladimir Bumbaširević, Rector of Belgrade University
Vladimir Popović, State secretary, Ministry of Education, Science
and Technological Development
Robert Sinclair, Chair of International Advisory Board

9:00

Plenary Session 1

Chair: Robert Sinclair & Tamara Radetić

9:00-9:30

Hannes Lichte: "Electron Waves for Comprehensive Analysis of Structures and Fields in Solids"

9:30-10:00

Rafal Dunin-Borkowski: " Model-Based Iterative Reconstruction of Charge Density and Electric Field using Off-Axis Electron Holography "

10:00-10:30

Fu-Rong Chen: "Low Dose in-Line Electron Holography: Toward Revealing Atomic Resolution Dynamics for MoS₂ Nanoparticles and Soft Materials"

10:30-11:00

Coffee Break

- 11:00 **Plenary Session 2**
Chair: Rafal Dunin-Borkowski & John Verbeeck
- 11:00-11:30 **Erdmann Spiecker:** "Scanning Transmission Electron Microscopy and Diffraction in SEM: Novel Approaches and Applications"
- 11:30-12:00 **Peter Denes:** "High-Speed Direct Electron Detection: Past, Present and Future"
- 12:00-12:30 **Gianluigi Botton:** "Applications of Direct Electron Detectors and Machine Learning with Neural Networks in Energy Loss Spectroscopy and Mapping"
- 12:30-14:00 Lunch Break
- Vendor Presentations Small Lecture Hall 8:**
- 13:00-13:30 **Thermo Fisher Scientific:** Dominique Delille
- 13:30-13:45 **NanoMEGAS SPRL:** Stavros Nicolopoulos
- 14:00 **Plenary Session 3**
Chair: Erdmann Spiecker & Peter Denes
- 14:00-14:30 **Stephen Pennycook:** "Materials Under the Microscope: the Atomic Origin of Functionality"
- 14:30-15:00 **David Bell:** "Advancing Topological Materials for Quantum Computing Applications with Electron Microscopy"
- 15:00-15:30 **Wayne D. Kaplan:** "Incoherent Interfaces: Strain, Adsorption, and Reconstruction"
- 15:30-16:00 **Laurence Marks:** "Profile Imaging: 35 years Old and Still Truckin"
- 16:00-16:30 Coffee Break
- 16:30 **Plenary Session 4**
Chair: Stephen Pennycook & Wayne D. Kaplan
- 16:30-17:00 **Robert Sinclair:** "In Situ High Resolution and Transmission Environmental Electron Microscopy of Material Reactions"
- 17:00-17:30 **Tamara Radetić:** "Atomic Mechanisms of Grain Boundary Migration in Au Bicrystals"
- 17:30-18:00 **Wolfgang Jäger:** "Advanced and In Situ TEM of Functional Nanomaterials"
- 18:00-20:00 **Poster Session 1**

Tuesday, August 28, Main Lecture Hall

- 8:30 **Plenary Session 5**
Chair: David Bell & Jürgen Plitzko
- 8:30-9:00 **Rolf Erni:** "Possibilities of Differential Phase Contrast STEM to Study Functional Oxides"
- 9:00-9:30 **Maria Varela del Arco:** "High Resolution STEM-EELS Mapping of Magnetic Quantities Across Oxide Multiferroic Interfaces"
- 9:30-10:00 **Miran Čeh:** "Microstructure Tailoring of Oxide Thermoelectrics to Increase the Figure of Merit (ZT) Value"
- 10:00-10:30 **Johan Verbeeck:** "The Road Towards a Versatile Programmable Phase Plate for Electrons"
- 10:30-11:00 Coffee Break
- 11:00 **Plenary Session 6**
Chair: Maria Varela del Arco & Rolf Erni
- 11:00-11:30 **Kazu Suenaga:** "Single Atom Spectroscopy in Low-Dimensional Materials Using Low-voltage STEM"
- 11:30-12:00 **Ferdinand Hofer:** "Quantitative Electron Microscopy At Atomic Resolution"
- 12:00-12:30 **Jürgen Plitzko:** "Cryo-Electron Tomography - The Past, the Present and the Future"
- 12:30-14:00 Lunch Break
- Vendor Presentation Small Lecture Hall 8:**
- 13:00-13:15 **JEOL-SCAN:** Guillaume Brunetti
- 14:00-16:00 **Poster Session 2**
- 19:00-22:00 Invited speakers boat tour and dinner

Wednesday, August 29, Main Lecture Hall

XII

8:30

Plenary Session 7

Chair: Kazu Suenaga & Wolfgang Jäger

8:30-9:00

Paulo Ferreira: "On the Degradation of PtNi Nanocatalysts for PEM Fuel Cells: An Identical Location Aberration-corrected TEM Study"

9:00-9:30

Hamish Fraser: "The Role of Structural Instabilities on Micro-structural Evolution in Metastable Beta Titanium Alloys"

9:30-10:00

Jan Neethling: "Applying Cs-corrected TEM/STEM to Long-standing Materials Science Problems"

10:00-10:30

Coffee Break

10:30

Plenary Session 8

Chair: Hamish Fraser & Ferdinand Hofer

10:30-11:00

Joachim Mayer: PICO – Chromatic Aberration Correction and Applications in Materials Science

11:00-11:30

Zoran Mišković: " Theoretical Modeling of Electron Energy Loss Spectroscopy of Graphene: Comparing Ab initio Calculations and Empirical Models with Experiments "

11:30-12:00

Dominique Delille: "Sub-Å STEM Resolution From 30 to 300kV: Themis Z Opens a New Era for Ultra-high Resolution in Low kV Imaging and Analysis"

12:00-12:15

Poster Awards & Closing Ceremony

POSTER SESSION 1

Monday, August 27th, 2018, 18:00-20:00h

XIII

• PO1.1

Measuring and Controlling Out-of-Plane Shape of Free-Standing Two-Dimensional Materials

Ursula Ludacka, Mohammad R. A Monazam, Toma Susi, Christian Rentenberger, Jannik C. Meyer and Jani Kotakoski

Faculty of Physics, University of Vienna, Austria

• PO1.2

Structural Characterization of Organic and Perovskite Solar Cells

Vuk V. Radmilović¹, Yi Hou², Fei Guo², Christoph J. Brabec², Erdmann Spiecker³, Velimir R. Radmilović^{4,5}

¹*Innovation Center, Faculty of Technology and Metallurgy, University of Belgrade, Karnegijeva 4, 11120 Belgrade, Serbia,* ²*Institute of Materials for Electronics and Energy Technology (i-MEET), Friedrich-Alexander-University Erlangen-Nuremberg, Martensstrasse 7, 91058 Erlangen, Germany,* ³*Center for Nanoanalysis and Electron Microscopy (CENEM), Friedrich-Alexander-University of Erlangen-Nuremberg, Cauerstrasse 6, 91058 Erlangen, Germany,* ⁴*Faculty of Technology and Metallurgy, University of Belgrade, Karnegijeva 4, 11120 Belgrade, Serbia,* ⁵*Serbian Academy of Sciences and Arts, Knez Mihailova 35, 11000 Belgrade, Serbia*

• PO1.3

Silicon Nanostructuring by Ag Ions Implantation Through Polystyrene Nanomask

Almedina Modrić-Šahbazović¹, Mirjana Novaković², Izet Gazdić¹, Nataša Bibić² and Zlatko Rakočević²

¹*University of Tuzla, Faculty of Natural Sciences and Mathematics, 75000 Tuzla, BiH,* ²*University of Belgrade, Institute of Nuclear Sciences Vinča, 11351 Belgrade, Serbia*

• PO1.4

XRD and HRTEM Study of Rutile Precipitates in Chrysoberyl Crystals

Aleksander Rečnik¹, Sandra Drev², Matjaž Mazaj³ and Nina Daneu⁴

¹*Department for Nanostructured Materials, Jožef Stefan Institute, Ljubljana, Slovenia,* ²*Center for Electron Microscopy and Microanalysis, Jožef Stefan Institute, Ljubljana, Slovenia,* ³*Laboratory for Inorganic Chemistry, National Institute of Chemistry, Ljubljana, Slovenia,* ⁴*Advanced Materials Department, Jožef Stefan Institute, Ljubljana, Slovenia*

• **PO1.5**

Electrospun Hybrids of Carbon Nanofibers with Cobalt and Manganese Oxide Nanoparticles as High-Performance Electrodes for Supercapacitors

Daniel M. Mijailović¹, Uroš Č. Lačnjevac², Vuk V. Radmilović¹, Dušica B. Stojanović³, Velimir R. Radmilović^{3,4}, Vladimir D. Jović², Petar S. Uskoković³

¹*Innovation Center, University of Belgrade, Faculty of Technology and Metallurgy, Karnegijeva 4, 11120, Belgrade, Serbia,* ²*Institute for Multidisciplinary Research, University of Belgrade, Kneza Višeslava 1, 11030 Belgrade, Serbia,* ³*University of Belgrade, Faculty of Technology and Metallurgy, Karnegijeva 4, 11120, Belgrade, Serbia,* ⁴*Serbian Academy of Sciences and Arts, Knez Mihailova 35, 11000 Belgrade, Serbia*

• **PO1.6**

Atomic Scale Investigations of 1D-2D Heterostructures

Kimmo Mustonen¹, Heena Inani¹, Viera Skakalova¹, Christoph Hofer¹, Mohammad R.A. Monazam¹, Toma Susi¹, Esko Kauppinen², Jannik C. Meyer² and Jani Kotakoski¹

¹*Faculty of Physics, University of Vienna, Boltzmanngasse 5, A-1090 Vienna, Austria,* ²*Department of Applied Physics, Aalto University School of Science, 15100, FI-00076 Aalto, Finland*

• **PO1.7**

Solubility Limits and Micro-Structural Changes Induced by Ca Content in the Ba_{1-x}Ca_xTiO₃ Perovskite-Type Particles

Ionel F. Mercioniu¹, Marjeta Maček Kržmanc², Daniela Ghica¹, Adrian V. Maraloiu¹ and Ioana D. Vlaicu¹

¹*National Institute of Materials Physics, Magurele-Ilfov, Romania,* ¹*Advanced Materials Department, Jožef Stefan Institute, Ljubljana, Slovenia*

• **PO1.8**

A Quantitative EDXS Analysis of Oxide Ceramic-Electrode Systems

Judith Lammer^{1,2}, Evelin Fisslthaler¹, Martina Dienstleder¹, Sebastian Rauch¹ and Werner Grogger^{1,2}

¹*Graz Centre for Electron Microscopy, Steyrergasse 17, 8010 Graz, Austria,* ²*Institute of Electron Microscopy and Nanoanalysis, Graz University of Technology, Steyrergasse 17, 8010 Graz, Austria*

• **PO1.9**

Comprehensive Characterization of Multiferroic BiFeO₃ Powder Fabricated by the Hydrothermal Procedure

Maria Čebela¹, Radmila Hercigonja², Milena Rosić¹, Dejan Zagorac¹, Jelena Luković¹, Jelena Zagorac¹, Dragana Jordanov¹ and Branko Matović¹

¹*Institute for Nuclear Sciences, Centre of Excellence-CextremeLab Vinca, University of Belgrade, Belgrade, Serbia,* ²*University of Belgrade, Faculty of Physical Chemistry, Serbia*

• **PO1.10**

The Effect of Particle Shape and Composition on the Electrochemical Behavior of Pt-based Nanostructured Catalysts for Fuel Cells

Mila N. Krstajić Pajić¹, Sanja I. Stevanović², Vuk V. Radmilović³, Piotr Zabinski⁴, Nevenka R. Elezović⁵, Aleksandra Gavrilović-Wohlmutter⁶, Velimir R. Radmilović^{1,7}, Snežana Lj. Gojković¹ and Vladislava M. Jovanović²

¹*Faculty of Technology and Metallurgy, University of Belgrade, Serbia,* ²*Institute for Chemistry, Technology and Metallurgy, Department of Electrochemistry, University of Belgrade, Serbia,* ³*Innovation Center, Faculty of Technology and Metallurgy, University of Belgrade, Serbia,* ⁴*AGH University of Science and Technology, Faculty of Non-Ferrous Metals, Krakow, Poland,* ⁵*Institute for Multidisciplinary Research, University of Belgrade, Serbia,* ⁶*CEST Competence Center for Electrochemical Technologies, Vienna, Austria,* ⁷*Serbian Academy of Sciences and Arts, Belgrade, Serbia*

• **PO1.11**

Formation of Ag Nanoparticles in CrN by Using Ag Ion Implantation and Thermal Annealing

Mirjana Novaković¹, Maja Popović¹, Emanuel Schmidt², Philipp Schöppe², Miodrag Mitrić¹, Nataša Bibić¹, Carsten Ronning², Zlatko Rakočević¹

¹*University of Belgrade, Institute of Nuclear Sciences VINČA, 11351, Belgrade, Serbia,* ²*Institute of Solid State Physics, Friedrich Schiller University Jena, Max-Wien-Platz 1, D-07743, Jena, Germany*

• **PO1.12**

Ion Implantation and Electron-beam Modification of Graphene

Mukesh Tripathi¹, Cong Su^{2,3}, Roman Böttger⁴, Stefan Facsko⁴, Ju Li², Juan-Carlos Idrobo⁵, Jani Kotakoski¹ and Toma Susi¹

¹*University of Vienna, Faculty of Physics, Vienna 1090, Austria,* ²*Department of Nuclear and Materials Science and Engineering, Massachusetts Institute of Technology, Cambridge MA 02139, USA,* ³*Research Lab of Electronics, Massachusetts Institute of Technology, Cambridge MA 02139, USA,* ⁴*Helmholtz-Zentrum Dresden-Rossendorf, Institute of Ion Beam Physics and Materials Research, 01314 Dresden, Germany,* ⁵*Center for Nanophase Materials Sciences, Oak Ridge National Laboratory, Oak Ridge TN 37831, USA*

• **PO1.13**

Advanced TEM Characterization of Interfaces and Strain-Related Distortions in Epitaxial Perovskite Heterostructures

Raluca F. Negrea and Corneliu Ghica

National Institute of Materials Physics, Magurele, Romania

• **PO1.14**

ABF-STEM Investigations of Taaffeite $\text{Be}_x\text{Mg}_y\text{Al}_{2(x+y)}\text{O}_{4(x+y)}$ Structures

Sandra Drev¹, Aleksander Rečnik², Matej Komelj², Christian Gspan³, Goran Dražič⁴, Vesna Šrot⁵, Miran Čeh^{1,2}, Ferdinand Hofer³, Peter A. van Aken⁵, Nina Daneu²

¹*Center for Electron Microscopy and Microanalysis, Ljubljana, Slovenia*, ²*Department for Nanostructured Materials, Jožef Stefan Institute, Ljubljana, Slovenia & Jožef Stefan International Postgraduate School, Ljubljana, Slovenia*, ³*Institute for Electron Microscopy and Nanoanalysis, Graz University of Technology, Graz, Austria* ⁴*Laboratory for Materials Chemistry, Institute of Chemistry, Ljubljana, Slovenia*, ⁵*Stuttgart Center for Electron Microscopy, Max Planck Institute for Solid State Research, Stuttgart, Germany*

• **PO1.15**

Temperature Dependent Quasimolten Crystallinity of Sub-nm Pt and Au Clusters Observed in 3D by Fast Dynamic STEM

Trond Henninen, Marta Bon, Daniele Passerone, Rolf Erni

Empa, Swiss Federal Laboratories for Materials Science and Technology, CH-8600 Dübendorf, Switzerland

• **PO1.16**

Efficient First Principles Simulation of Electron Scattering Factors for Transmission Electron Microscopy

Toma Susi¹, Jacob Madsen², Ursula Ludacka¹, Jens J. Mortensen², Timothy J. Pennycook^{1,3}, Zhongbo Lee⁴, Jani Kotakoski¹, Ute Kaiser⁴ and Jannik C. Meyer¹

¹*University of Vienna, Faculty of Physics, 1090 Vienna, Austria*, ²*Technical University of Denmark, Department of Physics, Kgs. Lyngby, Denmark*, ³*Max Planck Institute for Solid State Research, Center for Electron Microscopy, Stuttgart, Germany*, ⁴*Ulm University, Electron Microscopy Group of Materials Sciences, Ulm, Germany*

• **PO1.17**

HRTEM and HAADF-STEM Study of Translation States and Cation Ordering on Basal Plane Inversion Boundaries in ZnO with III+, VI+ and V+ Dopants

Vesna Ribić¹, Aleksander Rečnik², Goran Dražič³, Zorica Branković¹, Goran Branković¹ and Nina Daneu⁴

¹*Institute for Multidisciplinary Research, University of Belgrade, Belgrade, Serbia*, ²*Department for Nanostructured Materials, Jožef Stefan Institute, Ljubljana, Slovenia*, ³*Department of Materials Chemistry, National Institute of Chemistry, Ljubljana, Slovenia*, ⁴*Advanced Materials Department, Jožef Stefan Institute, Ljubljana, Slovenia*

• **PO1.18**

Study of Ge and SiGe Nanoparticles Formed by RTA and Laser Pulse Annealing of SiGeO Amorphous Films Obtained by RF Sputtering

Valentin S. Teodorescu¹, Adrian V. Maraloiu¹, Corneliu Ghica¹, Andrei Kuncser¹,

Ionel Stavarache¹, Ana-Maria Lepadatu¹, Magdalena L. Ciurea¹, Nicu D. Scarisoreanu², Andreea Andrei² and Maria Dinescu²

¹National Institute for Materials Physics, Bucharest-Magurele, Romania, ²National Institute for Lasers, Plasma and Radiation, Bucharest-Magurele, Romania

• **PO1.19**

Study of Structural Defects in Ga_{2-x}Fe_xO₃ Thin Layers

Corinne Bouillet¹, Xavier Devaux², Anna Demchenko¹, Christophe Lefevre¹, François Roulland¹, Nathalie Viart¹

¹Institut de Physique et Chimie des Matériaux de Strasbourg (IPCMS), UMR 7504 CNRS, Université de Strasbourg, 23 rue du Læss BP 43, 67034 Strasbourg, France,

²Institut Jean Lamour, UMR 7198 CNRS-Université de Lorraine, Campus ARTEM 2, allée André Guinier, BP 50840 F54011 NANCY Cedex, France

• **PO1.20**

Analysis of Coatings With Scented Microcapsules

Rastko Milošević¹, Nemanja Kašiković¹, Živko Pavlović¹, Urška Stanković Elesini², Tomislav Cigula³ and Raša Urbas²

¹University of Novi Sad, Faculty of Technical Sciences, Department of Graphic Engineering and Design, Novi Sad, Serbia, ²University of Ljubljana, Faculty of Natural Sciences and Engineering, Department of Textiles, Graphic Arts and Design, Ljubljana, Slovenia, ³University of Zagreb, Faculty of Graphic Arts, Department of Printing Plates, Zagreb, Croatia

• **PO1.21**

Potentials, Implementation and Perspectives of Atomic Force Microscopy for Characterization of Drug Delivery Nanosystems

Ines Nikolic¹, Danijela Randjelovic², Snezana Savic¹

¹University of Belgrade, Faculty of Pharmacy, Department of Pharmaceutical Technology and Cosmetology, Belgrade, Serbia, ²University of Belgrade, Institute of Chemistry, Technology and Metallurgy, Department of Microelectronic Technologies, Belgrade, Serbia

• **PO1.22**

Epitaxial Growth of Metastable (P-type) Al–Mn–Si Quasicrystal from the Stable (F-type) Al–Cu–Fe Quasicrystalline Surface

Blaž Leskovar¹, Sašo Šturm², Zoran Samardžija², Bojan Ambrožič², Boštjan Markoli¹, Iztok Naglič¹

¹University of Ljubljana, Faculty of Natural Sciences and Engineering, Department of Materials and Metallurgy, Aškerčeva cesta 12, 1000 Ljubljana, Slovenia, ²Jožef Stefan Institute, Department for Nanostructured Materials, Jamova cesta 39, 1000 Ljubljana, Slovenia

• **PO1.23**

Morphology and Structure of TiO₂ Thin Films and Nanostructures Deposited on ZnO Nanorods for Photovoltaic Application

Andreja Gajović¹, Ivana Panžić¹, Krunoslav Juraić¹, Nikša Krstulović², Domagoj Belić¹, Milivoj Plodinec^{1,3}, Davor Gracin¹, Ana Šantić¹, Marc Gregor Willinger³

¹*Ruder Bošković Institute, Bijenička 54, 10000 Zagreb, Croatia*, ²*Institute of Physics, Zagreb, Croatia*, ³*Fritz Haber Institute of Max Planck Society, Berlin, Germany*

• **PO1.24**

Mapping Twins in B₄C using ASTAR Electron Precession System on Transmission Electron Microscope

Andrei C. Kuncser¹, Corneliu Ghica¹, Ionel Mercioniu¹, Oleg Vasylykiv² and Petre Badica³

¹*National Institute of Materials Physics, Laboratory of Atomic Structures and Defects in Advanced Materials, Magurele, Romania*, ²*National Institute of Materials Science, Tsukuba, Ibaraki, Japan*, ³*National Institute of Materials Physics, Laboratory of Magnetism and Superconductivity, Magurele, Romania*

• **PO1.25**

Influence of Zr Concentration on the Morphology and Structure of BaTi_{1-y}Zr_yO₃ Particles

Valentin A. Maraloiu¹, Ioana D. Vlaicu¹, Marjeta M. Maček Kržmanc², Ionel Mercioniu¹ and Daniela Ghica¹

¹*National Institute of Materials Physics, 405A Atomistilor Str., 077125 Magurele-IIfov, Romania*, ²*Advanced Materials Department, Jožef Stefan Institute, Jamova cesta 39, Ljubljana 1000, Slovenia*

• **PO1.26**

From Titania to Titanates: Phase and Morphological Transition

Bojana Simović¹, Aleksandra Dapčević², Jelena Zdravković³, Jugoslav Krstić⁴ and Goran Branković¹

¹*Institute for Multidisciplinary Research, University of Belgrade, Belgrade, Serbia*, ²*Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia*, ³*Innovation Centre Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia*, ⁴*Institute of Chemistry, Technology and Metallurgy, Department of Catalysis and Chemical Engineering, University of Belgrade, Belgrade, Serbia*

• **PO1.27**

Sunlight-driven Photocatalytic and Photo-electrochemical Activity of ZnO/SnO₂ Composite

Smilja Marković¹, Ivana Stojković Simatović², Ana Stanković¹, Srečo Škapin³, Lidiya Mančić¹, Slavko Mentus^{2,4} and Dragan Uskoković¹

¹*Institute of Technical Sciences of SASA, Belgrade, Serbia*, ²*University of Belgrade*,

Faculty of Physical Chemistry, Belgrade, Serbia, ³Institute Jožef Stefan, Ljubljana, Slovenia, ⁴Serbian Academy of Sciences and Arts, Knez Mihajlova 35, 11000 Belgrade, Serbia

• **PO1.28**

Synthesis and Characterization of Na_{0.4}MnO₂ as a Positive Electrode Material for an Aqueous Electrolyte Sodium-ion Energy Storage Device

Lazar Rakočević¹, Mirjana Novaković², Jelena Potočnik², Dragana Jugović³ and Ivana Stojković Simatović¹

¹*University of Belgrade, Faculty of Physical Chemistry, Belgrade, Serbia, ²University of Belgrade, Vinča Institute of Nuclear Sciences, Serbia, ³Institute of Technical Sciences of SASA, Belgrade, Serbia*

• **PO1.29**

Metal Nanoparticles-PANI Nanocomposites and their Applications

Una Stamenović¹, Vesna Vodnik¹ and Mojca Otoničar²

¹*Vinča Institute of Nuclear Sciences, University of Belgrade, P. O. Box 522, 11001 Belgrade, Serbia, ²Jožef Štefan Institute, Department of Advanced Materials, Jamova 39, 1000 Ljubljana, Slovenia*

• **PO1.30**

Morphology of Nanotubular Oxide Layer Formation on Titanium and Titanium Alloy Using Electrochemical Anodization

Dragana R. Barjaktarević¹, Ivana D. Dimić¹, Ivana Lj. Cvijović-Alagić², Veljko R. Đokić¹ and Marko P. Rakin¹

¹*Faculty of Technology and Metallurgy, University of Belgrade, Karnegijeva 4 11120 Belgrade, Serbia, ²Institute of Nuclear Sciences "Vinča", University of Belgrade, P.O. Box 522, 11001, Belgrade, Serbia*

• **PO1.31**

Depth Analysis of Thin Films Using StrataGem Program

Jelena Potočnik, Maja Popović, Mirjana Novaković, Davor Peruško, Zlatko Rakočević *University of Belgrade, INN Vinča, Mike Petrovića Alasa 12-14, 11351 Belgrade, Serbia*

• **PO1.32**

Improvement of Density and Influence of Sb Doping on Structural Properties of Perovskite BaSnO₃

Jelena Vukašinović¹, Milica Počuča-Nešić¹, Danijela Luković Golić¹, Slavica M. Savić², Zorica Branković¹, Nikola Tasić¹, Aleksandra Dapčević³, Slavko Bernik⁴, Matej Kocen⁴ and Goran Branković¹

¹*Institute for Multidisciplinary Research, University of Belgrade, Belgrade, Serbia, ²Biosense Institute, University of Novi Sad, Novi Sad, Serbia, ³Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia, ⁴Jožef Stefan Institute, Ljubljana, Slovenia*

• **PO1.33**

Perovskite Thin Films in Tunable Microwave Technologies

Jelena Vukmirovic¹, Elvira Djurdjic², Andrea Nesterovic¹, Ante Bilusic³, Zeljka Cvejic² and Vladimir V. Srdic¹

¹*Department of Materials Engineering, Faculty of Technology, Novi Sad, Serbia,*
²*Department of Physics, Faculty of Sciences, Novi Sad, Serbia,* ³*Department of Physics, Faculty of Science, University of Split, Croatia*

• **PO1.34**

Synthesis, Structure, Morphology and Properties of Biphasic ZnO–ZnMn₂O₄

Lidija Radovanović¹, Predrag Vulić², Željko Radovanović¹, Bojana Balanč¹, Bojana Simović³, Ivana Zeković⁴, Miroslav Dramićanin⁴ and Jelena Rogan⁵

¹*Innovation Center of the Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia,* ²*Faculty of Mining and Geology, Department of Crystallography, Petrology and Geochemistry, University of Belgrade, Belgrade, Serbia,*
³*Institute for Multidisciplinary Research, University of Belgrade, Belgrade, Serbia,*
⁴*Vinča Institute of Nuclear Sciences, University of Belgrade, Belgrade, Serbia,* ⁵*Faculty of Technology and Metallurgy, Department of General and Inorganic Chemistry, University of Belgrade, Belgrade, Serbia*

POSTER SESSION 2

Tuesday, August 28th, 2018, 14:00-16:00h

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• PO2.1

Electron Microscopy Characterization of TiO₂ Nanotubes Sensitized with CdS Quantum Dots

Andjelika Bjelajac¹, Rada Petrović², Veljko Djokic², Kassioqe Dembele³, Simona Moldovan^{3,4}, Ovidiu Ersen³, Gabriel Socol⁵, Ion N. Mihailescu⁵, Djordje Janačković²
¹University of Belgrade, Innovation center of Faculty of Technology and Metallurgy, Karnegijeva 4, 11000 Belgrade, Serbia, ²University of Belgrade, Faculty of Technology and Metallurgy, Karnegijeva 4, 11000 Belgrade, Serbia, ³Institut de Physique et Chimie des Materiaux de Strasbourg, UMR 7504CNRS - Université de Strasbourg, 23 rue du Loess, BP 43, 67037 Strasbourg cedex 02, France, ⁴Groupe de Physique des Matériaux UMR CNRS 6634, Université de Rouen, INSA Rouen, Avenue de l'Université – BP12, 76801 Saint Etienne du Rouvray, France, ⁵National Institute for Lasers, Plasma, and Radiation Physics, Lasers Department, "Laser-Surface-Plasma Interactions" Laboratory, PO Box MG-54, RO- 77125, Magurele, Ilfov, Romania

• PO2.2

Cathodically Protonated TiO₂ Nanotube Arrays Decorated with Pd Nanoparticles as Highly Efficient and Stable Electrocatalysts for the Hydrogen Evolution Reaction

Uroš Lačnjevac¹, Rastko Vasilić², Tomasz Tokarski³, Grzegorz Cios³, Piotr Żabiński⁴, Nevenka Elezović¹ and Nedeljko Krstajić^{5†}
¹Institute for Multidisciplinary Research, University of Belgrade, Kneza Višeslava 1, 11030 Belgrade, Serbia, ²Faculty of Physics, University of Belgrade, Studentski trg 12-16, 11000 Belgrade, Serbia, ³Academic Centre for Materials and Nanotechnology, AGH University of Science and Technology, al. A. Mickiewicza 30, 30-059 Krakow, Poland, ⁴Faculty of Non-Ferrous Metals, AGH University of Science and Technology, al. A. Mickiewicza 30, 30-059 Krakow, Poland, ⁵Faculty of Technology and Metallurgy, University of Belgrade, Karnegijeva 4, 11000 Belgrade, Serbia

• PO2.3

Elemental Mapping in (Alpha2/O)-Phase Lamellae of a Gamma-TiAl Alloy

Heike Gabrisch¹, Tobias Krekeler², Uwe Lorenz¹, Marcus Willi Rackel¹, Martin Ritter¹, Florian Pyczak¹ and Andreas Stark¹

¹Helmholtz-Zentrum Geesthacht, Department of Metal Physics, Max-Planck-Str.1, 21502 Geesthacht, Germany, ²Technische Universität Hamburg, Betriebseinheit Elektronenmikroskopie BEEM, Eißendorfer Straße 42, 21073 Hamburg, Germany

• **PO2.4**

Various Structures of ZnO Grown by Vapor - Liquid - Solid Method

Danilo D. Kisić, Miloš T. Nenadović, Jelena M. Potočnik and Zlatko Lj. Rakočević
University of Belgrade, Vinča Institute of Nuclear Sciences, Laboratory of Atomic Physics, Belgrade, Serbia

• **PO2.5**

Influence of Generation Time on Optical Properties of Gold Nanoparticles

Nataša Nastić, Jaroslava Švarc-Gajić and Zorica Stojanović
Department of Applied and Engineering Chemistry, Faculty of Technology, University of Novi Sad, Novi Sad, Serbia

• **PO2.6**

Problems in Obtaining High-Density, Pure-Phase BiFeO₃ Ceramics

Nikola I. Ilić, Jelena D. Bobić, Adis S. Džunuzović, Mirjana M. Vijatović Petrović and Biljana D. Stojanović
Institute for Multidisciplinary Research, University of Belgrade, Materials Science Department, Belgrade, Serbia

• **PO2.7**

Synthesis, Calcination and Characterization of CoMoO₄ Nanopowders by GNP Method

Milena Rosić¹, Dejan Zagorac¹, Maria Čebela¹, Dragana Jordanov¹, Jelena Zagorac¹, Jelena Luković¹, Aleksandra Zarubica² and Branko Matović¹
¹Institute for Nuclear Sciences, Centre of Excellence-CextremeLab Vinca, University of Belgrade, Belgrade, Serbia, ²Department of Chemistry, Faculty of Science and Mathematics, University of Niš, Višegradska 33, 18000 Niš, Serbia

• **PO2.8**

Polyacrilic Acid and Chitosan Assisted Solvothermal Synthesis of Up-converting NaYF₄: Yb,Er Particles

Marina Vuković¹, Ivana Dinić¹, Lidija Mančić², Marko Nikolić³, Mihailo Rabasović³ and Olivera Milošević²
¹Innovation Center of the Faculty of Chemistry, University of Belgrade, Serbia, ²Institute of Technical Sciences of SASA, Belgrade, Serbia, ³Photonic Center, Institute of Physics Belgrade, University of Belgrade, Belgrade, Serbia

• **PO2.9**

Alkali Activated Slag as Adsorbents for Cu²⁺ Removal from Wastewaters

Irena Nikolić^{1,2}, Dijana Đurović², Ivana Milašević², Smilja Marković³, Ljiljana Veselinović³, Vuk V. Radmilović⁴, Ivona Janković-Častvan⁵, Velimir R. Radmilović^{5,6}
¹University of Montenegro, Faculty of Metallurgy and Technology, Podgorica, Montenegro, ²Institute of Public Health of Montenegro, Podgorica, Montenegro, ³Institute of Technical Sciences of SASA, Belgrade, Serbia, ⁴Innovation Centre, Faculty

of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia, ⁶Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia, ⁷Serbian Academy of Sciences and Arts, Belgrade, Serbia

• **PO2.10**

Nanostructured Boehmite Powders as Efficient Absorbent in Water Treatments

Marija Milanović¹, Ivan Stijepović¹, Vesna Vasić², Dragana Kukić², Marina Šćiban²

¹University of Novi Sad, Faculty of Technology, Department of Materials Engineering, Bulevar cara Lazara 1, 21000 Novi Sad, Serbia, ²University of Novi Sad, Faculty of Technology, Department of Biotechnology and Pharmaceutical Engineering, Bulevar cara Lazara 1, 21000 Novi Sad, Serbia

• **PO2.11**

The Effect of Alkaline Activator Molarity and Aging Time on the Structure of Inorganic Polymer

Marija Ivanović¹, Ljiljana Kljajević¹, Jelena Gulicovski¹, Bratislav Todorović², Adela Egelja¹, Vladimir Pavlović³ and Snežana Nenadović¹

¹Institute of Nuclear Sciences Vinča, Department of Materials Science, University of Belgrade, Serbia, ²Faculty of Technology of Leskovac, University of Niš, Serbia, ³Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Knez Mihailova 35/IV, University of Belgrade, 11000 Belgrade, Serbia

• **PO2.12**

SEM-EDS and AFM Study of a Novel Magnetic Polymer/Bentonite Nanocomposite

Bojana M. Marković¹, Ivan S. Stefanović¹, Jasna V. Džunuzović¹, Danijela V. Randelović¹, Bojan Kostić², Aleksandra B. Nastasović¹

¹University of Belgrade, Institute of Chemistry, Technology and Metallurgy, Njegoševa 12, Belgrade, Serbia, ²University of Belgrade, Faculty of Mining and Geology, Đušina 7, 11000 Belgrade, Serbia

• **PO2.13**

Ultra-fine Grained Structure and Fracture Mode in Low Carbon Steel Subjected to Severe Plastic Deformation

Marko Vilotić, Leposava Šidjanin and Dragan Rajnović

Department of Production Engineering, Faculty of Technical Sciences, University of Novi Sad, Novi Sad, Serbia

• **PO2.14**

Microstructure of Nanolayered CrAlN/TiSiN Coating

Aleksandar Miletić¹, Peter Panjan², Miha Čekada², Lazar Kovačević¹, Pal Terek¹ and Branko Škorić¹

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

• **PO2.15**

Synthesis and Characterization of MnCo₂O₄ Porous Spinel Oxide

Vesna Antunović¹, Dijana Jelić¹, Zoran Nedić², Marija Ilić³, Aleksandar Lolić⁴

¹*Department of Pharmacy, Faculty of Medicine, University of Banja Luka, Banja Luka, Bosnia and Herzegovina,* ²*Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia,* ³*Faculty of Mining and Geology, University of Belgrade, Belgrade, Serbia,* ⁴*Faculty of Chemistry, University of Belgrade, Belgrade, Serbia*

• **PO2.16**

Fabrication of NiFe₂O₄ Nanofibers/Net Via Combined Sol-Gel and Electrospinning Method

Aleksandar Grujić¹, Vladan Ćosović¹, Jasna Stajić-Trošić¹, Aleksandar Ćosović², Mirko Stijepović² and Tomáš Žák³

¹*Institute of Chemistry, Technology and Metallurgy, University of Belgrade, Belgrade, Serbia,* ²*Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia,* ³*Institute of Physics of Materials of the Czech Academy of Sciences, Brno, Czech Republic*

• **PO2.17**

TiO₂ Nanoparticle Deposition on Solid CP-Ti Substrate through Spraying Water Colloid in the Arc Plasma

Vladimir Pavkov¹, Milovan M. Stoilković², Vesna M. Maksimović¹, Ivana Lj. Cvi-jović-Alagić¹, Jovan Ciganović² and Mila R. Vranješ³

¹*Laboratory of Material Science, Vinča Institute of Nuclear Sciences, University of Belgrade, Belgrade, Serbia,* ²*Laboratory of Physical Chemistry, Vinča Institute of Nuclear Sciences, University of Belgrade, Belgrade, Serbia,* ³*Laboratory of Radiation Chemistry and Physics-Gamma, Vinča Institute of Nuclear Sciences, University of Belgrade, Belgrade, Serbia*

• **PO2.18**

Bioactive Hydroxyapatite/Chitosan/Gentamicin Composite Coating Electrodeposited on Titanium

Milena Stevanović¹, Marija Đošić², Ana Janković¹, Maja Vukašinović-Sekulić³, Vesna Kojić⁴ and Vesna Mišković-Stanković³

¹*Innovation center of Faculty of Technology and Metallurgy, Karnegijeva 4, Belgrade, Serbia,* ²*Institute for Technology of Nuclear and Other Mineral Raw Materials, Bulevar Franš d'Eperea 86, Belgrade, Serbia,* ³*Faculty of Technology and Metallurgy, University of Belgrade, Karnegijeva 4, Belgrade, Serbia,* ⁴*Faculty of Medicine, Oncology Institute of Vojvodina, University of Novi Sad, Dr Goldmana 4, Sremska Kamenica, Serbia*

• **PO2.19**

Electrochemical Deposition of Ni in the Liquid Cell: Groundwork Experimental Approach Prior to LC TEM Experiments

Maja Koblar^{1,3}, Kristina Žužek Rožman², Sašo Šturm³, Miran Čeh^{1,2}

¹*Center for Electron Microscopy and Microanalysis (CEMM), Jožef Stefan Institute, Jamova 39, 1000 Ljubljana, Slovenia,* ²*Department for Nanostructured Materials (K7), Jožef Stefan Institute, Jamova 39, 1000 Ljubljana, Slovenia,* ³*Jožef Stefan International Postgraduate School, Jamova 39, 1000 Ljubljana, Slovenia*

• **PO2.20**

Characterization Of Composite Polymer Membranes Modified By Electrospinning Method

Lana Putić¹, Jasna Stajić-Trošić¹, Branka Pilić², Vladan Čosović¹, Aleksandar Grujić¹

¹*Institute of Chemistry, Technology and Metallurgy, University of Belgrade, Belgrade, Serbia,* ²*Faculty of Technology, University of Novi Sad, Novi Sad, Serbia*

• **PO2.21**

Morphology of Poly(urethane-siloxane)/Montmorillonite Nanocomposites

Ivan S. Stefanović, Bojana M. Marković, Aleksandra B. Nastasović, Marija V. Pergal and Jasna V. Džunuzović

Institute of Chemistry, Technology and Metallurgy, Center of Chemistry, University of Belgrade, Njegoševa 12, 11000 Belgrade, Serbia

• **PO2.22**

Morphology, Biocompatibility and Antimicrobial Activity of Hydroxyapatite Simultaneously Doped with Silver and Strontium Ions

Djordje Veljovic¹, Zeljko Radovanovic¹, Suzana Dimitrijevic-Brankovic¹, Vesna Kojic², Rada Petrovic¹ and Djordje Janackovic¹

¹*University of Belgrade, Faculty of Technology and Metallurgy, Department of Inorganic Chemical Technology, Karnegijeva 4, 11120 Belgrade, Serbia,* ²*University of Novi Sad, Faculty of Medicine, Oncology Institute of Vojvodina, Put Dr Goldmana 4, 21204 Sremska Kamenica, Serbia*

• **PO2.23**

Nanocomposite Hydrogels Based on Poly(vinyl alcohol) and Chitosan with Silver Nanoparticles and Graphene Aimed for Wound Dressing Applications

Katarina Nešović¹, Ana Janković¹, Maja Vukašinović-Sekulić², Aleksandra Perić-Grujić² and Vesna Mišković-Stanković²

¹*Innovation center of the Faculty of Technology and Metallurgy, Karnegijeva 4, Belgrade, Serbia,* ²*Faculty of Technology and Metallurgy, University of Belgrade, Karnegijeva 4, Belgrade, Serbia*

• **PO2.24**

Bacteria-Based Self-Healing System for Concrete Structures

Snežana Vučetić¹, Andrijana Sever Škapin², John M. van der Bergh², Bojan Miljević¹, Ivan Ristić¹, Siniša Markov³, Ana Vidaković³, Olja Šovljanski³ and Jonjaua Ranogajec¹

¹University of Novi Sad, Faculty of Technology, Dept. of Materials Engineering, Novi Sad, Serbia, ²Slovenian National Building and Civil Engineering Institute, Ljubljana, Slovenia, ³University of Novi Sad, Faculty of Technology, Dept. of Biotechnology and Pharmaceutical Engineering, Novi Sad, Serbia

• **PO2.25**

Processing and Characterization of Hydroxyapatite/tricalcium Phosphate Biomaterials for Obtaining Scaffolds

Željko Radovanović¹, Saša Vasilijić², Djordje Veljović³, Ivona Janković-Častvan³, Slavica Lazarević³, Rada Petrović³, Djordje Janačković³

¹University of Belgrade, Innovation Center of the Faculty of Technology and Metallurgy, Karnegijeva 4, Belgrade 11070, Serbia, ²University of Defense, Institute for Medical Research Military Medical Academy, Faculty of Medicine of Military Medical Academy, Crnotravska 17, Belgrade 11000, Serbia, ³University of Belgrade, Faculty of Technology and Metallurgy, Karnegijeva 4, Belgrade 11070, Serbia

• **PO2.26**

Synthesis of Phosphate Based Bioactive Glass-ceramics Scaffolds

Vladimir S. Topalović¹, Srđan D. Matijašević¹, Jelena D. Nikolić¹, Marija S. Đošić¹, Veljko V. Savić¹, Sonja V. Smiljanić², Snežana R. Grujić²

¹Institute for the Technology of Nuclear and Other Mineral Raw Materials, 86 Franchet d'Esperey St, 11000 Belgrade, Serbia, ²Faculty of Technology and Metallurgy, University of Belgrade, Karnegijeva 4, 11000 Belgrade, Serbia

• **PO2.27**

Assessment of Three Microscopic Techniques in Observing Morphology of Pygidial Glands of Ground Beetles

Marija Nenadić¹, Aleksandar Krmpot², Nikola Vesović¹, Mihailo Rabasović², Srećko Ćurčić¹, Danica Pavlović², Vesna Lačković³, Svetlana Savić-Šević² and Dejan Pantelić²

¹Institute of Zoology, University of Belgrade-Faculty of Biology, Belgrade, Serbia, ²Institute of Physics, University of Belgrade, Belgrade, Serbia, ³Institute of Histology and Embryology "Aleksandar Đ. Kostić", University of Belgrade - Faculty of Medicine, Belgrade, Serbia

• **PO2.28**

Electron Tomography Analysis of Human Islet Amyloid Polypeptide Crystalline Structures in *Drosophila Melanogaster*

Ling Xie¹, Xiaohong Gu², Kenta Okamoto³, Gunilla T Westermark² and Klaus Leifer¹

¹Department of Engineering Sciences, Applied Materials Sciences, Uppsala University, SE-75121, Uppsala, Sweden, ²Department of Medical Cell Biology, Uppsala University, SE-75123, Uppsala, Sweden, ³Department of Biology Physics, Uppsala University, SE-75123, Uppsala, Sweden

• **PO2.29**

Metformin and Itraconazole Combination is Effective Against Fibrosarcoma in Hamsters

Kosta J. Popović¹, Dušica J. Popović², Dušan Lalošević², Dejan Miljković², Ivan Čapo², Jovan K. Popović³

¹Department of Pharmacy, Faculty of Medicine, University of Novi Sad, Novi Sad, Republic of Serbia, ²Department of Histology and Embryology, Faculty of Medicine, University of Novi Sad, Novi Sad, Republic of Serbia, ³Department of Pharmacology, Toxicology and Clinical Pharmacology, Faculty of Medicine, University of Novi Sad, Novi Sad, Republic of Serbia

• **PO2.30**

Synergistic Anticancer Interaction of Metformin and Caffeine on Fibrosarcoma in Hamsters

Dušica J. Popović¹, Dušan Lalošević¹, Dejan Miljković¹, Kosta J. Popović², Ivan Čapo¹, Jovan K. Popović³

¹Department of Histology and Embryology, Faculty of Medicine, University of Novi Sad, Novi Sad, Republic of Serbia, ²Department of Pharmacy, Faculty of Medicine, University of Novi Sad, Novi Sad, Republic of Serbia, ³Department of Pharmacology, Toxicology and Clinical Pharmacology, Faculty of Medicine, University of Novi Sad, Novi Sad, Republic of Serbia

• **PO2.31**

Differential Polarization Laser Scanning Microscopy (DP-LSM) - Technique for Rapid Screening of Cell Walls of Different Plant Species

Jasna Simonović Radosavljević¹, Daniela Djikanović¹, Gabor Steinbach², Aleksandra Lj. Mitrović¹, Jelena Bogdanović Pristov¹, Győző Garab³, Ksenija Radotić¹

¹Institute for multidisciplinary study, University of Belgrade, Kneza Višeslava 1, 11000 Belgrade, Serbia, ²Institute of Biophysics, Biological Research Center, Szeged 6701, Hungary, ³Institute of Plant Biology, Biological Research Center, Szeged 6701, Hungary

• **PO2.32**

Transmission Electron Microscopy in Evaluation of Curcumin Nanoparticles Cellular Uptake

Tamara Kravic-Stevovic¹, Tamara Martinovic¹, Darko Ciric¹, Verica Paunovic², Biljana Ristic², Zoran Markovic³, Biljana Todorovic-Markovic⁴, Milica Kosic², Jovana Prekodravac⁴, Matej Micusik³, Zdeno Spitalsky³, Vladimir Trajkovic², Ljubica Harhaji-Trajkovic⁵ and Vladimir Bumbasirevic¹

¹*Institute of Histology and Embryology, School of Medicine, University of Belgrade, Visegradska 26, Belgrade 11000, Serbia*, ²*Institute of Microbiology and Immunology, School of Medicine, University of Belgrade, Dr Subotica 1, Belgrade 11000, Serbia*, ³*Polymer Institute, Slovak Academy of Sciences, Dubravska cesta 9, 84541 Bratislava, Slovakia*, ⁴*Vinca Institute of Nuclear Sciences, University of Belgrade, P.O. Box 522, Mike Petrovica Alasa 12-14, Belgrade 11001, Serbia*, ⁵*Institute for Biological Research "Sinisa Stankovic", University of Belgrade, Despot Stefan Blvd. 142, Belgrade 11000, Serbia*

• **PO2.33**

Polyethylene Glycol Coated Gold Nanoparticles Nerve Tissue Uptake After Spinal Cord Injury

Tamara Martinovic¹, Darko Ciric¹, Tamara Kravic-Stevovic¹, Florentia Papastefanaki², Igor Jakovcevski^{3,4}, Nafsika Poulia², Nevena Djogo³, Florian Schulz⁵, Gabrielle Loers³, Tobias Vossmeier⁵, Horst Weller^{5,6}, Melitta Schachner⁷, Rebecca Matsas² and Vladimir Bumbasirevic¹

¹*Institute of Histology and Embryology, School of Medicine, University of Belgrade, Visegradska 26, Belgrade 11000, Serbia*, ²*Laboratory of Cellular and Molecular Neurobiology, Hellenic Pasteur Institute, 127 Vassilissis Sofias Avenue, 11521 Athens, Greece*, ³*Zentrum für Molekulare Neurobiologie, Universitätsklinikum Hamburg-Eppendorf, Universität Hamburg, Martinistrasse 52, 20246 Hamburg, Germany*, ⁴*Experimental Neurophysiology, University Hospital Cologne, Joseph-Stelzmann-Str. 9, 50931 Köln, Germany*; *German Center for Neurodegenerative Diseases, Ludwig-Erhard-Allee 2, 53175 Bonn, Germany*, ⁵*Institut für Physikalische Chemie, Universität Hamburg, Grindelallee 117, 20146 Hamburg, Germany*, ⁶*Department of Chemistry, Faculty of Science, King Abdulaziz University, Jeddah, Saudi Arabia*, ⁷*Center for Neuroscience, Shantou University Medical College, 22 Xin Ling Road, Shantou, Guandong 515041, People's Republic of China*

• **PO2.34**

Ultrastructural Analysis of Large Graphene Quantum Dots Internalization in Hepatocytes

Darko Ciric¹, Tamara Martinovic¹, Tamara Kravic-Stevovic¹, Vladislav Volarevic², Verica Paunovic³, Zoran Markovic⁴, Bojana Simovic Markovic², Maja Misir-

kić-Marjanović^{3,5}, Biljana Todorović- Marković⁴, Sanja Bojić², Ljubica Vučićević^{3,5}, Svetlana Jovanović⁴, Nebojša Arsenijević², Ivanka Holclajtner-Antunović⁶, Momir Milosavljević⁴, Miroslav Dramićanin⁴, Miodrag L. Lukić², Vladimir Trajković³ and Vladimir Bumbasirević¹

¹*Institute of Histology and Embryology, School of Medicine, University of Belgrade, Visegradska 26, Belgrade 11000, Serbia,* ²*Centre for Molecular Medicine and Stem Cell Research, Faculty of Medical Sciences, University of Kragujevac, 69 Svetozara Markovića St., 34000 Kragujevac, Serbia,* ³*Institute of Microbiology and Immunology, School of Medicine, University of Belgrade, Dr Subotića 1, Belgrade 11000, Serbia,* ⁴*Vinča Institute of Nuclear Sciences, University of Belgrade, P.O. Box 522, Mike Petrovića Alasa 12-14, Belgrade 11001, Serbia,* ⁵*Institute for Biological Research "Sinisa Stanković", University of Belgrade, Despot Stefan Blvd. 142, Belgrade 11000, Serbia,* ⁶*Faculty of Physical Chemistry, University of Belgrade, Studentski trg 12-16, 11000 Belgrade, Serbia*

Problems in Obtaining High-Density, Pure-Phase BiFeO₃ Ceramics

*Nikola I. Ilić, Jelena D. Bobić, Adis S. Džunuzović,
Mirjana M. Vijatović Petrović and Biljana D. Stojanović*

*Institute for Multidisciplinary Research, University of Belgrade,
Materials Science Department, Belgrade, Serbia*

Multiferroic materials exhibit at least two of the so-called ferroic properties (ferroelectric, (anti)ferromagnetic and ferroelastic) in the same time. They are very interesting from the theoretical point of view because of a different nature of those properties, but coupling between the properties opens up huge possibilities for application as magnetoresistors, memory devices, sensors and many other devices [1]. Being ferroelectric up to 830 °C and antiferromagnetic (weakly ferromagnetic) up to 370 °C, bismuth ferrite (BiFeO₃) is one of the very few room-temperature single-phase multiferroic materials and one of the most studied ceramic materials in the last two decades. BiFeO₃ has also good potential to be used as a pigment, catalyst, photocatalyst or solar cell material [1,2].

However, because of specific obstacles in obtaining pure, dense and highly resistive ceramics, harnessing of those properties is still far from being achieved and the possibility of its application as a multiferroic material is arguable. High volatility of bismuth above 800 °C and thermodynamic instability of BiFeO₃ between 447 °C and 767 °C make the densification of BiFeO₃ ceramics very difficult, especially by conventional methods. High leakage currents in BiFeO₃ (originating mostly from oxygen and bismuth vacancies) disable ceramic samples to be polarized and to exhibit ferroelectric properties. Spiral structure of magnetic moments lowers the coupling between ferroelectric and magnetic orders [3,4].

BiFeO₃ ceramic materials presented in this study were synthesized by auto-combustion method with idea to lower the temperature needed for effective sintering in order to prevent volatilisation and improve the density and phase composition. Auto-combustion is a type of sol-gel route which enables high homogeneity in solutions stabilized by organic compounds, which oxidize vigorously producing

the ash powders as a wanted product. Because of such fast reaction, the defects are incorporated into structure enabling solid state sintering to take place at lower temperatures and more quickly. Presented microstructures are illustrating the usual problems that occur during the synthesis of powders and processing of ceramic materials. Powders tend to agglomerate, and although the agglomerates can be destroyed by milling (Figure 1), this process often disturbs the phase composition of ceramics synthesized from the milled powders. Because of a wide range of temperatures at which bismuth evaporates and secondary phases form, it is important to conduct heating and cooling of samples very fast (quenching), but even this way some secondary phases are formed (Figure 2) and densification is not complete (Figure 3).

The study presents the evolution of the mentioned problems during attempts to overcome them by modification of the synthesis conditions, by using different treatments of the powders and by modification of the sintering process.

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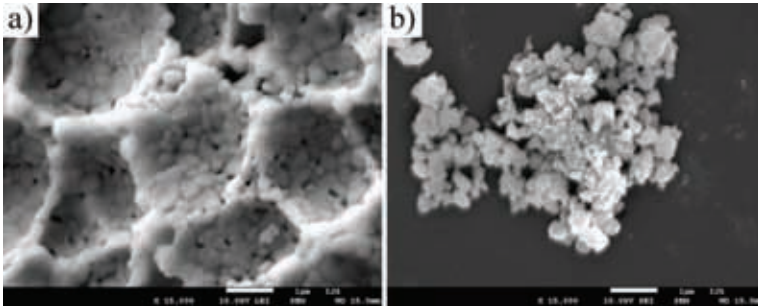


Figure 1. Microstructure of as prepared (a) and milled (b) BiFeO_3 powder.

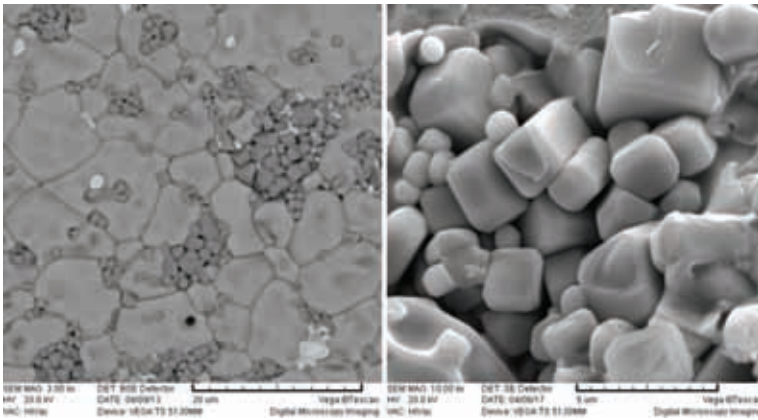


Figure 2. Secondary phases in BiFeO_3 ceramic samples.

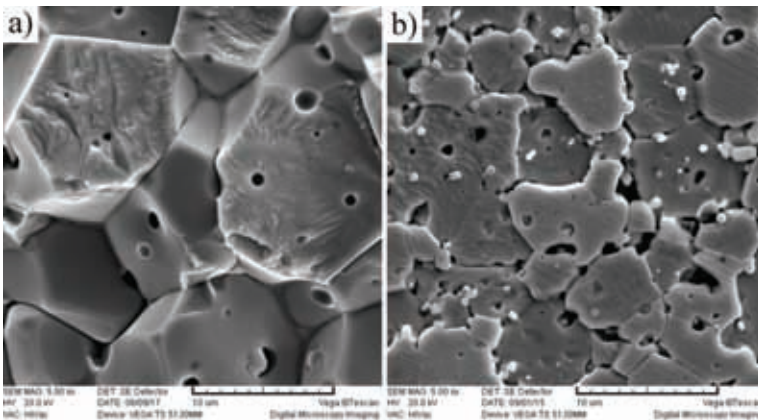


Figure 3. Porosity in BiFeO_3 ceramic samples: a) fracture, b) polished and chemically etched surface.