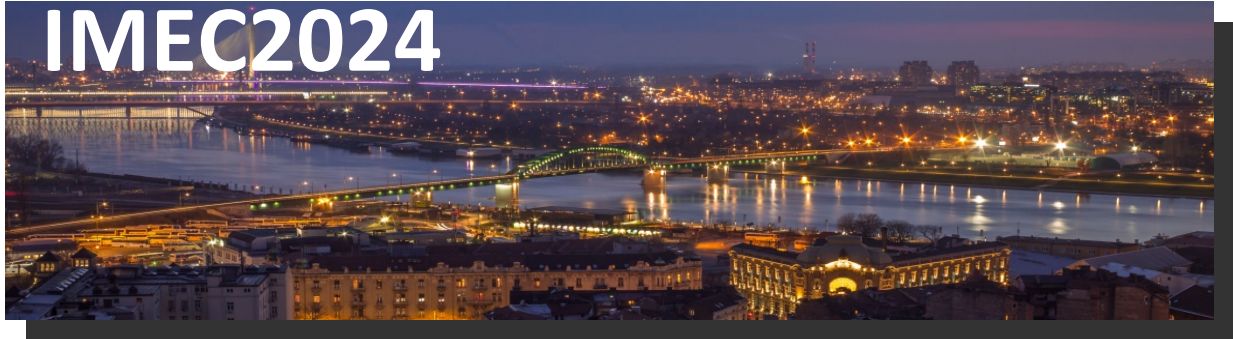


**2nd International Conference on Innovative Materials
in Extreme Conditions**



**PROGRAM
and
BOOK OF ABSTRACTS**

20-22 March 2024

Belgrade, Serbia

**2nd International Conference on Innovative Materials
in Extreme Conditions**

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Program and Book of Abstracts of the 2nd International Conference on Innovative Materials in Extreme Conditions (IMEC2024) publishes abstracts from the field of material science, physics, chemistry, earth, and computational science on the phenomena arising during the processing and/or exploitation of the innovative materials, which are presented at the international conference on innovative materials in extreme conditions.

Editors-in-Chief

Dr. Rer. Nat. Branko Matović

Dr. Ivana Cvijović-Alagić

Dr. Vesna Maksimović

Dr. Dejan Zagorac

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Preface

Dear conference participants and readers, we have the pleasure to welcome you all to Belgrade, Serbia, as the venue for the 2nd International Conference on Innovative Materials in Extreme Conditions (IMEC2024). This event is jointly organized by the Serbian Society for Innovative Materials in Extreme Conditions (SIM-EXTREME), the Center of Excellence "Center for Synthesis, Processing and Characterization of Materials for Application in Extreme Conditions - CEXTREME LAB" of the Vinča Institute of Nuclear Sciences - National Institute of the Republic of Serbia, University of Belgrade, and the Faculty of Mechanical Engineering, University of Belgrade.

The scope of the IMEC2024 is to become the worldwide forum for discussion of experts and young researchers on the phenomena arising during the processing and/or exploitation of the innovative materials. The IMEC2024 conference is focused on the current research in the field of material science, physics, chemistry, earth, and computational science. Experimental and computational investigations of materials obtained or operated under extreme conditions presented during the conference are highlighting recent progress in the development of the innovative materials at high pressures, under high magnetic and electric fields, over a wide range of temperatures, radiation conditions, corrosive environments, under extreme mechanical loads, and non-equilibrium thermodynamic conditions. The interrelation between external effects, microstructural characteristics, and material properties is considered on the experimental and theoretical level to obtain new or enhanced insights into the material behavior and their application.

We want to use this opportunity to thank our sponsors and co-organizers for helping us to successfully organize the IMEC2024 conference. First of all, we want to mention that the Ministry of Science, Technological Development and Innovation of the Republic of Serbia recognized our conference as an important event and gave their financial endorsement. Also, we want to thank the Vinča Institute of Nuclear Sciences – National Institute of the Republic of Serbia, University of Belgrade, for their strong financial support. We especially appreciate the support of the Royal Family of Serbia and the Serbian Royal Palace. In the end, we would like to thank all the members of the Conference Advisory Board, the Conference International Scientific Committee, and the Conference Organizing Committee who participated in the preparations of the IMEC2024 conference.

Editors

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TABLE OF CONTENTS

PROGRAM	14
20 th March 2024	15
21 st March 2024	17
22 nd March 2024	18
 PLENARY LECTURES	 20
 <i>Pavol Šajgalik, Ondrej Hanzel, Michal Hičák, Alexandra Kovalčíková, Chengyu Zhang, Alexander Mukasyan</i>	
Rapid hot-pressed silicon carbide ceramics for ultra-high temperature applications.....	21
 <i>Miloš Đukić, Alireza Behvar, Meysam Haghshenas, Gordana M. Bakić, Dejan Zagorac, Aleksandar Sedmak, Bratislav Rajičić</i>	
Hydrogen embrittlement in additively manufactured metals: A concise review	22
 <i>Miladin Radović</i>	
MAX Phases: Overcoming the challenges of extreme environments.....	23
 <i>Ravi Kumar</i>	
Small-scale mechanical testing of entropy stabilized ceramics	24
 INVITED LECTURES	 25
 <i>Tetiana Prikhna, T.B. Serbenyuk, O.P. Ostash, V.B. Sverdun, A.S. Kuprin, B. Matović, I. Cvijović-Alagić, V.Ya. Podhurska</i>	
The high-temperature applicability of the Ti,Nb-Al-C MAX phases-based bulk materials and vacuum-arc deposited films	26
 <i>Alexandra Kovalčíková, P. Tatarko, Z. Chlup, R. Sedlák, E. Múdra, J. Dusza</i>	
A role of micro/nano graphene platelets on strengthening and toughening mechanisms of TiB ₂ -SiC ceramic composites	27
 <i>Matej Fonović, Dario Kvrčić</i>	
Growth and stability of Ni ₃ N layers obtained in pure ammonia at high temperatures	28
 <i>Subramshu Shekar Bhattacharya</i>	
Order amidst disorder in multicomponent high entropy oxides (HEOs): synthesis, characterization and applications	29

<i>Peter Tatarko, Naser Hosseini, Fabrizio Valenza, Hakan Ünsal, Zdeněk Chlup, Alexandra Kovalčíková, I. Dlouhý</i>	
Development and integration of entropy stabilized ceramics	30
<i>Shanti Bhattacharya</i>	
Nano and micro optics on fibre tip: A possible solution for measurements in harsh environments	31
<i>Maria Čebela, Vitalii Turchenko, Milena Rosić, Dragana Jordanov, Vladimir Dodevski, Dejan Zagorac</i>	
Enhancement of weak ferromagnetism, exotic structure prediction and diverse electronic properties in bismuth ferrite and holmium-substituted multiferroic bismuth ferrite	32
<i>Thomas Bräuniger</i>	
NMR spectroscopy as a structure elucidation tool for compounds synthesised under high temperature and high pressure conditions	33
ORAL PRESENTATIONS	34
<i>Tatjana Volkov-Husović, Sanja Martinović, Ana Alil</i>	
Cavitation erosion resistance behavior of some refractory ceramics	35
<i>Hakan Ünsal, Alexandra Kovalčíková, Michal Hičák, Zdenek Chlup, Ivo Dlouhý, Branko Matović, Peter Tatarko</i>	
Ablation performance of rare-earth modified ZrB ₂ -SiC composites under oxyacetylene torch test	36
<i>Manuel Gruber, Peter Supancic, Raul Bermejo</i>	
Mechanical testing of brittle materials: from single crystals to ceramic systems	37
<i>Bratislav Rajičić, Aleksandar Maslarević, Gordana Bakić, Vesna Maksimović, Miloš Đukić</i>	
Erosion wear of HCCI alloys	38
<i>Lenka Ďaková, Monika Hrubovčáková, Alexandra Kovalčíková, Jana Andrejovská, Ján Dusza</i>	
Effect of SiC whiskers on microstructure, mechanical and tribological properties of (TiZrHfNbTa)C	39
<i>Alper Güneren, Prangya P. Sahoo, Boris Hudec, Matej Mičušík, Zoltán Lenčేశ, Karol Fröhlich</i>	
Atomic layer deposition assisted graphite/ZnO composite anodes in Li-ion batteries.....	40
<i>Marko Jelić, Ekaterina Korneeva, Nikita Kirilki, Tatiana Vershinin, Oleg Orelovich, Vladimir Skuratov, Zoran Jovanović, Sonja Jovanović</i>	
Physicochemical properties of bismuth vanadate photoanode irradiated by swift heavy ions	41

<i>Željko Mravik, Milica Pejčić, Danica Bajuk-Bogdanović, Nikita Kirilkin, Ekaterina Korneeva, Vladimir Skuratov, Zoran Jovanović</i>	
Utilization of swift heavy ions for modification of graphene oxide-based nanocomposites	42
<i>Ondrej Hanzel, Monika Tatarková, Pavol Šajgalik</i>	
Thermal and electrical conductivity of additive-free silicon carbide ceramics.....	43
<i>Dharma Teja Teppala, Shrikant Bhat, Leonard Keil, Jan Bernauer, Johannes Peter, Hans-Joachim Kleebe, Emanuel Ionescu</i>	
Synthesis and high-temperature / high-pressure exposure of compositionally complex rock-salt-type transitional metal (carbo)nitrides	44
<i>Muniyappa Amarnath, Ramachandra C G, H. Chelladurai, P. Sateesh Kumar, K. Santhosh Kumar</i>	
Experimental investigations to evaluate surface fatigue wear in journal bearing by using vibration signal analysis	45
<i>Ramachandra C G, Lokesh K S, Srinivasa Mayya D, Ravindra Babu G</i>	
Experimental and simulation analysis of influence of stacking sequence on tensile and abrasion resistance of e-glass/jute fibre-based hybrid composites	46
<i>Dejan Zagorac, Constantin Buyer, Jelena Zagorac, Hagen Grossholz, Sarah Wolf, Tamara Škundrić, Milan Pejić, Dušica Jovanović, J. Christian Schön, Thomas Schleid</i>	
Study of lanthanum fluoride selenides using a combination of crystal structure prediction and DFT calculations with experimental synthesis and characterization	47
<i>Dušica Jovanović, Dejan Zagorac, J. Christian Schön, Branko Matović, Aleksandra Zarubica, Jelena Zagorac</i>	
DFT study of new hybrid organic-inorganic perovskites: guanidinium-BX ³ substituted by B = (Sr ²⁺ , Ca ²⁺ , Mg ²⁺ , Be ²⁺) and X = (Cl ⁻ , F ⁻).....	48
POSTER PRESENTATIONS	49
<i>Ivana Cvijović-Alagić, Nikola Kanas, Jelena Maletaškić, Abishek M, Vesna Maksimović</i>	
Novel high entropy alloys for extreme environments	50
<i>Vesna Maksimović, Vladimir Urbanovich, Jelena Maletaškić, Vladimir Pavkov, Ivana Cvijović-Alagić</i>	
Characterization of the high-pressure sintered TiAl-TiB ₂ composites.....	51
<i>Nikolaos Kostoglou, Christos Tampaxis, Georgia Charalambopoulou, Georgios Constantinides, Vladislav Ryzhkov, Charalabos Doumanidis, Branko Matović, Christian Mitterer, Claus Rebholz</i>	
Boron nitride nanotubes versus carbon nanotubes: A thermal stability and oxidation behavior study	52

<i>Nikolaos Kostoglou, Sebastian Stock, Angelos Solomi, Damian Holzappel, Steven Hinder, Mark Baker, Georgios Constantinides, Vladislav Ryzhkov, Jelena Maletaškić, Branko Matović, Jochen Schneider, Claus Rebholz, Christian Mitterer</i> Purity and surface area: Key factors on thermal stability and oxidation resistance of BN nanoplatelets.....	53
<i>Anna Kityk, Miroslav Hnatko, Viliam Pavlik, Michal Hičák</i> Sustainable Solutions in Biomedical Substrate Design: Micro- and Nanotexturing on 3D Printed Titanium Alloys	54
<i>Tetiana Prikhna, Pavlo Barvitskyi, Branko Matović, Dejan Zagorac, Anastasiya Lokatkina, Bernd Büchner, Jochen Werner, Myroslav Karpets, Robert Kluge, Viktor Moshchil, Anatolii Bondar, Olexander Borymskyi, Leonid Devin, Semyon Ponomarov</i> Structure, mechanical characteristics and high-temperature stability of sintered under high and by hot pressing ZrB ₂ - and HfB ₂ -based composites.....	55
<i>Tamara Škundrić, Johann Christian Schön, Aleksandra Zarubica, Matej Fonović, Milan Pejić, Jelena Zagorac, Dejan Zagorac</i> Energy landscape exploration of the novel CrSi ₂ N ₄ compound	56
<i>Ivana Cvijović-Alagić, Jelena Maletaškić, Vladimir Pavkov, Slaviša Putić, Branko Matović, Vesna Maksimović</i> Enhanced aluminum matrix composites for structural applications.....	57
<i>Maria Čebela, Nataša Tomić, Milica Vujković, Milena Rosić, Vesna Lojpur</i> Two different paths to obtain pure nanosized Fe ₃ O ₄ : Morphology and Magnetic properties	58
<i>Dragana Jordanov, Dejan Zagorac, Klaus Doll, Johan Christian Schön, Milena Rosić, Maria Čebela</i> Theoretical Investigations of Electronic Properties of Predicted Y ₂ O ₂ S.....	59
<i>Bratislav Todorović, Dragan Stojiljković, Tanja Petrović Pantić</i> Carbonate compounds formed by degassing of geothermal water from borehole B-4 at Sijarinska Banja (Serbia).....	60
<i>Marija Egerić, Dimitrije Petrović, Marjetka Savić, Aleksandar Devečerski, Srboljub Stanković, Radojka Vujasin, Ljiljana Matović</i> Gamma Irradiation Induced Dyes Degradation: Recent Progress and Future Perspective for Wastewater Treatment.....	61
<i>Tetiana Prikhna, Aiswarya Kethamkuzhi, Roxana Vlad, Branko Matović, Semyon Ponomarov, Robert Kluge, Myroslav Karpets, Viktor E. Moshchil, Xavier Obradors, Joffre Gutierrez, Bernd Büchner, Teresa Puig</i> Characterization of high pressure oxygenated EuBCO and GdBCO coated conductors.....	62

Tijana Stamenković, Maria Čebela, Milena Rosić, Vesna Lojpur Photocatalytic application of SrGd ₂ O ₄ nanoparticles doped with rare earth.....	63
Milena Rosić, Maja Milošević, Vladimir Dodevski, Dragana Jordanov, Vesna Lojpur, Tijana Vlašković, Maria Čebela Spectroscopic and Morphological Properties of Co _{0.9} Ho _{0.1} MoO ₄ nanopowders.....	64
Marko Simić, Jovana Ružić, Dušan Božić, Željko Radovanović, Jelena Stašić Mechanical alloying as a crucial step in the fabrication process of Cu alloys	65
Tijana B. Vlašković, Bojana Laban, Maria Čebela, Vladimir Dodevski, Dragana Jordanov, Milena Rosić Preparation of Ca _{0.9} Er _{0.1} MnO ₃ nanopowders by combustion method.....	66
Ružica Mihailović, Aleksandra Zarubica, Branko Matović, Svetlana Butulija Activating agricultural residues: Corn cob as a resource for adsorption-based pollution management	67
Vladimir Pavkov, Gordana Bakić, Vesna Maksimović, Ivana Cvijović-Alagić, Aleksandar Maslarević, Bratislav Rajičić, Nenad Milošević The influence of stainless steel particles reinforcement on the fracture toughness of glass-ceramic matrix composite	68
Jana Andrejovská, Ondrej Petruš, Dávid Medved', Marek Vojtko, Marcel Riznič, Peter Kizek, Ján Dusza Mechanical properties of human enamel and dentin: a study by nanoindentation.....	69
Dejan Zagorac, Jelena Zagorac, Matej Fonović, Tamara Škundrić, Milan Pejić, Dušica Jovanović, Miloš B. Đukić, Branko Matović Structure-property relationship of AlN/BN mixed compounds on DFT level.....	70
Dávid Medved', Jana Andrejovská, Marek Vojtko, Annamária Naughton-Duszová, Piotr Klimczyk Nanoindentation Properties of Al ₂ O ₃ + ZrO ₂ + WTiC/ZrC Ceramics Fabricated by SPS...	71
Jelena Zagorac, Dušica Jovanović, Dejan Zagorac, Tamara Škundrić, Milan Pejić, Vesna Šrot, Branko Matović Multidisciplinary approach in investigating ZnO/ZnS core/shell nanostructures.....	72
Svetlana Butulija, Jelena Filipović Tričković, Ana Valenta Šobot, Bratislav Todorović, Sanja Petrović, Bojana Ilić, Danica Zmejkoski, Branko Matović Bacterial Cellulose-Cerium Oxide Hydrogel for Tailored Redox Balance in Biomedical Extremes.....	73
Marija Prekajski Đorđević, Jelena Maletaškić, Svetlana Butulija, Emilija Nidžović, Aleksa Luković, Ravi Kumar, Branko Matović High-entropy stabilized Zr _{0.2} Hf _{0.2} Ce _{0.2} Yb _{0.2} Gd _{0.2} O _{2-δ} with fluorite structure.....	74

<i>Aleksa Luković, Diana Carolina Lago, Jozef Kraxner, Dušan Galusek, Branko Matović, Danica Srećković-Batočanin, Jelena Maletaškić</i> Basaltic Glass-Ceramic Composites: Exploring Structural, Morphological, and Thermal Insights for Ballistic Protection and Radiation Shielding Applications.....	75
<i>Milan Pejić, Dejan Zagorac, Jelena Zagorac, Tamara Škundrić, Dušica Jovanović, Branko Matović</i> Energy Landscape Exploration of Novel Rare Earth Chalcohalides LaXY (X=O,S; Y=I,F).....	76
<i>Tamara Minović Arsić, Jelena Maletaškić, Svetlana Butulija, Emilija Nidžović, Jelena Erčić, Marija Prekajski Đorđević, Branko Matović</i> Synthesis and characterization of ceria doped with mercury.....	77
<i>Jelena Maletaškić, Yulia Gorshkova, Sergei Yurievich Kottsov, G.P. Kopitsa, Branko Matović</i> SAXS characterization of morphology controlled nano ceria.....	78
AUTHOR INDEX	79

PROGRAM

20th March 2024

9:00 – 16:00	Conference registration (Exhibition hall)
9:20	Conference opening and Welcome address <i>Branko Matović, Conference Chair</i>
SESSION A	
Session Chairs: <i>Branko Matović, University of Belgrade, Serbia</i> <i>Ivana Cvijović-Alagić, University of Belgrade, Serbia</i>	
9:30 – 10:00	<i>Pavol Šajgalik, Slovak Academy of Sciences, Slovakia</i>
Plenary Lecture	Rapid hot-pressed silicon carbide ceramics for ultra-high temperature applications
10:00 – 10:20	<i>Tetiana Prikhna, National Academy of Sciences of Ukraine, Ukraine</i>
Invited Lecture	The high-temperature applicability of the Ti,Nb-Al-C MAX phases-based bulk materials and vacuum-arc deposited films
10:20 – 10:35	<i>Tatjana Volkov-Husović, University of Belgrade, Serbia</i>
Oral Presentation	Cavitation erosion resistance behavior of some refractory ceramics
10:35– 10:50	<i>Hakan Ünsal, Slovak Academy of Sciences, Slovakia</i>
Oral Presentation	Ablation performance of rare-earth modified ZrB ₂ -SiC composites under oxyacetylene torch test
10:50 – 11:20	Coffee break (Exhibition hall)
SESSION B	
Session Chairs: <i>Pavol Šajgalik, Slovak Academy of Sciences, Slovakia</i> <i>Tatjana Volkov-Husović, University of Belgrade, Serbia</i>	
11:20 – 11:50	<i>Miloš Đukić, University of Belgrade, Serbia</i>
Plenary Lecture	Hydrogen embrittlement in additively manufactured metals: A concise review
11:50 – 12:05	<i>Manuel Gruber, University of Leoben, Austria</i>
Oral Presentation	Mechanical testing of brittle materials: from single crystals to ceramic systems

12:05 – 12:20	<i>Bratislav Rajičić, University of Belgrade, Serbia</i>
Oral Presentation	Erosion wear of HCCI alloys
12:20 – 12:40	<i>Alexandra Kovalčíková, Slovak Academy of Sciences, Slovakia</i>
Invited Lecture	A role of micro/nano graphene platelets on strengthening and toughening mechanisms of TiB ₂ -SiC ceramic composites
12:40 – 12:55	<i>Lenka Ďaková, Slovak Academy of Sciences, Slovakia</i>
Oral Presentation	Effect of SiC whiskers on microstructure, mechanical and tribological properties of (TiZrHfNbTa)C
12:55 – 14:30	Lunch break (Conference venue)
SESSION C	
Session Chairs:	
<i>Claus Rebholz, University of Cyprus, Cyprus</i>	
<i>Nikolaos Kostoglou, University of Leoben, Austria</i>	
14:30 – 14:50	<i>Matej Fonović, University of Rijeka, Croatia</i>
Invited Lecture	Growth and stability of Ni ₃ N layers obtained in pure ammonia at high temperatures
14:50 – 15:05	<i>Zoltán Lenčéš, Slovak Academy of Sciences, Slovakia</i>
Oral Presentation	Atomic layer deposition assisted graphite/ZnO composite anodes in Li-ion batteries
15:05 – 15:20	<i>Marko Jelić, University of Belgrade, Serbia</i>
Oral Presentation	Physicochemical properties of bismuth vanadate photoanode irradiated by swift heavy ions
15:20 – 15:35	<i>Željko Mravik, University of Belgrade, Serbia</i>
Oral Presentation	Utilization of swift heavy ions for modification of graphene oxide-based nanocomposites
15:35 – 15:50	<i>Ondrej Hanzel, Slovak Academy of Sciences, Slovakia</i>
Oral Presentation	Thermal and electrical conductivity of additive-free silicon carbide ceramics
16:00 – 18:00	Poster Session (Exhibition hall)
18:00	Welcome reception (Conference venue)

21st March 2024

SESSION D	
Session Chairs: <i>Alexandra Kovalčíková, Slovak Academy of Sciences, Slovakia</i> <i>Zoltán Lenčéš, Slovak Academy of Sciences, Slovakia</i>	
09:30 – 09:50 Invited Lecture	<i>Subramshu Shekar Bhattacharya, Indian Institute of Technology - Madras, India</i> Order amidst disorder in multicomponent high entropy oxides (HEOs): synthesis, characterization and applications
09:50 – 10:10 Invited Lecture	<i>Peter Tatarko, Slovak Academy of Sciences, Slovakia</i> Development and Integration of Entropy Stabilized Ceramics
10:10– 10:25 Oral Presentation	<i>Dharma Teja Teppala, Technical University of Darmstadt, Germany</i> Synthesis and high-temperature/high-pressure exposure of compositionally complex rock-salt-type transitional metal (carbo)nitrides
10:25 – 11:00	Coffee break (Exhibition hall)
SESSION E	
Session Chairs: <i>Tetiana Prikhna, National Academy of Sciences of Ukraine, Ukraine</i> <i>Dejan Zagorac, University of Belgrade, Serbia</i>	
11:00 – 11:30 Plenary Lecture	<i>Miladin Radović, Texas A&M University, USA</i> MAX Phases: Overcoming the challenges of extreme environments
11:30 – 12:30	Lunch break (Conference venue)
12:30 – 15:00	Guided visit to White Palace (the official residence of the former Yugoslav royal family)
20:00	Conference gala dinner Restaurant Caruso <i>Address: Terazije 23/8, Belgrade</i>

22nd March 2024

SESSION F	
Session Chairs:	
<i>Miladin Radović, Texas A&M University, USA</i>	
<i>Miloš Đukić, University of Belgrade, Serbia</i>	
9:30 – 10:00	<i>Ravi Kumar, Indian Institute of Technology - Madras, India</i>
Plenary Lecture	Small-scale mechanical testing of entropy stabilized ceramics
10:00 – 10:20	<i>Shanti Bhattacharya, Indian Institute of Technology - Madras, India</i>
Invited Lecture	Nano and micro optics on fibre tip: A possible solution for measurements in harsh environments
10:20 – 10:35	<i>Muniyappa Amarnath, Indian Institute of Information Technology Design and Manufacturing, India</i>
Oral Presentation	Experimental investigations to evaluate surface fatigue wear in journal bearing by using vibration signal analysis
10:35 – 10:50	<i>Ramachandra C G, Presidency University, India</i>
Oral Presentation	Experimental and simulation analysis of influence of stacking sequence on tensile and abrasion resistance of e-glass/jute fibre-based hybrid composites
10:50 – 11:20	Coffee break (Exhibition hall)
SESSION G	
Session Chairs:	
<i>Hari Kumar, Indian Institute of Technology - Madras, India</i>	
<i>Peter Tatarko, Slovak Academy of Sciences, Slovakia</i>	
11:20 – 11:40	<i>Maria Čebela, University of Belgrade, Serbia</i>
Invited Lecture	Enhancement of weak ferromagnetism, exotic structure prediction and diverse electronic properties in bismuth ferrite and holmium-substituted multiferroic bismuth ferrite
11:40 – 11:55	<i>Dejan Zagorac, University of Belgrade, Serbia</i>
Oral Presentation	Study of lanthanum fluoride selenides using a combination of crystal structure prediction and DFT calculations with experimental synthesis and characterization
11:55 – 12:10	<i>Dušica Jovanović, University of Niš, Serbia</i>
Oral Presentation	DFT study of new hybrid organic-inorganic perovskites: guanidinium-BX ₃ substituted by B = (Sr ²⁺ , Ca ²⁺ , Mg ²⁺ , Be ²⁺) and X = (Cl ⁻ , F ⁻)

12:10 – 12:30	<i>Thomas Bräuniger, Ludwig-Maximilians-University of Munich, Germany</i>
Invited Lecture	NMR spectroscopy as a structure elucidation tool for compounds synthesised under high temperature and high pressure conditions
12:30 – 14:00	Lunch break (Conference venue)
14:00	Conference closing ceremony

Enhancement of weak ferromagnetism, exotic structure prediction and diverse electronic properties in bismuth ferrite and holmium-substituted multiferroic bismuth ferrite

Maria Čebela^{1,2}, Vitalii Turchenko³, Milena Rosić¹, Dragana Jordanov¹, Vladimir Dodevski¹, Dejan Zagorac^{1,2}

¹Laboratory for Material Science, Institute of Nuclear Sciences „Vinča“, National Institute of the Republic of Serbia, University of Belgrade, P.O. Box 522, 11001 Belgrade, Serbia

²Center of Excellence “Cextreme Lab”, Institute of Nuclear Sciences Vinča, University of Belgrade, National Institute of the Republic of Serbia, Mike Petrovića Alasa 12-14, Belgrade, Serbia

³The Joint Institute for Nuclear Research (JINR), Dubna, Russian Federation

⁴Institute of Physics, University of Belgrade, Pregrevica 118, 11080, Belgrade, Serbia

Bismuth ferrite (BFO, BiFeO₃), exhibiting both ferromagnetic and ferroelectric properties at room temperature, is one of the most researched multiferroic materials with a growing number of technological applications. In the present study, using a combined theoretical-experimental approach, we have investigated the BFO and the influence of Ho-doping on BFO structural, electronic and magnetic properties. Well crystallized single-crystal BiFeO₃ and Bi_{1-x}Ho_xFeO₃ nanopowder has been successfully synthesized with the hydrothermal method. The phase composition of the synthesized samples was determined by the x-ray diffraction (XRD) analysis, and the results showed that synthesized material crystallizes in the space group R3c. In addition, a structure prediction has been performed and 11 additional BiFeO₃ modifications have been proposed. After structure prediction of Ho-doped BiFeO₃ using bond valence calculations (BVC) calculations six most favorable candidates were found: α-, β-, γ-, R-, T1, and T2. The magnetic behavior of the synthesized materials was investigated using a SQUID magnetometer equipped with an oven. The plethora of magnetic and electronic properties of the Ho-doped BFO that our theoretical research predicted can open rich possibilities for further investigation and eventual applications.

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