



**Serbian Ceramic Society Conference
ADVANCED CERAMICS AND APPLICATION IX
New Frontiers in Multifunctional Material Science and Processing**

**Serbian Ceramic Society
Institute of Technical Sciences of SASA
Institute for Testing of Materials
Institute of Chemistry Technology and Metallurgy
Institute for Technology of Nuclear and Other Raw Mineral Materials**

PROGRAM AND THE BOOK OF ABSTRACTS

**Serbian Academy of Sciences and Arts, Knez Mihailova 35
Serbia, Belgrade, 20-21. September 2021.**

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EUROPEAN ACADEMY
of Sciences and Arts

Dear colleagues and friends,

We have great pleasure to welcome you to the Advanced Ceramic and Application IX Conference organized by the Serbian Ceramic Society in cooperation with the Institute of Technical Sciences of SASA, Institute of Chemistry Technology and Metallurgy, Institute for Technology of Nuclear and Other Raw Mineral Materials and Institute for Testing of Materials.

It is nice to host you here in Belgrade in person. As you probably know, Serbia launched a vaccination campaign at the beginning of this year, so up to date more than 50 percent of the adult population has been vaccinated. Since there is no one statistic to compare the COVID19 outbreaks and fears for loved ones in different countries, we believe that we all suffer similarly during this pandemic. That is why we appreciate even more your positive attitude and readiness to travel in this uncertain time. We understand that some of you had to cancel your lectures in the last minute due to the travel limitation in your countries, but we hope that you will come next year. We deeply hope that the ACA IX Conference will be worth remembering, that you will respect all COVID-19 safety measures at SASA building, that you will have a nice time here and that ultimately you will return to your home safely. We are very proud that we succeeded in bringing the scientific community together again and fostering the networking and social interactions around an interesting program on emerging advanced ceramic topics. The chosen topics cover contributions from fundamental theoretical research in advanced ceramics, computer-aided design and modeling of new ceramics products, manufacturing of nanoceramic devices, developing of multifunctional ceramic processing routes, etc.

Traditionally, ACA Conferences gather leading researchers, engineers, specialists, professors and PhD students trying to emphasize the key achievements which will enable the widespread use of the advanced ceramics products in the High-Tech industry, renewable energy utilization, environmental efficiency, security, space technology, cultural heritage, etc.

Serbian Ceramic Society was initiated in 1995/1996 and fully registered in 1997 as Yugoslav Ceramic Society, being strongly supported by American Ceramic Society. Since 2009, it has continued as the Serbian Ceramic Society in accordance with Serbian law procedure. Serbian Ceramic Society is almost the only one Ceramic Society in South-East Europe, with members from more than 20 Institutes and Universities, active in 16 sessions. Part of our members are also members of the Serbian Chapter of ACerS since 2019. Their activities in the organization of this conference is highly recognized. To them and all of you thanks for being with us here at ACA IX.

Prof. Dr Vojislav Mitić
President of the Serbian Ceramic Society
World Academy Ceramics Member
European Academy of Sciences & Arts Member

Prof. Dr Olivera Milošević,
President of the General Assembly of the
Serbian Ceramic Society
Academy of Engineering Sciences of Serbia Member

Conference Topics

- Basic Ceramic Science & Sintering
- Nano-, Opto- & Bio-ceramics
- Modeling & Simulation
- Glass and Electro Ceramics
- Electrochemistry & Catalysis
- Refractory, Cements & Clays
- Renewable Energy & Composites
- Amorphous & Magnetic Ceramics
- Heritage, Art & Design

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P

PRACTICAL APPLICATION OF TiO₂

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Significant research is devoted to investigation of nano-sized transition metal oxides, among which titanium-dioxide (TiO₂) has a very significant role. Due to its outstanding physical and chemical properties, low price, non-toxicity, stability, easy synthesis, possibility for modifications and commercial availability, TiO₂ has become one of the most important materials, applied in many scientific areas. Besides its excellent properties, TiO₂ is also readily modified with the employment of simple and inexpensive experimental procedures during which many factors can be varied in order to finely adjust the target property. This work reviews the application of TiO₂ in some of the most challenging and important areas.

P

Effect of prolonged precipitation on morphology and crystal structure of the bacterial nanocelulose/Fe₃O₄ composite

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Cellulose is a biopolymer with a wide range of properties like biocompatibility, hydrophilicity, porosity, good mechanical properties, biodegradability and non-toxicity. The properties and application of cellulose based materials are related to the source of the cellulose production. Despite the fact that the plant cellulose is playing a leading role in obtaining cellulose fibers, it has been found that ecologically and economically, a better source for obtaining cellulose is by fermenting a particular strain of bacteria. Although bacterial nano cellulose (BCN) based materials can be used in numerous industries, from the paper and food industries to biomedicine, their application in electronics is limited because bacterial cellulose does not have conductive and ferromagnetic properties. Having this in mind in this research, the results of the development of nanocomposite materials based on BCN modified with Fe₃O₄ has been presented. The differences in the interaction of Fe₃O₄ nanoparticles and BCN obtained by varying precipitation parameters were investigated and

the effect of reaction time was followed by SEM-EDS, XRD, and FTIR analysis. It has been found that this type of modifications of the initial BCN, enables development of new composite materials with superior properties, which can be used in various fields of electronics.

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Macrophages as cells suitable for use in bone tissue engineering in order to manage angiogenic process

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During bone defects repair, one of the main indicators that osteoreparation is going in the right direction is development of blood vessels network. Therefore, one of the tasks of bone tissue engineering is to find ways to stimulate angiogenic process. The approach of combining bioceramic biomaterials with cells and/or various factors is already well known. Macrophages have been shown to be suitable for use in this approach, because these cells can synthesize factors that activate and stimulate blood vessels development. Our experience shows that combining bioceramic biomaterial with untreated or pre-treated macrophages can affect the intensity and course of the angiogenic process. This influence depends on the agent used in pre-treatment and its concentration, but also on the time frames in which this effect has been analyzed.

P

Stem cells as biological triad component in bone tissue-engineered constructs

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Biological triad components (biomaterials, growth factors, cells) have precious importance in bone tissue engineering (BTE). Since presence of vascular network is necessary for bone tissue regeneration, numerous combinations of different biomaterials, various growth factors and different cell types have been employed in order to achieve adequate vascularization in bone defects treatment. To contribute to the solution of this problem, our aim was to examine the importance of addition of stem cells combined with a source of growth factors to hydroxyapatite-based biomaterial. Two types of bone tissue-engineered constructs were