

The Serbian Society for Ceramic Materials  
Institute for Multidisciplinary Research (IMSI), University of Belgrade  
Institute of Physics, University of Belgrade  
Center of Excellence for the Synthesis, Processing and Characterization of  
Materials for use in Extreme Conditions "CEXTREME LAB" - Institute of  
Nuclear Sciences "Vinča", University of Belgrade  
Faculty of Mechanical Engineering, University of Belgrade  
Center for Green Technologies, Institute for Multidisciplinary Research,  
University of Belgrade  
Faculty of Technology and Metallurgy, University of Belgrade  
Faculty of Technology, University of Novi Sad

A microscopic image of ceramic particles, showing a transition from white to red. The particles are spherical and densely packed. The top half is white, and the bottom half is red, with a horizontal boundary line.

# PROGRAMME and the BOOK of ABSTRACTS

## 5CSCS-2019

5<sup>th</sup> Conference of  
the Serbian Society for Ceramic Materials  
June 11-13.2019. Belgrade Serbia

Edited by:  
**Branko Matović**  
**Zorica Branković**  
**Aleksandra Dapčević**  
**Vladimir V. Srdić**

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**Faculty of Technology and Metallurgy, University of Belgrade**  
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Edited by:  
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**Vladimir V. Srdić**

**SPECIAL THANKS TO**



Република Србија  
МИНИСТАРСТВО ПРОСВЕТЕ,  
НАУКЕ И ТЕХНОЛОШКОГ РАЗВОЈА



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## WELCOME MESSAGE

The 5<sup>th</sup> Conference of the Serbian Society for Ceramic Materials: 5CSCS-2019 aims to review the knowledge, experience and share new ideas among the professionals, industrialists and students from research areas of ceramic materials and by taking an active part in discussions and technical sessions at the conference. The conference provides exhibitor booths for the companies and the institutions to showcase their services, products, innovations, innovative ideas and research work & results.

The conference includes all aspects of ceramics: modelling, synthesis, properties, processing and applications of bulk, films, powders, nanomaterials, composites providing a platform for academic exchange among participants from universities, institutes, companies around the region in the field of ceramics research as well as to explore a new direction for future development. The conference has an elemental feature to the distinguished motive speakers, plenary speeches, young investigators, poster presentations, oral presentations, technical workshop, and scientific sessions.

The conference is hosted and organized by the Serbian Society for Ceramic Materials, and co-organized by the Institute for Multidisciplinary Research - University of Belgrade, Center of Excellence for the Synthesis, Processing and Characterization of Materials for use in Extreme Conditions “CEXTREME LAB” - Institute of Nuclear Sciences “Vinča” - University of Belgrade, Institute of Physics - University of Belgrade, Faculty of Mechanical Engineering - University of Belgrade, Center for Green Technologies of the Institute for Multidisciplinary Research - University of Belgrade, Faculty of Technology and Metallurgy - University of Belgrade, Faculty of Technology - University of Novi Sad.

We are grateful for the support of the Ministry for education, science and technological development of the Republic of Serbia. We would also like to express our sincere thanks to the conference organizers, session chairs, presenters, exhibitors and all the conference attenders for their efforts and enthusiastic support in this exciting time in Belgrade. I look forward to meeting you and interacting with you at Conference.

Branko Matovic,  
President of the Serbian Society for Ceramic Materials



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**MULTIFERROIC COMPOSITES**  
**BaTiO<sub>3</sub>-Ni<sub>0.7</sub>Zn<sub>0.29</sub>Cu<sub>0.01</sub>Fe<sub>1.95</sub>Sm<sub>0.05</sub>O<sub>4</sub>**

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Multiferroics are a class of multifunctional materials (a single phase or multiphase/composite materials) characterized by the coexistence of at least two ferroic orders (ferroelectric, ferromagnetic, or ferroelastic). Numerous multiferroics are being developed during the years of intensive research. As compounds with good ferroelectric and piezoelectric properties, barium titanate based materials are usually used as a constituent of these composites and nickel ferrite based materials as a constituent with magnetic properties [1].

The nickel ferrite combines wide range of useful magnetic properties with relatively low electrical conductivity and high value of magnetization. In order to improve electrical and magnetic properties of this material it is usually doped with Jahn-Teller ions such as zinc, manganese or copper [1,2].

Composite ceramics prepared by mixing barium titanate (BT) and nickel zinc (NZF) ferrite doped with Cu and Sm in different mass ratios, BT-NZCSF/70-30, BT-NZCSF/80-20 and BT-NZCSF/90-10 were sintered at 1080 °C for 4 h. The formation of barium titanate tetragonal crystal structure and nickel zinc ferrite cubic spinel structure was identified. Polygonal grains of both constituents were homogeneously distributed in the ceramic samples. Ferroelectric hysteresis loops were roundish and not typical for classical ferroelectric material due to high conductivity of ferrite phase in the materials. The composition with the highest concentration of BT possessed the lowest value of leakage current density. Impedance spectroscopy analysis has shown that total resistivity of the BT-NZCSF/70-30 composition is the lowest due to the highest concentration of conductive ferrite phase in the system. Temperature dependence of the grain and grain boundary conductivity was analyzed using the Arrhenius equation. The activation energies were approximately from 0.2 eV up to 0.5 eV, suggesting the mechanism of polaronic conduction of both, *n* and *p* types. When investigated materials were placed in the humid atmosphere, the fastest change in resistivity was noticed in the composite material with the highest concentration of barium titanate.

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