



**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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**Book title:** Serbian Ceramic Society Conference - ADVANCED CERAMICS AND APPLICATION IX Program and the Book of Abstracts

**Publisher:**

Serbian Ceramic Society

**Editors:**

Prof.dr Vojislav Mitić

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**Technical Editors:**

Ivana Dinić

Marina Vuković

**Printing:**

Serbian Ceramic Society, Belgrade, 2021

**Edition:**

100 copies

CIP - Каталогизacija y публикацији  
Народна библиотека Србије, Београд

666.3/.7(048)

66.017/.018(048)

SRPSKO KERAMIČKO DRUŠTVO. CONFERENCE ADVANCED CERAMICS AND APPLICATION : NEW FRONTIERS IN MULTIFUNCTIONAL MATERIAL SCIENCE AND PROCESSING (9 ;2021 ; BEOGRAD)

Program ; and the Book of abstracts / Serbian Ceramic Society Conference Advanced Ceramics and Application IX : New Frontiers in Multifunctional Material Science and Processing, Serbia, Belgrade, 20-21. September 2021 ; [organized by Serbian Ceramic Society ... [et al.] ; [editors Vojislav Mitić, Lidija Mančić, Nina Obradović]. - Belgrade : Serbian Ceramic Society, 2021 (Belgrade : Serbian Ceramic Society). - 93 str. : ilustr. ; 30 cm

Tiraž 100.

ISBN 978-86-915627-8-6

а) Керамика -- Апстракти б) Наука о материјалима -- Апстракти в) Наноматеријали -- Апстракти

COBISS.SR-ID 45804553



**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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## **MAGNETIC FEATURES OF MnZn FERRITE FOR ELECTRONIC APPLICATIONS**

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MnZn ferrites are one of the most common soft magnetic materials for application in microelectronics as a material for microwave components (transformers, transducers, inductors, magnetic fluids, sensors,). MnZn ferrites attracted attention due to wide range of relative magnetic permeability values (from  $10^3$  to  $10^4$ ), high resistivity (consequently low magnetic losses) as well as high thermal stability (high saturation magnetic flux density at high temperatures ( $B_s > 0.4$  T at  $100$  °C) and a relatively high Curie temperature of about  $230$  °C). Recently, a variety of technologies have been examined for MnZn ferrite production: powder/ceramic injection moulding (PIM/CIM), chemical co-precipitation method, conventional ceramic processing, sol-gel or microemulsion. In this study a toroidal samples of MnZn ferrites with dimensions appropriate for applications in electronic industry (i.e. microelectronics: inner diameter 3.5 mm, outer diameter 7 mm, height 2 mm) were investigated. Magnetic properties were measured by hysteresis graph (B-H curve at level of magnetic excitation up to 1 kA/m and at different frequencies from 5 Hz to 10 kHz). Relative magnetic permeability as well as magnetic power (active) losses was analyzed as frequency dependent. Very stable maximum magnetic permeability was observed for magnetic field of 200 A/m in the frequency range from 50 Hz ( $\mu_r \approx 480$ ) to 10 kHz ( $\mu_r \approx 450$ ). Active power referred to unit mass of about 30 W/kg was recorded at frequency of 1 kHz (@ 280 mT). As the hysteresis losses are proportionally to the frequency ( $\sim f$ ) and eddy-current losses are proportionally to the square of frequency ( $\sim f^2$ ) it was performed separation between these two components from total magnetic power (active) losses. Numerical fitting of this functionality on frequency were performed and analysed. The results obtained were compared with the catalogue data for other MnZn ferrite components for applications in electronics.