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

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

Programme and Book of Abstracts of The Fifth Conference of The Serbian Society for Ceramic Materilas **publishes abstracts from the field of ceramics, which are presented at international Conference.**

Editors-in-Chief
Dr. Branko Matović
Dr. Zorica Branković
Prof. Aleksandra Dapčević
Prof. Vladimir V. Srdić

Publisher
Institute for Multidisciplinary Research, University of Belgrade
Kneza Višeslava 1, 11000 Belgrade, Serbia

For Publisher
Prof. Dr Sonja Veljović Jovanović

Printing layout
Vladimir V. Srdić

Press
Faculty of Technology and Metallurgy, Research and Development Centre of Printing Technology, Karnegijeva 4, Belgrade, Serbia

Published: 2019

Circulation: 150 copies

CIP - Каталогизација у публикацији - Народна библиотека Србије, Београд

666.3/.7(048)
66.017/.018(048)

DRUŠTVO za keramičke materijale Srbije. Konferencija (5 ; 2019 ; Beograd)

Programme ; and the Book of Abstracts / 5th Conference of The Serbian Society for Ceramic Materials, 5CSCS-2019, June 11-13, 2019, Belgrade, Serbia ; [organizers] The Serbian Society for Ceramic Materials ... [et al.] ; edited by Branko Matović ... [et al.]. - Belgrade : Institute for Multidisciplinary Research, University, 2019 (Beograd : Faculty of Technology and Metallurgy, Research and Development Centre of Printing Technology). - 139 str. : ilustr. ; 24 cm

Tiraž 150. - Str. 6: Welcome message / Branko Matovic. - Registar.

ISBN 978-86-80109-22-0

a) Керамика - Апстракти
b) Наука о материјалима - Апстракти
c) Наноматеријали - Апстракти

COBISS.SR-ID 276897292

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

PROGRAMME AND THE BOOK OF ABSTRACTS

5th Conference of The Serbian Society for Ceramic Materials

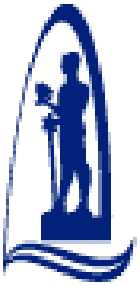
June 11-13, 2019
Belgrade, Serbia
5CSCS-2019

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

SPECIAL THANKS TO

Република Србија
МИНИСТАРСТВО ПРОСВЕТЕ,
НАУКЕ И ТЕХНОЛОШКОГ РАЗВОЈА

ROFA



Turistička
organizacija
Beograda

SERBIA

NATIONAL TOURISM
ORGANISATION of
SERBIA

Committees

Organizer

- 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

Scientiific Committee

1. Dr. Snežana Bošković, Institute of Nuclear Sciences "Vinča", University of Belgrade, *Serbia*
2. Prof. Biljana Stojanović, Institute for Multidisciplinary Research, University of Belgrade, *Serbia*
3. Dr. Branko Matović, Institute of Nuclear Sciences "Vinča", University of Belgrade, *Serbia*
4. Prof. Vladimir V. Srdić, Faculty of Technology, University of Novi Sad, *Serbia*
5. Dr. Zorica Branković, Institute for Multidisciplinary Research, University of Belgrade, *Serbia*
6. Dr. Goran Branković, Institute for Multidisciplinary Research, University of Belgrade, *Serbia*
7. Dr. Zorana Dohčević-Mitrović, Institute of Physics, University of Belgrade, *Serbia*
8. Dr. Maja Šćepanović, Institute of Physics, University of Belgrade, *Serbia*
9. Prof. Tatjana Volkov-Husović, Faculty of Technology and Metallurgy, University of Belgrade, *Serbia*
10. Dr. Miroslav Komljenović, Institute for Multidisciplinary Research, University of Belgrade, *Serbia*
11. Dr. Dejan Zagorac, INN Vinca, University of Belgrade, *Serbia*
12. Prof. Gordana Bakić, Faculty of Mechanical Engineering, University of Belgrade, *Serbia*
13. Prof. Pavle Premović, Faculty of Science, University of Niš, *Serbia*
14. Dr. Nina Obradović, Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Belgrade, *Serbia*
15. Prof. Vladimir Pavlović, Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Belgrade, *Serbia*

International Advisory Board

GERMANY:

Dr. J. Christian Schön, *Max-Planck-Institute for Solid State Research*
Dr. Klaus Doll, *Institute of Theoretical Chemistry, University of Stuttgart*
Dr. Žaklina Burghard, *Institute for Mater. Science, University of Stuttgart*
Dr. Vesna Srot, *Max-Planck-Institute for Solid State Research*

UNITED STATES OF AMERICA:

Dr. Yuri Rostovtsev, *Department of Physics, University of North Texas*
Dr. Miladin Radović, *Department of Materials Science and Engineering Program, Texas A&M University*
Dr. Nikola Dudukovic, *Lawrence Livermore National Laboratory*

SLOVENIA:

Dr. Barbara Malič, *Jozef Stefan Institute, Ljubljana*
Dr. Aleksander Rečnik, *Jozef Stefan Institute, Ljubljana*
Dr. Slavko Bernik, *Jozef Stefan Institute, Ljubljana*

ITALY:

Dr. Carmen Galassi, *Istituto di Scienza e Tecnologia dei Materiali Ceramici-CNR*
Dr. Floriana Craciun, *Istituto di Struttura della Materia-CNR, Area di Ricerca di Roma-Tor Vergata*
Dr. Claudio Ferone, *Department of Engineering, University of Napoli*

CROATIA:

Dr. Jasminka Popović, *Ruđer Bosković Institute, Zagreb*
Dr. Andreja Gajović, *Ruđer Bosković Institute, Zagreb*

FRANCE:

Dr. Xavier Rocquefelte, *Institut des Sciences Chimiques de Rennes*

HUNGURY:

Dr. Gábor Mucsi, *University of Miskolc*

INDIA:

Dr. Ravi Kumar, *Indian Institute of Technology Madras*

JAPAN:

Dr. Anna Gubarevich, *Laboratory for Advanced Nuclear Energy, Institute of Innovative Research, Tokyo Institute of Technology*

POLAND:

Dr. Malgorzata Makowska-Janusik, *Institute of Physics, Faculty of Mathematics and Natural Science, Jan Dlugosz University in Czestochowa*

ROMANIA:

Dr. Eniko Volceanov, *University Politechica Bucharest*

SLOVAKIA:

Dr. Peter Tatarko, *Institute of Inorganic Chemistry, Slovak Academy of Sciences*

UKRAINE:

Dr. Tetiana Prikhna, *V. Bakul Institute for Superhard Materials of the National Academy of Sciences of Ukraine*

Organizing Committee

1. Dr. Aleksandra Dapčević, Faculty of Technology and Metallurgy, Belgrade, *Serbia*
2. Maria Čebela, Institute of Nuclear Sciences "Vinča", Belgrade, *Serbia*
3. Miljana Mirković, Institute of Nuclear Sciences "Vinča", Belgrade, *Serbia*
4. Jelena Luković, Institute of Nuclear Sciences "Vinča", Belgrade, *Serbia*
5. Dr. Marija Vuksanović, Institute of Nuclear Sciences "Vinča", Belgrade, *Serbia*
6. Dr. Milica Počuča Nešić, Institute for Multidisciplinary Research, Belgrade, *Serbia*
7. Dr. Milan Žunić, Institute for Multidisciplinary Research, Belgrade, *Serbia*
8. Dr. Jovana Ćirković, Institute for Multidisciplinary Research, Belgrade, *Serbia*
9. Dr. Nikola Ilić, Institute for Multidisciplinary Research, Belgrade, *Serbia*
10. Jelena Vukašinović, Institute for Multidisciplinary Research, Belgrade, *Serbia*
11. Jelena Jovanović, Institute for Multidisciplinary Research, Belgrade, *Serbia*
12. Olivera Milošević, Institute for Multidisciplinary Research, Belgrade, *Serbia*
13. Dr. Sanja Martinović, IHTM Belgrade, *Serbia*
14. Dr. Milica Vlahović, IHTM Belgrade, *Serbia*
15. Dr. Nataša Tomić, Innovation Center of the Faculty of Technology and Metallurgy, Belgrade, *Serbia*
16. Dr. Slavica Savić, Biosense Institute, Novi Sad, *Serbia*
17. Dr. Bojan Stojadinović, Institute of Physics, Belgrade, *Serbia*
18. Dr. Marija Milanović, Faculty of Technology, Novi Sad, *Serbia*

P-69

THE INFLUENCE OF SINTERING PROCESSING ON MICROSTRUCTURAL, OPTICAL AND ELECTRICAL PROPERTIES OF ZINC OXIDE CERAMICS DOPED WITH Al^{3+}, B^{3+}, Mg^{2+}

Danijela Luković Golić[1], Jelena Vukašinović[1], Vesna Ribić[1], Matej Kocen[2], Matejka Podlogar[2], Aleksandra Dapčević[3], Goran Branković[1], Zorica Branković[1]

[1]*Institute for Multidisciplinary Research, University of Belgrade, 11030 Belgrade, Serbia*
[2]*Jožef Stefan Institute, 1000 Ljubljana, Slovenia*
[3]*Faculty of Technology and Metallurgy, University of Belgrade, 11120 Belgrade, Serbia*

Zinc oxide (ZnO) is a versatile functional material, widely employed in industry and technology as varistor ceramics, transparent conducting films, surface acoustic wave resonators etc. ZnO-based conductive ceramics, attractive for various applications, should have low electrical resistivity and good linearity. The n-type conductivity of wide band gap (3.37 eV) ZnO semiconductor could be enhanced by multiple doping with trivalent metals (B^{3+}, Al^{3+}, Ga^{3+}, In^{3+}), as shallow donors. The intrinsic defects, zinc vacancies and interstitial oxygen, exist in the grain boundaries of n-type ZnO ceramics as localized acceptor states. These states attract charge carriers, creating a depletion region around the grain boundaries and energy potential barrier, which hinder the motion of the electrons [1]. In this work, zinc oxide ceramics doped with Al^{3+}, B^{3+} and Mg^{2+} was prepared using solid-state reaction technique from ZnO powder obtained in solvothermal synthesis and Al_2O_3, MgO and B_2O_3 (H_3BO_3) commercial powders. Al_2O_3 was used as a donor dopant to increase the carrier concentration, B_2O_3 was added to enhance densification and grain growth, and MgO – to decrease the thermal conductivity [2,3]. The pressed ZnO (0.25 % Al_2O_3, 0.5 % B_2O_3, 1 % MgO) pellets were sintered by conventional (CS) and spark plasma (SPS) method. The ceramic samples were analyzed by X-ray diffraction (XRD), scanning electron microscopy (SEM), transmission electron microscopy (TEM), UV-Vis spectroscopy and current-voltage (I–U) measurements. The correlation between the sintering processing, microstructure and electrical properties of multiple doped ZnO-based ceramics was investigated. The electrical performances of ZnO (0.25 % Al_2O_3, 0.5 % B_2O_3, 1 % MgO) ceramics were strongly dependent on composition and microstructure (density, grain size, segregation of secondary phase in grain boundaries). The electrical resistivity of SPS sample was an order of magnitude lower than electrical resistivity of CS sample and it showed almost linear I-U characteristics in temperature range of (25–150) °C.

1. T.K. Gupta, W.G. Carlson, *J. Mater. Sci.*, **20** (1985) 3487
2. T. Tian, L. Cheng, J. Xing, L. Zheng, Z. Man, D. Hu, S. Bernik, J. Zeng, J. Yang, Y. Liu, G. Li, *Mater. Design*, **132** (2017) 479
3. B. Yuksel, T. O. Ozkan, *Mater. Sci. – Poland*, **33** (2015) 220

P-70

SBA-15 ASSISTED SnO_2 HUMIDITY SENSOR

Slavica M. Savić[1], Katarina Vojisavljević[2], Milica Počuča-Nešić[2], Nikola Knežević[1], Minja Mladenović[1], Veljko Đokić[3], Zorica Branković[2]

[1]Biosense Institute, Group for Nano and Microelectronics, University of Novi Sad, Novi Sad, Serbia
[2] Institute for Multidisciplinary Research, University of Belgrade, Belgrade, Serbia
[3]Faculty of Technology and Metallurgy, University of Belgrade, Belgrade, Serbia

Over the past decade, the interest for fabrication of mesoporous metal oxides has been increased, and that draw attention globally on fabrication and designing efficient humidity sensors based on these materials. Their unique properties like high surface area, large pore volume and interconnected pore channels provide easier adsorption and facile transportation of water molecules across their surfaces. Nanocasting as technique based on various silica hard templates is one of usually utilized and efficient methods for processing of such materials.

Silica SBA-15 as a template is currently obtaining exclusive attention in applications like photocatalysis, sensing, drug delivery and nanomaterials fabrication since it has high surface area, pore volume, excellent thermal stability and distinctive interconnectivity of its tunable pore channels. In this work, we used SBA-15 as a hard template for production of SnO_2 humidity sensor. SBA-15 assisted mesoporous SnO_2 has been synthesized using incipient wet impregnation process, consisting of two loading/calcination steps to fill up 15 % of the total pore volume of template with SnO_2, followed by template etching with 2M NaOH.

A few micron thick SnO_2 film has been fabricated by applying the paste by the doctor blade applicator onto alumina substrate provided with interdigitated Pt/Ag electrodes. The sensor response of the film towards humidity was tested measuring the change of the complex impedance of the sample exposed to a humid climate chamber environment with the relative humidity, RH ranging from 40 % to 90 % at 25 °C and from 30 % to 90 % at 50 °C. This study demonstrated that nanocast SnO_2 possesses sufficient quality to be used as a material for fabrication of high performance humidity sensors.