

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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**Vladimir V. Srdić**

**SPECIAL THANKS TO**



Република Србија  
МИНИСТАРСТВО ПРОСВЕТЕ,  
НАУКЕ И ТЕХНОЛОШКОГ РАЗВОЈА



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## COMPARISON OF SENSING PROPERTIES OF SnO<sub>2</sub>/KIT-5 AND SnO<sub>2</sub> HUMIDITY SENSORS

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In this work, two different syntheses approaches – nanocasting and sol-gel technique were employed for the preparation of SnO<sub>2</sub> powders for humidity sensors. Stock solution of SnCl<sub>2</sub> in ethanol (0.5 M) was used as a Sn-precursor for both syntheses.

In the first procedure, this solution was infiltrated by wet impregnation method into the hydrothermally prepared KIT-5 used as silica template. Mesoporous SnO<sub>2</sub>/KIT-5 hybrid was obtained after two step loading/calcination process. Calcination was performed at 550 °C for 5 h. In the second procedure, silica template was excluded from synthetic path. Ethanol solution of SnCl<sub>2</sub> was slowly heated to form the gel which was later submitted to the same calcination conditions resulting in the preparation of SnO<sub>2</sub> nanopowder.

By dispersing the as prepared powders in the ethyl-cellulose/ $\alpha$ -terpineol solution and adding a few drops of acetic acid in the mixture, viscous pastes were prepared and further homogenized for 24 h with magnetic stirrer. Using doctor blade applicator a few micron thick films were deposited onto alumina substrates provided with interdigitated Pt/Ag electrodes.

Sensors' characteristics were compared by measuring the change of the complex impedance of the samples exposed to a humid climate chamber environment at different temperatures and RH values from 40 % to 90 % at 25 °C and from 30 % to 90 % at 50 °C. The value of impedance measured at 42 Hz and within the RH range of 40 % to 90 %, changes 53 times at 25 °C, and 96 times at 50 °C. In contrast, for the sensor prepared from chemically derived SnO<sub>2</sub>, the impedance changes in a moderate way – 8 times at 25 °C and 3 times at 50 °C. Fast response/recovery time of the SnO<sub>2</sub>/KIT-5 hybrid sensor exposed to humidity change from 40 % – 90 % at room temperature, confirmed superior potentials of this material for humidity sensing over the SnO<sub>2</sub>.