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
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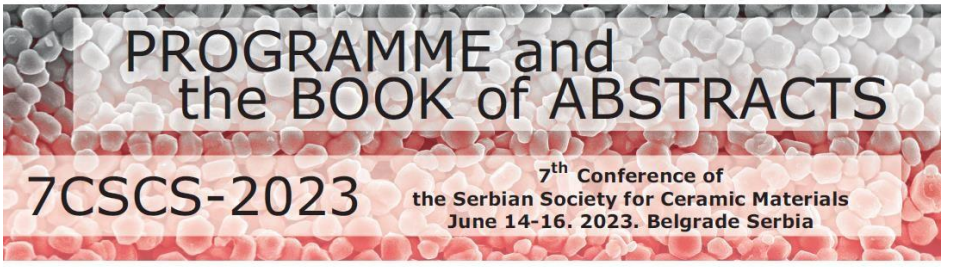


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# PROGRAMME AND THE BOOK OF ABSTRACTS

## 7th Conference of The Serbian Society for Ceramic Materials

**June 14-16, 2023**
**Belgrade, Serbia**
**7CSCS-2023**

Edited by:
**Branko Matović**
**Jelena Maletaškić**
**Vladimir V. Srdić**

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simple technique used for the sequential deposition of carboxyl functionalized single-walled carbon nanotubes (SWCNTs-COOH) and polyethyleneimine (PEI) in monolayers. PEI served as the positively charged layer, while carboxyl functionalized nanotubes were used as the negatively charged layer to establish an electrostatic bond [4,5]. The resulting samples were composed of 1, 2, 3, 4 and 5 bilayers (PEI+SWCNT), and after each bilayer, the samples were dried at 120 °C for 10 min. Finally, produced thin films were thermally treated at 300 °C for 1 h to investigate how temperature influences on their electrical and optical properties. Different samples were investigated in order to find the optimal transparency/conductivity ratio for further application of the films.

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## HIGH-TEMPERATURE HUMIDITY SENSING ABILITY OF INDIUM-DOPED BARIUM CERATE

Aleksandar Maleševi[1], Aleksandar Radojković[1], Milan Žunić[1], Slavica M. Savić[2], Sanja Perać[1], Zorica Branković[1], Goran Branković[1]

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Acceptor-doped perovskites ($ABO_3$ general formula) with large lattice constants (such as $BaCeO_3$, $SrCeO_3$, and $BaZrO_3$) have been known as fast proton conductors. The ability to conduct protons at high temperatures makes them suitable for humidity sensors in a high-temperature environment. The presence of traces of humidity can play a key role in the functioning of certain industrial processes at higher temperatures. Electrical characteristics of $BaCe_{0.75}In_{0.25}O_{3-\delta}$ (BCI25) sintered sample were analyzed in a dry and a wet argon atmosphere in the 250–700 °C temperature range. The water vapor sensing properties of BCI25 porous film and its response and recovery times were investigated under different conditions of temperature and water vapor concentration. A 30 μm thick film obtained from the powder calcined at 1050 °C exhibited sensitivity comparable to that of the sintered sample with significantly shorter response and recovery times. While the sensitivity of the film gradually decreased with a decrease in partial pressure of water vapor ($p(H_2O)$), a noticeable sensitivity was still observed at $p(H_2O)$ of 200 Pa. Decrease in

conductivity depended logarithmically on the partial pressure of water with the slope of 0.52 that is close to the theoretical value. After several cycles, the reusability test proved an almost unchanged ratio between the impedance value in the dry and the wet Ar atmosphere ($p(H_2O)$ = 2.34 kPa), which implied that BCI25, having good stability and sensitivity, is a promising high-temperature humidity sensor.

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## A STRAIGHTFORWARD METHOD FOR SCROLLING PLANAR MATERIALS INTO FREE-STANDING 3D STRUCTURES WITH A SIGNIFICANT REDUCTION IN AREA FOOTPRINT

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One important task of micro-/nanotechnology is to arrange materials into three-dimensional structures and thereby change their mechanical, electrical or optical properties, while at the same time reducing their footprint. A versatile approach to achieve that is rolling origami technology, which yields cylindrical micro-/nanostructures of considerable interest for numerous applications. However, despite recent progress along these lines, a fast, reliable and sustainable rolling method that provides access to high-quality rolling structures of controlled morphology is still needed. We demonstrate a straightforward and sustainable fabrication that uses external mechanical stress to scroll micrometre thick, flexible planar films with centimetre lateral dimensions in one step into tubular or spiral geometry within a few seconds. It furthermore allows controlling the scrolls' diameter, number of windings and nanostructured surface morphology, and it is applicable to a wide range of functional materials as it is performed at ambient condition. A scale-like surface morphology of the scrolls could be exploited in applications such as actuators, in order to speed up, e.g. opening and closing movements. Scales could furthermore improve electrode performance in energy storage systems by enhancing the surface area and reducing the ion diffusion path. As further important advantages, the method has a yield approaching 100%, allows for an easy control of the scrolling direction, and also enables the fabrication of entire arrays wherein each 3D object is located at a predefined position. Finally, it involves only one step, works with a minimal number of components, and does not require additional treatments like etching. This renders it not only cost effective but also eco-friendly and sustainable, thus opening the door for its large-scale application. The obtained 3D structures are highly promising for applications in energy storage, microrobotics, as well as biomedical and optical devices.