

**13th CONFERENCE for
YOUNG SCIENTISTS in CERAMICS**

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and
BOOK OF ABSTRACTS**

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OC-99

**TAILORING A NEAR ZERO TEMPERATURE COEFFICIENT
OF RESISTANCE IN PRESSURELESS SINTERED
MWCNT/Al₂O₃ AND GPO/Al₂O₃ COMPOSITES**

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Near zero temperature coefficient of resistance (TCR) in heating elements is essential for the precise control of temperature and constant power draw hence easy to control electronically. The aim of this work was to form a heater with a TCR of 500 ppm/K in the temperature range room temperature to 500 °C. This was achieved by percolating a network of electrically conductive near zero TCR multiwall carbon nanotubes (MWCNTs) or reduced graphene oxide (GPO) in insulating Al₂O₃. Using MWCNT compositions 1, 2 and 3 wt.%, MWCNT/Al₂O₃ samples were pressureless sintered in Ar at 1400, 1550 and 1700 °C for 4 hours. As a result, 88–96 % theoretical density was achieved for the composites sintered at 1550 and 1700 °C. Once percolation was achieved, the samples showed near zero TCR behaviour. However, thermal cycling revealed some hysteresis behaviour. These near zero TCR composites have also been thermally cycled multiple times to understand its effect on degradation of electrical properties and address the issue of health and safety on use of carbon nanomaterials in consumer products.

OC-100

**SYNTHESIS AND CHARACTERIZATION OF METAL-GLASS
COMPOSITE MATERIAL**

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Parts of industrial machines and structures are often exposed to aggressive environments, which in a short period of time can cause the loss of their integrity. Depending on working conditions, a surface of the material can be exposed to various mechanisms of damage, of which corrosion damage stands out. Commercial stainless

steels have a significant application in making machine parts in the industry because of their outstanding properties. However, the high prices of this material can sometimes be a limiting factor. For this reason, the idea is to replace expensive stainless steel with a composite material with lower price and improved mechanical properties.

Austenitic stainless steel is a material which is widely used in an industry primarily due to good corrosion resistance. Powder of commercial austenitic stainless steel (SURFIT TM 316L) of the diameter from 45 to 63 μm was used, in our experiment. The steel powder has a spherical shape which is obtained by gas atomization. The source of glass was andesite basalt rock from the locality "Donje Jarinje" Leposavic, the Republic of Serbia. Basalt is a hard aluminosilicate rock which has a relatively low melting point and low viscosity. The composite material was manufactured by mechanical mixing of stainless steel powders with freshly crushed basalt rock in diameter about 10 μm . The composite material consists of stainless steel and different content of basalt.

The green compact was obtained by a hydraulic pressing of the mixture, with a pressure of 150 MPa using a steel mold. Sintering is done at 1250 $^{\circ}\text{C}$ in a time of 30 minutes in a high-temperature vacuum furnace.

Semi-quantitative analysis of andesite basalt powder is obtained by energy dispersive X-ray spectrometry (EDS). Starting powder as well as sintered composites were characterized by X-ray diffraction method (XRD). Morphology of powders and microstructure of sintered sample were followed by a scanning electron microscope (SEM) and a light optical microscope (LOM). The hardness of the composite material is determined by the Vickers method.

OA-101

PRODUCTION OF Si_3N_4 CERAMIC TAPES BY TAPE CASTING METHOD FOR ARTIFICIAL BONE APPLICATION

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Porous silicon nitride ceramics having properties similar to human bone have been sintered and characterized with a primary purpose to develop a material to be used as bone substitute. Functional grade materials are preferred to represent the human bone. Tape casting provides a good grading of this type of material. In the concept of this paper, tape casting method was studied for the production of porous Si_3N_4 ceramics containing "bone-like" micro and macro pores. In order to produce Si_3N_4 tapes by tape casting method, recipes were prepared by using different alcohol based solvent system