Innovation Center of Faculty of Mechanical Engineering

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„International Conference of Experimental and Numerical Investigations and New Technologies“

Sponsored by:

MINISTRY OF EDUCATION, SCIENCE AND TECHNICAL DEVELOPMENT

OF THE REPUBLIC OF SERBIA

Programme

and

The Book of Abstracts

29 June – 02 July 2021

Zlatibor, Serbia

Title:	International Conference of Experimental and Numerical Investigations and New Technologies – **CNN TECH 2021** **PROGRAMME AND THE BOOK OF ABSTRACTS**
Publisher:	Innovation Center of Faculty of Mechanical Engineering Kraljice Marije 16, 11120 Belgrade 35 tel: (+381 11) 3302-346, fax 3370364 e-mail: cnntechno@gmail.com web site: http://cnntechno.com, http://www.inovacionicentar.rs
Editors:	Dr Goran Mladenovic, Associate Professor Dr Martina Balac, Senior Scientific Researcher Dr Aleksandra Dragicevic, Scientific Researcher
Technical editor	Dr Goran Mladenovic, Associate Professor
Cover page:	Dr Goran Mladenovic, Associate Professor
Printed in:	Innovation Center of Faculty of Mechanical Engineering Kraljice Marije 16 11120 Belgrade 35 tel: (+381 11) 3302-346
Circulation:	100 copies. The end of printing: June 2021.

ISBN: 978-86-6060-077-8

THE INFLUENCE OF MECHANICAL ACTIVATION ON MICROSTRUCTURE AND DIELECTRIC PROPERTIES OF $SrTiO_3$ CERAMICS

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Abstract

In recent years, a lot of interest has been shown in obtaining materials with predetermined properties. The aim is to establish a functional dependence between the synthesis parameters, structural characteristics, and properties of the material. Ceramic materials based on strontium titanate ($SrTiO_3$) are of special interest due to their unique physical-chemical properties. Having in mind the importance of examining the influence of synthesis parameters on the process of obtaining and properties of functional electroceramic materials, and the importance of $SrTiO_3$ as a perovskite material, the motive was to analyze and consider the influence of mechanical activation. It has been established that the time of mechanical activation (0, 10, 30, 60, 90, and 120 minutes) of $SrTiO_3$ powders indirectly affects on electrical properties of $SrTiO_3$ ceramics. It was noticed that in $SrTiO_3$ ceramics the values of relative dielectric permittivity in the radio frequency range (0,3 MHz-3 GHz) are stable, which is important for the fabrication of electronic components. Microstructural SEM analysis showed that the increase in mechanical activation time results in less porous samples. It was found that the value of the relative dielectric permittivity of ceramic samples at room temperature changes following the combined effect of changes in sample density, grain size, as well as changes in the grain boundary region. The maximum value of dielectric permittivity was observed in the sample activated for 10 minutes. Also, the sample activated for 10 min exhibits relatively low values of loss tangent, compared to the other mechanically activated samples, providing the best overall dielectric performance compared to other samples.

Keywords:

strontium titanate, mechanical activation, sintering, electrical properties

Acknowledgment

This research is financed by project 451-03-9/2021-14/ 200175 within the Institute of technical sciences of SASA