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

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Programme

and

The Book of Abstracts

05 – 08 July 2022

Zlatibor, Serbia

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SPARK PLASMA SINTERING OF MECHANICALLY ACTIVATED MGO-TIO$_2$ SYSTEM

Suzana Filipovic[1*], Nina Obradovic[1], William Fahrenholtz[2], Steven Smith[2], Miljana Mirkovic[3], Adriana Peles[1], Antonije Djordjevic[4]

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Abstract

MgTiO3 is a material often used in different types of high-frequency capacitors, temperature compensating capacitors, and chip capacitors, so the enhancement of this material is still the focus of many research groups due to its remarkable dielectric properties. Outstanding features can only be achieved when the ceramics are highly dense. Densification of magnesium titanate by Spark Plasma Sintering (SPS) was the aim of this work. Magnesium titanate ceramics were prepared by applying mechanical activation as the first step. Powders prepared in this way were SPS sintered, at 1200°C with a heating rate of 100°C/min. After reaching the desired temperature, a uniaxial pressure of 50 MPa was applied. The dwell time at this condition was 5 min, followed by cooling to room temperature at 5°C/min. X-ray diffraction was performed in order to establish the phase composition of milled powders and obtained ceramics. Differences between samples milled in various times intervals, as well as sintered ceramics were examined by means of scanning electron microscopy (SEM) and energy dispersive spectroscopy (EDS). The presence of $MgTi_2O_5$ phase was detected in XRD and was confirmed by EDS analysis for the non-milled ceramics. In the samples obtained from milled powders, no $MgTi_2O_5$ wasn't detected in XRD patterns, but this phase was detected in EDS spectra in a lower amount. Dielectric measurements were performed at a wide range of frequencies, while the hardness of the SPS samples was measured at loads up to 10 N. The highest value of the hardness was obtained from powder milled for 15 min before SPS.

Keywords

Magnesium titanate, SPS, Mechanical activation, Dielectric properties, Hardness

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