Serbian Ceramic Society Conference
ADVANCED CERAMICS AND APPLICATION XI
New Frontiers in Multifunctional Material Science and Processing

Serbian Ceramic Society
Institute of Technical Sciences of SASA
Institute for Testing of Materials
Institute of Chemistry Technology and Metallurgy
Institute for Technology of Nuclear and Other Raw Mineral Materials

PROGRAM AND THE BOOK OF ABSTRACTS

Serbian Academy of Sciences and Arts, Knez Mihailova 35
Serbia, Belgrade, 18-20. September 2023.

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Structural analysis of nanostructured porous LNTO ceramics was performed by means of SEM, X–ray diffraction and Raman spectroscopy measurements. In the frequency range from 100 Hz to 10 MHz, the room temperature impedance responses of synthesized samples indicated that LNTO ceramics exhibit semiconducting nature (NTCR–type behavior) and non–Debye type of relaxation phenomena. In order to establish correlation between the microstructures and electrical properties, the obtained impedance spectra were modeled using an equivalent electrical circuit based on only one parallel *R–CPE* element. As part of a systematic study, the dependence of impedance response on the relative humidity has been also evaluated. At room temperature and frequency of about 15 kHz, the prepared LNTO ceramics with 2% ZnO and 5% ZnO as sensing materials showed a linear response of impedance change within the wide relative humidity range from 15% to 85%. The experimental results demonstrated that good sensing linearity and stability, small humidity hysteresis error (~ 3%), relatively fast response time (~ 11 s) and recovery time (~ 15s) can be attributed to the high surface area and porous structure of synthesized LNTO ceramics.

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INV10

Luminescence transitions of Pr^{3+} ($4f^2$) in fluorapatite nanocrystals for potential biomedical application

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Fluorapatite (FAP) crystals have drawn significant interest over the last few decades as important hosts matrix for optically active trivalent rare earth ions, due to the strong crystal field splitting and large transition cross-sections. Nano-sized FAP particles doped with rare earth ions have been extensively studied as luminescent materials for biomedical applications for cell labeling and bioimaging, as well as antimicrobial agents for therapeutics.

Fluorapatite nanoparticles doped with praseodymium ions (Pr^{3+}) were prepared by the co-precipitation method and characterized. The different number of Pr^{3+} ($4f^2$) transitions in the ultraviolet and visible parts of the spectrum was investigated by photoluminescence spectroscopy. Multivariate Curve Resolution–Alternating Least Squares (MCR-ALS) analyses of fluorescence spectra and *ab initio* calculation indicated that Pr^{3+} ions are preferentially substituted Ca2 (*6h*) sites in FAP lattice. In addition to the substitution of cations, there is also the substitution of anionic species such as OH^-, CO_3^{2-}, and NO_3^-, which

are confirmed by the CHNS method. The obtained samples were tested as bioimaging and antibacterial agents and can potentially be used for further biomedical research.

INV11

Chalcogenide glasses as memristive materials

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Nowadays memristive materials are an attractive field of study due to their importance in application in artificial neural networks inspired by biological neurons and synapses. Chalcogenide glasses (ChG) are promising memristive materials considering that they possess good resistive switching properties which are necessary for the fabrication of the active layer of the memristive devices.This study reports memristive properties of silver doped Ag-$As_{40}S_{30}Se_{30}$ ChG glasses as an active layer in Ag/chalcogenide sample/Ag memristive structure. Experimental results showed that the investigated samples with different silver concentrations possess bipolar resistive switching characteristics. Namely, under the influence of external voltage stimulus, these materials change their resistance between two different states i.e. high resistance state (HRS) and low resistance state (LRS) at low current values. Further, constant value of memory window in whole measurement temperature range remains the same indicating its stability. Good resistance ratio between HRS and LRS and its good switching endurance are beneficial for its application in memristive devices. Also, analysis of the obtained results showed that the doping with Ag affects the resistive switching voltage by decreasing its value with increasing the silver concentration. Direction of the pinched memristive loops indicates possible filamentary type of resistive switching effect that was explained through the formation and degradation of the silver conductive filament in ChG materials. Furthermore, presence of phase separation in these materials may be crucial in the formation of conductive filaments in active layer of memristive devices.

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