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HYSTERESIS AND TUNABILITY CHARACTERISTICS OF $Ba(Zr,Ti)O_3$ CERAMICS DESCRIBED BY FIRST ORDER REVERSAL CURVES DIAGRAMS

L. MITOSERIU[1,2], L. STOLERIU[1], D. PIAZZA[3], V. BUSCAGLIA[4], C.E. CIOMAGA[1], A. STANCU[1], C. GALASSI[3], P. NANNI[2]
[1]Dept. of Solid State & Theoretical Physics, Al. I. Cuza Univ, Iasi, Romania.
[2]Dept. of Chemical & Process Engineering, University of Genoa, Genoa, Italy.
[3]Institute of Science and Technology of Ceramics-CNR, Faenza, Italy.
[4]Institute for Energetics & Interphases – CNR, Genoa, Italy.
lmtsr@uaic.ro

The First Order Reversal Curves (FORC) diagrams are proposed for the characterization of the switching process and the tunability in $Ba(Zr_xTi_{1-x})O_3$ ceramics with various compositions x in the range (0, 0.5), prepared via solid state reaction. The changes induced by the compositional-induced crossover ferroelectric-to-relaxor state are investigated by monitoring the changes of the FORC diagrams (the coercive and bias fields corresponding to the maximum, ratio of the reversible/irreversible contribution to the polarization, the diffuse character of the FORC distribution). The first derivative of the FORCs related to the tunability is a function of both the applied and reversal fields. The critical fields for the highest tunability were found to be composition-dependent.

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FAR INFRARED REFLECTION SPECTROSCOPY OF Zn_2SnO_4 OBTAINED BY SINTERING MECHANICALLY ACTIVATED ZnO-SnO_2 POWDER MIXTURES

T. IVETIC[1], M.V. NIKOLIC[2], K. PARASKEVOPOULOS[3], T. ZORBA[3], V. BLAGOJEVIC[4], D. VASILJEVIC-RADOVIC[5]
[1]Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Belgrade, Serbia and Montenegro.
[2]Center For Multidisciplinary Studies of the University of Belgrade, Belgrade, Serbia and Montenegro.
[3]Aristotle University of Thessaloniki, Department of Physics-Solid State Section, Thessaloniki, Greece.
[4]Faculty of Electrical Engineering, University of Belgrade, Belgrade, Serbia and Montenegro.
[5]IHTM-Institute of Microelectronic Technologies and Single Crystals, Belgrade, Serbia and Montenegro.
tamara@itn.sanu.ac.yu

A mixture of starting ZnO and SnO_2 powders with a molar ratio 2:1 were mechanically activated for 10, 40, 80 and 160 minutes in a planetary ball mill. The resulting powders were isothermally sintered at 1300ºC for 2 hours in order to obtain Zn_2SnO_4. X-ray diffraction analysis of sintered samples was performed. SEM and AFM were used to examine the microstructure of sintered samples. Far infrared reflection spectra of all samples were measured in the frequency range 100-1400 cm^{-1}. X-ray data confirmed single-phase polycrystals for all samples. Similarly, FIR data for all samples showed the existence of the same oscillators, but with different intensities. The highest intensity of reflectivity peaks was obtained for the powder activated 10 minutes and it gradually decreased with longer times of mechanical activation. This is in agreement with microstructure analysis where longer times of mechanical activation lead to increased porosity and defects. Using group theory six ionic oscillators were calculated for single crystal Zn_2SnO_4 spectra, but two more oscillators were observed in the obtained experimental spectra, which could be the result of mechanical activation and sintering. The FIR experimental results were numerically analyzed and oscillator parameters were calculated.