Serbian Ceramic Society Conference
ADVANCED CERAMICS AND APPLICATION V
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
School of Electrical Engineering and Computer Science of Applied Studies

PROGRAM AND THE BOOK OF ABSTRACTS

Serbian Academy of Sciences and Arts, Knez Mihailova 35
Serbia, Belgrade, 21st-23rd September 2016.

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Book title: Serbian Ceramic Society Conference -
ADVANCED CERAMICS AND APPLICATION V: Program and the Book of Abstracts

Publisher:
Serbian Ceramic Society

Editors:
Prof.dr Vojislav Mitić
Dr Lidija Mančić
Dr Nina Obradović

Technical Editors:
Dr Lidija Mančić
Dr Nina Obradović
Adriana Peleš

Printing:
Serbian Ceramic Society

Circulation:
140 copies

CIP - Каталогизација у публикацији -
Народна библиотека Србије, Београд

666.3/.7(048)
66.017/.018(048)

SERBIAN Ceramic Society Conference - Advanced Ceramics and Application
(5 ; 2016 ; Beograd)
Advanced Ceramics and Application : new frontiers in multifunctional material science and processing : program and the book of abstracts / V Serbian Ceramic Society Conference, Belgrade, 21-23. September 2016. ; [organized by] Serbian Ceramic Society ... [et al.] ; [editors Vojislav Mitić, Lidija Mančić, Nina Obradović]. - Belgrade : Serbian Ceramic Society, 2016 (Belgrade : Serbian Academy of Sciences and Arts). - 82 str. ; 30 cm

Tiraž 140.

ISBN 978-86-915627-4-8

1. Serbian Ceramic Society (Beograd)
a) Керамика - Апстракти b) Наука о материјалима - Апстракти c) Наноматеријали - Апстракти
COBISS.SR-ID 225924876

dynamics and thin film properties. Coupling of strain with the ferroelectric order parameter give rise to changes in elastic properties and these have been investigated for a ceramic sample of $Ba_6GaNb_9O_{30}$ (BGNO) by resonant ultrasound spectroscopy (RUS). Room temperature values of the shear and bulk moduli for BGNO are rather higher than for TTB's with related composition which are orthorhombic at room temperature, consistent with suppression of the ferroelectric transition. Instead, a broad, rounded minimum in the shear modulus measured at ~1 MHz is accompanied by a broad rounded maximum in acoustic loss near 115 K, and signifies relaxor freezing behaviour. Elastic softening with falling temperature from room temperature, ahead of the freezing interval, is attributed to the development of dynamical polar nanoregions (PNRs), while the non-linear stiffening below ~115 K is consistent with a spectrum of relaxation times for freezing of the PNR microstructure.

INV3

Modeling, designing and processing of barium titanate stannate functionally graded electroceramics

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Barium titanate stannate (BTS, $BaTi_{1-x}Sn_xO_3$) functionally graded materials (FGMs) with an uniaxial Ti/Sn concentration gradient are very useful for applications in electroceramics, due to a high dielectric constant in a wide temperature range. The relative dielectric permittivity, position and width of the transition temperature range for BTS FGM depends on the Ti/Sn concentration gradient and can be easily tailored.
Sintering is the most challenging step of FGMs processing, since the constituent layers with different chemical compositions shrink with different rates and the resulting mismatch stresses can lead to FGMs distortion. To obtain high-quality FGMs it is desirable to predict the sintering process for every graded layer and to design sintering strategy.
Two- and four-component BTS FGMs were chosen as model systems for the designing of sintering strategy. To calculate the residual stresses and predict distortions during sintering, a finite element analysis (FEA) was performed. The model was coupled with a measurement of BTS components shrinkage obtained during sintering, in a heating microscope, up to 1420 °C with heating rates of, 2, 5, 10 and 30 °/min. The linear coefficients of thermal expansion, calculated from the shrinkage data for BTS components, were used as input data for FEA. After calculation of the residual stress and prediction of a distortion, optimal heating rate was chosen and BTS FGMs were fabricated. The microstructure and chemical (Ti/Sn) gradient in the FGMs were examined by SEM–EDS methods, while the electrical characterization was done on an Impedance Analyzer at frequencies of 1 Hz–100 kHz.