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

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

PROGRAM AND THE BOOK OF ABSTRACTS

Book title: Serbian Ceramic Society Conference - ADVANCED CERAMICS AND

APPLICATION II: Program and the Book of Abstracts

Publisher:

Serbian Ceramic Society

Editors:

Prof.dr Voja Mitić Dr Nina Obradovic Dr Lidija Mančić

Technical Editor:

Dr Lidija Mačić

Printing:

Serbian Academy of Sciences and Arts, Knez Mihailova 35, Belgrade Format Pop Lukina 15, Belgrade

Edition:

100 copies

Mosaics: Original Format 30x40 cm

Mirjana Milić, Vladimir Skerlić, Maja Opačić, Maša Nicić, Nina Nicić, Milica Konstantinović, Marjan Vesić - Academy od SOC for Fine Arts and Conservation

CIP - Каталогизација у публикацији Народна библиотека Србије, Београд

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

SERBIAN Ceramic Society. Conference (2; 2013; Beograd)

Advanced Ceramics and Application: new frontiers in multifunctional material science and processing: program and the book of abstracts / II Serbian Ceramic Society Conference, Sep 30th-Oct 1st, 2013, Belgrade, Serbia; organized by Serbian Ceramic Society... [et al.]; [editors Vojislav Mitić, Nina Obradović, Lidija Mančić]. - Belgrade: Serbian Ceramic Society, 2013 (Belgrade: Serbian Academy of Sciences and Arts). - XVI, 61 str.; 30 cm

Tiraž 100.

ISBN 978-86-915627-1-7

- 1. Serbian Ceramic Society (Beograd)
- а) Керамика Апстракти b) Наука о материјалима Апстракти
- с) Наноматеријали Апстракти

COBISS.SR-ID 201203212

INV5

Microelectronics miniaturization and fractal electronic frontiers

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The intergrain ceramic structures are very complex and difficult to describe by using traditional analytical methods. In this study, in order to establish grain shapes of sintered ceramics, new approach on correlation between microstructure and properties of doped BaTiO₃ -ceramics based on fractal geometry has been developed. BaTiO₃ ceramics doped with CeO₂, Bi₂O₃, Fe₂O₃, CaZrO₃ Nb₂O₅, MnCO₃, La₂O₃, Er₂O₃, Yb₂O₃ and Ho₂O₃, were prepared using conventional solid state procedure and sintered at 1350°C. The sintered specimens microstructure was investigated by SEM-5300 and capacitance has been done using LCR-metra Agilent 4284A. The fractal modeling method using a reconstruction of microstructure configurations, like grains or intergranular contacts shapes has been successfully done. Furthermore, the area of grains surface was calculated by using fractal correction which expresses the grains surface irregularity through fractal dimension. For better and deeper the ceramics material microstructure characterization the Voronoi model and mathematical statistics calculations, are applied, also. The fractal nature for ceramics structure analysis providing a new ideas for modeling the grain shape and relations between the BaTiO₃ ceramic structure and dielectrical properties and new frontier for higher integration on electronic circuits. The presented results indicate that fractal method for structure ceramics analysis creates a new approach for describing, predicting and modeling the grain shape and relations between the BaTiO₃ -ceramic structure and dielectric and generally electric and microelectronics properties.