Neues Denken. Neue Materialien.

INM-KOLLOQUIUM

"FROM $BaTiO_3$-CERAMICS TO FRACTAL NATURE IN CERAMICS AND MATERIALS SCIENCES"

Prof. Dr. Vojislav V. Mitić
University of Niš, Faculty of Electronic Engineering, Niš, Serbia
Institute of Technical Sciences of SASA, Belgrade, Serbia

Freitag, 08.12.2017, 11.00 Uhr

INM, Leibniz-Saal, Campus D2 5
Gastgeber: Dr. Peter W. de Oliveira

$BaTiO_3$-ceramics is very "exciting" and actual material for nowadays research with permanent applications growth (over three hundred different applications).
The samples used in our research were prepared by a conventional solid state sintering procedure starting from reagent grade powder $BaTiO_3$ (Murata, Rhone Poulenc Ba/Ti=0.996±0.004) doped with different additives: CeO_2, Bi_2O_3, Fe_2O_3, $MnCO_3$, $CaZr_2O_3$, Nb_2O_5, Er_2O_3, Yb_2O_3, Ho_2O_3, La_2O_3, Dy_2O_3, Sm_2O_3. The content of additive ranged from 0.01 to 1.0 wt%. Starting powders were ball milled in ethyl alcohol. After milling powders were drying for several hours, and pressed into pellets 2 mm thick and 7 mm in diameter at a pressure from 35 to 150 MPa. The pellets were sintered in air from 1180°C to 1380°C for 2 and 4 hours. The microstructure of $BaTiO_3$ doped samples was investigated by scanning electron microscope, JEOL, SEM-5300 equipped by EDS (Energy Dispersive Spectrometer) system. The electrical characteristics were measured using LCR meter Agilent 4284A, in frequency range from 20 Hz to 1 MHz. Most of microstructures have been done with selection of some grains and pores with minimum five magnifications. Which is important, because microstructure fractal nature analysis.

Multistep method and materials sintering consolidation. Materials consolidation and sintering in the light of fractal nature analysis. Modified Coble's model and fractal nature. Heywang model of intergranular capacity and fractal correction. Grains and pores reconstruction by fractal nature analysis. $BaTiO_3$-ceramics porosity fractal structured approach. Fractal nature structure method in designing micro/nano-structure properties. The role of pores in the frame of fractal nature analysis of sintered ceramics materials. Structure and Voronoi cells reconstruction method - microstructure properties prognosis. Thermodynamics parameters and fractal nature (Gibbs energy, entropy …). Some other ceramics samples and fractal applications. Micro synthetized diamonds and fractals. Brownian Motion Fractal Nature in Material Structure. Improved intergranular impedance of doped $BaTiO_3$-ceramics based on Curie-Weiss Law fractal modification. Fractal dimension and

fractal tensor product. Meso-Kinetics of one time relaxation electrical processes in $BaTiO_3$-ceramics. Clausius-Mossoti relation fractal modification. Ceramics materials energy storage and fractal intergrain contact distribution. Sustainable energy, fractals and micro-nano sizes. Alternative energy (electrochemical, solar, wind) sources and fractal nature corrections. New ceramics Tesla fontaine and fractal simulator. Materials properties prognosys, designing predicting, programming and new simple materials properties modelling within the fractal nature perspective applications. Microelectronics, micro-impedances-intergranular and packaging fractal nature frontiers. Higher level microelectronics circuits integrations and fractal microelectronics frontiers.

Keywords:
$BaTiO_3$-ceramics, sintering, grains and pores, Heywang model, intergrannular capacity, intergranular microimpedance, fractals, Brownian motion, Curie-Weiss law, Clausius-Mossoti relation, materials properties prognosis, energy storage Voronoi cells model, fractal microelectronics

Authors:
Vojislav V. Mitić[1,2], Ljubisa Kocić[1], Goran Lazovic [3], Vesna Paunović[1], Hans-J. Fecht[4], Branislav Vlahović[5]

[1]University of Niš, Faculty of Electronic Engineering, Niš, Serbia
[2]Institute of Technical Sciences of SASA, Belgrade, Serbia
[3]University of Belgrade, Faculty of Mechanical Engineering, Belgrade, Serbia
[4]University of Ulm, Ulm, Germany,
[5]North Carolina Central University, USA

Wir laden 15 Minuten vor Beginn zu einem Get-together mit dem Referenten ein.