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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

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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 $BaTiO_3$ -ceramics based on fractal geometry has been developed. $BaTiO_3$ ceramics doped with CeO_2, Bi_2O_3, Fe_2O_3, $CaZrO_3$ Nb_2O5, $MnCO_3$, La_2O_3, Er_2O_3, Yb_2O_3 and Ho_2O_3, 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 $BaTiO_3$ 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 $BaTiO_3$ -ceramic structure and dielectric and generally electric and microelectronics properties.