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ADVANCED CERAMICS AND APPLICATION III
New Frontiers in Multifunctional Material Science and Processing

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Institute of Technical Sciences of SASA
Institute of Chemistry Technology and Metallurgy
Institute of Physics
Institute for Technology of Nuclear and Other Raw Mineral Materials
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Towards Electronic Materials Fractal Theory

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We are witnesses of blowing-up of new technologies and materials that nowadays are being introduced by the increasing rate. With huge diversity of electrophysical properties as well as difference between dimensions of 12 orders of magnitude, from nano tubes to boulders of ore which makes the length scale 10^{-9} to 10^{3} m yields a demand of introducing an universal analytic tool that will independent from both dimension and phenomenology. Next remark is that these materials are usually of amorphous, amorphous-crystals and crystals solid state ceramics, and thou of very irregular geometry, with characteristic example of powder metallurgy. There are also evidences of self-similar phenomena upon different magnitude of magnification of materials' grains or intergranular pores. Besides, the grains themselves possesses very irregular contours which makes difficult calculating their surface area or probability of intergranular contacts. All of these arguments makes reasonable to treat such materials as fractal objects and apply fractal analysis to extract new information about their inner properties regardless dimension range or underlying phenomena. The existing literature as well as our experiments and results show that materials like different ceramics, especially electronics ceramics materials, semiconductors, electromagnetics, ferroelectrics, multiferroics, thin films, diamond films etc., already have fractal nature. As practical outcome we propose introducing suitable correction quantities that would take care of fractal reality as well as involvement of important physical laws. Especially, these fractal nature analysis approaches do open a new perspective for deeper and higher level electronics integrations within the new fractal electronics ideas.