EuroSciCon

World Congress on

Materials Science & Engineering

August 23-25, 2018
Amsterdam, Netherlands

Vojislav V Mitic et al., Nano Res Appl 2018, Volume: 4
DOI: 10.21767/2471-9838-C4-017

MATERIAL SCIENCE FRACTAL NATURE ANALYSIS AND ENERGY ENGINEERING FRONTIERS

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In science and technology, means and tools are always adjusted to the problem. The orderly packed atomic structures suits Euclidian geometry, up to the nano sizes, but it is not suitable for rather characterized particles flows and irregular structures. In order to analyse these structures, our previous research open fractal approach new frontiers. The notable trend is that a wide range of disordered systems, e.g., linear and branched polymers, biopolymers, epoxy resins and percolation clusters can be characterized by the fractal nature over a microscopic correlation length. It is favourable to the fact that energy transformations are permitted on a small scale. The modern material science faces with very important priorities of the new perspectives which open new directions within deeper structure knowledge even down to nano and due to lack of energy, towards new and alternative energy sources. Through our up today research, we recognize that BaTiO3 and other ceramics, as well as synthetized diamonds, have fractal configuration nature based on three different phenomena: first, ceramic grains have fractal shape seeing as a contour in cross section or as a surface, second, there are so called "negative space", pores and inter-granular space plays an important role in micro-capacity, microelectronics, PTCR, and other phenomena, third, there is Brownian fractal motions process inside the material during and after sintering in the form of micro-particles flow (ions, atoms and electrons). The stress in this note is set on inter-granular supermicro-capacity in function of higher energy harvesting and energy storage. An attention is paid to components affecting overall impedances distribution, too. Fractal theory allows recognizing micro-capacitors with fractal electrodes. The method is based on iterative process of interpolation which is compatible with the model of grains itself. Inter-granular permeability is taken as a function of temperature as fundamental thermodynamic parameter. All our research and scientific approach is completed and fulfilled in the area of the microstructure Minkowski hull analysis, micro scales fractal relativization (mega-mezo-micro-nano), fractal curvatures tensor product, thermodynamic parameters (temperature, Gibbs energy and entropy), ferroelectric properties (Curie-Weiss law and Clausius-Mossotti equation), on the way to the new lights in future fractal microelectronics.

Biography

Mitic obtained his B.Sc. degree 1982 in Material science at the University of Nis; M.Sc. degree 1990 in Material science at the University of Belgrade and Ph.D. in Material science at the University of Nis. In 1995 he got position of research scientist at the Institute of Technical Sciences of the Serbian Academy of Sciences and Arts; 1999 Mitic was promoted to senior (higher) scientific associate at the Institute of Technical Sciences of the Serbian Academy of Sciences and Arts – elected into the Center for Multidisciplinary Studies, University of Belgrade - main research field: Electronic Ceramic Materials.

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