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Sustainable energy, fractals and micro-nano sizes

Unlike the orderly unit cells at the atomic scale and the Euclidian surfaces at macroscale, the surface of nano structures, is characterized by randomness, and are difficult to characterize quantitatively. In order to analyse these nanostructures, many authors proposed a fractal approach. The notable trend in the recent literature 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 future new frontiers which opens new directions within higher and deeper structure knowledge even down to nano and due to lack of energy, towards new and alternative energy sources. For ex., through our up today research we recognize that BaTiO₃ and other ceramics 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” made of pores and inter-granular space. Being extremely complex, the pore space plays an important role in microelectronics, micro-capacity, PTC, piezoelectric and other phenomena. Third, there is Brownian process of fractal motions 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 micro-capacity and super micro-capacitors in function of higher energy harvesting and energy storage. An attention is paid to components affecting overall impedances distribution. Constructive 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.

Biography

Vojislav Mitic in 1995 has completed his PhD from University of Nis (Serbia). He is a Full Professor at University of Belgrade and Nis. In 1995-2006, he was the Director of Electronic Industry Corporation, Serbia – Ei. He has published more than 200 papers in reputed journals and has been serving as an Editorial Board Member of repute. He is a Scientific Adviser at the Institute of Technical Sciences of the Serbian Academy of Sciences and Arts. He is a member of European Academy of Sciences and Arts, member of World Academy of Ceramics and President of Serbian Ceramics Society.

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