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ABSTRACT BOOK

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MODELING THE THERMAL AND ELECTRICAL CONDUCTIVITY RELATION OF SYNTHESIZED DIAMONDS WITHIN FRACTAL NATURE ANALYSIS

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Improvement of novel materials could be very good development base for enhancement of new technologies. One of the most promising material of modern science is undoubtedly synthesized diamond. Because of variety of modern applications, the research in this area is becoming intensive. Utilization of this material made great step forward in many areas, beside the most known jewelry, also in producing microcomponents, in medical-surgery, as well as in high professional industry. These and others specific application of polycrystal diamonds, require permanently research and improvement of their properties. Although, the first synthesized diamond was created half a century ago using high pressure - high temperature (HPHT) method, diamonds created by chemical vapor deposition (CVD) method were much more convenient for application in so many areas. By applying CVD method, microcrystalline diamond (MCD) with grain size approximately 100 nm were created. Due to some disadvantages of MCD films, like values of hardness and Young's modulus, new nanocrystalline (NCD) and ultra-nanocrystalline (UNCD) diamond materials were developed, with average grains size of 5-100 nm and 3-5 nm, respectively. The properties of polycrystalline diamonds can vary depending on the consolidation process like composition and pressure of applied gases, filament setup and reactor geometry. In that sense, changing the parameters of consolidation process, there is a possibility to change the microstructure of thin films and understanding its fundamentals. Also, fractal nature analysis could contribute to the revealing possibilities for improvement of polycrystalline diamond films. During carried out experiments, it was observed that there is the influence of grain size on thermal and electrical conductivity - when the thermal conductivity is increasing then electro conductivity is decreasing and opposite. Relation between the structures and final properties of synthetized diamonds can be achieved by explaining these phenomena based on fractal nature.

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