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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
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Application of Minkowski layer for microalloyed alumo-silicate ceramics grains fractal analysis

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Porous aluminium-silicate ceramics, modified by alloying with magnesium and microalloying with alluminium belongs to a group of advanced multifunctional ceramics materials. This multiphase solid-solid system has predominantly amorphous microstructure and micro morphology. Intergranular and interphase areas are very complex, because they represent areas, where numbered processes and interactions take place, making new boundaries and regions with fractal nature. Solid contact between grains is actually very complex configuration of microcontacts with fractal nature. Fractal analysis of intergranular microstructure has included application of Minkowski layer. This layer is in correlation with fractal dimension, and defines grains contact probability. It represents convex layer of grains contour roughness and irregularity. Considering the fractal nature of intergranular contacts, it is possible to establish correlation between material electrical properties and fractal analysis, as a tool for future correlation with microstructure characterization.

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Electrical properties of sintered system $MgCO_3$-TiO_2

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Important role among ceramic materials have those that are applied in electronics. Most common way of obtaining those materials is by using the process of sintering. During mechanical activation of the inorganic materials, they are subjected to grinding and the grain size is being reduced. Crystal structure is distorted and changed, which, in some systems, leads to chemical reaction and formation of new compound. In this paper we explain the influence of mechanical activation on electrical properties in system $MgCO_3$-TiO_2. Important domains in ceramic materials are those materials that are applied in electronics. Magnesium titanate ($MgTiO_3$) based dielectric materials are used for producing type-I capaicitors. Common way of obtaining this material is solid state reaction during reaction sintering. Process of sintering can be enhanced if mechanical activation precedes. In this work starting powders of magnesium carbonate ($MgCO_3$) and titanium dioxide (TiO_2) with a rutile crystal modification were weight to attain 1:1 molar $MgCO_3$:TiO_2 ratio. Mechanical activation of the starting mixture was performed by high energy ball milling using ZrO balls and vessels with ball to powder mass ratio 40:1. The observed grinding times were 15, 30, 60