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Influence of technological conditions on structure and absorptive capacity of AlN-Y₂O₃-diamond based materials

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The composite materials based on AlN-Y₂O₃-diamond have been produced by the pressureless sintering at the temperature 1800 and 1850 °C. The composition of the charge for the preparation of samples differed by the time of grinding and mixing (3, 6 and 9 min.). The study of the structures by X-ray diffraction analysis and SEM microprobe analysis showed that this materials include a small amount of carbon which was formed due to the graphitization of diamond during sintering. The highest density (3,11-3,14 g / cm³) was found in composite materials that were sintered at the temperature 1850 °C. It should be noted the density of composite materials was increased with an increase in grinding time of 3 to 6 minutes. But a further increase of mixing duration 9 min. led to decrease of materials density.

The measurements of absorption of the electromagnetic energy in the 25.9-37.5 GHz frequency range showed the following. The absorption coefficients, of the samples of AlN-Y₂O₃-diamond composites were 25-50 dB/cm. The samples which were obtained by mixing the charge for 6 minutes had larger absorption value. These materials had homogenous structure with uniformly distributed inclusions of carbon.

Thus, the optimal technological conditions for obtaining of materials with high density and absorption microwave energy were the mixing of charge for 6 minutes and sintering at the temperature 1850 °C.