STRUCTURE FORMATION DURING SINTERING OF THE SYNTHESIZED POWDER MATERIALS BASED ON TITANIUM CARBIDE

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Wide applying of additive technology is inhibited by a narrow range of consumables used. Most often the powder mixture is applied as consumables according to functional features of equipment used. Generally the final material composition of the formed part is determined by the mixture of trade powders. It causes the difficulties related to the structure control; it's homogenously, the degree of faultiness.

One solution to this problem is to use consumable powder materials with a pre-formed multicomponent structure, which under the conditions of the additive process can be transformed into a controlled type to ensure the functional properties of the resulting part. Secondary structure formation studies of compacted samples from synthesized multicomponent powder materials were carried out to assess the possible degree of structure transformation of these powders under conditions of vacuum sintering.

The composition based on titanium carbide with titanium binder (TiC-50 vol% Ti) was selected as the test material. The powders were obtained by the SHS method in the regime of layerwise combustion with subsequent grinding and screening of the fraction used 40-60 μm. Grinding of synthesized cakes was carried out both in the standard mode and with the use of additional mechanical activation. Sintering was carried out in a vacuum at a temperature of 1200-1350 °C with an exposure time of 180 minutes. The residual porosity, compaction, grain size and phase composition before and after sintering were evaluated as the main parameters of the structure change of the synthesized powder material.

The carried out researches have shown, that carbide grains undergo significant changes during sintering: a partial coalescence or the carbides growth with a decrease in the thickness of the interparticle interlayer of the titanium binder occurs. At the same time the pore volume content significantly reduced. The intensity of compaction increases when mechanical activation of the synthesized powder material is additionally used.

The results obtained give grounds to assume that the studied synthesized powder materials (TiC-50 vol% Ti) can be successfully used in surfacing processes with low temperatures due to a significant degree of their sinterability which can be increased by the additional mechanical activation.