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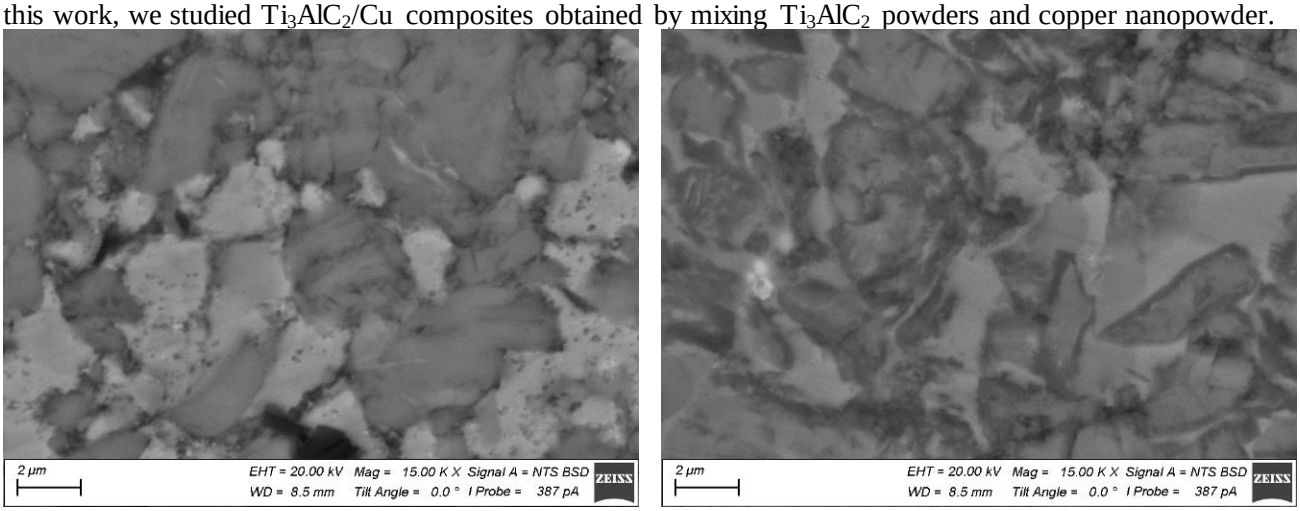
# SINTERING OF COMPOSITE POWDER COMPACTS $Ti_3AlC_2$ / Cu*

*M.G. KRINITCYN* [1]

[1]*Institute of Strehngth Physics and Materials Science SB RAS, Tomsk, Russia*

Triple carbides and nitrides, called MAX phases, form a new class of materials that has very specific properties, combining the properties of both metal alloys and ceramic materials [1, 2]. One of the most promising MAX phases is formed in the Ti-Al-C system. The materials of this system can be used as materials with high strength and deformation resistance, including cyclic loading [3]. The chemical etching of aluminum results in the formation of so-called MXenes, which, due to their nanolaminate structure, can be used in including for storage of electrical energy or hydrogen [4, 5]. Composites "metal - $Ti_3AlC_2$" are promising materials that combine the advantages of the metal enhanced by the features of the MAX phase. In this work, we studied $Ti_3AlC_2$/Cu composites obtained by mixing $Ti_3AlC_2$ powders and copper nanopowder.




a b

Fig.1. SEM pictures of $Ti_3AlC_2$ / Cu powder composite cross-sections after sintering at 800 °C and 1050 °C

Bulk samples from the powder of the MAX phase $Ti_3AlC_2$ and Cu nanopowder were obtained by dry mixing and cold pressing with further vacuum sintering at different temperatures. A comprehensive structural-phase study was carried out using optical and electron microscopy techniques, as well as XRD and EDX analysis. This study allowed to describe the elemental and phase composition, as well as the morphology of both the initial powders and bulk samples.

It was found that the structure of the composites changes with an increase in the sintering temperature, and phase changes also occur: titanium carbide begins to form along the perimeter of the MAX-phase particles. In addition, the MAX phases begin to delaminate, which is clearly seen in the micrographs of the samples. The use of copper nanopowder provides a higher density of compacts and a larger contact surface between copper particles and the MAX phase compared to composites with copper micropowder.

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