У даний час факультет бере участь у міжнародій науково-технічній програмі NATO «Infrared Transparent Ceramic Windows for High-Speed Vehicles» («Інфрачервоні прозорі керамічні вікна для швидкісних транспортних засобів»).

За роки діяльності співробітнгиками факультету одержано понад 300 авторських свідоцтв СРСР, Патентів України та інших держав, опубліковано понад 3000 друкованих праць, у т.ч. майже 300 монографій і навчальних видань, впроваджено у промислове виробництво понад 200 нових розробок.

Випускники факультету усіх часів були і є провідними фахівцями у своїй галузі, всесвітньо відомими вченими. Загалом серед випускників понад 25 академіків та член-кореспондентів НАН України та інших держав, понад 65 лауреатів Державних премій, більше 100 докторів і 400 кандидатів наук.

За час свого існування факультет підготував і випустив більше 9000 висококваліфікованих фахівців, які працюють на провідних підприємствах України та зарубіжжя, зберігають вдячну пам'ять про свою альма-матер та рідний факультет.

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STRUCTURE AND PROPERTIES OF CERMET COMPOSITES B_4C-TiB_2 WITH THE ADDITION OF A METAL BINDER

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Nowadays development of structural ceramics at a rapid pace, what opens wide opportunities for its use in new technologies and technics. Ceramics has advantages over metals: less specific gravity, high corrosion and heat resistance, the products have a low cost. However, it has several disadvantages: fragility, which leads to the destruction of parts under dynamic loads, high hardness, which complicates the mechanical processing, low resistance to sharp temperature fluctuations.

Combining high hardness and low specific gravity, boron carbide also has the same disadvantages as ordinary ceramics. Titanium boride reduces the temperature of sintering due to the eutectic, which has a temperature of 2310 °C and increases the physical and mechanical properties. But the obtaining temperature remains relatively high. Therefore, the research of new sintered composite materials B_4C-TiB_2-Al which were obtained by cladding metal binder onto eutectic powder B_4C-TiB_2 for today is an actual task.

There are 2 methods for obtaining composites based on B_4C-TiB_2: sintering and floating zone melting. The last method allows receiving directed crystallized alloys, although it has a size

limitation. So, the sintering method is more perspective in terms of obtaining materials of different shapes and sizes.

In turn, the use of metals as binders is widely used in the technology of hard alloys reducing the temperature of sintering to 1500 ^{o}C.The use of aluminum in the system B_4C-TiB_2 is perspective for several reasons.On the one hand, aluminum has a low melting temperature, on the other hand, it is wetting boron carbide and titanium diboride at temperatures above 1200 ^{o}C.

In this study, the following methods were used.The powder cladding by aluminum was carried out in the ANGA-1, obtaining composite materials (B_4C-TiB_2-Al) by spark-plasma sintering at the FCT-25 (Germany) at a temperature up to 1600 °C in a vacuum (the pressure of compression was 50 MPa, holding time 1 min), study of microstructure on the optical microscope "NEOPHOT-21" and electron microscope Selmi REM-106I, hardness test on MHV-1000, strength measurement was made on the "Instron 4505" by three-point bending in a vacuum, X-ray survey was made on an X-ray diffractometer in the presence of a selective-absorption filter.

Study of the microstructure of sintered samples of the system B_4C-TiB_2-Al showed that the composite is a polycrystalline material, which consisting of multidirectional eutectic grains with a delimited layer of aluminum-based phases, which are mostly on the grain boundaries.

The study of the chemical composition of composite material B_4C-TiB_2-Al revealed the presence of four phases (B_4C, TiB_2, AlB_2 and Al). Such results also confirm the literature data, which shows that the interaction in the system of Ti-Al-C-B leads to the formation of aluminum borides AlB_2 or AlB_{12}.

Calculated on the load chart, the mechanical characteristics of the material are: bending strength 460,6 MPa, elastic modulus 487,9 GPa. The obtained data on the bending strength almost 2 times exceed the results of tests for similar eutectic composites sintered without the metal binder. Was found that the obtained materials are destroyed by a mixed mechanism, but mostly by the transcrystalline type of destruction.

Thus, obtained sintered composite materials B_4C-TiB_2-Al by their characteristics can be good candidates for the replacement of traditional hard alloys in difficult conditions of cutting and abrasive wear. Therefore, they are perspective for further research as wear-resistant materials.