

## Who we are

The department is engaged in researches of thermodynamics and kinetics the chemical reactions occurring in working spaces of furnaces of reduction, carburising and sintering. The special attention is given to research of process of reception of powders of tungsten and single-phase carburising components. Mechanisms of formation of thin crystal structure of solid solutions of carbides, influences alloying on structure, physics and mechanical and operational properties cemented carbides are investigated. Researches of the phenomena of migration of a liquid phase are carried out at processing cemented carbides liquid metals. The special attention is given to working out of "know-how" large-sized and products from cemented carbides and composite materials for various scopes (power mechanical engineering, pipeline transport, metallurgy, metal working and a mining complex)

## Collaboration interests

There is an interest in participation with the European co-authors in projects of EU, the international programs and large industrial orders which are directed on development of scientific bases, creation of new processes and technologies reception nano- and supergrades powders of refractory metals (W, Ti, Ni, Co, etc.), their carbides and alloys on their basis, researches on creation of products with gradient structure, revealing of laws of formation nano, micro and mesostructures of cemented carbides, and also on introduction of the

specified workings out in industrial production

Potential role: major partner, scientific expert, technology provider.

## Research Areas

- Working out of new processes and the equipment for reception of powders of refractory metals and their combination at use of chemically active gas environments.
- Research of processes of formation of structure and physics and mechanical properties of cemented carbides and multiphase composites at stages solid and liquid sintering.
- Development of methods of definition of structural characteristics and properties of cemented carbides and composite materials, an establishment of influence on them of various stages of technological process of manufacture sintered powder products.
- A scientific substantiation of conditions of industrial production of refractory connections with the set structural, geometrical, physical and mechanical characteristics and alloys on their basis

## Main achievements

Scientific bases of migration of a liquid phase in cemented carbides are developed at their processing liquid metals, by capillary and butt welding. It has allowed to make products in length to 1,5 m and diameter to 350 mm.

Are studied thermodynamics and kinetics interaction processes oxides, pure metals with reductions and carbidisations gas environments. "Know-how" of powders of tungsten with the size of particles to 700 microns, carbide of tungsten WC - to 200

microns, two-layer particles WC + W<sub>2</sub>C - to 500 microns are as a result developed.

Scientific bases of creation wearproof tribotechnical composite materials of bearings, hydroheels, face consolidations which are greased with water, by gasoline, kerosene and others low liquids are developed.

Changes of structure and development of microdestructions details of cemented carbides of high-pressure apparatuses (HPA) in the conditions of cyclic pressure to 80 kBar are studied. Requirements to structure and properties of cemented carbides for HPA are optimised, the equipment and a quality monitoring is developed for manufacture of details HPA with optimum structure and properties.

Processes visoplastic flow large-sized preparations from tungsten heavy alloys are studied.

## Contact information

Full name of the Research Department:  
Department of cemented carbides and the structured composite materials

Full name of the Institute:

V.N. Bakul Institute for Superhard Materials of the National Academy of Sciences of Ukraine

Country: Ukraine

Number of employees working in the research division: 16

Working languages: English, Ukrainian, Russian

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Well-qualified researchers: 3 Dr. Sci., 5 Ph.D., 4 M.Sc.

Well-qualified workforces to operate with high temperature furnaces, press equipment, analytical and technological facilities (powder metallurgy).

Wide experience on materials science, chemistry of refractory metals, cemented carbides, heavy alloys research areas.

We have experience of co-operations with partners from Poland, France, Sweden, Japan, China and USA.

What makes us a good partner

