



Who we are

For a long time the main task of the department was synthesis of diamond and cubic boron nitride powders. We use the powders for sintering of superhard polycrystalline and composite materials at high pressure and temperature. Researchers of department study phase transitions at pressures up to 8 GPa and temperatures up to 2800 K. They establish correlation between formed structure and physico-mechanical and chemical properties of sintered materials. They develop technologies of new superhard materials synthesis. One of the main advantages of research equipment of the department is the ability to use extremely high pressure and temperature to produce samples having 14 mm in diameter and 4 mm in height.

Collaboration interests

The department of synthesis and sintering of superhard materials at extremely high p, T parameters is interested in participating in EU projects under FP8 program and also in other forms of international cooperation in the following research areas: materials science, chemistry of materials and high pressure physics. We are able to synthesize materials at high pressure and temperature and interested in thorough characterization of synthesized samples with the use of modern research facilities.

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

Research Areas

- synthesis of new superhard and functional materials
- study of high pressure phase transformations, construction of phase diagrams of multicomponent systems at high pressure and temperature
- high pressure sintering of superhard polycrystalline and composite materials on the basis of diamond and cubic boron nitride
- development of technology of producing cutters for machining steel, iron, nickel alloys as well as for tools for drilling for oil and gas

Main achievements

17 binary and 8 ternary phase diagrams have been constructed at pressures of 5-8 GPa. Kinetics of diamond and cubic boron nitride crystallization from melts of multicomponent systems has been studied.

Polycrystalline cBN materials with different bonding additives as well as materials without binders with different physico-mechanical properties have been sintered.

Polycrystalline and composite structured diamond-containing materials having extremely high thermostability and wear resistance have been sintered.

The technology of producing two layer diamond / hard alloy plates at high pressure has been developed.

Reference projects

NATO ARW, 12-15.05.2004, N° 980377, project «Innovative superhard materials and sustainable coatings»

Programme ECO-NET, 2005-2006, N° 10278XC, projet «Nouvelles phases super-dures dans le système B-N-O synthétisées à haute pression et haute température»

NATO CLG, 2006-2008, N° 981851, project «High-Pressures Synthesis of New Superhard Phases in the B-N-O System»

Program of joint Ukraine-Israel projects, 2006-2007, project "Synthesis at high pressure and temperature of new superhard materials in the B-N-O system and study of their properties"

Contact information

Full name of the Research Department:
Synthesis and Sintering of Superhard Materials at Extremely High p, T Parameters

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: 29

Working languages: English, Russian, Ukrainian

Contact person: Prof. Dr. V. Turkevich

Position: Head of the Department

e-mail: vturk@ism.kiev.ua

tel.: +380444675681

Well-qualified researchers: 4 Dr. Sci., 10 Ph.D., 8 M.Sc.

Well-qualified workforces to operate with high pressure equipment, analytical and technological facilities.

Wide experience on materials science, chemistry of materials and high pressure physics research areas.

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

What makes us a good partner

