1) Hydro power system that includes more that 50% of Hydro power plants.
2) Heat oriented with more than 50% Combined Heat and Power Plant.
3) Nuclear oriented with more that 50% of nuclear power plant.
4) Systems with equal amount of 3 types of plants.
5) Systems that are consisted only from.

But one the other hand there are systems with mobile structure. So uniting of power systems can be happened due to sectioning of power plants which have big units that can function in several systems that lead to the system of mobile structure, in other words with changing of external impacts that can affect transmission of power, system can change its structure for keeping producing of power on a normal level.

Direct or alternating current?

As you know, the power can be transported by 2 methods: on alternating or direct current. After considering of all factors power engineers chose the most efficiency and beneficial way of power transmission. The main advantage of direct current is that the allowed electric field strength for wires with direct current is much higher than for wires with alternating current. For example, wires that are supposed to function with voltage of 35 kV on alternating current can be used on direct current with 200 kV voltage. That is why despite of its expensive cost, transmissions of direct current is more beneficial in case of extensive transmissions (more than 30 km). But if direct current allows us to increase efficiency of electric transmissions why do we even need transmissions on alternating current? The main answer is in expensiveness of transforming stations that change direct current into alternating current that people use in their electrical appliances and devices. That is why nowadays, there is a great interest in increasing of capacity of transmission on alternating current. Thus, direct current is more beneficial in case of extensive transmission while alternating current is better in local one.

References:

1. Gerasimanko A.A. Electrical power transmission: Study letter/ A.A.Gerasimanko,V.T. Fedin-Publishing house. 2. Rostov :Phoenix, 2008. 715 p.
2. Shabad V.K. Rezhimes of power systems: Study letter/ V.K. Shabad-Publishing house.MSU, 2009. 208 p.
3. Venikov,V. A**.** Extensive power transmissions on alternating and direct current: Study letter/ V.A.Venikov,U.P.Ryzhkov. M.:Energoatomizdat, 1985. 272 p.
4. Miheev G.M. Power plants and electrical wires: Study letter/ G.M. Miheev. Publishing house. Dodeka-XXI, 2010. 297 p.

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Synthesis of TiC nanopowder

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In recent years, nanopowders have attracted much attention due to their unique properties and suitability for practical applications in various fields of science and technology. Titanium carbide refers to such compounds. It has at least two unique characteristics. Firstly, it is superhard, about 30 GPa: this material is promising for use as superhard abrasives and coat reinforcing polishing materials. Secondly, it is high heat resistant. Titanium carbide is promising for use as a refractory compound in high technology. Titanium carbide still has good

conductivity and low evaporation rate, allowing the use of titanium carbide, for example, as anti-emission coating in the production of electronic devices [1].

There is a problem of obtaining fine powder from metals, alloys, and fine-grain materials, which are intended for a variety of technologies. Thus, this problem has been long discussed in scientific circles. The existing traditional methods are rather complex. The conventional methods are time consuming and requiring bulky and expensive equipment, as well as high energy input, with following safety regulations and environmental safety demands [2].

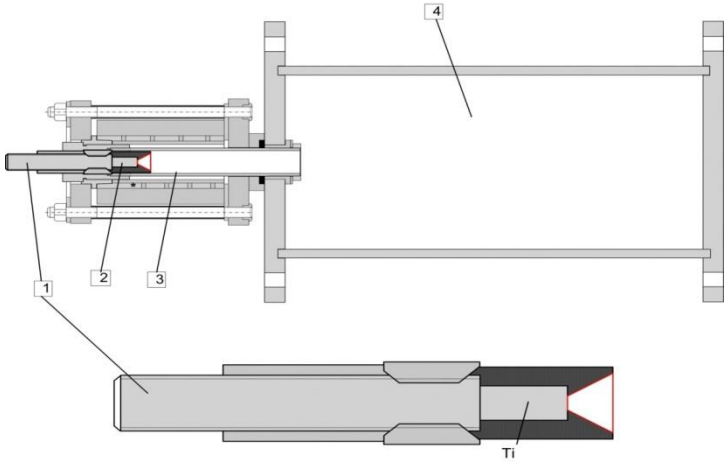


Fig.1 (left). Coaxial magnetoplasma accelerator.

Therefore, experiment was carried out with the aim to investigate the possibility of synthesis titanium carbide nanopowder by means of coaxial magnetoplasma accelerator (CMPA) [2]. CMPA design is shown in Fig. 1. There are a central electrode (1), accelerating channel (3), reactor-camera (5). As precursor titanium is applied carbide powder with an average particle size of 40 microns in the amount of 1,3 g. Power supply of accelerator was carried out by a capacitive storage at a charging voltage of U=2,5 kV and the capacitors C=28,8 mF. Thus, the energy W=90 kJ was supplied.

As a result, dark powder was obtained in reactor-camera. The phase composition of the powder was identified using XRD method. Figure 2 shows the X-ray diffraction pattern of the coating produced by X-ray diffractometer Shimadzu XRD7000 (Cu-Kα). A full analysis of the diffraction patterns of coating was carried out on basis of the program called "PowderCell2.4" and structural data PDF4 +. These results of are presented in Table 1. Dominant phase powder is titanium carbide with the content 83,8%. The average size of coherent scattering for TiC is 55 nm. Judging from average size of coherent scattering, we can say, that powder is nanosized.

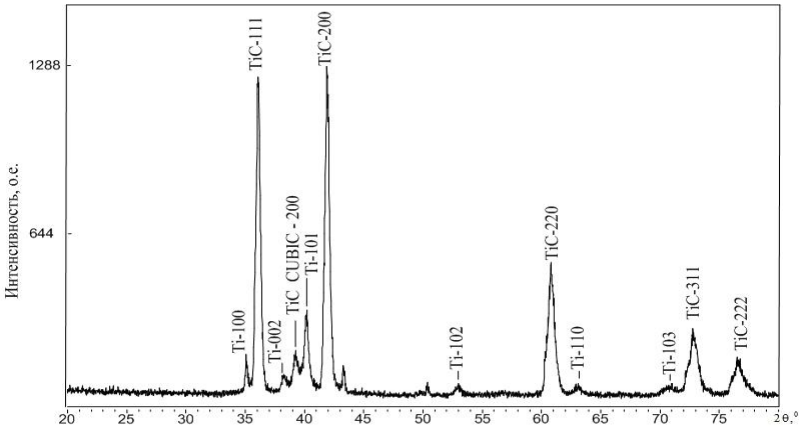
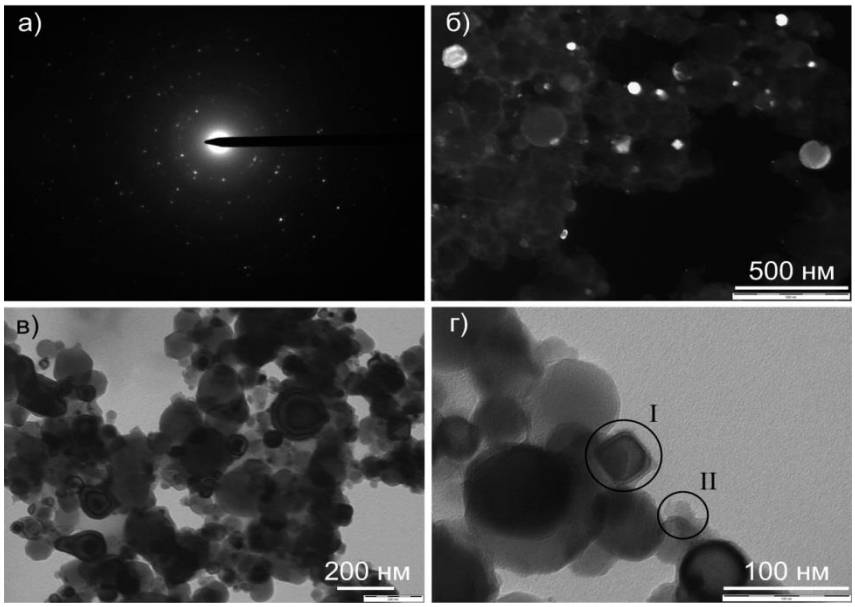


Fig.2. XRD diffraction pattern of the TiC nanopowder.

Table 1. Results of XRD diffraction analysis

Phase, transformation group	Weight, %	CSR, nm	Lattice parameter.experiment/PDF	
			a	c
TiC. F4/m-3 2/m	83,8	55	4,3002/4,3280	-
TiC_CUBIC. F 2 3	4,8	25,7	4,5778/4,6000	-
Ti-ALFA. P6_3/m 2/m 2/c	11,4	74,3	2,9446/2,9505	4,6888/4,6826

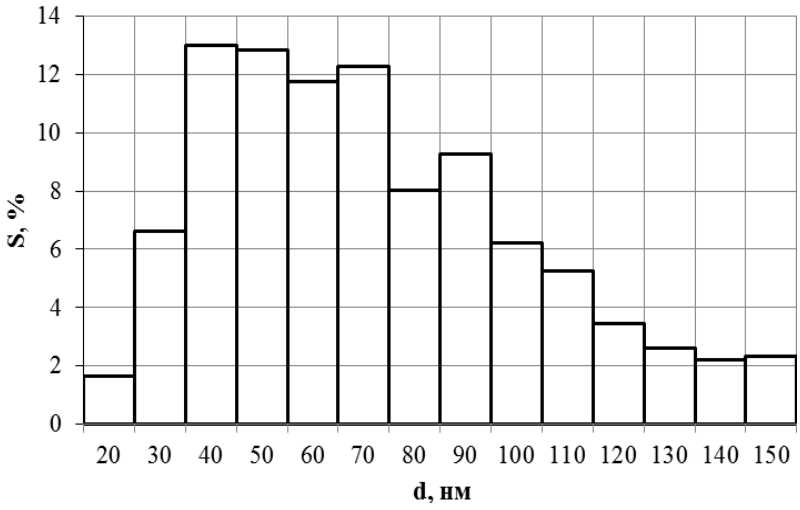
In order to obtain more detailed investigation the powder was analyzed by means of transmission electron microscopy. TEM pattern taken with a microscope Phillips CM 12 are shown in Fig. 3.



A product can be identified two main types of objects. I – is a polygon with an average particle size of 150 nm. II – is invisible objects on this microscope. Dark-field TEM micrograph (Fig. 1.) was obtained by the displacement of the aperture diaphragm to one of the amplitudes. The glow object can be identified as titanium carbide.

Fig.3. TEM pattern of the TiC nanopowder.

Histogram of particle size distribution is constructed using TEM images. By distribution is can be seen that the main part of the particle size ranges from 30 to 100 nm.



In the course of the investigation it has been proved the possibility of synthesis titanium carbide nanopowder in hypersonic jet titanium-carbon plasma generated by CMPA. This conclusion was based on the analysis of the product obtained by XRD, SEM methods.

Fig.4. Histogram of particle size distribution.

References:

1. Кипарисов С.С., Левинский Ю.В., Петров А.П. Карбид титана: получение, свойства, применение. М.: Металлургия, 1987, 216 с.
2. Быстров Ю.А., Ветров А.А., Лисенков А.А. Плазмохимический синтез карбида титана на медных подложках // Письма в ЖТФ. 2011. т.37. №15. с. 33-39.
3. Пат. 2150652 РФ. 7F41B 6100. Коаксиальный ускоритель / Сивков А.А. Заявлено 24.02.1999; Опубл. 10. 060 2000.

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