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PRIORITIES OF UKRAINE IN THE CREATION OF SCIENTIFIC PRINCIPLES AND INNOVATIVE TECHNOLOGIES METALLURGY TITANIUM AND ITS ALLOYS.

Abstract

In the second half of the last century soared modes of technology of new generation. There was a special need for new materials. Titanium began to be used as an independent structural material. It was necessary to improve its quality and volume of production.

Industrial production of titanium consists of several stages. Titanium ore concentrate is smelted with coal in the mixture in an electric furnace. Titanium slag blown chlorine and titanium tetrachloride is formed. Therefrom via the liquid sodium is obtained porous titanium sponge (up to 60% Ti) alloy. Next task was to develop a technology for the processing of titanium sponge, to devise ways of producing metal workpieces or castings for hire

Technology of production of pure titanium developed dozens of institutes and laboratories in the USSR, USA, UK, France and other countries. Results of the work was kept secret - the main customers are the creators of new military equipment. At the end of the 1950s, the Institute has developed the world's first technology for welding of titanium halide flux. It found a fundamentally new direction in the field of metallurgy of titanium metal refining at electroslag remelting.

The E.O. Paton Electric Welding Institute in 1958 began a study of electron-beam processes and the development of equipment for these types of electron-beam technologies, such as welding, melting, evaporation.

It has been found possible to use this source of energy for melt and refine a wide range of metal materials. Powerful electron beam melts the work piece in a vacuum 0.1 ... 0.01 Pa, which removes impurities and dissolved gas produces ingots of titanium and its alloys with a uniform defect-free structure. In 1965 it came into effect the first commercial installation of U-270 in Donetsk Chemical-Metallurgical Plant (c. Volnovaha) in 1969. - Adopted into operation B-254 at a metallurgical plant "Elektrostal" (c. Elektrostal, RF). In addition, as part of the IRTC "PWI E.O. Paton Electric Welding Institute" was created by Research and Production Center" Titan "with capacity of up to 3,000 tons per year of titanium alloys by electron-beam melting. We have developed new alloys of titanium for medical purposes, for chemical engineering, automotive and aerospace industries. In 1989 the world's first technology designed remelting not broken blocks of titanium sponge in a specialized electron-beam installation with intermediate capacity, which will reduce cost and complexity of manufacturing titanium ingots of raw materials (in the form of a sponge kritsa), as well as improve the quality of the metal. In 1998, the first in the world to not broken blocks of titanium sponge was obtained ingot diameter 1100 mm, length 4000 mm, weight 16 tons. Use of ingots, slabs, instead of the cylindrical ingot allowed to increase metal yield by 10% and to reduce the cost of titanium sheets by 20%.

In the last decade, is working on the creation of new titanium alloys with high performance, develop their production technology by the electron-beam melting. Theoretical and experimental work done in conjunction with the Aviation Scientific-Technical kompleks them O.K. Antonov, allowed to develop a new high-strength.

In 1975 it was organized by "The department of plazmashlak metallurgy". For the first time in the world created by the powerful metallurgical plasma torches. The plasma-arc furnaces smelt harvesting one or more arcs, the compressed stream of argon plasma torch.

An alternative to the melting in vacuum conditions is ESR heat by passing an electric current from the electrode to the metal bath through a molten flux - slag. The leading direction are magnetically electroslag process of melting titanium alloys. Titanium alloys can melt any more components.

For the first time in the world practice in the IES has developed a technology of manufacturing of hollow ingots of large-sized titanium tubes and rings directly from the cast round billets. The technology introduced at the Nikopol Southern Pipe Plant in 1998.

Government of Ukraine adopted a program of "Titan of Ukraine." The introduction of innovative technologies to create in Ukraine closed-cycle production of products of titanium and its alloys are entrusted to the E.O. Paton Electric Welding Institute.

600 issued patents for innovative technologies and equipment, which was created in Ukraine. Works implemented on metallurgical and engineering France, Sweden, USA, Germany, Japan and other countries.

Keywords:

history of technology, metallurgy, special electrometallurgy, titanium, aviation building, rocket building, shipbuilding, E.O. Paton Electric Welding Institute.

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