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Topic: Finding optimal modes of heat treatment of titanium alloys with high strength

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Key words: strength, titanium alloys, heat treatment, optimal modes of the alloy

Object of study: phase composition, structure and properties titanium alloy ingot.

The purpose of the work: numerical analysis of the structural-phase state of titanium-based multi-component alloys with the help of computer calculation and analysis methods and creation of optimal modes of their heat treatment.

Relevance of work: The high performance characteristics of products made of titanium and its alloys, which reduce the weight of equipment, increase acid resistance, corrosion and heat resistance of machine parts and mechanisms, are used by the aerospace industry, oil and gas production of the Republic of Kazakhstan and opens up opportunities for use in the chemical industry. In the near future, the need for high-quality titanium alloys in the world market will only increase, and it is clear that the requirements for their quality will continue to grow. Therefore, the creation of scientific bases for the production and processing of high-quality titanium alloys of the new generation from domestic raw materials is becoming an urgent problem. In addition, titanium and titanium alloys are good welders and has paramagnetic properties. New titanium alloys and products made from them must have the necessary technological and operational properties, in particular, high strength, ductility, heat resistance and resistance. It is known that as a result of alloying, thermal and thermomechanical treatment, many industrial alloys, including titanium-based ones, can obtain the desired set of properties. . However, the difficulty in solving this problem is that, unlike many industrial alloys based on iron and nickel, titanium alloys are characterized by high structural sensitivity to the concentration of alloying elements, thermal and thermomechanical treatment modes.

Issues to consider: Using the Thermo-Calc computer program, phase diagrams of titanium-based Ti - Al - Nb - Mo and Ti - Al - V - Mo systems are calculated and their polythermal and isothermal sections are constructed. Polythermal and determination of the optimal concentrations of alloying elements Al, Nb and Mo and the optimal composition of single-phase gamma-alloy as a result of the study of isothermal sections. Development of single-phase γ-alloy manufacturing technology using Al-Nb and Al-Mo ligatures. Heat treatment of Ti-Al-Nb-Mo system alloy create optimal modes. Study of phase composition, structure and properties of titanium alloy after heat treatment. In the master's thesis, the phase diagrams of systems based on titanium Ti -Al - Nb - Mo and Ti - Al - V - Mo were calculated and constructed. A method was developed for the preparation of single-phase γ-alloys using Al-Nb and Al-Mo ligatures. The phase composition, structure and properties of a titanium alloy in an ingot have been investigated. The optimal mode of heat treatment of the alloy of the system Ti-Al-Nb-Mo has been developed.