PROCESSING OF TITANIUM AND ALLOYS BASED ON IT

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ABSTRACT

Titanium and alloys based on it are among the materials of the new generation. Unlike other complex (construction) materials, titanium-containing materials have high physical and mechanical properties. It is characterized by high relative strength and heat tolerance, as well as resistance to corrosion and corrosion in an aggressive environment.

Keywords: Titanium alloys, aluminum, thermal recovery, plastic.

The advantages of titanium alloys include good weldability, paramagnetic and some other properties that are important in the technical branches of production. Thus, due to the quality of titanium alloys, they can be widely used in the production of ships, rockets and airplanes, as well as in machine building.

Up to the spatial transformation temperature, titanium has a hexagonal close-packed crystal lattice, lattice period a=0.29503 km and c=0.48631 km (c/a=1.5873); at higher temperatures, titanium crystallizes in a volume-centered crystal lattice with a period of a=0.33132km (at 900°C). It is also important to give the quantitative value of its main properties: density a - density of titanium is equal to 4.505 g/cm3, b - 4.32 g/cm3 at a temperature of 900°C. The coefficient of linear expansion of titanium is 8.3-10-6 °C-1 in the range of 20-100 °C, the thermal conductivity is 15.4 W/(m·k) at 50 °C. Both forms of titanium, either in the annealed state or after casting, have a high rate of cooling, resulting in an α-phase needle device. This phase is characterized by a distorted GIK structure and resembles martensite in steel.

Titanium alloys are also divided into groups after deformation and heat treatment regimes. Thus, a, b and (a+b) are divided into alloys (a and b phases have different ratios).

Strengthening of titanium is carried out by alloying α- and β-alloys with stabilizing elements by significantly changing the temperature, resulting in a polymorphic, i.e. multi-shaped, alloy. Also, the thermal treatment of two-phase (a+b) alloys increases the strength of titanium.

In this case, a-alloys have high plasticity (softness), they do not have a tendency to wear, (a+b)- and b-alloys have low plasticity (softness), and therefore they are often prone to wear.

Chemical elements such as aluminum, to a lesser extent tin, and zirconium (Al, Ca, La, Ce, O, C, N) are considered elements capable of increasing the stability of titanium α-phase. The advantage of a-class alloys of titanium is excellent weldability.

Alloying mixtures that increase the stability of the b-phase can be divided into two groups: b-eutectoid stabilizers, in which chron, manganese, nickel, iron, zinc, etc., are used as alloying elements, which produce eutectoid decomposition at low temperatures; and isomorphic β-stabilizers, in which tungsten, vanadium, molybdenum, etc. are used as alloying agents.

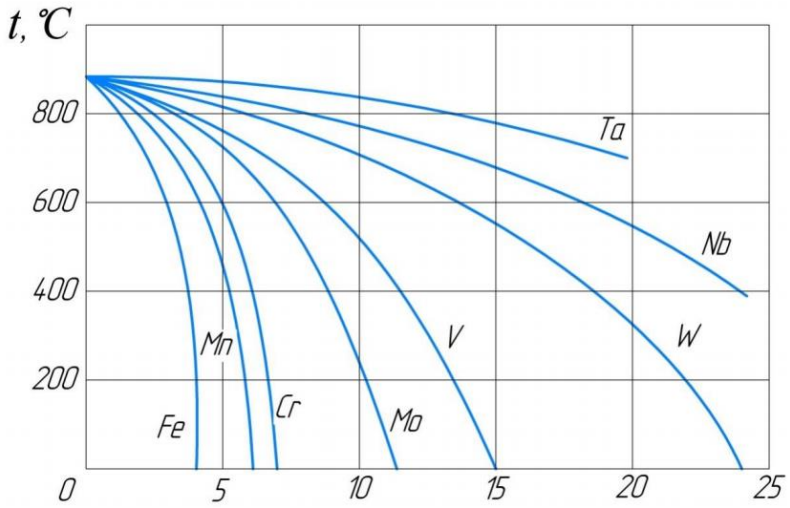

Figure 1 - the dependence of the temperature of the change of mantensite on the alloying elements (according to the experience of A.P. Gulyayev) Titanium alloys can again be divided into groups depending on the size of the conditional coefficient of stabilization KB. This coefficient B- is the ratio of the amount of stabilizing, alloying element to its amount in the critical composition of the alloy. If there are several B-stabilizing elements in the alloy, their KB coefficients are added. Two-phase (a+b) alloys are characterized by thermal strengthening (with additional thermal treatment or wear), which ensures high coefficients of strength and heat resistance.

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