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INVESTIGATION OF THE COMPOSITION, STRUCTURE AND HARDNESS OF TITANIUM AFTER INDUCTION NITRIDING

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Titanium alloys occupy an important place among modern structural materials because they have a unique combination of mechanical, physical and technological properties. Due to the high specific strength, low density, high corrosion resistance and heat resistance, titanium alloys have found wide application in aviation and space technology, medicine. However, these materials are characterized by low values of wear resistance and hardness, which leads to the need to develop new methods of their hardening. One of the most studied methods for creating hardened layers on titanium is nitriding. This paper presents a study of the effect of induction nitriding conditions on the composition, structure and hardness of technical titanium grade VT1-00.

Methodology

The studies used cylindrical samples with a diameter of 10 mm and a thickness of 5 mm made of technical titanium VT1-00 , without preliminary thermal treatment.

Nitriding of the samples was carried out in a specially designed sealed chamber in a reaction gas medium at a temperature of 800...1000 s . The duration of the process was 60, 300, 600 s. As a result of modification, a nitride wear-resistant layer was formed on the sample (Fig. 1).

Results

The analysis of the surface microhardness carried out using the Vickers method at a load of 100 gf showed that the surface microhardness of the sample is 1500±30 HV.

The chemical composition of the cross-section of the samples (Fig. 2) was studied using a scanning electron microscope "MIRA II LMU". Saturation of titanium with nitrogen with its content in the surface layer from 2.05 to 12.95 at.% was observed.

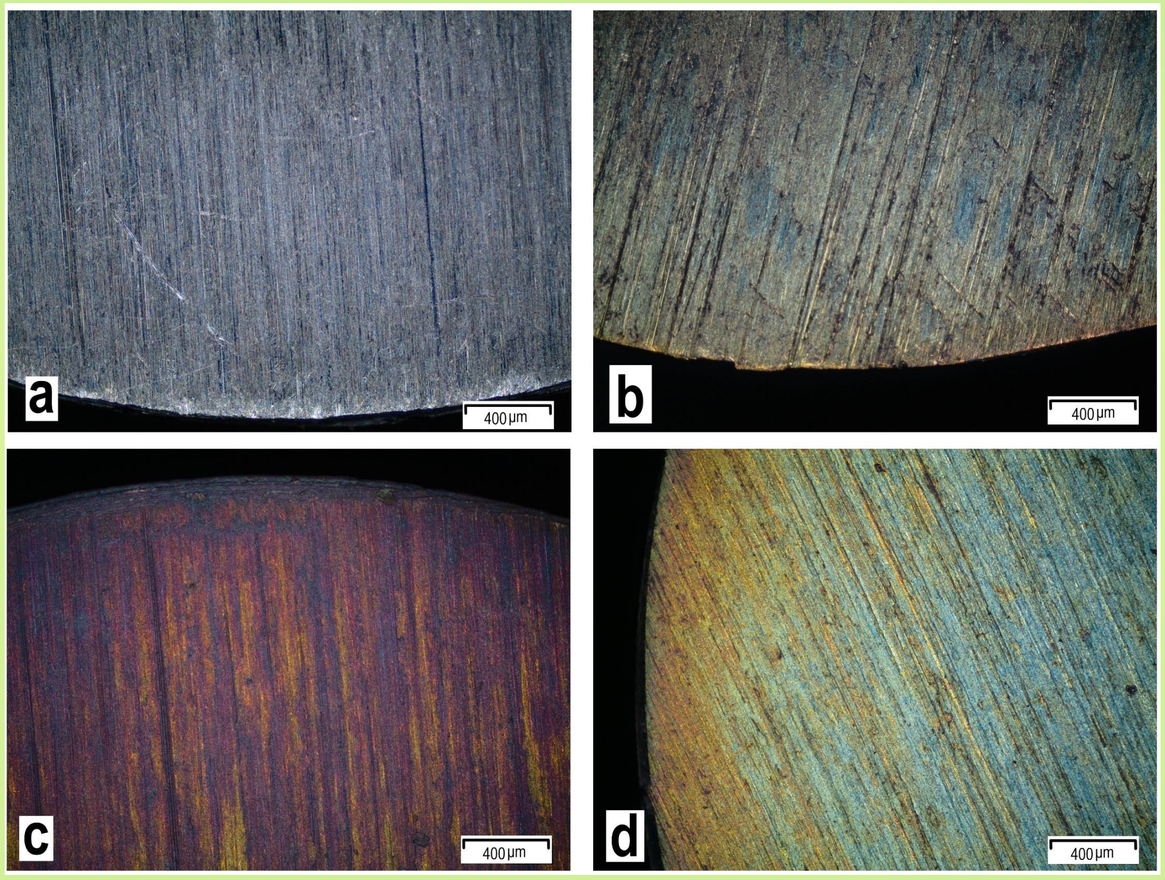

Fig. 1. Surface structure of the sample at magnification ×50 after induction nitriding: a – initial sample; b – 60 s; c – 300 s; d – 600 s

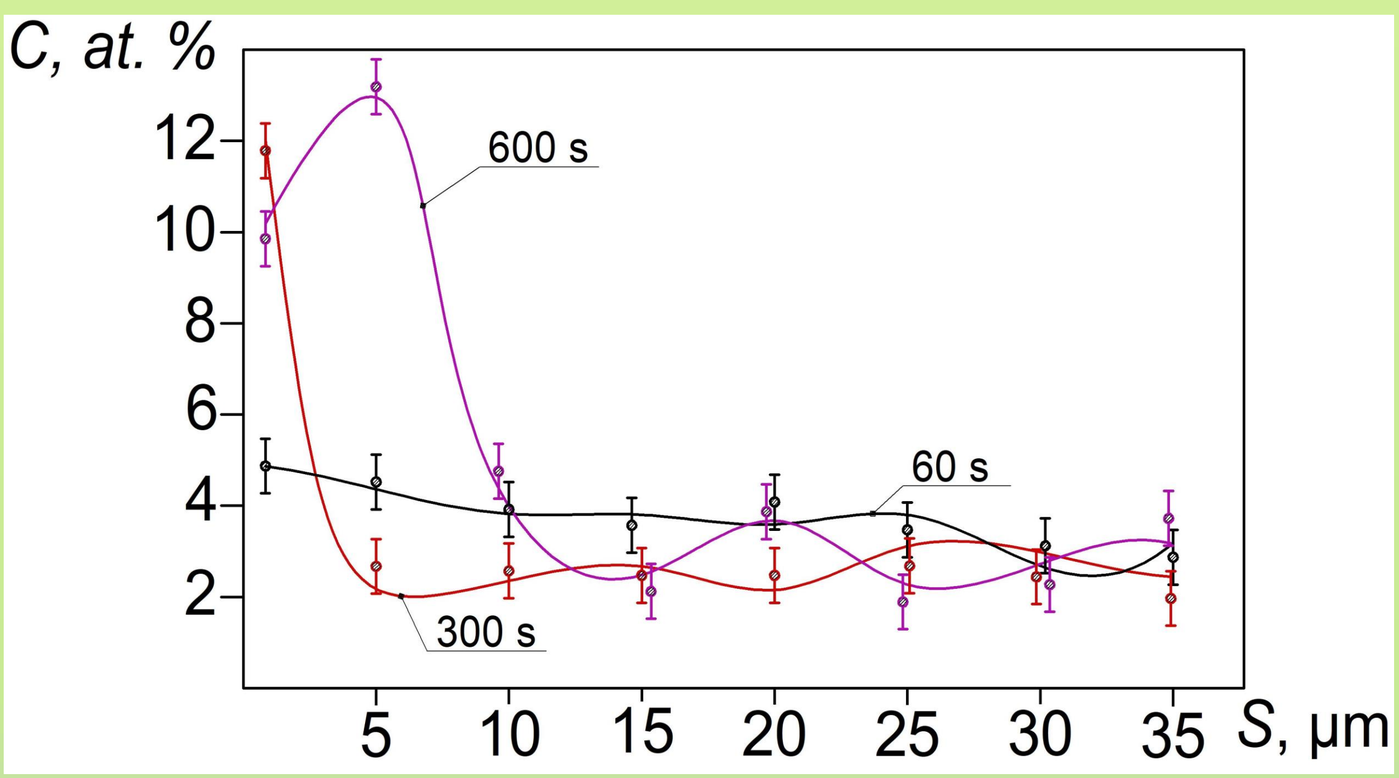

Fig. 2. Graph of nitrogen distribution by sample cross-section

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