Abstract

This doctoral dissertation deals with issues related to the production of nitrided layers on the basis of technical titanium Ti99,2 under glow discharge conditions.

The literature review characterizes the nitriding process in glow discharge plasma. Special attention was paid to the issues concerning the role of ion sputtering in glow treatment, chemisorption, titanium nitride mechanism and the influence of ion nitriding parameters on the properties of the produced surface layers. A separate chapter was designed to the discussion of the ion nitriding method with the use of an active screen.

The research part of the work has been divided into two parts, i.e. the results and the analysis of preliminary tests as well as the results and analysis of the main studies. As part of the preliminary tests, parameters of nitriding processes in the glow discharge plasma were selected and the limiting process temperature was determined, ensuring the creation of a continuous and uniform thickness of the titanium nitride layer on the nitrided samples. The basic research included a detailed analysis of the surface layers produced at a nitriding temperature of 685, 700 and 715 °C. Additionally, the nitriding process was carried out at 750 °C, where the samples were placed on two appropriately prepared cathodes (a mechanically polished cathode, a blasted cathode). Increasing the cathode roughness by sandblasting was aimed at ensuring the free flow of the nitriding atmosphere between the bottom surface of the sample and the cathode, thereby increasing the nitrogen stream to the bottom surface of the sample.

It has been shown that the nitriding of technical titanium Ti99,2 under glow discharge conditions of direct current, allows the formation of surface layers with a more favorable structure and properties compared to the surface layers produced as a result of classical gas nitriding.

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