

FEATURES OF OBTAINING HIGH PERFORMANCE PROPERTIES OF MACHINE PARTS

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One of the most common methods of increasing the hardness and wear resistance of steels is surface modification. Surface modification methods, in which protective coatings are formed on steel surfaces, usually consist of carbides, nitrides or carbonitrides. However, they do not allow obtaining high performance indicators of metal products. Therefore, further developments of diffusion saturation of the surface with various atomic elements due to the complex effect on the surface layers of machine and tool parts are currently relevant.

In industry, one of the main methods of strengthening the surface of parts is thermochemical treatment to obtain the functional properties of the surface layers of products. One of the most popular methods of thermochemical treatment of steels and alloys is the production of hardened surface layers by gas nitriding together with gas carbonation and gas carbonitriding. In order to change the microstructure and increase wear resistance after gas nitriding, a laser modification with and without remelting is used. To change the tribological characteristics of medium-carbon steels, anodic-plasma electrolytic nitrocementation in a urea electrolyte is used. At the same time, it is also possible to increase the corrosion resistance of low-carbon steels due to significant changes in its structure during electrolyte-plasma saturation of the anode with nitrogen and carbon. This method is accompanied by physical and chemical features of diffusion saturation of structural steels.

Borating is one of the most effective methods for improving the wear resistance and corrosion properties of steel parts and high-entropy alloys due to the formation of solid borides. Boron alloys using nanoscale borating powders showed reduced friction coefficients and low wear losses.

Recently, more and more attention has been paid to the use of low-cost atomic saturation elements (carbon, nitrogen and boron) and the processes of obtaining reinforced diffusion layers due to complex chemical and thermal treatment: boronitriding, boroncarburization, saturation with nitrogen, boron and carbon.

Thus, in order to obtain high performance properties of machine parts, the development of diffusion saturation of the surface with various atomic elements for the formation of a complex surface layer structure is currently relevant.

To form a composite structure on the surface of steel parts, a complex finish was proposed, which consisted in sequential carburization, nitrocementation and boriding. Studies have shown that after the developed complex treatment under various modes, a complex structure of the reinforced layer is formed, which consists of sequentially arranged carbide, carbonitride and boride layers.