STANDARDIZATION OF THE METHOD OF LIBRARY SURFACES OF DETAILS

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ABSTRACT

The surfaces of shafts, axles, drums and similar parts exposed to high oxidation and corrosive chemicals in manufacturing plants are subject to rapid corrosion, rapid corrosion under the influence of chemicals, and reduced strength. For this reason, elimination of technological defects and defects that arise during the production process by chemical-thermal treatment of the surfaces of these details and increasing their hardness and corrosion resistance.

Keywords: nitriding, nitrided layer, martensite, defect, alloying element.

Enter: Today, researchers and metallurgists are working on metals to obtain harder, more useful, less expensive metals that can withstand pressure. In order to improve the mechanical properties of materials, nitrogen injection by chemical thermal method is used to simplify the surface of metal materials, to increase corrosion resistance and serviceability of metals, to increase their surface strengthening and polishing properties, and to reduce friction. Several nitriding methods are known: gas nitriding, plasma and laser nitriding, ion implantation with nitrogen, reactive magnetic saturation, etc.

But the above-mentioned methods have some disadvantages from the engineering point of view, for example, they need complex and expensive equipment and materials such as ammonia, which cannot form a thick nitride layer. For over 100 years, since 1912, nitrogen (N) has been studied in iron and steel. The nitriding process was first used in the early 20th century by American engineer-metallurgist Adolph McLeod. In his experiments, he discovered that surface hardening with nitriding caused the problem of increased hardening at high temperatures and surface degradation due to suspension in water or oil. Through his research determined the solubility of nitrogen in iron. At this time, the researcher Adolf Fry also started his research in 1906. He, like Maclett, took ammonia as a source of nitrogen. They note that for nitrogen to affect the reaction, the nitrogen source must be thermally decomposable. Later, in 1913, both researchers were granted a patent. According to Fry, steel has alloying elements because Cr, Mo, Al, V and W can form nitrides such as CrN, AlN, etc.

The main part

Nitriding is a chemical-thermal treatment process consisting of saturating this layer with nitrogen in order to increase the surface layer's hardness, abrasion resistance, and corrosion resistance. The thickness of the nitrided layer is much higher than that of the cemented layer and is maintained at 400-600°C, while the hardness of the cemented martensite structural layer is maintained up to 200-250°C. Alloy steels such as 35XMYuA, 40X, 18XGT, 40XNMA containing aluminum, chromium, titanium are nitrogenized.

Nitriding is widely used to improve the cutting properties of stainless steels, high-temperature and heat-resistant steels, martensitic-aging steels, and late-time and tool steels (R18, R9, X12M,, 15X5VF X12F1.). Gear wheels, cylinders, worms, spindles, bushings, etc. are made of 38X2MUA steel in mechanical engineering, and their strength is increased by nitriding on a large scale.

Before nitriding, the parts are hardened, released at high temperature, and their mechanical properties are improved. The thickness of the nitrided layer reaches 0.2-0.6 mm. Nitriding layer is well polished and polished. Car details (wheels, crankshafts), as well as stamps, press molds and dies are nitrogenized. As a result of nitriding, the detail sizes are slightly larger. Therefore, a 0.02-0.03 mm thick layer of nitrided parts is carefully removed by grinding (for example, the necks of the crankshaft are re-grinded).The graph of the hardness of the nitrided 38X2MYuA steel as a function of time (Fig. 2.1) and the surface thickness as a function of time (Fig. 2.2) are shown.

As you can see from the picture. In order to correctly visualize the process of nitriding, we familiarized ourselves with the state diagram of the Fe-N system. Such a diagram is shown in Figure 2.2, where the single-phase branches are dashed.

The following phases can be formed in the Fe-N system:

α-phase, this phase is a solid solution of nitrogen in α-iron (nitrogenous ferrite). Nitrogenous ferrite contains 0.42% nitrogen at 591°C and 0.10% nitrogen at 18°C.

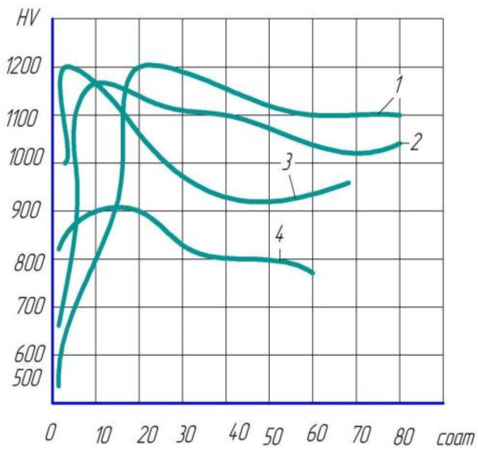

Figure 1. Hardness and temperature of steel 38X2MyuA brand anitrided 0C 1-500; 2-525; 3-550; 4-600:

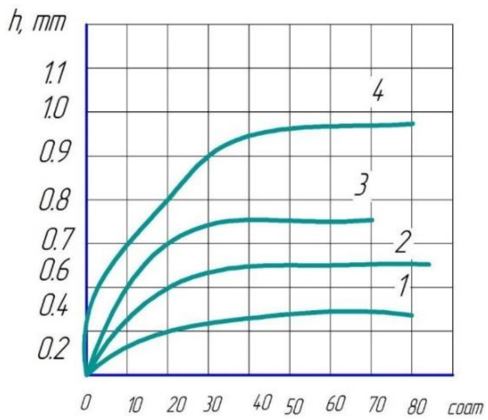

Figure 2. Nitriding 38X2MYuA brand steel thickness and temperature 0C 1-500; 2-525; 3-550; 4-600:

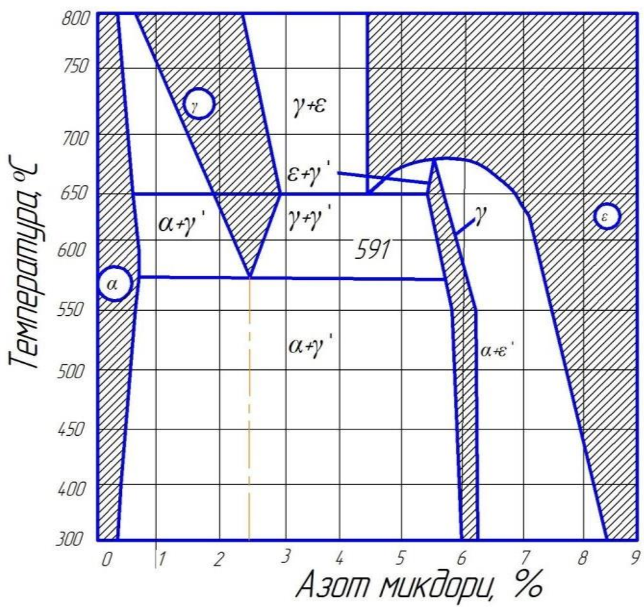

Figure 2.2 Part of the state diagram of the Fe-N system.

b) γ-phase solid solution of nitrogen in γ-iron (nitrogenous austenite). Nitrogenous austenite can exist only at a temperature higher than the eutectoid temperature (591ºC). If the steel is cooled slowly at 591ºC, nitrogenous austenite decomposes and forms eutectoid (a+g), eutectoid contains 2.35% nitrogen. When the steel is cooled rapidly, nitrogen martensite is formed from the γ-phase.

c) g!-phase, which is iron nitride, whose chemical composition is represented by the formula Fe4N; The crystal lattice of Fe4N is a face-centered cube; γ!-phase contains 5.9% nitrogen.

g)e-phase, this phase is a nitride of iron with Fe4N composition, its crystal lattice is a hexagonal lattice.

Nitriding is usually carried out in an ammonia environment at a temperature of 500-600°C. Ammonia decomposes with the release of active nitrogen in the atomic state: 2NN32N + 6N. At this temperature, nitrogen enters the surface layer of steel in a hermetically closed muffle poured into the furnace, enters into a chemical reaction with the alloying element, and forms chromium, molybdenum, tungsten nitrides. Nitrides of alloying elements increase the hardness of steel up to HV 700. The hardness of ordinary structural steels that are nitrided is lower, and that of carbon steels is much lower, because they do not form special nitrides. That is why carbon steels are nitrogenized only against corrosion.

REFERENCES:

1. Khusanboyev, A., & Mukhtorov, S. (2022). IMPROVING THE STRENGTH OF DETAILS BY CHROMING THE SURFACES. Educational Research in Universal Sciences, 1(6), 626–634. Retrieved from http://erus.uz/index.php/er/article/view/832

2. Xusanboyev, A., & Muxtorov, S. (2022). NOSOZLIKLAR SONINI TAQSIMLASH VA KANALIZATSIYA TARMOQLARI ELEMENTLARINI TIKLASH MUDDATI. Educational Research in Universal Sciences, 1(6), 617–625. Retrieved from http://erus.uz/index.php/er/article/view/831