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GALVANIC COATING WITH CHROME: FEATURES, TECHNOLOGIES AND METHODS OF COATING THE SURFACE OF METALS WITH CHROMIUM

Stud. F.S. Makatera, gr. BTE-1-15
Scientific supervisor V.A. Velykozhon
Scientific supervisor Yu.V. Borisenko
Kiev National University of Technologies and Design

Purpose and objectives. The main purpose of applying a chrome coating depends on the purpose. Chrome covers are divided into decorative and functional. The first is applied in the form of thin (<1 microns) layers on a rough intermediate sublayer, and the second is applied directly to the steel or other substrate. The thickness of the functional coatings reaches several millimeters. The main task of applying chrome coatings is to observe all technological processes and requirements when working with toxic substances.

Object and subject of research. The object of research: the application of chrome coatings on metal products. Subject of study: determination of the exact amount of CgO3 and (H2SO4; HCl) to exclude defects in the coating of a metal product.

Methods and means of research. The universal bath, suitable for technical and decorative chromium, contains: chrome anhydride (250 g / l) and sulfuric acid (2.5 g / l). Decorative coatings are applied at ~ 50 ° C and an average current density of 25 A / dm2, and functional coatings – at 55-60 ° C and a current density of 45-60 A / dm 2.

Scientific novelty and practical value of the results. For many years, it was considered that the corrosion resistance of multilayer coatings depends, in general, on the thickness and quality of nickel and copper layers. However, the application of chrome coatings significantly improved the protection of the metal mainly in the automotive industry, where the decorative and protective functions of coating details are given very high requirements.

Research results. Traditional baths for decorative chromium in 1 liter contain ~ 400 g of CrO3 and 4 g of H2SO4, which is primarily due to high electrical conductivity of the bath, which allows to achieve very high current density at relatively low voltage. With the wide application of generators with U> 6 B it is very important.

Highly concentrated baths are also characterized by the good ability of coated products of complex shape. They have a brilliant coating already at 35-40 ° C and 15-20 A / dm 2, which is important.

The general tendency to save materials and reduce the degree of sewage pollution requires the use of baths with a lower content of chrome anhydride. Many workshops successfully use a universal bath containing chromium anhydride 250 g / l for functional and decorative chromium. To apply only decorative coatings, you can use a bath containing chromium anhydride 300 g / l and sulfuric acid (3 g / l), which will work at 40 ° C, ~ 20 A / dm2. Already, the reduction of temperature is equivalent to energy savings, which is in line with national interests.

The current density at decorative chromation reaches 15-20 A / dm 2, and the temperature is 40-50 ° C. The most effective parameters are chosen experimentally. At the beginning of the chromination of the products of a complex form, a high density current is applied to impose layers of chromium in in-depth locations, and after a few seconds, the current density is reduced to a minimum value. It should be borne in mind that the initial strong shock with the current can lead to a bulging of coverage in places close to the anodes, and therefore the parameters of this impact should be determined experimentally.

In accordance with the basics of electroplating, it would be worth choosing the current density depending on the surface area of one load. The premise at first glance is very simple, but in the case of products of a complex profile, the calculation of the surface is difficult.

The final processing of chrome plated products. After unloading from the bath to catch large and heavy products remain warm and so they are washed in warm water, because very cold water could lead to cracks in the chrome layer.

After disassembly of the suspensions, the product is usually cooled and can be rinsed in running cold water. Flushes of the dried solution of the bath are washed with 5% sodium carbonate. Thermal treatment is a very important operation, which has a great influence on the grinding of the chrome layer. During restoring parts of machines, they usually chrome out of excess and, consequently, there is a need for grinding in order to get the specified sizes.

The grinding of the chrome layer should be performed by a specialist in the processing of chromium, as the improper performance of this process can lead to peeling the coating, resulting in the complete removal of chromium and the repetition of the whole process again, and the re-chromium is more complicated.

During galvanic chromium, hydrogen released on the surface of the cathode, partly penetrates into the structure of steel (material parts, which is applied to the coating) and creates internal tension. This can lead to corrosion cracking of parts. In some cases, internal tensions that have arisen in galvanic chromium can be combined with the stresses that arose during the preparatory operations and the parts may crack (especially if they have rather thin walls).

The defective coating is removed using an electrochemical or chemical method. Electrochemical removal of galvanic chrome coating means anodic dissolution in an electrolyte containing 150 - 200 g / l of sodium hydroxide. The process is carried out at a current density of 3 - 10 A / dm2 and room temperature. In chemical removal, the chrome piece is immersed in a solution of hydrochloric acid with water at a ratio of 1: 1 and at a temperature of 300 - 314K.

Conclusions. Galvanic chromium coating is very widespread, because it is characterized by high wear resistance, hardness, durability, chemical and thermal resistance. Galvanic chromium coating has high decorative properties (it does not dim and does not change the colour even when heated). Under the action of strong oxidants or simply in the open air, the surface of the chromium coating passes into a passive state (it forms a thin film of oxides). An essential disadvantage of protective galvanic chrome coatings is the fact that in the presence of pores, scratches, cracks, etc. it does not provide electrochemical protection against corrosion, because it has a positive potential.

Keywords: *chromium, chrome plating, electroplating, shiny chrome coatings.*

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