Study on common faults and effective control methods of passivation of copper and copper alloy

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Abstract: In the industrial production, copper as an important common metal, has strong thermal conductivity, processability and electrical conductivity, in the construction, electrical and mechanical industries have been widely used. However, copper in the big flag is easily oxidized, and then the formation of copper oxide, which also affects its actual application performance. In this regard, in order to further improve the corrosion resistance of copper and copper alloy, we can passivate it, but the actual process will also encounter some common faults, in this regard, this paper discusses the common faults and effective control methods of copper and copper alloy passivation, hoping to provide some references to the relevant people.

Key words: Copper; Copper alloy; Passivation; Common faults; Control method

Due to its excellent physical properties and diverse application scenarios, copper and copper alloys have become indispensable materials in today's industrial fields. However, copper materials are prone to oxidation problems in the atmosphere, resulting in copper oxide and cuprous oxide grinding, and will be corroded to form green oil layers such as basic copper carbonate in a humid environment, affecting its aesthetic and practical properties. In order to overcome this problem, passivation technology has been widely used, and has played a great role in enhancing the corrosion resistance of copper and copper alloys. However, the passivation process will often face some failure problems. In this regard, it is necessary for us to deeply grasp these common faults, and actively explore effective control methods, in order to optimize the passivation process of copper and copper alloy, promote their better application, and promote the innovation and development of industry.

I. The passivation process of copper and copper alloys

For copper and copper alloy passivation process, it belongs to a chemical conversion film treatment technology, mainly through a specific chemical solution to treat, so that the surface of copper and copper alloy can form a passivation film. With this layer of grinding, it can make copper and copper alloy and external corrosive substances are effectively isolated, and then fully improve their corrosion resistance. In the actual production process, it is mainly operated in accordance with HB/ Z5081-1978 "Copper and copper alloy Chemical passivation process" standard.

Conventional copper and copper alloy passivation process includes a number of steps, each step has its unique and important role. The first step is the degreasing process. This step is mainly to remove some impurities or oil on the copper and copper alloy, and then improve the adhesion of the subsequent surface to achieve the purpose of uniform film layer. The second step is the flow of hot and cold water cleaning. The main purpose of this step is to further clean the surface of copper and copper alloy, and lay a solid foundation for the follow-up chemical treatment work. The third step is pre-corrosion and bright corrosion. This step belongs to the key link in the passivation process of copper and copper alloy. The former can effectively remove the weak metal layer and oxide on the surface of copper and copper alloy, promote its smooth and uniform, and ensure its subsequent adhesion; The latter is to treat copper and copper alloy through a specific chemical solution, so that their surface can form a certain luster, and then promote the improvement of its appearance quality. The fourth step is chemical passivation. It is the core step of the entire passivation process of copper and copper alloy. The main operation is to prepare a solution containing sodium chloride, hydrochloric acid and sodium chromate, and then immerse copper and copper alloy in it. On this basis, a dense film is formed on the surface of copper and copper alloy with the help of the polishing property of sulfuric acid, the penetration of chloride ions and the strong oxidation of hexavalent chromium. And then effectively improve the wear resistance and corrosion resistance of copper and copper alloy. The fifth step is stable treatment and drying. The main purpose of this step is to further strengthen the passivation film of copper and copper alloy, improve its stability, and remove the residual chemical substances and moisture on the surface. Through the treatment of this step, the quality of the passivation film of copper and copper alloy can be further strengthened and its actual life can be improved. In general, the passivation process of copper and copper alloy is a very common and important surface treatment technology of copper and copper alloy, which can effectively improve the corrosion resistance and wear resistance of copper and copper alloy, and then increase its actual life. In the actual production process, should be strictly in accordance with the relevant process flow to operate, at the same time to strengthen the supervision and control, so as to further improve the process effect and quality.

II. Copper and copper alloy passivation common faults and effective control

1. Fault analysis of the original surface

The condition of the original surface directly affects the passivation quality of copper and copper alloy. Combined with the relevant process operation flow, there are two main factors affecting the surface of the original parts, respectively, wire cutting processing and heat treatment.

(1) The fault problem of wire-cutting processing

The passivation process of copper and copper alloy often requires cutting between copper parts, and in this processing step, the electrode wire tension will change, and its cyclic repeated movement will produce some periodic stripes on the surface of the parts, especially in the fast wire processing, this phenomenon will be very obvious. The application of wire cutting process, the use of emulsified oil for cooling, which also makes the oil permeate into the fringe, after a long time will dry on the surface of the parts, and show a black solidified state, it is difficult to clean up, which also leads to the copper and copper alloy passivation layer film adhesion affected, hinder the effective formation of chemical conversion film.

In the face of this common failure and problem, it is necessary to carry out targeted control, the main control method is to add a polishing procedure after the copper parts are cut, to clean the oil inside, to ensure that the striation concave is kept clean, so as to further improve the passivation quality of copper and copper alloy.

(2) The fault problem of heat treatment

Heat treatment is one of the most common processes in the production of copper and copper alloy parts. However, this process will cause discoloration and oxidation on the surface of copper parts, which will not only affect the actual appearance quality, but also have a negative impact on the subsequent passivation treatment. Therefore, how to effectively control the problems and failures of heat treatment is also the problem point that needs to be focused on in the passivation process of copper and copper alloy.

In the face of this problem, we must first understand the specific reasons for discoloration and oxidation. It can be seen that heat treatment is mainly to heat the parts for a certain amount of time to change the performance of the parts. During this period, the surface of the part will have a chemical reaction with the atmosphere, producing oxides, which will make it discolored and oxidized. In order to reduce this problem, a series of measures can be taken to control it. First of all, it is necessary to strictly control the time and temperature of heat treatment, ensure that the time and temperature are proper, avoid too long or high temperature, and set the temperature and time reasonably according to the material properties, equipment conditions and process requirements. Secondly, after the heat treatment, polishing treatment should be carried out in time, using chemical methods or mechanical methods to remove the discoloration layer on the surface of the parts and restore its original luster. Moreover, before passivation treatment, surface inspection should be carried out to ensure that the surface is clean and clean, no oxidation discoloration, uneven, impurities, etc., in order to ensure the quality of subsequent passivation treatment.

2. Fault analysis of operation

In the passivation process of copper and copper alloy, the passivation quality problem caused by improper operation is also a common fault that we need to pay attention to and solve. Specifically, it mainly includes incomplete cleaning, excessive loading, abrasion and so on. The following is an analysis of these three fault situations:

(1) Clear and incomplete faults

There are a number of cleaning links in the passivation process of copper and copper alloy, in order to ensure that the surface of the parts is clean, no pollution residue, and then improve the vitality of the passivation film. In the actual operation process, there will be a clear and incomplete situation, specifically, there are two main kinds. First of all, the acid is not effectively cleaned, this situation appears in some blind hole class of copper and copper alloy parts passivation treatment, in its bright corrosion, the hole often will remain a certain amount of acid, if the acid can not be effectively cleaned up, it will affect the later passivation film formation, resulting in its emergence of loose and other situations. Secondly, the passivation liquid cleaning is not thorough. The passivation treatment process has a number of water processes in order to clean the passivation solution indicated by it and avoid too much residual passivation solution, which leads to the formation of brown traces of chromic acid or the situation of “soy sauce color” after drying, affecting the corrosion resistance and anti-wear of the passivation level.

And for this problem, we first strengthen the skills and attitude of staff training, enhance their quality awareness and responsibility awareness, to guide them in strict accordance with the relevant process, according to the steps, according to the standard to complete the cleaning work. Especially for the blind hole class of copper and copper alloy, to use medical syringes and other parts to carry out detailed cleaning of the blind hole, while ensuring the continuity of water in the cleaning process, that is, to make the syringe connected to the water source, to achieve clear continuity, and further improve the quality of cleaning. And if you encounter the blind hole deep parts, you can also install a hose and other water guide device in the front end of the medical syringe to carry out deep cleaning and cleaning of the blind hole, effectively reduce its subsequent quality problems.

(2) The fault problem of excessive loading

In the passivation process of copper and copper alloy, if the loading is too large, the parts may be bonded to each other, resulting in incomplete local treatment, and then uneven film, which not only affects the appearance quality of the parts, but also may pose a potential threat to its performance and service life.

In this regard, we can first use bundling or hanging and other ways to divide and fix the parts to prevent their mutual adhesion, to ensure that each part can evenly contact the solution to reduce the problem of non-uniformity. Secondly, it is necessary to strictly control the loading amount to avoid the uneven problem caused by too many parts, resulting in passivation. Moreover, we can consider optimizing the concentration and formulation of the treatment solution to improve its reactivity and permeability. On this basis, regular inspection and maintenance of the equipment to ensure that it can always operate safely and with high quality, ensure the treatment quality of each step, improve the appearance quality of passivation between copper and copper alloy, enhance the service life and performance of the passivation

film, and lay the foundation for the long-term and stable operation of the product.

(3) Chafing failure problem

Passivation films of copper and copper alloys are gel-like before drying and are prone to chafing. When the relevant personnel use the material frame for passivation, if the reaction is too large, there will be bruising problems, and after passivation through air drying, the parts are also very prone to collision and bruising problems.

In response to this problem, plastic brush can be used to turn parts to reduce the hard contact between each other and the material frame, and at the same time, the size of the parts should be combined with the scientific control of mutual distance and air pressure when blowing dry, in order to reduce the collision of parts.

3. Failure analysis of improper storage mode

QJ 476-1988 "Technical Conditions for Passivation film of Copper and Copper alloys" clearly states that copper and copper alloy parts after passivation should be oil-sealed if they need to be stored for a long time. In the process of oil seal packaging, some enterprises or personnel directly use a brush to brush, which also leads to uneven coating of anti-rust oil film, which can not cover the entire surface of the parts, and then it is easy to be corroded by gases such as chlorine and sulfur dioxide in the air, which makes the parts discoloration after being stored for a period of time. At the same time, if the anti-rust oil is improperly stored or the oil seal expires, the inactive sulfide will decompose into copper sulfide and mercaptan, which will corrode the parts, causing it to produce copper sulfide black corrosion, affecting the quality of the passivation layer.

In view of the passivation failure caused by improper storage, the following measures can be taken to effectively control: First of all, the oil seal packaging. If it involves long-term storage, copper and copper alloy parts should be oil sealed packaging, and in the oiling process to ensure that the parts are fully immersed in oil, forming a complete anti-rust oil film, in addition to do a good job of regular reinspection and maintenance work. Secondly, it is necessary to do a good job of anti-rust oil management. Strengthen the management of anti-rust oil, regularly check its service life, avoid expiration, and regularly recheck its acidity and do a good job of T3 copper corrosion test, on this basis, the use of its specifications are clear.

In short, with the wide application of copper and copper alloy, the quality of its passivation process has attracted more and more attention. In this regard, we should fully control the work, avoid its common problems, and constantly improve its passivation quality to provide the society with more high-quality parts products.

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