

UNITED STATES PATENT OFFICE

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OXIDATION REMOVING PROCESS

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1 Claim. (Cl. 134—41)

This invention relates to a process for removing oxidation and heat treating scale from beryllium copper alloy.

The purpose of the invention is to provide a chemical method of removing the oxidation from beryllium copper alloy without in any way affecting the surface of the alloy.

Heretofore in the art the alloy of beryllium copper, approximately 98% copper is cleaned through the use of sulphuric acid together with a potassium dichromate bath, which while cleaning the metal left the surface with a frosty or crystalline appearance. Also it was impossible to plate the surface of the beryllium copper after such a cleaning as the dichromate bath rendered the surface passive to plating and it would have to be bright cleaned before it could be plated.

The procedure now generally used and accepted by most industries is the use of a two solution method, the one solution being a sulphuric acid dip having the approximate composition of two parts of acid and one part of water. This solution removes the black copper oxide and leaves a red copper oxide film. The second solution which is used for removal of the red copper film is composed of a potassium dichromate solution. This process removes the film but the surface of the metal is rather dull and frosty in nature. The use of a chromate solution also renders the metal passive to plating and in order to plate the metal a bright dip or acidizing was required. When the above process was used on small parts there is a tendency for slight embrittlement caused by the evolution of hydrogen.

It is the object of the present invention to provide a chemical bath which will thoroughly clean beryllium copper and at the same time prepare the surface for plating.

It is a further object of the invention to provide a chemical bath which will remove the oxidation on a beryllium copper alloy which has been subject to heat treatment and which will not pit the surface of the alloy.

It is a still further object of the invention to provide a chemical bath which will remove any and all oxidation or scale from beryllium copper alloy without any hardening of the surface of the metal being cleaned.

The new process which is listed in this paper provides a one solution bath, which satisfactorily removes the oxidation normally obtained in heat

treating of beryllium copper alloys. The surface of the metal following this process is free from oxidation and frosty appearance. There is no evolution of hydrogen from the work and the metal coming from this solution can be plated without any necessity for acidizing.

The solution which has been used to produce the above results is an 85% solution of phosphoric acid (H_3PO_4). This solution can be used at room temperature if the oxidation is not excessive, but it has been found that heating of the solution to 110° F. to 120° F. will reduce the time required for the removal of the oxidation. The applicant is well aware that phosphoric acid is used as a cleaning agent for iron and steel where the surface is rust-proofed and treated prior to the application of paint. A search of the literature for cleaning of beryllium copper has not shown the use of concentrated phosphoric acid for the removal of oxidation from beryllium copper alloy.

Beryllium copper is used extensively for production of coil springs and for small parts which require a non-magnetic alloy and one which will have satisfactory spring properties. In order to obtain the required properties a hardness treatment is required at a temperature ranging from approximately 600° to 700° F. This results in copper oxidation which is usually rather difficult to remove without affecting the finish of the metal.

The process which is used is as follows:

Parts after being hardened are covered with the above mentioned scale. After heat treatment the articles are immersed in a 85% phosphoric acid solution either in bulk or racked. They are allowed to remain in the solution for a sufficient length of time to completely remove the oxidation. This will vary, depending on the degree of oxidation. The ordinary cleaning period will be approximately 5 to 10 minutes. The parts cleaned in this method are then rinsed in water, alcohol, and dried. Prior to plating, the parts can be cleaned in the conventional cleaners used in the normal plating procedures.

What I claim is:

A process for removing oxidation from beryllium copper alloy consisting in subjecting the alloy to a bath of 85% pure phosphoric acid at a temperature approximating 120° F. to produce a surface capable of being plated.

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