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PICKLING AGENT FOR COPPER-BERYLLIUM ALLOYS

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6 Claims. (Cl. 148—8)

This invention relates to metallurgy and more particularly to pickling solutions for use in the removal of surface scale and oxides from copper-beryllium alloys. In the manufacture of articles comprised of copper-beryllium alloys the cast alloy must be subjected to hot working and heat-treatment operations prior to any cold mechanical deformation of the same and prior to such cold mechanical deformation the scale on the surface of the alloy must be removed. Frequently also the cold worked alloy must be heat-treated to anneal the same, resulting in surface discolorations due to oxidation. One of the objects of the present invention is to provide an effective pickling agent for the removal of surface scale and oxides from said alloys. Another object is to provide a pickling solution that is relatively inexpensive, readily corrosive towards copper and beryllium oxides but substantially non-corrosive towards the alloy per se and a solution that is useful over substantially prolonged time intervals towards successive batches of said alloy. Still another object is to facilitate the surface cleaning of copper-beryllium alloys. Other objects and advantages will be apparent as the invention is more fully hereinafter disclosed.

In accordance with these objects, we have discovered that a caustic alkali aqueous solution, particularly a strong or concentrated caustic alkali solution containing from 25 to 50% caustic alkali, such as a 50% (by weight) NaOH, and up to 10% (by weight) of an alkali cyanide, such as sodium cyanide, is an effective pickling agent in the removal of surface scale and oxides from copper-beryllium alloys and that such solutions are substantially non-corrosive towards the metal alloy itself.

The solution activity of such caustic alkali solutions towards BeO and CuO increases with increase in temperature and with increase in caustic alkali concentration up to about 50% but decreases with increase in cupric ions in the solution. We have found that by adding an alkali cyanide to the caustic alkali solution, thereby providing free cyanide ions in the solution, the cupric salts formed on solution of CuO in the alkali solution are converted into complex cuprous cyanide compounds and the solution activity of the caustic alkali solution thereby is maintained at its maximum at any given temperature and range of caustic alkali concentration.

The amount of sodium cyanide in the caustic alkali solution may be varied widely without essential departure from the present invention. In general we add only a small amount of sodium cyanide to the solution, up to a 10% concentration of sodium cyanide in the solution and then add further amounts of the said cyanide as needed to maintain the caustic solution colorless.

Relatively large amounts of Cu and Be oxides may be dissolved in the pickling solution before the effectiveness of the solution as a pickling agent is deleteriously affected.

For most pickling operations on cold Cu.Be alloys we prefer to maintain the caustic alkali concentration within the range 40–50%, the sodium cyanide concentration within the range 5–10%, and the temperature of the solution within the range 80–100° C.

As a modification of the present invention, the pickling solution above identified may be employed as a combined pickling and quenching bath for Cu.Be alloys. In the mechanical deformation of Cu.Be alloys, it is frequently necessary to heat treat the metal to temperatures known in the art as beta-solutioning temperatures for prolonged time intervals. Following such heat-treatments the metal is cooled rapidly to preserve the solid solution structure formed at the temperature of treatment in order to condition the metal for cold mechanical deformation. Such heat-treatments are frequently practiced during both hot and cold mechanical deformation and invariably result in considerable surface oxidation which must be removed prior to the practice of any cold mechanical deformation of the alloys. By quenching the hot metal in relatively cold caustic alkali-sodium cyanide-pickling solution, the local heating incident to the immersion of the hot metal in the cold solution accomplishes substantially the same pickling effect produced by immersing the cold metal in the solution heated to 80–100° C. with the added advantage of the rapid quench necessary to preserve the solid solution structure developed by the preceding heating step.

It is believed apparent from the above description that the present invention may be widely varied without essential departure therefrom and all such modifications and departures are contemplated as may fall within the scope of the following claims.

What we claim is:

1. A pickling agent for removing scale and metal oxides from the surface of copper-beryllium alloys, said agent consisting of an aqueous solution containing caustic alkali and alkali cyanide.

2. A pickling agent for removing scale and metal oxides from the surface of copper-beryllium

alloys, said agent consisting of water containing up to 50% (by weight) of a caustic alkali and up to 10% (by weight) of an alkali cyanide.

3. A pickling agent for removing scale and metal oxides from the surface of copper-beryllium alloys, said agent comprising a caustic soda and sodium cyanide aqueous solution, the concentration of said caustic soda approximating 40–50% (by weight) and the concentration of said sodium cyanide approximating 5–10% (by weight).

4. The agent of claim 3, heated to temperatures approximating 100° C.

5. The method of removing surface scale and metal oxides from copper-beryllium alloys which comprises immersing the same in a pickling bath comprised of an aqueous solution containing from 25–50% caustic alkali and sodium cyanide from small but effective amounts up to about 10%.

6. The method of removing surface scale and metal oxides from copper-beryllium alloys which comprises immersing the same in a pickling bath comprised of an aqueous solution of caustic soda and sodium cyanide heated to elevated temperatures within the range 80–100° C.

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