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STRIPPING OF COATED TITANIUM ELECTRODES

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ABSTRACT OF THE DISCLOSURE

A method of stripping the coating from an electrode comprising a titanium support and a coating comprising a platinum group metal oxide and titanium dioxide thereon, which comprises immersing the electrode in an acid or alkaline aqueous solution containing 0.3%–3% by weight of hydrogen peroxide at a temperature of 60° C.–80° C. for at least 1½ hours and then immersing the electrode in hydrochloric acid containing 20%–30% by weight of hydrogen chloride at a temperature of 60–80° C. until the coating has become detached from the titanium support.

The present invention relates to the stripping of coated titanium electrodes. More particularly it relates to a method for the removal of a coating comprising one or more platinum group metal oxides and titanium dioxide from a titanium support which carries the coating, in a manner which renders the titanium surface suitable for re-coating and without excessive loss of titanium from the support.

It has recently been proposed to employ as electrodes, particularly as anodes in cells electrolysing aqueous solutions of alkali metal chloride, a combination of a film-forming metal support and a coating thereon comprising oxides of one or more of the platinum group metals in admixture with an oxide of a film-forming metal. (See for instance British patent specification No. 1,147,442 and Belgian patent specification No. 710,551.) In electrodes of this type the film-forming metal of both the support and the oxide coating mixture is most suitably titanium.

Electrodes of the aforesaid type have advantages over prior art electrodes when employed as anodes in the electrolysis of alkali metal chloride solutions in that they have both low chlorine overpotential characteristics and high resistance to electrochemical attack in use.

Although the electrodes have a very low wear rate in the cell, their useful lives are not infinite and in time they must be replaced or re-coated in order to maintain optimum performance. When the electrodes are taken out of service they still retain an appreciable amount of the original coating and this must be removed if the titanium support is to be used as a support for a new coating. This presents the problem of removing the oil coating cheaply and easily without at the same time removing an unacceptable amount of titanium metal from the support. Also, the method used for removing the old coating should desirably leave the surface of the titanium support in a suitable condition for re-coating without further treatments, such as the conventional etching treatments, which necessarily remove further amounts of titanium metal.

The present invention provides a solution to these problems of stripping oxide-coated titanium electrodes of the aforesaid type.

According to the present invention we provide a method of stripping the coating from an electrode comprising a titanium support and a coating comprising a platinum group metal oxide and titanium dioxide thereon, which comprises immersing the electrode in an acid or alkaline aqueous solution containing 0.3%–3% by weight of hydrogen peroxide at a temperature of 60° C.–80° C.

for at least 1½ hours and then immersing the electrode in hydrochloric acid containing 20%–30% by weight of hydrogen chloride at a temperature of 60° C.–80° C. until the coating has become detached from the titanium support.

The optimum temperature for both the stages as defined in the preceding paragraph is 70° C. At higher temperatures the surface of the titanium support is left in a condition which is not so suitable for re-coating. Lower temperatures increase the time need to remove the coating. If greater concentrations of hydrogen peroxide than 3% by weight are employed in the first stage the titanium support is severely attacked and the resultant surface is unsuitable for re-coating. Lower concentrations than 0.3% by weight of hydrogen peroxide in the first stage cause little or no attack on the coating.

The time of immersion in the first stage is most suitably 2–3 hours at 70° C. This first-stage treatment alone removes less than 5% of the coating and since furthermore the second-stage treatment alone will not strip the coating it is necessary to use the two-stage treatment of the invention to obtain complete removal.

The electrodes to be treated in accordance with the invention may have coatings in which the whole of the platinum group metal content is in the form of platinum group metal oxides. The method of the invention is, however, also applicable to coatings wherein a minor amount of the platinum group metal content is in the form of free platinum group metals, the remainder and major amount being in the form of oxides. The platinum group metal content thus defined may consist of any one or more of the metals platinum, iridium, rhodium, osmium, ruthenium and palladium.

The invention is further illustrated by the following examples on the stripping of coatings consisting substantially of ruthenium oxide in admixture with titanium dioxide on titanium supports. The weight of the coatings was in the range 15–20 g./m.² of the titanium surface. All percentages are by weight.

EXAMPLE 1

A section from a coated titanium electrode blade having the coating on both faces of the blade was immersed in a solution consisting of H_2SO_4 94.6%, H_2O_2 0.8%, remainder water at 70° C. for 3 hours and was then immersed in a solution consisting of 90 volumes of 35% hydrochloric acid and 10 volumes of water at 70° C. for 4 hours. At the end of this time the coating had fallen away from the titanium support and the titanium surface was suitable for re-coating. The loss of titanium amounted to a reduction of 0.030 mm. in the thickness of the supporting titanium blade.

EXAMPLE 2

Another section from the coated titanium electrode blade as in Example 1 was immersed in a solution consisting of 8.33% oxalic acid, 2.5% H_2O_2, remainder water at 70° C. for 2 hours and was then immersed in a solution consisting of 80 volumes of 35% hydrochloric acid and 20 volumes of water at 70° C. for 5 hours. At the end of this time the coating had fallen away from the titanium support and the titanium surface was suitable for re-coating. The loss of titanium amounted to a reduction of 0.046 mm. in the thickness of the supporting titanium blade.

EXAMPLE 3

Another section of the coated titanium electrode blade as in Example 1 was immersed in a solution consisting of 21.4% KOH, 2.1% H_2O_2, remainder water at 70° C. for 3 hours and was then immersed in a solution consisting 80 volumes of 35% hydrochloric acid and 20 volumes

of water at 70° C. for 4 hours. At the end of this time the coating had fallen away from the titanium support and the titanium surface was suitable for re-coating. The loss of titanium amounted to a reduction of 0.033 mm. in the thickness of the supporting titanium blade.

What we claim is:

1. A method of stripping the coating from an electrode comprising a titanium support and a coating comprising a platinum group metal oxide and titanium dioxide thereon, which comprises immersing the electrode in an acid or alkaline aqueous solution containing 0.3%–3% by weight of hydrogen peroxide at a temperature of 60° C.–80° C. for at least 1½ hours and then immersing the electrode in hydrochloric acid containing 20%–30% by weight of hydrogen chloride at a temperature of 60–80° C. until the coating has become detached from the titanium support.

2. A method according to claim 1, wherein the said solution containing hydrogen peroxide and the said hydrochloric acid are both maintained at a temperature of 70° C.

3. A method according to claim 1, wherein the electrode is immersed in the said solution containing hydrogen peroxide for 2–3 hours at a temperature of 70° C.

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