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PRODUCTION OF CORROSION-RESISTANT
COATINGS ON ALUMINUM AND ALUMINUM
ALLOYS

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4 Claims. (Cl. 204-1)

The present invention relates to the production of corrosion-resistant coatings on aluminum and aluminum alloys by passage of an alternating current in acid baths, especially saturated chromic acid baths. In this process an object of aluminum or an aluminum alloy, already provided with a protective coating, is used as often as desired as counter-electrode in producing a protective coating on a second object of aluminum or of an aluminum alloy. When using relatively low concentrations of chromic acid, for instance 0.05% or 3% chromic acid solutions there is the possibility of producing uniformly colored protective coatings in many cases but the use of saturated solutions is more advantageous.

In testing this process by using different aluminum alloys, there was found that in some cases irregularities in the color of the protective coatings occurred, especially in the production of black coatings on aluminum alloys, known under the name "Lautal" and "Duralumin". To avoid this drawback, the invention provides a method, in which a saturated chromic acid solution is used for obtaining a coating of oxide on the counter-electrode by passage of an alternating current and advantageously also for obtaining a protective coating on untreated objects of aluminum and aluminum alloys. The protective coatings can be produced by employing a bath temperature ranging between about 40 and 60° C. and by employing voltages of alternating current between about 40 and 60 volts for a period of about 20 minutes.

A chromic acid solution, saturated at room temperature (20° C.) which contained about 102 g of solid chromic acid (CrO_3) in 100 ccm of water and had a specific weight of about 1.71 was used for the production of oxide containing coatings on two plates of Duralumin. The temperature of the solution was maintained at 50° C. and an alternating voltage of 50 volts was employed. After about 20 minutes one of the two plates had a hard, nearly colorless, glass-like coating and on the other plate was deposited a pearl-grey coating.

Then the so treated plates were used as counter-electrodes in two identical chromic acid solutions and under the same working conditions as before, together with other untreated plates of Duralumin. In all cases excellent protective coatings of glass-like color were deposited on the untreated plates by this process. The first mentioned counter-electrode did not maintain its former nearly colorless coating, but became covered with a pearl-grey coating. The pearl-grey

coating of the second counter-electrode, however, remained practically unchanged.

It was observed that increases or decreases in voltage of not more than about 10 volts and also variations in bath temperature of not more than about 10° C. had no essential influence on the qualities of the coatings, especially on the color and the protective action. The coating process could be extended to 30 minutes when using a voltage of 40 volts. The best coatings were produced with a temperature of 50° C. and an alternating voltage of 50 volts in a coating period of 20 minutes. At 70 volts unsatisfactory coatings were obtained.

Almost the same results were found to be produced with plates of Lautal. The same chromic acid solutions and substantially the same bath temperatures and bath voltages could be used for producing good coatings. The color of the protective coatings on Lautal was similar to that of the above mentioned coatings on Duralumin; only on the white surface of Lautal the coatings had a somewhat gloomy aspect.

On objects of pure aluminum there are always deposited by the above described process dark brownish glass-like coatings on one electrode and bright grey coatings on the other electrode.

In order to dye the coatings produced on aluminum or on an aluminum alloy it is advantageous to dip the coatings immediately after their production and after washing with water into suitable organic dye solutions or to paint or flow such solutions upon the described coatings.

It will be understood that, in executing the new method, not only chromic acid solutions saturated at room temperature (20° C.) can be used but also chromic acid solutions saturated at the working temperature (40-60° C.). The formation of the saturated chromic acid solutions advantageously takes place by dissolving crystalline chromic acid (CrO_3) in water which is heated to a higher temperature than the desired temperature of saturation and by cooling the resulting solution to the temperature of saturation afterwards. Such a quantity of crystalline chromic acid must be employed that a portion of the chromic acid remains on the bottom of the solution vessel in solid state.

What we claim as our invention and desire to be secured by Letters Patent is:

1. In the production of corrosion-resistant, oxide-containing coatings on articles of aluminum and aluminum alloys, the process which comprises immersing such articles in a saturated solution of chromic acid and passing alternating

current between said articles through said solution.

2. The process of claim 1 wherein a previously coated article is employed as a counter electrode to the article which is being coated.

3. The process of claim 1 wherein the temperature of the bath is maintained between about 40° to 60° C. and an alternating current voltage of about 40 to 60 volts is employed.

4. The process of claim 1 wherein the temperature of the bath is maintained between about 40° to 60° C., an alternating current voltage of about 40 to 60 volts is employed, and a coating time of 20 to 30 minutes is allowed.

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15	90
20	95
25	100
30	105
35	110
40	115
45	120
50	125
55	130
60	135
65	140
70	145
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