COLORING METHOD OF ALUMINUM ANODIC OXIDE COATING FILM
11 Claims, No Drawings

ABSTRACT: Alumite is colored by first subjecting same to an alternating current electrolyzing treatment in an electrolyte followed by a direct current electrolyzing treatment in a coloring solution in which the alumite is the cathode.
COLORING METHOD OF ALUMINUM ANODIC OXIDE COATING FILM

BACKGROUND OF THE INVENTION

This invention relates to a method for coloring an aluminum anodic coating film which is hereinafter called "aluminate." As for aluminate coloring methods hitherto known, there is a method of dyeing the same using a dyestuff; a method of coloring an aluminum alloy by electrolyzing; a method of coloring same by electrolyzing using an organic acid bath or the like and recently, there has been proposed an alternating current coloring method for aluminate.

The dyeing method however is so defective that the product is poor in weather resistance, and all of the foregoing electrolyzing methods are defective in that they are of high cost and more importantly, uniformity of color is difficult to achieve. The recently proposed alternating current method has overcome certain of these defects but still has a disadvantage regarding uniformity of color and the present invention is an improvement thereof.

DETAILED DESCRIPTION OF THE INVENTION

The present invention is a method according to which an aluminate produced by a conventional process is colored using an electrolyzing coloring solution with the use of a direct current after a pretreatment in which the aluminate is subjected to an alternating current electrolyzing. This method gives excellent results in terms of uniformity of color when compared with the alternating current method discussed above.

The present invention will now be explained in greater detail as follows:

After a sample of aluminum is anodized into aluminate by a conventional method with an ordinary electrolyte such as sulfuric acid, oxalic acid, chromic acid or the like, the same is subjected to an alternating current for a short time within the same electrolyte, and then the aluminate is electrolyzed in an electrolyte containing metallic ions while using the aluminate as the cathode, ordinary carbon being used as the anode. As a result of this electrolysis, the metallic ions are attracted to the cathode and enter the pores of the aluminate and thus the coloring of the aluminate is brought about. The present invention is especially characterized by this alternating current treatment after the anodizing, and by this alternating current treatment, any unevenness of the color can be eliminated and control of the coloring operation becomes very easy.

If aluminate is directly, that is, without being subjected to this alternating current treatment, electrolyzed within a metallic ion-containing electrolyte while using the aluminate as the cathode, there is caused such trouble that the coating film breaks down, or the aluminate is not colored but there is produced only hydrogen thereon, or the aluminate, even if colored, has a coating film of uneven color and thus the uniformity of color is not achieved. If direct current coloring is effected at the alternating current electrolyzing treatment is effected, these defects are all overcome and a strong uniform coating is obtained.

It is convenient that the alternating current electrolyzing treatment is carried out within the anodizing electrolyzing bath, but any acid or alkali electrolyte, i.e., one which is separately prepared, can be used as well. According to this invention, uniformity of color becomes possible by the length of coloring time regardless of the thickness of the coating film desired.

The coloring solution in this method should be a strong electrolyte so that control of the solution is very easy and control of the electrolyzing condition, is also easy in comparison with that in the alternating current method. The choice of the metallic ions in the coloring solution will naturally vary with and depend upon the desired color.

The following examples are given to further explain the invention:

EXAMPLE I

A piece of 99 percent pure aluminum (35×70×0.4 mm.) is used in this example. After this aluminum is anodized in an oxalic acid bath (5 percent, oxalic acid 20°C.) at a current density of 1.5 A/dm.² for 30 minutes, the anodized aluminum is subjected to an alternating current electrolyzing (1 A/dm.²) for 2 minutes in a sulfuric acid bath, and then the same is electrolyzed, with the aluminate being used as a cathode (the anode is carbon), for 2 minutes at a current density of 0.6 A/dm.² in a coloring solution comprising NiSO₄ (150 g/l), boric acid (15 g/l) and ammonium chloride (15 g/l) at room temperature (i.e., about 20°C.) where there is obtained a uniformly bronze-colored coating film.

EXAMPLE II

A piece of 99.9 percent pure aluminum (35×70×0.4 mm.) is used in this example. After this aluminum is anodized with a sulfuric acid bath (15 percent, 20°C.) for 30 minutes at a current density of 1.5 A/dm.², the anodized aluminum is subjected to an alternating current electrolyzing (1 A/dm.²) for 2 minutes in the same sulfuric acid bath. Then, the same is electrolyzed, with the aluminate being used as the cathode, (the anode is carbon) for 2 minutes at a current density of 0.6 A/dm.² in a coloring solution comprising KAu(CN)₄ (3 g/l), citric acid (10 g/l) and sodium citrate (100 g/l) at room temperature (i.e., about 20°C.) where there is obtained a uniformly purple-colored coating film.

What is claimed is:

1. A method of coloring an aluminum anodic oxide coating film, said method comprising subjecting an article having said anodic aluminum oxide coating to an alternating current electrolyzing treatment in an electrolytic solution, position said article in said electrolytic solution to form a cathode, and then subjecting same to a direct current electrolyzing treatment in an electrolyte containing color producing metallic ions.

2. A method as claimed in claim 1 wherein the direct current electrolyzing treatment is effected for about 2 minutes at a current density of about 0.6 A/dm.².

3. A method as claimed in claim 1 wherein the electrolytic solution is sulfuric acid.

4. A method as claimed in claim 1 wherein the electrolyte containing color producing metallic ions comprises KAu(CN)₄, citric acid and sodium citrate.

5. A method as claimed in claim 1 wherein the alternating current electrolyzing treatment is effected for about 2 minutes at a current density of about 1.5 A/dm.².

6. A method as claimed in claim 5 wherein the direct current electrolyzing treatment is effected for about 2 minutes at a current density of about 0.6 A/dm.².

7. A method as claimed in claim 1 wherein the electrolyte containing color producing metallic ions comprises NiSO₄, boric acid and NH₄Cl.

8. The product produced by the method as claimed in claim 1.

9. A method as claimed in claim 1 wherein the anodic aluminum oxide is prepared by an oxidizing aluminum in a bath which is the same as the electrolytic solution in which the alternating current electrolyzing treatment is effected.

10. A method as claimed in claim 9 wherein the bath is sulfuric acid.

11. The product produced by the method as claimed in claim 10.