Patented Apr. 24, 1951

2,550,388

UNITED STATES PATENT OFFICE

2,550,388

SURFACE TREATMENT OF ALUMINUM AND ALUMINUM ALLOYS

Eli Simon, Los Angeles, and Frederic M. Carasso, Pasadena, Calif., assignors to Lockheed Aircraft Corporation, Burbank, Calif.

No Drawing. Application May 12, 1945, Serial No. 593,544

2 Claims. (Cl. 204—58)

1

This invention relates to the surface treatment of aluminum and aluminum alloys, and more particularly to the use of a non-ionic wetting agent in an anodizing bath for aluminum and its alloys.

It is an object of this invention to use a non-ionic wetting agent in the anodizing bath that makes it possible to produce a porous, more adsorbent anodic oxide coating on aluminum and its alloys at a lower current density than could be used to produce the same coating under corresponding conditions without the use of the wetting agent.

A further object of the invention is to produce in a short anodizing time, at ordinary temperature and at low current density, a thick, uniform and porous anodic coating.

In the preferred practice of this invention, the aluminum article to be treated is first thoroughly cleaned, and then employed as the anode in the electrolysis of a sulfuric acid solution containing a non-ionic wetting agent.

The amount of sulfuric acid in the electrolyte may vary from 10% to 20% by volume. A porous adsorbent oxide coating which satisfactorily retained dyes, was produced on aluminum articles with a current density as low as one ampere per square foot of surface when approximately 0.1% by volume of the non-ionic wetting agent consisting of alkylated phenoxy polyethoxy ethanols was added to the electrolyte. The use of the non-ionic wetting agent in the anodizing bath also made it possible to produce anodic oxide coatings suitable for dyeing, that were thicker and had greater adsorptive powers than those producible under corresponding conditions, but without the effective wetting agent.

It was also found that by adding a non-ionic wetting agent in an aqueous solution of sulfamic acid, ammonium bisulphate, or other electrolyte in which it is stable, it was possible to produce a porous, adsorbent anodic oxide coating on aluminum at a lower current density than could be used to produce the same coating with the same electrolyte without the wetting agent. But in experimenting with wetting agents, we discovered that neither the adding of the usual anion-active type, nor the adding of the cation-active type wetting agent in the anodizing bath had any appreciable effect on the production of the anodic oxide coating on the aluminum article.

In practice, we prefer to employ the wetting agent known to the trade as "Triton NE", it being understood that other suitable non-ionic

2

wetting agents may be used. "Triton NE" is a non-ionic surface-active material consisting of iso octyl species of alkylated phenoxy polyethoxy ethanols. Good results were obtained when the electrolyte contained approximately 0.1% by volume of the wetting agent mentioned.

Although the use of the non-ionic wetting agent makes it possible to produce an oxide coating on the aluminum which satisfactorily retained dyes, at the low current density of one ampere per square foot of surface coated, the current density may, however, vary from one to twenty amperes per square foot, depending upon the dye to be used, the color intensity desired, the anodizing time, and the dyeing conditions. The voltage required for forming a thick, porous, adsorbent and otherwise satisfactory oxide coating on the aluminum article is approximately fourteen volts. The anodizing time may vary from ten to thirty minutes.

An important advantage of the process is that the anodizing bath may remain at ordinary room temperature, that is from about 60° Fahrenheit to 100° Fahrenheit. In practice, the best results were obtained when the temperature of the anodizing bath ranged from 70° Fahrenheit to 80° Fahrenheit.

After the anodic treatment, the article is removed from the sulfuric acid bath and washed with water. It may then be dyed.

Having now particularly described the method of our invention and the improved results obtained thereby, what we claim is:

1. An electrolyte for the anodic oxidation of aluminum and alloys thereof to produce an absorbent coating, said electrolyte comprising an aqueous solution containing from 10% to 20% by volume of sulfuric acid, and approximately 0.1% by volume of a non-ionic wetting agent consisting of iso octyl species of alkylated phenoxy polyethoxy ethanols.

2. In a process of producing thick, porous, absorbent oxide coatings on aluminum suitable for dyeing, the steps comprising using the article to be treated as the anode in an electrolytic cell, the electrolyte of which contains 10% to 20% by volume of sulfuric acid and 0.1% by volume of a non-ionic wetting agent consisting of iso octyl species of alkylated phenoxy polyethoxy ethanols, the temperature of said electrolyte ranging from 60° Fahrenheit to 100° Fahrenheit, and impressing an electric current having an operating voltage of approximately fourteen volts and a current density of the order of from one

to twenty amperes per square foot of surface on said electrolytic cell for a period ranging from ten to thirty minutes.

ELI SIMON.
FREDERIC M. CARASSO.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,279,252	Slunder	Apr. 7, 1942
2,320,999	Beebe	June 8, 1943
2,376,082	Pullen	May 15, 1945

FOREIGN PATENTS

Number	Country	Date
176,945	Switzerland	July 16, 1935

OTHER REFERENCES

Ser. No. 369,618, Sassetti et al. (A. P. C.), published May 18, 1943.

"Industrial and Engineering Chemistry," Jan. 1941, pp. 17 thru 22.

"Surface Active Substances," by Young and Coons, published in 1945, p. 110.

"Chemical Industries," Mar. 1943, pp. 326, 327, 328.