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PROCESS OF ANODIZING ALUMINUM

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3 Claims. (Cl. 204—58)

The present invention relates to improvements in the processes for the anodic oxidation of aluminum or aluminum alloys.

It is known that these processes have many applications particularly in the manufacture of boxes. In this field of manufacture, the anodic oxidation not only, in the case of water containers, represents an optical treatment, but also a treatment preceding the glazing or varnishing of aluminum which renders it possible to secure excellent resistance against corrosion. The processes of anodic oxidation employed up to these past few years in which the electrolytic bath customarily contained sulphuric acid, had the main disadvantages of being slow and of requiring large-size plant.

More recently, new processes have been tried experimentally, which have recourse to electrolytes containing an alkali metal bisulphate and organic acids such as acetic, formic, citric, oxalic or tartaric acid. In particular, it was found that with the sodium bisulphate/citric acid bath, use could be made of high current densities leading to a distinct reduction in the processing period. The densities were limited however by the appearance of extensive corrosion.

The present invention has as its object the creation of an oxidising treatment allowing a reduction in the period of oxidation and equally in the amount of corrosion.

According to the present invention there is provided a method of anodising aluminum comprising the step of employing the aluminum to be treated as the anode in an aqueous bath comprising zinc sulphate, and an electrolyte selected from the group consisting of sulphuric acid and a bisulphate of an alkali metal with an organic acid selected from the group consisting of citric acid and tartaric acid.

According to another aspect of the present invention there is provided a method of anodising aluminum comprising the step of employing the aluminum to be treated as the anode in an aqueous bath comprising zinc sulphate, a bisulphate of an alkali metal and an organic acid selected from the group consisting of citric acid and tartaric acid. Preferably, the bath comprises 250 g./litre of sodium bisulphate, 200 g./litre of citric acid and between 10 and 50 g./litre of zinc sulphate. A particular advantage is gained if the bath comprises between 15 and 20 g./litre of zinc sulphate. The addition of an alkali metal bisulphate leads to a substantial reduction in the processing period, since it allows high current densities to be applied without appreciable corrosion. This addition is specially advantageous in the case of a sodium bisulphate/citric acid bath.

Example

An electrolytic bath of the following composition has been used with excellent results:

	G./l.
Sodium bisulphate	250
Citric acid	200
Zinc sulphate	15 to 20

A bath of this nature renders it possible to operate with very high current densities, and above all to assure excellent uniformity in the thickness of the layer, which was verified by the uniform shade of a processed specimen passed through the dyeing bath.

Tests had been carried out previously with baths having the following compositions:

	G./l.
Sodium bisulphate	250
Citric acid	50 to 200

The best results had been obtained with baths having a high citric acid concentration. These baths rendered it possible to use high current densities without involving the need to apply high voltages, and in addition operated very satisfactorily at high temperatures. Nevertheless, by using current densities of the order of 30 a./dm.^{2} corresponding to a processing period of 1 to 2 minutes instead of the 15 minutes usual in sulphuric acid baths, substantial corrosion was observed, so that in practice one could not count on exceeding a current density of 6 a./dm.^{2}. At these high densities moreover, the layers obtained were not uniform and the projecting parts of the specimen were attacked. This led to losses of metal and to poor electrochemical efficiency.

By contrast, after the addition of a quantity of the order of 20 g. of zinc sulphate per litre to these baths, it was found that the components processed were anodised uniformly and that corrosion of the projecting parts had disappeared.

It is assumed that a film of zinc is deposited on the aluminum by chemical displacement from the time of the immersion of the component in the electrolyte, and thus protects the metal at the start of electrolysis. The electrochemical efficiency is increased considerably, so that a box or container may be treated in 30 seconds at the same current density as in the bath lacking zinc sulphate, and in this instance, without substantial corrosion.

Equally satisfactory results are obtained by adding zinc sulphate to an electrolytic bath containing sulphuric acid or sodium bisulphate and tartaric acid. Likewise, the zinc sulphate concentration preferably lies between 15 and 20 g./l., but good results are obtained with lower or higher concentrations, lying between 10 and 50 g./l.

Moreover, the values specified for citric acid and sodium bisulphate concentrations represent optimum values and satisfactory results are still obtained if citric acid concentration amounts to between 50 and 200 g./l., whereas the concentration of sodium bisulphate may amount to between 130 g./l. and the limit of solubility of this salt at 20° C.

The process according to the invention may be applied to the anodic treatment of aluminum in coils or rolls before glazing or varnishing, in order to obtain excellent protection against corrosion. One may thus, quickly and economically obtain thick layers of oxide assuring the protection of aluminum alloy components, apart from those used in containers, against wear, the treated components frequently exhibiting low coefficients of friction. Many applications for such components can evidently be found in industry.

I claim:

1. A method of anodizing aluminum comprising the step of employing the aluminum to be treated as the anode in a bath consisting essentially of an aqueous solution of a bisulfate of an alkali metal, of an organic acid selected from the group consisting of citric acid and tartaric acid, and of zinc sulfate.

2. A method according to claim 1 wherein the bath contains about 250 g./liter of sodium bisulfate, about 200 g./liter of citric acid and between about 10 and about 50 g./liter of zinc sulfate.

3. A method according to claim 2 wherein the bath comprises between about 15 and about 20 g./liter of zinc sulfate.

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