

Specification No. 96662. Application No. 96662, dated 24th November 1964. Complete Specification left on 18th September 1965. (Application accepted 11th May 1966.)

Index at acceptance—70c4 [LVIII(5)].

PROVISIONAL SPECIFICATION

IMPROVEMENTS IN OR RELATING TO ETCHING AND DECORATIVE ANODISING OF ALUMINIUM AND ITS ALLOYS.

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH, RAFI MARG, NEW DELHI-1, INDIA, AN INDIAN REGISTERED BODY INCORPORATED UNDER THE REGISTRATION OF SOCIETIES ACT (ACT XXI OF 1860).

The following specification describes the nature of this invention.

This is an invention by BALKUNJE ANANTHA SHENOI Scientist, and MISS KARAIKUDI SANKARA NARAYANA SASTRI INDIRA, Senior Scientific Assistant, both of the Central Electrochemical Research Institute, Karaikudi, India, both Indian citizens

This invention relates to improvements in or relating to etching and decorative anodising and colouring of aluminium and its alloys

Hitherto it has been proposed to resort to decorative anodising of aluminium having multitonned effect (I) by costly engraving, printing and (II) by recrystallisation process

This process (I) is open to the objection that it is (1) costly, (2) laborious and (3) time consuming. We have made improvement over the process (II) by introducing the pre-etching treatment which is not mentioned in the literature so far in this process. Recrystallisation process in aluminium is made easier by introducing this pretreatment

To these ends, the invention broadly consists in cleaning the aluminium surface in etchants of acid halides or in solutions of chromic acid, phosphoric acid, sodium hydroxide, etc, then heat treating aluminium and etching in sodium chloride solutions containing hydrochloric acid with the aforesaid specimen as the anode and steel or aluminium as the cathode

The following typical examples are given to illustrate the invention —

EXAMPLE

The specimen of aluminium or its alloys were cleaned in etchants like HF, HCl, NaOH or desmudding solutions for 30 seconds to 2 minutes, heat treated in a furnace at 300-800°C for 2 minutes to 1 hour. Specimens are quenched in water. Etched in the following solution anodically. The specimens are then anodised and coloured

ETCHING SOLUTION

Composition	Sodium chloride	.. 10 gms—100 gms
	Water	.. 1 litre
	Hydrochloric acid	.. 10 ml.
Temperature		.. 20—50°C
Time		.. 5 minutes to 1 hour
Current density		.. 40 mA—160 mA/cm ²
Cathode		.. Aluminium or Steel

The following are among the main advantages of the invention —

1 The preplated aluminium gives better grain contrast and the spangle effect is obtained at lesser time, say even in less than 5 minutes.

2 Cheap, working at room temperature with low current densities.

3 Etching time after heat treatment is lowered to bring out the same grain contrast

4 The decorative effect obtained on aluminium after etching is unique and attractive and have different shades. This can be anodised and can be given different colours

5 Suitable for tableware, camera-finishes, etc.

REFERENCES

1 Ornamental surfaces for dyed aluminium, B. P. 953,344, C A 60 No 13 P 15443

2 Decorative Aluminium surface—N Mostovych & W A. Mitchell, U. S P 2941, 930 (1960)

R. BHASKAR PAI,

Patents Officer,

Council of Scientific & Industrial Research

Dated this 18th day of November 1964.

COMPLETE SPECIFICATION

IMPROVEMENTS IN OR RELATING TO ETCHING AND DECORATIVE ANODISING OF ALUMINIUM AND ITS ALLOYS.

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH, RAFI MARG, NEW DELHI-1, INDIA, AN INDIAN REGISTERED BODY INCORPORATED UNDER THE REGISTRATION OF SOCIETIES ACT (ACT XXI OF 1860).

The following specification particularly describes and ascertains the nature of this invention and the manner in which it is to be performed

This is an invention by BALKUNJE ANANTHA SHENOI, Scientist, and MISS KARAIKUDI SANKARA NARAYANA SASTRI INDIRA, Senior Scientific Assistant, both of the Central Electrochemical Research Institute, Karaikudi, India, both Indian citizens

This invention relates to improvements in or relating to etching and decorative anodising of aluminium and its alloys

Hitherto it has been proposed to resort to decorative anodising of aluminium and its alloys having multitonned effect by (1) costly engraving, printing and (2) by recrystallisation process. The process (1) is open to the objection that it is (a) costly, (b) laborious and (c) time consuming. We have made improvement over the process (2) by introducing the pre-etching treatment which is not mentioned in the literature so

far in this process. Recrystallisation process in aluminium is made easier by introducing this pretreatment

To these ends, the process according to the present invention broadly consists in cleaning the aluminium surface in etchants of acid halides or in solutions of chromic acid, phosphoric acid, sodium hydroxide or sodium carbonate, then heat treating aluminium and etching electrolytically in solutions containing sodium chloride, hydrochloric acid with the aforesaid specimen as the anode and steel or aluminium as the cathode. Alternatively the heat treated aluminium pieces may also be etched chemically in solutions containing nitric acid, hydrochloric acid and hydrofluoric acid in suitable concentrations as to control the depth of preferential etching to any desired extent

The following typical examples are given to illustrate the invention —

Price: TWO RUPEES.

EXAMPLE.

The specimen of aluminium or its alloys were cleaned in suitable etchants such as HF, HCl, NaOH or desmudging solution for 30 seconds to 2 minutes, strained and heat treated in a furnace at 300-800°C. for 2 minutes to 1 hour. Specimens can be either cooled slowly, i.e., annealed at any time interval at desired temperature or quenched in water, depending upon the mechanical properties and crystallise as desired. The samples are then etched in the following solution anodically or alternately chemically etched.

Composition :	Sodium chloride	10—100 gms
	Water	1 litre
	Hydrochloric acid	10 ml/l
Operating conditions	Temperature	20—50°C
	Time	5 mts—1 hr.
	Current density	40 mA/cm ² —160mA/cm ²
	Cathode	Aluminium or steel

Superpurity aluminium or its alloys containing magnesium gives the best results with respect to its controlled grain growth and retention of the same reflectivity even after anodising. Aluminium alloys with purity 99.5 per cent. gives the best results with regard to surface finish. 2S, 3S, 56S alloys also give satisfactory finishes.

The anodising conditions are given below :

Concentration of sulphuric acid .	12% - 20% V/V
Current density	10 - 20 asf
Temperature	10 - 20°C.
Time	5 - 20 minutes
Voltage	10 - 12V

The plates after anodising are washed with water and coloured using organic dyestuff solutions and sealed in boiling water.

The following are among the main advantages of the invention :—

1. The preplated aluminium gives better grain contrast and the spangle effect is obtained at lesser time, say even in less than 5 minutes.
2. Cheap, working at room temperature with low current densities.
3. Etching time after heat treatment is lowered to bring out the same grain contrast.

4. The decorative effect obtained on aluminium after etching is unique and attractive and have different shades. This can be anodised and can be given any desired colour.

5. Suitable for finishes such as tableware, camera finishes, etc.

6. Spangle finish on aluminium is a new and attractive finish. This finish is expected to have large potentialities in decorative applications. Field of application range from jewellery window frames, refrigerator trim, car trim, name plate industry, architectural anodising, furniture industries and a number of other applications.

7. The tiny mirror like facets of each grain with different shades which sparkle at different directions is an added advantage as regards eye appeal.

We claim :

1. A process for etching and decorative anodising of aluminium and its alloys which consists in cleaning the aluminium surface in etchants of acid halides or in solutions of chromic acid, phosphoric acid, sodium hydroxide or sodium carbonate ; then heat treating aluminium and etching electrolytically in solutions containing sodium chloride, hydrochloric acid with the aforesaid specimen as the anode and steel or aluminium as the cathode.

2. A process as claimed in Claim 1 wherein the heat treated aluminium pieces are etched chemically in solutions containing nitric acid, hydrochloric acid and hydrofluoric acid in suitable concentrations as to control the depth of preferential etching to any desired extent.

3. A process for the etching and decorative anodising of aluminium and its alloys, substantially as described in the example.

4. A process for the etching and decorative anodising of aluminium and its alloys, substantially as hereinbefore described.

5. Etched and decoratively anodised aluminium and its alloys whenever obtained according to a process substantially as hereinbefore described.

R. BHASKAR PAI,

Patents Officer,

Council of Scientific & Industrial Research.

Dated this 31st day of August 1965.