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METHOD OF ELECTROPLATING ALUMINUM

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This invention relates to a method of electroplating aluminum and more particularly to a method of electroplating aluminum from a molten bath and to an electroplating bath therefor.

Objects of the invention are to provide: a method of electroplating aluminum wherein the aluminum electrodeposit has improved properties; wherein the deposit obtained is permanent light gray in color, shiny, ductile and continuous; wherein the cathode metal may be iron, copper, zinc, aluminum, or alloys thereof; and wherein very high current densities may be employed without affecting the quality of the aluminum electrodeposit.

These and other objects and advantages are provided by the method of the invention which generally includes passing an electric current between an aluminum anode and a cathode of a suitable base material maintained in a molten mixture consisting of aluminum chloride, sodium chloride, and vanadium pentoxide.

In accordance with this invention a container of suitable size and shape is filled with a mixture of aluminum chloride, sodium chloride, and vanadium pentoxide. The mixture is maintained in a molten state by the application of heat to the mixture or to the container therefor. The temperature of the mixture may be maintained from about 180° to about 250° C. and preferably from about 180° to about 190° C., as at the higher temperatures substantial fuming of the electroplating bath results.

An aluminum anode and a cathode, comprising the object to be electroplated, are placed in the bath and an electric current of from about 5 to 100 amperes per square foot of surface of the object to be plated is passed through the bath.

It has been found that a very satisfactory aluminum electrodeposit is obtained over a wide range of compositions of the electroplating bath, for example; the aluminum chloride can be varied from about 50 to about 90 percent, the sodium chloride can be varied from about 5 to about 50 percent and the vanadium pentoxide can be varied from about 0.05 to about 1.0 percent.

It has further been found that a very satisfactory

aluminum electrodeposit may be formed when the cathode object is iron, copper, zinc, aluminum or alloys of these metals.

Example I

A molten mixture consisting of aluminum chloride, 800 parts, sodium chloride, 200 parts, and vanadium pentoxide, 1 part is prepared in a glass container. The temperature of the melt is maintained at about 180° to about 185° C. A direct current of about 80 amperes per square foot of cathode is passed using a copper cathode and an aluminum anode. After the desired thickness of coating, the copper cathode is removed from the cell, and washed under flowing water. The copper cathode is then dried in an oven at 110° C.

Example II

A molten mixture consisting of aluminum chloride, 800 parts, sodium chloride, 200 parts, and vanadium pentoxide, 1 part is prepared in a glass container. The temperature of the melt is maintained at about 180° to about 185° C. A direct current of about 80 amperes per square foot of cathode is passed using an iron cathode and an aluminum anode. After the desired thickness of coating, the iron cathode is removed from the cell, and washed under flowing water. The iron cathode is then dried by rinsing in solvents and air dried.

We claim:

1. The method of electroplating aluminum on a base of suitable material which comprises passing an electric current between an aluminum anode and a cathode of said base material maintained in a molten mixture consisting of from about 50 to about 90 percent aluminum chloride, from about 5 to about 50 percent sodium chloride, and from about 0.05 to about 1.0 percent vanadium pentoxide at a current density of from about 5 to about 100 amperes per square foot.

2. The method defined in claim 1 wherein said base material comprises iron.

3. The method defined in claim 1 wherein said base material comprises copper.

4. The method defined in claim 1 wherein said base material comprises zinc.

5. The method defined in claim 1 wherein said base material comprises aluminum.

References Cited in the file of this patent

UNITED STATES PATENTS

1,927,772 Chittum ---------- Sept. 19, 1933

OTHER REFERENCES

Verdieck et al.: Journal Physical Chemistry, vol. 48 (1944), pp. 268–279.