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[54] **COMPOSITION AND METHOD FOR SUPPRESSING SPRAY IN ELECTROLYTIC PROCESS**

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[52] **U.S. Cl.** **204/51**, 204/DIG. 1

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[58] **Field of Search** 204/DIG. 1, 51, 16

[56] **References Cited**

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[57] **ABSTRACT**

A method for the electroplating of metals is described wherein incorporated into the plating bath is a sufficient amount of metallic ions to be electroplated and a quantity of hydrophilic particles sufficient to suppress spraying of electrolyte during electrolysis.

7 Claims, No Drawings

COMPOSITION AND METHOD FOR SUPPRESSING SPRAY IN ELECTROLYTIC PROCESS

The present invention relates to new material compositions which are used in conjunction with plating processes, but more particularly it relates to material compositions and method for depressing cloud and vapor formation in electrolytic processes.

It is generally known that in electroplating baths, such as for example chromium plating baths, substantial losses occur due to mist and vapor formations. Furthermore, vapor formation in electroplating baths is also objectionable for reasons of health and also leads to dirt deposits and results in pollution problems. The utilization of various additives to the material composition of electroplating baths is not completely satisfactory, considering that such additives are usually surface active materials. Such surface active materials may be expensive and may exert harmful effects on the produced electroplated objects.

Further investigations were carried out in order to reduce the formation of vapors and mists, and for this purpose plastic objects swimming on the top of the bath, such as PING-PONG balls, were used in order to reduce the effective surface which may give rise to the establishment of vapors and mists. Never-the-less, these experiments were not completely satisfactory as it was found that such swimming objects may take up wax particles and other foreign materials which in turn may precipitate on the surface of the objects being plated either before or after the electroplating process, thereby giving rise to defects such as strips, spots, voids, etc.

Now the present invention proposes new material compositions which were found to be useful in electroplating processes. Another characteristic of the present invention consists in the proposal of new material compositions which depress vapor formation, said compositions may be applied to electroplating processes. An essential advantage is that the hereby proposed new material compositions for the depression of vapor formation in electroplating baths do not exert any adverse effects on the plated objects.

Consequently, the present invention relates to new material compositions and to a method for depressing vapor and mist formation in aqueous material compositions to which hydrophilic particles are added having particle sizes from 0.002 to 100 microns. By "hydrophilic" is meant that the particles are held by the solution or in other words the particles are wet-table.

Consequently, the present invention relates to a method for depressing the formation of vapors and mists in aqueous electroplating bath solutions wherein an electric current is conducted from an anode to a metallic cathode which has a mixed dispersion of hydrophilic particles with a particle size from 0.002 to 100 microns where upon the plated objects are then removed from the aqueous electroplating bath solution.

The hydrophilic particles to be used according to the method of the present invention may consist of inert powders which do not substantially dissolve in the particular plating bath solution wherein a formation of vapors is to be suppressed or reduced. In addition, these particles should have a sufficient density so as to float on the electroplating bath and must be stable in the bath. The particular hydrophilic materials that may be used are polypropylene, polyethylene, polyvinylchloride, and polystyrene.

Of these, the preferred material is a polyethylene powder having a particle size of 0.002 to about 100 microns. Preferably, the particles should have an average diameter of about 0.005 to about 50 microns and even more preferably from about 1 to about 30 microns.

Typical electroplating baths which may be treated according to the method of the present invention are chromium electroplating baths, tin electroplating baths, zinc electroplating baths, and the like. The preferred bath is a chromium electroplating bath. The baths may be operated from about 95° to 135° F.

The material composition and the method according to the present invention were found to be particularly useful in chromium plating processes. It is known that chromium plating treatments will particularly develop vapor and spray mists during the electroplating process, these being particularly corrosive and result in substantial losses of plating material during the electroplating treatment.

The concentration of the fine-grained particles may range from about 10 to 400 grams per liter.

The particular advantage of the fine-grained particles is to prevent the bubbles that evolve in the electroplating of chrome from escaping into the atmosphere and, in addition, to prevent the formation of caking or lumping of particles to the cathode surface. This caking or lumping of various materials which are added to prevent the chrome spray from occurring has a particular disadvantage of lumping or caking to the chrome plated material when it is removed from the electroplating bath. Having described in general the invention, listed below are preferred embodiments. Percentages are percentages by weight and all temperatures are in degrees centrigrade, unless otherwise indicated.

EXAMPLE I

Preparation of Chrome Plating Bath — An aqueous bath was prepared having the following composition: CrO_3 —24.2 oz/gal.; SO_4— 0.161 oz/gal.; F 0.65 g/l. The ratio of chromic acid to sulfate is 150/1.

EXAMPLE II

To the bath of Example I was added 5 grams per liter of polyethylene powder (Microthene FN 500) having a particle size of 20 microns. Six rods of steel having a total area of 100 sq.in. were plated in the above bath at a temperature of 120° F for 4 hours at 1.5 amps/sq.in. at 3 volts.

The average thickness of chrome plate was 0.0064 inch. In another experiment using the above procedure and the bath of Example I, but plating at 3.0 amps/sq.in., a plate thickness of 0.0104 inch was obtained.

In each of the above experiments the chromic acid spray was effectively suppressed and when the cathode was removed very little of the polyethylene powder adhered to the cathode.

EXAMPLE III

To the bath of Example I was added sufficient polyethylene powder having a particle size of 20 microns to give 0.4 lbs./1.0 sq.ft. of plating area. The powder gave a cover of one-eighth inch on the surface of the bath. Good spray suppression was obtained at a current of 3 amps/sq.in.

Equivalent results are obtained with a ratio of 125/1 of chromic acid to SO_4.

In addition, equivalent results are obtained with the bath of Example I when no fluoride is present.

It is understood that the following claims are intended to cover all the generic and specific features of the invention herein described and all statements of the scope of the invention which is a matter of language might be said to fall there between.

What is claimed is:

1. A chromium electroplating bath solution comprising an effective spray suppressing amount of polyethylene particles having a particle size of 0.002 to about 100 microns wherein the particles float on the chromium electroplating bath solution.

2. The bath of claim **1** wherein the particles range in size from about 0.005 to about 50 microns.

3. A process for suppressing mist formation in a chromium electroplating bath solution which comprises incorporating therein an effective spray suppressing amount of polyethylene particles having a particle size ranging from 0.002 to about 100 microns wherein the particles float on the electroplating bath.

4. The process of claim **3** wherein the particles range in size from about 0.005 to about 50 microns.

5. The method of claim No. **5** wherein the particles range in size from about 1 to about 30 microns.

6. A process for suppressing the production of fumes and mist from a chromium electroplating bath composition which comprises passing current from an anode to a metal cathode through an aqueous electroplating bath solution containing a chromium metal compound providing chromium metal ions for electroplating metal and including an effective spray suppressing amount of polyethylene particles having a particle size of 0.002 to about 100 microns wherein the particles float on the electroplating bath solution.

7. The process of claim **6** wherein the particles range in size from about 0.005 to about 50 microns.

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