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2,383,798

ELECTROPLATING

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This invention relates to the electrodeposition of cadmium and is more particularly directed to processes and compositions adapted to produce cadmium deposits which are bright but subject to pitting, a small amount of a sulfonated vegetable oil being used as an anti-pit agent.

The development of the cadmium plating art has led in recent years to the production of brighter and brighter deposits and as a result the problem of pitting has become important. Cadmium deposits produced by most prior art practices have a matte surface or at the most are only moderately bright. With such deposits pitting is hardly noticeable unless it is unusually severe and it is rarely considered objectionable. With the bright, mirror-like cadmium deposits which the art is now able to make even a small amount of pitting produces major blemishes. On bright deposits pitting is a major imperfection.

Pitting is apparently caused by any of a number of things some of which are known and some of which are not. One of the principal causes of pitting is the presence of traces of thallium which find their way into the bath with the cadmium. Pitting also seems to be a property of certain plating baths, some one or more of the bath constituents probably being to blame.

Now I have found that pitting may be decreased in cyanide-cadmium plating baths by the inclusion of not substantially more than about 0.5 gram per liter of a sulfonated vegetable oil as an anti-pit agent. It is more specifically preferred to use sulfonated castor oil.

Westbrook in Patent 1,826,159 shows the use of sulfonated vegetable oils as addition agents for cadmium plating. These sulfonated oils according to the practices of Westbrook are used in amounts equivalent to from about 5 to 15 grams per liter and deposits of good character are obtained as explained in the patent. Unfortunately, sulfonated vegetable oils have certain deleterious effects when used in such amounts with other brightening agents which are capable of producing truly mirror-like deposits. When Turkon Oil is present in addition agent amounts the cadmium plating bath has a limited bright current density range, the deposits produced are likely to be streaked, and the cadmium surface is water repellent. This last leads to particularly great difficulty if the deposits produced are to be bright-dipped or if they are to receive a further electrodeposit.

When not substantially more than about 0.5 gram per liter of a sulfonated vegetable oil is used it serves as an anti-pit without the dele-

terious effects which result from using it in addition agent concentrations. When used with addition agents which lead to mirror-like deposits, a sulfonated vegetable oil acts synergetically to produce brilliant deposits over a wide current density range and the deposits are not water-repellent and they are free from pitting.

Any sulfonated vegetable oil may be used as an anti-pit agent and for examples reference may be had to the Westbrook Patent 1,826,159. Salts such as monopole soap or a cadmium salt may be used as suggested in the Westbrook patent or the sulfonated oils may be added in solvents or in another suitable manner as suggested in the Westbrook patent. By far the best results according to the present invention are obtained when a sulfonated castor oil is used as an anti-pit agent and it is still more specifically preferable to use the commercial grade of sulfonated castor oil, Turkon Oil, mentioned in the Westbrook patent.

A cyanide-cadmium plating composition adapted to produce deposits which are bright but subject to pitting is improved according to the present invention by the inclusion as an anti-pit agent of a sulfonated oil in an amount equivalent to not substantially more than about 0.5 gram per liter. More specifically it is desirable to use from about 0.01 to about 0.5 gram per liter and it is still more specifically preferred to use from about 0.05 to about 0.3 gram per liter of a sulfonated vegetable oil. When not substantially more than 0.5 gram per liter of a sulfonated vegetable oil is used as indicated the agent serves effectively as an anti-pit but does not impart the deleterious effects which result from the use of the material as an addition agent. It is further to be noted that when a sulfonated vegetable oil is used at a concentration suitable for an anti-pit according to the present invention there is no substantial effect upon the brightness of deposit.

The anti-pit agents of this invention may advantageously be used to prevent pitting in any cyanide-cadmium plating system, but the best results are obtained when the agents are used in conjunction with an addition agent which promotes the formation of brilliant, mirror-like deposits. While any addition agent may be used, particularly good results have been obtained using isoamketaldoresins as set out in Henricks 2,085,750 and as further described in Henricks 2,085,747, Henricks 2,085,748, Henricks 2,085,749, Hull 2,085,754, Hull 2,090,049, and Lutz 2,097,630. While any isoamketaldoresin may be used, it is

preferred to use amketaldoresins, while still more specifically it is preferred to use amaldacets. It is still more specifically preferred to use the anti-pit agents of this invention with cyaldacets as specifically set out in Henricks 2,085,747.

Metal brighteners as shown in the Westbrook Patent 1,681,509 such as iron, cobalt, and nickel may be used in baths of the present invention. It is preferred to use cobalt and this or the other of the metals may be used as shown in the above-mentioned patents to Westbrook, Henricks, Hull, or Lutz.

The anti-pit agents of this invention are used in cyanide-cadmium plating baths and any bath may be employed. Illustrative of cyanide-cadmium plating baths are those shown in the Westbrook, Henricks, Hull and Lutz patents above mentioned.

The anti-pit agents of this invention may most advantageously be included in compositions comprising addition agents, brighteners, and suitable bath constituents or any of them. When mention is made herein of a cyanide-plating composition this is intended to mean as is customary either a dry composition adapted upon dissolution at certain strengths for use in a cyanide-cadmium plating system, or a concentrated solution adapted to be used in such a system upon suitable dilution or finally a solution at proper concentration for use as a plating bath.

In order that my invention may be better understood reference should be had to the following illustrative example:

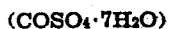
EXAMPLE

A cyanide-cadmium plating bath was made up with the following:

	Grams per liter
Sodium cyanide (NaCN)-----	130
Cadmium oxide (CdO)-----	43
Sodium sulfate (Na ₂ SO ₄)-----	50
Addition agent-----	2
Turkon oil-----	0.2

The addition agent employed is the concentrated agent of Example I of Henricks 2,085,747 the agent being used in very much the same fashion as in Example III of the patent. Using the above-described bath brilliant mirror-like deposits were obtained in a barrel plating installation and the work produced was free from visually discernible pits.

A similar bath was made up using additionally 10 grams per liter of cobalt sulfate



and excellent results were obtained in a still plating installation.

While I have described certain illustrative products in the foregoing, it will be understood that one skilled in the art may readily employ a sulfonated vegetable oil as an anti-pit agent in cyanide-cadmium plating baths in a variety of ways without departing from the spirit of this invention.

I claim:

1. In a process for the electrodeposition of cadmium from an aqueous cyanide-cadmium bath, the step comprising effecting deposition in the presence of an isoamketaldoresin and

substantially more than about 0.5 gram per liter of a sulfonated vegetable oil.

2. In a process for the electrodeposition of cadmium from an aqueous cyanide-cadmium bath, the step comprising effecting deposition in the presence of an amaldacet and not substantially more than about 0.5 gram per liter of a sulfonated vegetable oil.

3. In a process for the electrodeposition of cadmium from an aqueous cyanide-cadmium bath, the step comprising effecting deposition in the presence of a cyaldacet, a compound of cobalt, and not substantially more than about 0.5 gram per liter of a sulfonated vegetable oil.

4. In a process for the electrodeposition of cadmium from an aqueous cyanide-cadmium bath adapted to produce deposits which are bright but subject to pitting, the step comprising effecting deposition in the presence of an anti-pit agent comprising not substantially more than about 0.5 gram per liter of sulfonated castor oil.

5. In a process for the electrodeposition of cadmium from an aqueous cyanide-cadmium bath, the step comprising effecting deposition in the presence of an amaldacet and not substantially more than about 0.5 gram per liter of sulfonated castor oil.

6. In a process for the electrodeposition of cadmium from an aqueous cyanide-cadmium bath, the step comprising effecting deposition in the presence of a cyaldacet and about 0.1 to 0.5 gram per liter of sulfonated castor oil.

7. In a process for the electrodeposition of cadmium from an aqueous cyanide-cadmium bath, the step comprising effecting deposition in the presence of a compound of a metal selected from the group consisting of cobalt, nickel, and copper and about 0.1 to 0.5 gram per liter of sulfonated castor oil.

8. In a process for the electrodeposition of cadmium from an aqueous cyanide-cadmium bath, the step comprising effecting deposition in the presence of a cyaldacet, a cobalt compound, and about 0.5 to 0.3 gram per liter of sulfonated castor oil.

9. A composition of matter adapted to improve the character of deposit obtainable from cyanide-cadmium plating baths comprising about two parts by weight of a cyaldacet and about 0.01 to 0.5 part by weight of a sulfonated castor oil.

10. A composition of matter adapted to improve the character of deposit obtainable from cyanide-cadmium plating baths comprising about two parts by weight of a cyaldacet and about 0.05 to 0.3 part by weight of a sulfonated castor oil.

11. A composition of matter adapted to improve the character of deposit obtainable from cyanide-cadmium plating baths comprising about two parts by weight of an amaldacet and about 0.01 to 0.5 part by weight of a sulfonated vegetable oil.

12. A composition of matter adapted to improve the character of deposit obtainable from cyanide-cadmium plating baths comprising about two parts by weight of a cyaldacet and 0.2 part by weight of sulfonated castor oil.

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