GOVERNMENT OF INDIA, THE PATENT OFFICE, 214, ACHARYA JAGADISH BOSE ROAD, CALCUTTA-17

Complete Specification No. 137207 Application No. 220/72 and Provisional Specification filed on 17th May, 1972. Complete Specification filed on 12th June, 1973. Acceptance advertised on 31st May, 1975.

Index at acceptance—70C4 +5 [LVIII(5)]

PROVISIONAL SPECIFICATION

"DEVELOPMENT OF A BRIGHTENER FOR ELECTRO-DEPOSITION OF ZINC FROM CYANIDE BATH"

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, Mrs. MALATHY PUSHPAVANAM, Senior Laboratory Assistant and HANDADY VENKATAKRISHNA UDUPA, Director all of the Central Electrochemical Research Institute, Karaikudi-3, India, all Indian citizens.

This invention relates to the development of a brightener for the electrodeposition of zinc from cyanide baths.

Hitherto it has been proposed to electrodeposit brought zinc from cyanide baths containing one or a combination of

(1) certain aromatic aldehydes with heterocyclic compounds.

(2) aldehyde bisulfites with gelatin or lignin sulfonate

(3) condensation product of dicyandiamine with formaldehyde and urotropin.

(4) condensation product of polyamine with aliphatic or alicyclic ketones or aldehydes. as additives.

The object of this invention is to develop a combination of brighteners indigenously.

This invention broadly consists in producing lustrous deposits from the conventional cyanide bath using zinc cyanide, sodium cyanide and sodium hydroxide with oxidised polyvinyl alcohol, furfuraldehyde and pipranal, with pure zinc anode; cathode material can be of brass, copper or mild steel.

The following typical examples are given to illustrate the invention:

EXAMPLE 1

Zinc cyanide	60 g/l
Sodium cyanide	45 g/l
Sodium hydroxide	75 g/l
Oxidised polyvinyl alcohol	0·5-0·8 ml/l.
Furfuraldehyde	5-5·5 ml/l
Pipranal	1-1·5 ml/l.
pH	12·5-13
Temperature	30°-32°C
Current density	5A/dm²
Cathode current efficiency	90-95%
Reflectivity	92-95%
Thickness	1 thou

EXAMPLE 2

Zinc cyanide	50 g/l
Sodium cyanide	60 g/l
Sodium hydroxide	100 g/l
Oxidised polyvinyl alcohol	1-1·5 ml/l
Furfuraldehyde	2-2·5 ml/l
Pipranal	0·5-0·8 ml/l
pH	13
Temperature	40°C
Current density	4 A/dm²
Current efficiency	90-95%
Reflectivity	90-92%
Thickness	1 thou

The following are among the main advantages of the invention:

1. No post-treatment is required.
2. The additives are indigenously available.
3. Brilliant deposits can be obtained.
4. The brightness persists even upto a high thickness (2 thou).

Dated this 1st day of May, 1972

R. BHASKAR PAI,
PATENTS OFFICER,

Council of Scientific and Industrial Research

COMPLETE SPECIFICATION

SECTION 10

"IMPROVEMENTS IN OR RELATING TO THE ELECTRO-DEPOSITION OF ZINC FROM CYANIDE BATH"

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 follwoing 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, Mrs. MALATHY PUSHPAVANAM, Senior Laboratory Assistant and H. NDADY VENKATAKRISHNA UDUPA, all are Indian Nationals and are employed in the Central Electrochemical Research Institute, Karaikudi-6, India.

Price: TWO RUPEES

This invention relates to improvements in or relating to the electrodeposition of zinc from cyanide bath and is particularly useful for plating industries. It has particular reference to the development of a new brightener for electrodeposition of zinc from cyanide bath.

Hitherto it has been proposed to electrodeposit bright zinc from cyanide baths with various additives. They are—

(i) aromatic aldehydes with heterocyclic compounds,

(ii) aldehyde bisulfites with gelatin or lignin sulfonate,

(iii) condensation product of polyamines with aliphatic or alicyclic ketones or aldehydes,

(iv) condensation product of dicyandiamine with formaldehyde.

But most of the additives as claimed in the literature do not give lustrous deposits as required by the plating industries since the best brightener or group of brighteners are available only as a proprietary brightener whose composition is kept as a secret.

The main object of this invention is to develop a combination of brighteners which are as effective as proprietary imported brighteners.

According to the present invention, there is provided a process for the production of lustrous zinc deposits by (a) preparing conventional plating bath, (b) pretreating base metal and electro-depositing with a zinc anode, characterized in that the hightener consisting of

Oxidisied PVA	.. .. ..	2-2·5	ml/l
Furfuraldehyde	.. .. ..	3-4	ml/l
Piperanaldehyde	.. .. ..	3-4	ml/l

is added to the bath.

Thus a mixture of oxidised polyvinyl alcohol 1-2.5 ml/1, furfuraldehyde 2-5 ml/1 piperonal 1-3 ml/1 may be used as a brightener. The following plating bath has been found satisfactory:

Zinc cyanides	.. .. ..	60 g/l
Sodium cyanide	.. .. ..	45 g/l
Sodium hydroxide	.. .. ..	75 g/l
Oxidised polyvinyl alcohol	.. ..	1-2·5 ml/l
Furfuraldehyde	.. .. ..	2-5 ml/l
Piperonal	.. .. ..	1-3 ml/l

Oxidised polyvinyl alcohol is prepared by dissolving 300 gms of polyvinyl alcohol in 3000 cc of water to which 100 gms of 35 per cent hydrogen peroxide is added and the mixture heated for six hours at 85-95°C with stirring and finally diluted with water to 4000 ml.

The invented process gives lustrous deposits from the conventional cyanide bath using zinc cyanide, sodium cyanide and sodium hydroxide, with oxidised polyvinyl alcohol, furfuraldehyde and piperonal, with 99-100 per cent pure zinc anode. Cathode material may be steel, brass or copper as per requirement.

The bath consists of 60 g/1 zinc cyanide, 45 g/1 sodium cyanide, 75 g/1 sodium hydroxide and oxidised polyvinyl alcohol 1-2.5 ml/1, furfuraldehyde 3-5 ml/1 piperonal 1-3 ml/1. The oxidised polyvinyl alcohol is prepared as follows:

An aqueous solution of polyvinyl alcohol was prepared by dissolving 400 grams of polyvinyl alcohol, in 3000 cc of water. To this was added 100 grams of 35 per cent hydrogen peroxide solution and the mixture was heated for six hours at 85-95°C with stirring. The solution was cooled and diluted with water to 4000 ml. 1-2.5 ml of this solution with furfuraldehyde and piperonal should be taken in a separate flask and shaken well, with a little of the plating solution so that they are well mixed and then poured into the whole of the plating bath. Lack of good mixing causes the settling of the brighteners at the bottom. A well mixed brightener gives a very lustrous deposit. The pH of the solution should be 12-13. Temperature should be from 28—35°C. The lustre of the deposit was tested upto a thickness of 1 thou. The lustre was tested in a gloss reflectance meter with silver coated glass as the standard.

The bath purification is done by adding potassium permanganate and a polysulphide before adding brighteners. The solution is stirred well and allowed to settle and then filtered.

75-L/L:POCal.—150—9-10-75—GIPS

The present invention consists of a process which comprises conventional zinc cyanide bath from which bright deposits could be obtained with suitable combination of brighteners. The new brightener is cheaper (about Rs. 45 per 500 ml.) in cost as compared with the proprietary brighteners (about Rs. 60 to Rs. 70 per 500 ml) and also it produces high degree of brightness.

By way of example, the plating was carried out with 5 litres of the conventional bath to plate mild steel rods and plates.

Zinc cyanide	.. .. ..	60 g/l
Sodium cyanide	.. .. ..	45 g/l
Sodium hydroxide	.. .. ..	75 g/l

Pretreatment of the bath was done with sodium polysulphide and permanganate before adding brighteners. The pH of the bath was 12-13, and the experiments were carried out at room temperature. Occasional stirring with a glass rod may be given. The current density was 3 A/dm^2. The cathode efficiency was between 90 and 95 per cent. Thickness of the deposit was 1 thou. The concentration of the additives are:

Oxidised PVA	.. .. ..	2 ml/l
Furfuraldehyde	.. .. ..	5 ml/l
Piperanal	.. .. ..	3 ml/l

EXAMPLE 1

The experiment was also conducted to plate mild steel wires. The composition maintained is given below:

Zinc cyanide	.. .. ..	60 g/l
Sodium cyanide	.. .. ..	45 g/l
Sodium hydroxide	.. .. ..	75 g/l
Oxidised PVA	.. .. ..	1 ml/l
Furfuraldehyde	.. .. ..	3 ml/l
Piperanol	.. .. ..	2 ml/l
Current density	.. .. ..	5 A/dm
Thickness	.. .. ..	1 thou
Temperature	.. .. ..	32°C

The main advantages of this invention are that bright zinc deposits could be produced from a cyanide bath with indigenously available chemicals.

In summary, we can say that the brightener which we have developed produces a very good deposit as that of the proprietary brighteners. We have used the same bath which is normally used in the plating industry. But the proprietary brighteners are not produced in India and they have to be imported from foreign countries since their exact composition and constituents remain unknown. This development in India avoids the import of the brighteners.

We claim:

1. A process for the production of lustrous zinc deposits on a metal base such as steel rods or plates by (a) preparing conventional cyanide plating bath, (b) pretreating the metal base and electrodepositing zinc thereon from the cyanide plating bath by the conventional method, with a zinc anode and steel, brass or copper cathode material characterised in that a brightener consisting of

Oxidised PVA	.. .. ..	2-2·5 ml/l
Furfuraldehyde	.. .. ..	3-4 ml/l
Piperanaldehyde	.. .. ..	3-4 ml/l

is added to the cyanide plating bath prior to electrodeposition.

2. A process as claimed in claim 1 wherein the following plating bath is used:

Zinc cyanide	.. .. ..	60 g/l
Sodium cyanide	.. .. ..	45 g/l
Sodium hydroxide	.. .. ..	75 g/l
Oxidised polyvinyl alcohol	.. ..	1-2·5 ml/l
Furfuraldehyde	.. .. ..	2-5 ml/l
Piperonal	.. .. ..	1-3 ml/l

3. A process as claimed in claim 1 or 2 wherein oxidised polyvinyl alcohol is prepared by dissolving 300 gms of polyvinyl alcohol in 3000 cc of water to which 100 gms of 35 per cent hydrogen peroxide is added and the mixture heated for six hours at 85—95°C with stirring and finally diluted with water to 4000 ml.

4. A process as claimed in any of the preceding claims wherein a mixture of oxidised polyvinyl alcohol 1-2.5 ml/1, furfuraldehyde 2—5 ml/1 piperonal 1—3 ml/1 is used as a brightener.

Dated this 8th day of June 1973.

R. BHASKAR PAI
PATENTS OFFICER,
Council of Scientific and Industrial Research