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" An improved process for the electrodeposition of bright zinc coatings on substrates "

Council of Scientific and Industrial Research, Rafi Marg, New Delhi-110001, India, an Indian Registered Body incorporated under the Registration of Societies Act (Act XXI of 1960).

The following specification describes the nature of this invention.

PRICE : TWO RUPEES

This is an invention by Balkunje Anantha Shenoi, Scientist, and Mrs. Malthy Pushpavanam, Junior Technical Assistant, all employed in the Central Electrochemical Research Institute , Karaikudi-6 and all are Indian Nationals.

Hitherto it has been proposed to electrodeposit zinc from (1) Cyanide and (2) acid electrolytes with proper addition agent.

This is open to the objection that the first bath gives good performance but the handling of the chemicals and the disposal of the wastes involves problems. In the second bath, the throwing power is very poor, Moreover, the said chloride baths are more corrosive.

The object of this invention is to obviate these disadvantages by using a new bath which operates at a neutral pH and has good throwing power as that of cyanide baths.

To these ends, the invention broadly consists in depositing bright zinc from a neutral solution containing zinc 10-50/ g/1 potassium chloride 80-150 g/1, sodium gluconate 80-160 g/1 boric acid 30-60 g/1 at 25 - 30°C pH 5.5 - 6.5 at 2 - 6 A/dm^2 with benzimidazole thiol 0 .5 - 2 g/1 and piperonal 2-2 g/1 as brightners.

The following are the typical examples given to illustrate the invention:

EXAMPLE 1

Zinc	10 g/1
Potassium chloride	100 g/1
Sodium gluconate	120 g/1
Boric acid	30 g/1
Temperature	30°C
pH	6.5
Current density	3 A/dm^2
Benzionidazole Thiol	.1 g/1
Piperonal	1 g/1

EXAMPLE 2

Zinc	20 g/1
Potassium chloride	100 g/1
Sodium gluconate	150 g/1
Boric acid	50 g/1
Benzionidazole Thiol	.5 g/1
Temperature	40°C
pH	7
Current density	4 A/dm^2
Piperonal	1 g/1

The following are among the main advantages of the invention:

1) The new bath has a good throwing power. For cyanide bath throwing power in a Haring and Blum cell with 5:1 ratio is 45 - 50 whereas for the new bath it is between 35 - 40 with the formula $\frac{5 - M}{(5 + M - 2)} \times 100$

2) Bright deposits which require no post-treatment like bright dipping.

3) Less corrosive bath

4) Waste disposal problem is minimised.

Dated this 21st day of July 1978.

Sd/-

Asstt.Patents Officer,
Council of Scientific & Industrial Research

IA 9602

THE PATENTS ACT. 1970

COMPLETE SPECIFICATION

(Section—10)

" An improved process for the electrodeposition of bright zinc coatings on substrates "

Council of Scientific and Industrial Research, Rafi Marg, New Delhi-110001, India, an Indian Registered Body incorporated under the Registration of Societies Act (Act XXI of 1960).

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

149602

This is an invention by BALKUNJE ANANTHA SHENOI, Scientist, Mrs. MALATHY PUSHPAVANAM, Junior Technical Assistant both of them employed in the Central Electrochemical Research Institute, Karaikudi and are Indian Citizens.

This invention relates to an improved process for the electrodeposition of bright zinc coatings on substrates and particularly relates to the development of a new neutral bath for obtaining bright zinc deposits for use in the electroplating industry.

The process of electroplating of metal substrates is well known in the art and essentially consists of buffing the metal substrate, degreasing the same, electrocleaning, washing and rinsing in water and subjecting the cleaned substrate to an acid dip. The substrate is then subjected to the electroplating in usual electroplating cell in an electrolytic bath. The coated substrate thus obtained is dried and is ready for use or packing.

Hitherto zinc is electrodeposited from cyanide or acid electrolytic baths.

The first bath gives good performance but the handling of the chemicals and the waste disposal is a great problem and more money is being wasted for destroying the cyanide. In the second bath, the throwing power is very poor which makes the bath suitable only for substrates like plain strips, sheets and wire but which have no intricated shapes. Moreover, the acid chloride baths are more corrosive.

The object of this invention is to obviate these disadvantages by using new bath which operates at a neutral pH and has as good throwing power as that of cyanide baths.

The main finding of this invention is the development of a new neutral bath for electrodeposition of bright zinc coatings on substrates.

The use of newly developed bath avoid the problem of dealing with the poisonous chemicals and the throwing power of the bath is also very good. Unlike chloride baths, this bath is less corrosive also.

The present invention thus consists of a process for the electrodeposition of bright zinc coatings from a neutral bath which comprises of 10-20 g/l of zinc, 80 - 150 g/l of potassium chloride, 30 - 60 g/l of Boric acid wherein the addition are of 80 - 160 g/l of sodium gluconate, 0.05 - 1 g/l of Benzimidazolethiol and 0.2 - 1 g/l of piperonal at pH 5.5 - 6.5 to obtain bright zinc deposits.

Accordingly this invention provides an improved process for the electrodeposition of bright zinc coatings on substrates wherein electrolytic bath comprising a neutral content of 10 - 20 g/l of zinc, 80 - 150 g/l of potassium chloride, 30-60 g/l of boric acid used which is characterised in that the bath contains as additional agents 80 - 160 g/l of sodium gluconate, 0.05 - 1.00 g/l of benzimidazole thiol and 0.2 -1.00 g/l of piperonal and electrolysis is carried out at a pH of 5.5 - 6.5.

The additional agents used in the bath are preferably in the range of 100-120 g/l of sodium gluconate, 0.1 - 0.5 g/l of benzimidazole thiol and 0.5 - 0.8 g/l of piperonal.

The main advantages of this invention is the elimination of hazardous and corrosive chemicals with good threwing power.

The invention is further illustrated by the following typical examples:-

EXAMPLE -1

In the electroplating cell for coating zinc on metal substrate, the electrolytic bath used comprises:-

Zinc	- 10 g/l
Potassium chloride	- 100 g/l
Boric acid	- 30 g/l
Benzimidazole thiol	- 0.05 g/l
Sodium gluconate	- 100 g/l
Piperonal	- 1 g/l

The electrolysis is carried out at a temperature of 30°C, pH of 6.5 and with a current density of 3 A/dm^2.

Bright deposits of zinc coatings are obtained on the substrates. Reflectivity 98% (Reflectivity measured with reference to vacuum coated silver mirror).

EXAMPLE - 2

In the process of example 1, the bath used consist of:-

Zinc	- 20 g/l
Potassium chloride	- 150 g/l
Boric acid	- 60 g/l
Sodium gluconate	- 80 g/l
Benzimidazole thiol	- 0.1 g/l
Piperonal	- 2 g/l

The electroplating process is carried out at a temerature of 35°C and pH of 5.5. current density of 3 A/ dm^2.

Bright deposits of zinc coatings in the substrates have a reflectivity 95% when measured as above.

WE CLAIM :

1. An improved process for the electrodeposition of bright zinc coatings on substrates wherein electrolytic bath comprising a neutral contents of 10 -20 g/l of zinc, 80 - 150 g/l of potassium chloride, 30 - 60 g/l of boric acid used is characterised in that the bath contains as additional agents, 80 - 160 g/l of sodium gluconate, 0.05 to 1 g/l of benzimidazole thiol

and 0.2 - 1 g/l of piperonal and the electrolysis is carried out at a pH of 5.5 to 6.5.

2. A process as claimed in claim 1 wherein the additional agents used in the bath are preferably in the range of 100 - 120 g/l of sodium gluconate, 0.1 - 0.5 g/l of benzimidazole thiol and 0.5 - 0.8 g/l of piperonal.

3. An improved process for the electrodeposition of bright zinc coatings on substrates substantially as herein described and illustrated in examples.

Dated this 7th day of August, 1979.

(I.M.S. MAMAK)
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COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH.