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International classification—C23b, 5/10, 5/12

PROVISIONAL SPECIFICATION

" IMPROVEMENTS IN OR RELATING TO THE PROCESS OF ELECTRODEPOSITION OF BRIGHT ZINC FROM ACID BATHS "

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 BAIKUNJE ANANTHA SHENOI, SCIENTIST, (MRS) MALATHY PUSHPAVANAM, SENIOR LABORATORY ASSISTANT AND HANDADY VENKATAKRISHNA UDUPA, DIRECTOR, ALL ARE INDIAN NATIONALS AND ARE EMPLOYED IN THE CENTRAL ELECTROCHEMICAL RESEARCH INSTITUTE, KARAIKUDI-3, INDIA.

This invention relates more particularly to the improvements in or relating to the development of a new brightener for acid zinc bath to produce bright deposits.

Hitherto the following compounds—

- (1) Thiourea
- (2) Cystine
- (3) Hexamine
- (4) Naphthalene di-or trisulfonic acid or benzene sulfonic acid
- (5) Benzaldehyde, vanilaldehyde, coumarine, pipranaldehyde,
- (6) Pyridine, pyrrole, quinoline,
- (7) Mercapto compounds and selenium compounds
- (8) Urotropin and dithiocarbamates
- (9) Di-and tri-ethanolamines

were used as brighteners for bright acid zinc plating.

This is open to the objection that these compounds give such deposits which are mostly semibright and they require bright dipping in nitric acid or chromic acid.

The object of this invention is to obviate these disadvantages by using a brightener, which is indigenously available in the country and which gives the bright deposits without any bright dipping.

To these ends, the invention broadly consists in the development of a brightener for the electrodeposition of bright zinc deposit from acid solution. The bath composition is as follows :

Zinc sulphate :	300-450 g/l
Boric acid :	20-40 g/l
Aluminium sulfate :	0-30 g/l
Sodium chloride :	0-15 g/l
Dextrin	2-20 g/l

Salicylaldehyde is used as an addition agent in this bath and teepol is added as the wetting agent. The solution at higher current densities that is above 100 asf require vigorous stirring and filtration at intervals becomes necessary. The

bath works between 50-500 asf. At low current densities also, it requires some slight stirring. pH is 2.5, adjusted with sulfuric acid.

The following are the typical examples given to illustrate the inventions ;

Example 1

Zinc sulphate :	350 g/l
Boric acid :	30 g/l
Aluminium sulphate :	20 g/l
Dextrin	15 g/l
Salicylaldehyde :	0.5 ml/l
Teepol :	0.5 ml/l
Current density :	300 asf
pH	3
Current efficiency :	95-98%

Bright deposits are obtained. Reflectivity : 95% with vigorous agitation either by air or mechanically. (Reflectivity measured with reference to vacuum coated silver mirror). Current efficiency : 95-98%.

Example 2

Zinc sulphate :	300 g/l
Boric acid :	30 g/l
Dextrin :	10 g/l
Salicylaldehyde :	1.5 ml/l
Teepol	1 ml/l
Current density :	50 asf
pH	2.5
Cathode current efficiency :	95-98%
Reflectivity :	95%; slight agitation is given.

Example 3

Zinc sulphate :	400 g/l
Boric acid :	30 g/l
Aluminium sulfate :	10 g/l
Dextrin :	5 g/l
Salicylaldehyde :	1 ml/l
Teepol :	1 ml/l
Current density :	200 asf
pH	2.5

Price : TWO RUPEES

Current efficiency : 95% reflectivity 95% ; vigorous agitation and filtration.

The following are among the main advantages of the invention :

1. Very brilliant deposits from acid zinc bath which need no further polishing

2. Relatively cheaper cost of the addition agent
3. Wide range of current density.

Sd/- R. BHASKAR PAI

Patents Officer,
Council of Scientific & Industrial Research.

Dated this 24th day of August, 1972.

COMPLETE SPECIFICATION

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

THIS IS AN INVENTION BY BAIKUNJE ANANTHA SHENOI, SCIENTIST, (MRS) MALATHY PUSHPAVANAM, SENIOR LABORATORY ASSISTANT AND HANDADY VENKATAKRISHNA UDUPA, DIRECTOR, ALL ARE INDIAN NATIONALS AND ARE EMPLOYED IN THE CENTRAL ELECTROCHEMICAL RESEARCH INSTITUTE, KARAUKUDI-3, INDIA.

This invention relates to improvements in or relating to the process of electrodeposition of bright zinc from acid baths and this particularly relates to metal finishing industry.

Hitherto it has been proposed to use the following brighteners in the acid zinc bath :

1. Thiourea
2. Cystine
3. Hexamine
4. Naphthalene di or trisulfonic acid or benzene sulphonic acid
5. Benzaldehyde, vertraldehyde, coumarin piperonaldehyde
6. Pyridine, pyrole, quinoline
7. Mercapto compounds and selenium compounds
5. Urotropin and dithiocarbamates
9. Di and triethanolamines
10. Cetyl trimethyl ammonium bromide

Substances like beta naphthol, dextrin, dextrose, gum arabic glucose etc. have also been reported as grain, refining agents. But they produce only mat deposits.

These brighteners mostly give semi-bright deposits which require dipping in nitric acid or chromic acid to make it bright.

The main object of this invention is to develop a brightener which is indigenously available and which gives bright deposit in an acid bath that it requires no bright dipping.

The main finding is the development of a new brightener which gives bright deposit even in the as-plated condition.

According to the present invention, there is provided a process for the electrodeposition of bright zinc by zinc plating in an acid bath containing a brightener characterised in that the electrolytic bath consists of zinc sulphate 250-350 g/l, sodium chloride 5-15 g/l, aluminium sulphate 10-30 g/l, boric acid 10-30 g/l, to which is added a brightener consisting of dextrin 2-5 g/l, salicylaldehyde 0.6-1 ml/l and teepol 0.5-2 ml/l and is further characterised in that the electrodeposition is carried out employing a current density of 3.2-21.5 A/dm² at a temperature range of 20-40°C at pH 2-4 with mechanical agitation.

Using this brightener, it is possible to get a bright deposit from an acid sulphate bath. The bath composition and plating conditions are given below :

Bath composition :	
Zinc sulphate :	250-350 g/l
Sodium chloride	5-15 g/l
Aluminium sulphate	10-30 g/l
Boric acid	10-30 g/l
Condi- Temperature	20-40°C
tions :	
pH	2-4
Current density	3.2-21.5 A/dm ²
Agitation	Mechanical
Current efficiency :	90-98%

The addition agents used are of the following concentration :

Dextrin	2-5 g/l
Salicylaldehyde	0.6-1 ml/l
Teepol	0.5-2 ml/l

The aldehyde is mixed with teepol and then added to the bath. Dextrin can be dissolved in hot water and then added directly to the bath. This brightener produces bright deposit which requires no further post-treatment.

Example 1

The deposition has been carried out in 2-litre scale with the following conditions :

Zinc sulphate	—	300 g/l
Sodium chloride	—	15 g/l
Boric acid	—	30 g/l
Aluminium sulphate	—	30 g/l
Dextrin	—	3 g/l
Salicylaldehyde	—	0.6 ml/l
Teepol	—	1 ml/l
Agitation	—	Mechanical
Temperature	—	25°C
pH	—	3
Current density	—	8.4 A/dm ²
Reflectivity	—	95%
(measured with gloss reflectance meter)		
Cathode current efficiency		98%

Example 2

Zinc sulphate	—	350 g/l
Sodium chloride	—	10 g/l
Aluminium sulphate	—	10 g/l
Boric acid	—	30 g/l
Dextrin	—	5 g/l
Salicylaldehyde	—	1 ml/l
Teepol	—	2 ml/l
Agitation	—	Mechanical
Temperature	—	35°C
pH	—	4
Current density	—	21.5 A/dm ²
Reflectivity	—	95%
(measured with gloss reflectance meter)		
Cathode current efficiency 90%		

The main advantage of this process is that the deposit obtained from acid bath with indigenously available chemicals does not require any post-treatment. Moreover, the cyanide disposal problem is eliminated which saves a large amount of expenditure and the cost incurring by way of importing cyanide is also avoided.

In sum, the acid zinc sulphate bath gives bright deposit under the conditions stated in the examples.

WE CLAIM:—

1. A process for the electrodeposition of bright zinc in an acid bath containing a brightener characterised in that the electrolytic bath consists of zinc sulphate 250-350 g/l, sodium chloride 5-15 g/l, aluminium sulphate 10-30 g/l, boric acid 10-30 g/l with a brightener consisting of dextrin 2-5 g/l, salicylaldehyde 0.6-1 ml/l and teepol 0.5-2 ml/l which is characterised in that the electrodeposition is carried out employing a current density of 3.2- 21.5 A/dm² at a temperature range of 20-40°C at pH 2-4 with mechanical agitation.

2. A process for the electrodeposition of bright zinc substantially as hereinbefore described.

Sd/- Illegible
Asst. Patents Officer
Council of Scientific & Industrial Research

Dated this 18th day of October, 1973.

PROVISIONAL SPECIFICATION

COUNCIL OF SCIENTIFIC &
INDUSTRIAL RESEARCH
No. 138579.

NO OF SHEETS: 2
SHEET NO.: 1

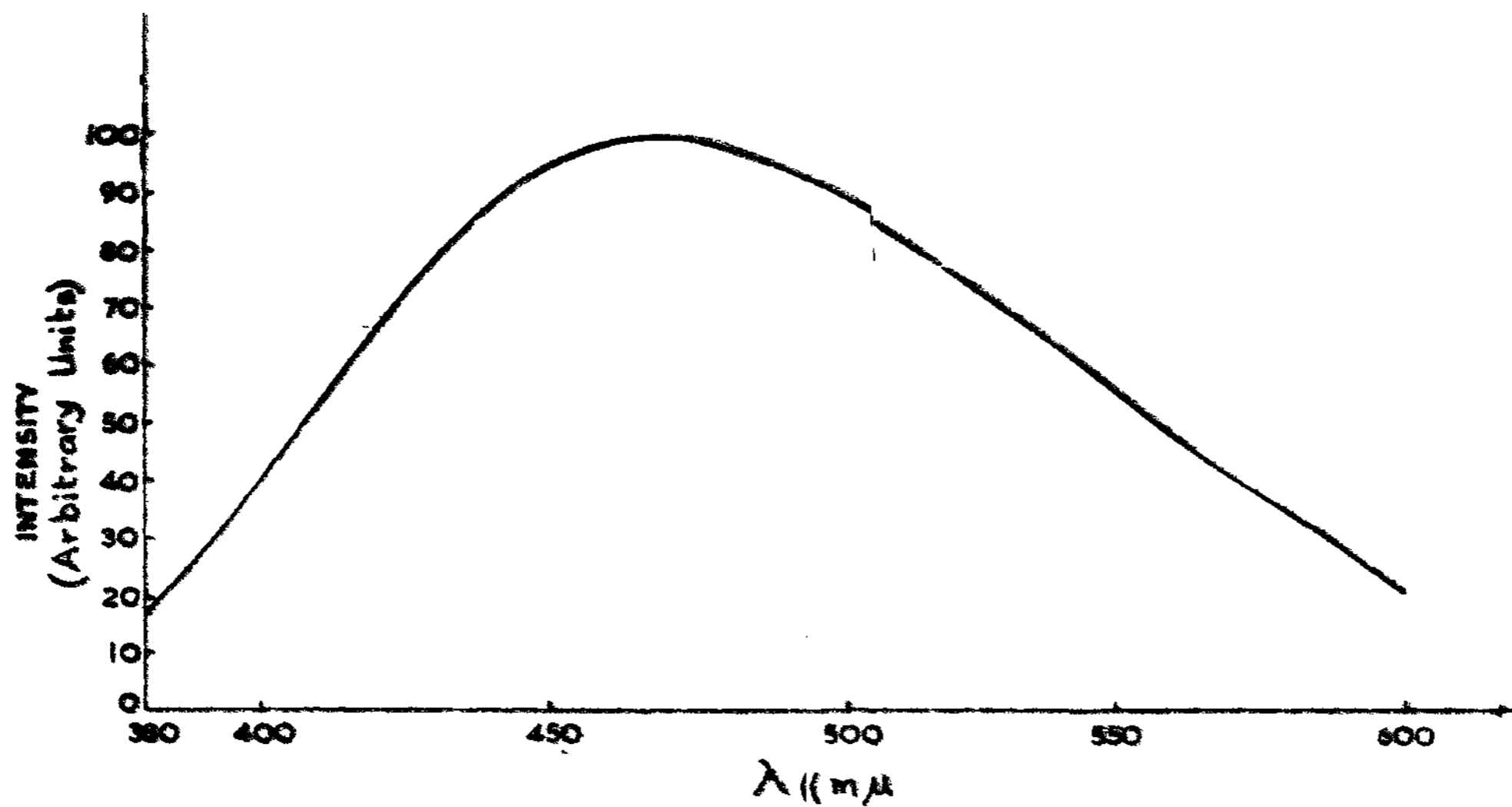


FIG. 1.

S. Kumar
S. KUMAR
Asst PATENTS OFFICER,
CSIR.

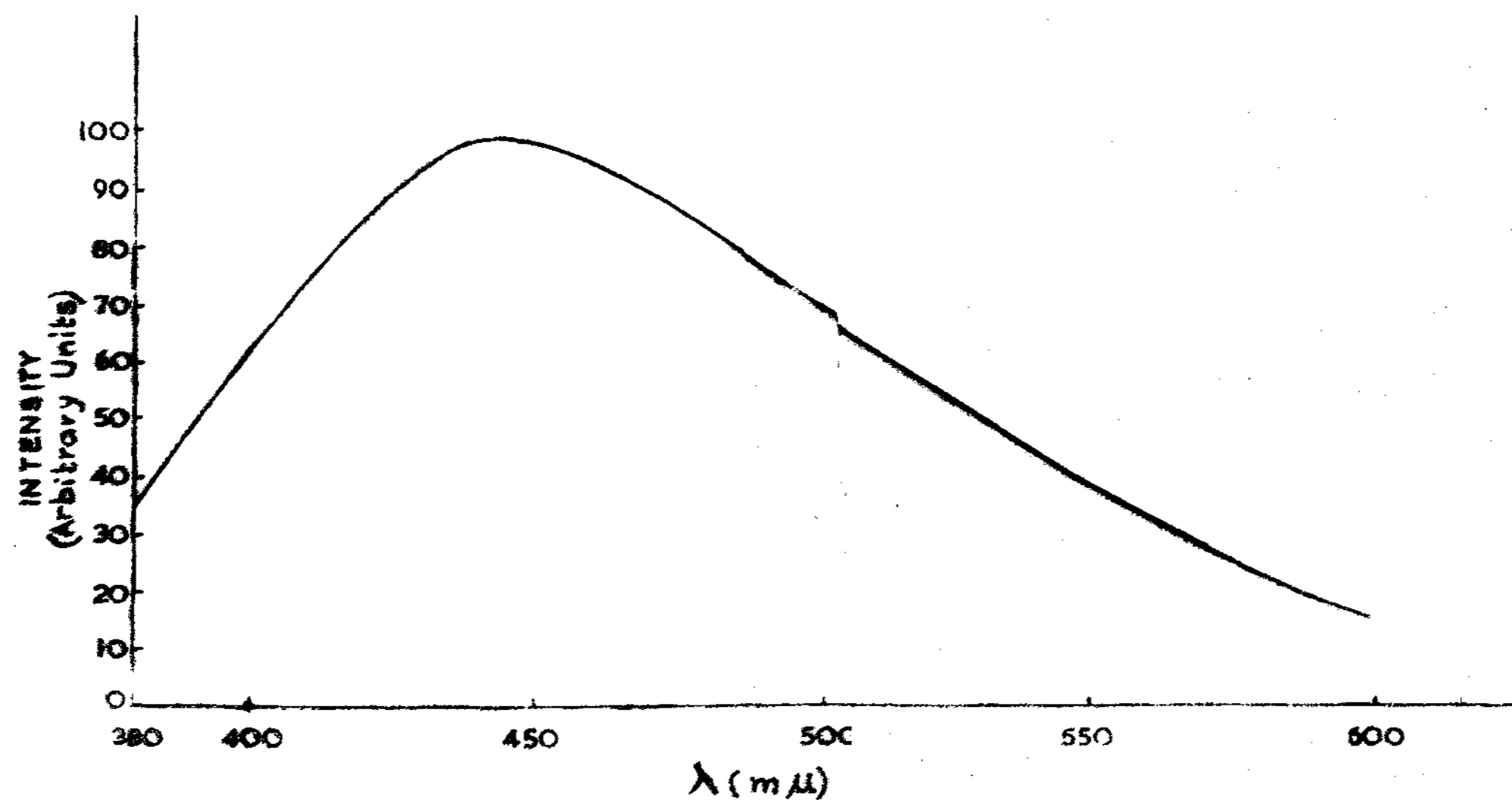
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No. 138579.

NO. OF SHEETS: 2

SHEET NO. : 2



λ (m μ)

FIG. 2

S. Kumar
S. KUMAR
ASST. PATENTS OFFICER,
CSIR