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IMPROVEMENTS IN OR RELATING TO ELECTRODEPOSITION OF BLACK CHROMIUM PLATING

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH, RAJF MARG, NEW DELHI-1, INDIA, AN INDIAN REGISTERED BODY INCORPORATED UNDER THE REGISTRATION OF SOCIETIES ACT (ACT XXI OF 1860).

THIS IS AN INVENTION BY BALKUNJE ANANTHA SHENOI, SCIENTIST, KARAIKUDI SANKARANARAYANA SHASTRI INDIRA, SENIOR SCIENTIFIC ASSISTANT, AND SETHURAMAN GOWRI, SENIOR LABORATORY, ASSISTANT, ALL OF CENTRAL ELECTROCHEMICAL RESEARCH INSTITUTE, KARAIKUDI-3, INDIA, ALL INDIANS.

The following specification describes the nature of this invention.

This invention relates to improvements in or relating to Electrodeposition of Black Chromium Plating from aqueous electrolyte.

Hitherto it has been proposed to resort to electro-deposition of black chromium from (1) acetate (2) nitrate (3) fluosilicic acid containing baths.

This is open to the objection that baths (1) and (2) are short-lived and colour of the finish is not good and bath (3) operates at low current densities and contains microcracks.

The object of this invention is to obviate these disadvantages by using acids or compounds containing amino or amido groups such as sulfamates, sulfamic acids, formamide and acetamide etc.

To these ends, the invention broadly consists in electrolysing an aqueous solution containing chromic acid and a compound selected from the class consisting of any compounds suggested above with lead-antimony anode and copper brass or steel or any other metal on which bright chrome can be plated as cathodes at temperature ranging from 10-40°C. and at c.d. of 15-150 amps/sq.dm.

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

EXAMPLE 1.

Chromic acid (free from sulphates)	= 150-400 gm/l
Sulphamic acid or its salt	= 5-40 gm/l
Boric acid	= 20 gm/l
Barium salt	= 10-30 gm/l
Current density	= 30-100 amps/dm ²
Time	= 5 mts—2 hrs.
Temperature	= 20-25°C.

EXAMPLE 2.

Chromic acid (free from sulphates)	= 150-400 gm/l
Formamide	= 5-40 ml/l

Operation conditions as in Example 1.

The following are among the main advantages of the invention :

1. A cold process.
2. Deposit is homogeneous.
3. Composition is easily controlled.
4. Deposits are crack-free.
5. Resistant towards many of the mineral acids.
6. Jet black adherent deposit.

R. BHASKAR PAI
Patent Officer,

Council of Scientific & Industrial Research.

Dated this 11th day of December, 1964.

COMPLETE SPECIFICATION

IMPROVEMENTS IN OR RELATING TO THE ELECTRODEPOSITION OF BLACK CHROMIUM PLATING

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH, RAJF MARG, NEW DELHI-1, INDIA, AN INDIAN REGISTERED BODY INCORPORATED UNDER THE REGISTRATION OF SOCIETIES ACT (ACT XXI OF 1860)

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

This invention relates to improvements in or relating to the Electrodeposition of Black-Chromium Plating from aqueous electrolyte.

Hitherto it has been proposed to resort to electro-deposition of black chromium from (1) acetate (2) nitrate (3) fluosilicic acid containing baths.

This is open to the objection that baths 1 and 2 are short lived and colour of the finish is not good and bath (3) operates at low current densities and the deposits contain micro cracks and requires replating (nickel) treatments.

The object of this invention is to obviate these disadvantages by using acids or compounds containing amino or amido groups such as sulphamates, sulphamic acids, formamide and acetamide etc.

To these ends, the invention broadly consists in electrolysing an aqueous solution containing chromic acid and a compound selected from the class consisting of any compounds suggested above with lead antimony anode and copper, brass or steel or any other metal on which bright chrome can be plated as cathodes at temperature ranging from 10-40°C. and at current density of 15-150 amp/dm².

Good adherent black hard wear resistant uniform coatings are obtained from bath containing chromic acid with addition of sulphamic acid or its salts. The deposits obtained from this new type of bath compares equally well with other baths known. The effect of altering the composition of the bath current density, temperature, time of treatment, pH etc. on the characteristics of the deposit are worked and in detail. Our investigation shows that promising results could be obtained with regard to black chromium deposits from baths containing "sulphamate". The functional use of sulphamic acid has been extended to black chromium.

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

EXAMPLE 1.

Chromic acid (free from sulphate)	= 250-300 gpl
Sulphamic acid or its salt	= 10-20 gpl
Barium Carbonate	= 10-30 gpl

Price : TWO RUPEES.

The operating conditions for the above bath are given below :

Current density	60-100 amp/dm ²
Time of treatment	5 mts - 15 mts.
Temperature	20-30°C.

EXAMPLE 2.

Chromic acid (free from sulphate)	250 gpl
Formamide or any other amino or amido aliphatic or aromatic compound	5-40 gms/l
Operating conditions	As in Example 1.

The chromic acid used in the above solution is of commercial grade from which the traces of "sulphate" is removed by barium treatment. 250 gpl of chromic acid is beneficial since below 250 gpl efficiency is poor and above this concentration, the CrO₃ crystallises as it is operated at low temperature and drag out loss is also high.

The deposits are sound and varied from grey black to jet black in appearance. The deposits obtained under the typical conditions which are covered in the patent are hard, adherent shining black and smooth.

The following are among the main advantages of the invention:

1. It is a cold process.
2. The deposits are homogeneous.
3. The composition of the bath is easily controlled.
4. Deposits are crack free.
5. The deposits are resistant towards many of the mineral acids.
6. Jet black adherent deposit.
7. The deposit can be grown to sufficient thickness without any change in the ductility of the deposit.

8. Black chromium from sulphamate bath is readily wetted by both oil and water.
9. Particularly advantageous in the field of application where friction is to minimum.
10. Apart from the appearance the properties of black chromium deposits from the sulphamate bath including micro hardness, structure etc. are almost superior or equal with those of deposits from the fluosilicate type baths produced under typical conditions.
11. The use of 'sulphamate' as catalyst for black chromium plating is proposed for the first time.

We claim :

1. A process for the electrodeposition of black chromium plating which consists in electrolysing an aqueous solution containing chromic acid and a compound selected from the class consisting of any of the following compounds, namely, acids or compounds containing amino or amido groups such as sulphamates, sulphamic acids, formamide and acetamide etc., with lead antimony anode and copper, brass or steel or any other metal on which bright chrome can be plated as cathodes at temperature ranging from 10-40°C. and at current density of 15-150 amp/dm².

2. A process for the electrodeposition of black chromium plating substantially as described in the examples.

3. Electrodeposited black chromium plating whenever obtained according to a process substantially as hereinbefore described.

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Dated this 7th day of September, 1965.