

# **The Complete Technology Book on Electroplating, Phosphating, Powder Coating and Metal Finishing (2nd Revised Edition)**

**Author:** NIIR Board of Consultants & Engineers

**Format:** Paperback

**ISBN:** 9788194099536

**Code:** NI129

**Pages:** 504

**Price:** Rs. 1,675.00    **US\$** 44.95

**Publisher:** Asia Pacific Business Press Inc.

Usually ships within **5** days

The Complete Technology Book on Electroplating, Phosphating, Powder Coating and Metal Finishing (2nd Revised Edition)

Electroplating is the process of depositing a metal coating onto the surface of an object through the use of an electrical current. Electroplating has evolved into a highly complex process requiring a high level of precision and expertise. Phosphating is the process of converting a steel surface to iron phosphate. This is mostly used as a pretreatment method in conjunction with another method of corrosion protection.

Powder coating is a finishing process in which a coating is applied electrostatically to a surface as a free-floating, dry powder before heat is used to finalize the coating. The powder can be made of any number of products: polyester, polyurethane, polyester-epoxy, straight epoxy, and acrylics. Metal finishing is the final step in the manufacturing process used to provide aesthetics and environmental protection.

The electroplating market mostly is driven by the electronics and electrical industry and followed by the automotive industry. The demand for electroplating is rising rapidly from the end user industries which propel the growth of the market. The increasing demand for durable metals and growing use of adaptable manufacturing processes for a wide range of applications in the automotive, aerospace & defense, and electrical & electronics industries are likely to boost the demand for electroplating. With the growing demand for high-performance automobile components having excellent resistance to corrosion to enhance the appearance of exterior automobile parts, such as emblems, door handles, hood ornaments, and wheel rims, is driving the demand for electroplating and likely to continue owing to the increasing automobiles production in Asia-Pacific and other emerging economies in the Middle East & Africa. The zinc-nickel electroplating is one of the popular methods of electroplating in the automotive industry.

The book cover various aspects related to different Electroplating, Phosphating, Powder Coating and Metal Finishing with their manufacturing process and also provides contact details of machinery suppliers with equipment photographs and plant layout.

A total guide to manufacturing and entrepreneurial success in one of today's complete process of electroplating to metal finishing in industry. This book is one-stop guide to one of the fastest growing electroplating, phosphating, powder coating and metal finishing industry, where opportunities abound for manufacturers, retailers, and entrepreneurs. The book serves up a feast of how-to information, from concept

to purchasing equipment.

# Contents

## Contents

### 1. INTRODUCTION

### 2. CLEANING, PICKLING AND DIPPING

Routine Operations in Cleaning

Preliminary Cleaning and Degreasing

Solvent Cleaning

Aqueous Neutral Detergent Pre-Cleaners

Mersol Soak Cleaner

Solution Composition

Solution Preparation

Operating Conditions

Operating Procedure

Ultrasonic Cleaning

Alkaline Cleaners

Hot Alkaline Cleaners

Classification of Metal Cleaners

Electrolytic Cleaning

Equipment for Hot Alkaline Cleaners

Barrel Cleaning

Active Cleaner

Equipment

Solution Preparation

Solution Concentration and Operating Conditions

Cleaning of Zinc Base Alloy Die Castings

Barrel Cleaning

Solution Maintenance

Nuvax Cleaner

Equipment

Solution Preparation

Cleaning of Zinc Base Alloy Die Castings

Barrel Cleaning

Solution Concentration and Operating Conditions

Solution Maintenance

Cleaner

Equipment

Solution Preparation

Solution Concentration and Operating Conditions

Solution Maintenance

Multiklense

Equipment

Solution Preparation

Solution Maintenance

Cleaner No. 50

Solution Concentration and Operating Conditions

Solution Composition

Solution Preparation  
Operating Conditions  
Solution Maintenance  
Anozyn  
Equipment  
Solution Composition  
Solution Preparation  
Operating Conditions  
Solution Maintenance  
10-15 Cleaner  
Equipment  
Solution Concentration and Operating Conditions  
Solution Preparation  
Solution Maintenance  
10-55 Cleaner  
Equipment  
Solution Preparation  
Operating Conditions  
Solution Maintenance  
Emphax  
Equipment  
Solution Composition  
Operating Conditions  
Solution Maintenance  
Zonax Metal Cleaner  
Solution Concentration and Operating Conditions  
Anodax Metal Cleaner  
Equipment  
Solution Composition  
Solution Preparation  
Operating Conditions  
Solution Maintenance  
Alkaline Cleaners for Aluminium  
For Cleaning without Etching the Surface  
For Light Etch Cleaning of Aluminium  
For Frosted Etch Finish  
Minco Cleaner  
Equipment  
Solution Concentration and Operating Conditions  
Solution Maintenance  
Kelco Cleaner  
Equipment  
Solution Composition  
Solution Preparation  
Operating Conditions and Procedure  
Solution Maintenance  
Maintenance of Metal Cleaners  
Additions of Metal Cleaner  
Pickling and Dipping  
Zonax Dry Acid Salt  
Equipment  
Solution Concentration and Operating Conditions  
Solution Preparation

Sulphuric Acid Pickling  
Equipment  
Solution Composition  
Operating Conditions  
Solution Maintenance  
Hydrochloric Acid Pickling  
Solution Composition  
Equipment  
Operating Procedure  
Skalene Pickle for Iron and Steel  
Alkaline Deruster Salts  
Additional Uses of Alkaline Deruster Salts  
Equipment  
Section a—Cyanide-free Solution for Rust Removal  
Solution Composition  
Solution Preparation  
Operating Conditions  
Section B.—Cyanide Solution for Rust and Scale Removal  
Solution Composition  
Operating Conditions  
Process Sequence used in Sections A and B  
Treatment of High Tensile Steels  
Spray Suppression  
Effluent Treatment  
Solution Maintenance  
Hydrofluoric Acid Pickling  
Solution Composition  
Equipment  
Operating Procedure  
Pickling of Magnesium Alloys  
Pickling of Stainless Steel  
Equipment  
Operating Procedure  
Pickle Aid  
For Combined Pickling and Degreasing Solutions  
As a Spray Suppressant  
Equipment  
Concentration  
Operating Conditions  
Solution Maintenance  
Bright Dipping of Copper Alloys  
Aqua Fortis Bright Dipping Acid  
Solution Composition  
Equipment  
Bright Dipping Procedure  
Chromic Acid Dip for Brass, Copper and its Alloys  
Solution Composition  
Equipment  
Operating Procedure  
Nitric Free Bright Dip C22924 for Copper and its Alloys  
Solution Composition  
Equipment  
Operating Procedure

Solution Maintenance  
Barrel Pickling  
Second Stage or Surface Activation Cleaning  
Cyanide Containing Cleaners  
Klenowell  
Equipment  
Solution Composition  
Solution Preparation  
Operating Conditions  
Operating Procedure  
Solution Maintenance  
Kleenax  
Solution Concentration  
Operating Conditions  
Operating Procedure  
Solution Maintenance  
Non-Cyanide Cleaners  
Activax Cleaner  
10-55 Cleaner and Anodax Metal Cleaner  
Anozyn  
Alkaline Deruster  
Emphax Cleaner  
Acid Etching  
Anodic Sulphuric Acid Etching of Iron and Steel  
High Concentration Acid Etch for Steel  
Equipment  
Solution Composition  
Solution Preparation  
Operating Conditions  
Operating Procedure  
Solution Maintenance  
Acid Etching of Steel and Iron before Heavy Deposition  
Solution Composition  
Solution Preparation  
Operating Conditions  
Solution Maintenance  
Pre-Treatment Systems  
Pre-Cleaning  
Typical Cleaning Cycles  
Nickel Plating of Mild Steel  
General Method  
Where a cyanide-free cleaning line is required  
Use of a sulphuric acid etch to ensure maximum adhesion of deposit  
D.—Energy Saving Cleaning Line  
Cadmium and Zinc Plating of Mild Steel  
Rack Plating  
Notes  
Barrel Plating  
Notes  
Plating on High Carbon Steel  
Plating on Cast Iron and Malleable Castings  
Plating on Stainless Steel  
Nickel Chloride Strike for Stainless Steel

- Nickel Sulphate Strike for Stainless Steel
- Nickel Plating of Brass and Other Copper Alloys
  - General Method
  - Alternative method where a cyanide-free cleaning line is required
- Nickel Plating of Copper
- Nickel Plating of Leaded Brass
- Copper and Nickel Plating on Zinc Base Alloy Die-Castings
- Plating on Aluminium and its Alloys
  - The Bondal Process
  - Bondal Cleaner
  - Equipment
  - Solution Composition
  - Solution Preparation
  - Operating conditions
  - Solution Maintenance
- Bondal Dip
  - Standard process sequence for electro-plating on Aluminium and its alloys
  - Modification to the standard process
  - Articles likely to carry over solution
  - Articles having unpolished areas
  - Deposition of metals other than nickel
- Jigging
- Dips and Rinses
  - Dilute Acid Dips
  - Cyanide Dips
  - Rinsing or Swilling
  - Rinse-Aid
  - Scouring

### 3. ELECTROLYTIC AND CHEMICAL PROCESSES FOR THE POLISHING OF METALS

- Electro-polishing Solutions
  - Aluminium and Aluminium Alloys
  - Aluminium Electro-polishing Solution
    - Equipment
    - Solution Composition
    - Solution Preparation
    - Operating Conditions
    - Operating Procedure
    - Solution Maintenance
  - Brytal Process
    - Equipment
    - Operating Conditions
  - Desmutting
- Stainless Steels
  - Canning Stainless Steel Electro-polishing Solution
    - Solution Composition
    - Equipment
    - Operating Conditions
  - Process Sequence
  - Solution Maintenance
- Copper, Brass and Nickel Silver
- Canning Non-Ferrous Electro-polishing Solution

Solution Composition  
Equipment  
Operating Conditions  
Process Sequence  
Solution Maintenance  
Chemical Polishing of Aluminium  
Typical Operating Conditions

#### 4. COPPER PLATING

Properties of Copper  
Decorative Applications  
Functional Applications  
Copper Plating Solutions  
Rates of Deposition and Specification Requirements  
Cathode Efficiency of Copper Plating Solutions  
Rates of Deposition  
Deposit Specifications  
Equipment  
Cyanide Solutions  
Anodes  
Cyanide Copper Plating Processes  
Copper Strikes  
PH Control  
Cuprax High Efficiency Copper Solution  
Anodes  
Solution Composition  
Operating Conditions  
Solution Maintenance  
Purification  
Analytical Standards  
Plating Procedure for Zinc based diecastings  
Zonax Copper Solution  
Anodes  
Solution Composition  
Operating Conditions  
Maintenance of the Solutions  
Low Cyanide Strike Solution for Cast Iron, Lead and Soldered Articles  
Analytical Standards  
Rochelle Copper Solution  
Solution Composition  
Operating Conditions  
Solution Maintenance  
Analytical Standards  
Acid Copper Plating Processes  
Cuprasol Mk 2 Bright Levelling Acid Copper Plating Solution  
Preparation of the Cuprasol Mk. 2 Base Solution  
Solution Composition  
Operating Conditions  
Solution Maintenance  
Chloride Content  
Visual Control of the Cuprasol Solution  
Acid Copper Sulphate Solution  
Solution Compositions

Operating Conditions  
Solution Maintenance  
Correction of Faults in Acid Copper Sulphate Solutions  
Copper Pyrophosphate Plating Solution  
Super Pyrobrite Copper Pyrophosphate Plating Solution  
Solution Composition  
Solution Maintenance  
Plating Procedure  
Neutral Copper Plating Solutions  
Solution Composition  
Operating Conditions  
Plating Procedure  
Immersion Plating Without Applied Current  
On Steel  
Solution Composition  
On Brass  
Solution for Barrel Copper Plating  
Barrel Plating with Zonax Copper Solution  
Solution Compositions  
Operating Conditions  
Maintenance of Solutions  
Analytical Standards  
Barrel Plating with Cuprax Copper Solution  
Solution Composition  
Operating Conditions  
Solution Maintenance  
Analytical Standards  
BarRel Plating in Rochelle Copper Solution  
Operating Conditions  
Analytical Standards  
Solutions for Heavy Copper Deposition  
Cuprasol Mk. 2 Acid Copper Plating Process for Heavy Deposits  
Preparation of the Acid Copper Base Solution  
Solution Composition  
Operating Conditions  
Solution Maintenance  
Analytical Standards  
Copper Fluoborate Solution  
Equipment  
Operating Conditions  
Solution Maintenance  
Purification  
Analytical Standards  
Super Pyrobrite Copper Pyrophosphate Plating Solution  
Properties of the deposit  
Operating Conditions  
Purification  
Cuprax Cyanide Copper Solution  
Copper Plating Procedure  
Cyanide Copper Solutions  
Zinc Base Alloy Diecastings  
Special Techniques used in Printing Application  
Photogravure



Building Up Copper Cylinders  
Skin Deposits  
Cast Iron and Steel Cylinders  
Aluminium Cylinders  
Copper Electrotypes  
Lithography  
Stopping-Off  
Methods for Stripping Copper Deposits  
From Steel  
Universal Stripping Salts for Steel  
Alkaline Cyanide Solution  
Immersion Process  
Sulphuric Acid Etch  
From Zinc Alloy Diecastings  
5. ELECTROFORMING  
Applications of Electroforming  
Materials for Electroforming  
Nickel Solution  
The Watts Solution  
The Sulphamate Solution  
The Ni-speed Solution  
Zero-stress conditions for the Ni-speed process  
Nickel/Cobalt Alloy Solutions  
Copper Plating Solution  
Throwing power  
Sodium High-Sulphate Nickel Solution  
Operating Techniques  
Mandrels for Electroforms  
Permanent Mandrels  
Stainless steel  
Mild Steel  
Copper and Brass  
Electroformed Nickel  
Rigid Plastic  
Collapsible Plastics  
Expendable Mandrels  
Aluminium  
Zinc alloys  
Fusible alloys  
Plastics  
Wax  
Other Materials  
Post Plating Treatment  
Electroforming in Gramophone Record Production  
Printing Application  
Printing Methods  
Electroplating Techniques Special to the Printing Industry  
Electroplating Solutions used in the Printing Industry  
  
6. BRASS PLATING  
Decorative Brass Plating  
Zonax Brass Solution for Decorative and General Plating  
Equipment

Solution Composition  
Operating Conditions  
Solution Maintenance  
Colour Consistency and Control  
Analytical Standards  
Plating Procedure  
Brass Plating upon Cast Iron and Lead  
Barrel Brass Plating  
Solution Composition  
Operating Conditions  
Solution Maintenance  
Analytical Standards  
Brass Plating for Rubber Adhesion  
Solution Composition  
Operating Conditions  
Solution Maintenance  
Analytical Standards  
Plating Procedure  
Correction of Faults in Zonax Brass Plating Solutions.

## 7. SILVER PLATING

Cyanides Systems  
High-Speed Selective Plating  
Non-cyanide System  
Iodide Solutions  
Trimetaphosphate Solution  
Thiosulfate Solutions  
Succinimide Solutions  
Organic Solvent Solutions  
Summary  
Tin, Lead, and Tin-Lead Plating  
Additives  
Tin, Lead, and Tin-Lead Plating Baths  
Tin Barrel, Still, and High-Speed Baths  
Lead Barrel and Still Baths  
60 Tin/40 Lead Solder Barrel, Still, and High-Speed Baths  
90 Tin/10 Lead Barrel, Still, and High-Speed Baths  
93 Lead/7 Tin Barrel and Still Baths  
10 Tin/88 Lead/2 Copper Ternary Alloy Barrel and Still Baths  
Fluoborate Plating  
Methane-Sulfonic-Acid-Based Plating  
Tin Plating from Stannate Baths  
Anodes in Stannate Baths  
Operation of Stannate Baths  
Reflowing Tin Deposits  
Determination of Acid Neutralization Value

## 8. GOLD PLATING (GILDING)

Properties of Gold  
History of Gold Plating  
Applications of Gold Plating  
Rates of Deposition and Specification Requirements  
Specification Requirements

- Undercoats
- Corrosion Resistance
- Carat Value
- Equipment for Gold Plating
- Anodes
- Effluent Treatment
- Gold Deposits and Solutions
- Ultra-pure Gold Deposits
- Low-Alloy Gold Deposits
- High-Alloy Decorative Golds
- General Gold Plating Procedure
- Plated Undercoats
- Barrier Layers
- Strike solutions
- Post plating treatment
- Traditional Gold Plating Practice (Gilding)
- Gilding Articles Inside
- Immersion Gilding
- Stripping Gold Deposits
- Electrolytic Process for Stripping Flux and Oxide from Gold

## 9. CADMIUM PLATING

- Properties of Cadmium
- Applications and Corrosion Resistance
- Cadmium Deposits on Non Ferrous Metals
- Passivation Processes
- Specification Requirements and Rates of Deposition
- Rates of Deposition and Plating Times
- Determination of Deposits Thickness
- Strip and re-weigh method for average thickness of cadmium deposits
- Test for Porosity of Deposit
- Cadmium Plating Equipment
- Cadmium Plating Solutions
- Cadmium Plating Salts
- Zonax Cadmium Plating Solution
- Solution Composition
- Operating Conditions
- Solution Maintenance
- Analytical Standards
- Kadax Cadmium Solution for Barrel Plating
- Solution Composition
- Operating Conditions.
- Solution Maintenance
- Analytical Standards
- Kadamax High Speed Bright Cadmium Plating Solution
- Equipment
- Solution Composition
- Operating Conditions
- Solution Maintenance
- Analytical Standards
- Cadmium Plating Procedure
- Cleaning and Preparation of Work
- Removal of Embrittlement

Treatment after Cadmium Plating  
Kadip Bright Dip  
Equipment  
Solution Composition  
Operating Conditions  
Solution Maintenance  
Chromic Acid Dip  
Equipment  
Solution Composition  
Operating Conditions  
Stripping Cadmium Deposits  
Using Ammonium Nitrate Solution  
Using Ammoniacal Persulphate Solution  
Using Hydrochloric Acid

## 10. ZINC PLATING

Properties of Zinc  
Applications Corrosion Resistance  
Specification Requirements and Rates of Deposition  
Thickness Requirements for Zinc Deposits  
Determination of Thickness of Zinc Deposit  
Rate of Deposition  
Zinc Plating Equipment  
Cyanide solutions  
Zinc Plating Solution  
Cyanide Zinc Plating Solutions  
Base Solution Composition  
Unizin Universal Zinc Brightner  
Anodes  
Solution Composition  
Operating Conditions  
Solution Maintenance  
Analytical Standards  
Purification  
Hylite 80 Bright Zinc Solutions  
Solution Composition  
Operating Conditions  
Solution Maintenance  
Zinc Oxide  
Zinc Cyanide  
Purification  
Analytical Standards  
Treatment after Plating  
Cyanide Zinc Plating Procedure  
Cleaning and Preparation of Work  
Treatment After Zinc Plating  
Bright Zinc Plating  
Dilute Nitric Acid Bright Dip  
Dull Zinc Plating  
Correction of Faults In Cyanide Zinc Plating Solutions  
Alkaline Non-Cyanide Zinc Solutions  
Envirozin 2 Bright Alkaline Non-Cyanide Solution  
Solution Composition: Rack

Solution Composition: Barrel  
Solution Preparation  
Operating Conditions  
Rate of Deposition  
Solution Maintenance  
Analytical Standards  
Purification  
Alkaline Non-Cyanide Plating Procedure  
Acid Zinc Plating Solutions  
Zincalux Bright Acid Zinc Solution  
Solution Composition  
Operating Conditions  
Rate of Deposition  
Solution Maintenance  
Purification  
Analytical Standards  
Treatment after Plating  
Chloride Zinc Plating Solution  
Equipment  
Solution Composition  
Operating Conditions  
Rate of Deposition  
Solution Maintenance  
Treatment of Work after Plating  
Acid Zinc Plating Procedure  
Stopping-off  
Stripping Zinc Deposits  
Immersion Process  
Correction of Faults in Acid Chloride Zinc Plating Solutions  
Electrolytic Process

## 11. THE PLATING OF PLASTICS AND OTHER NON-METALLIC MATERIALS

Plating-on-Plastics  
Applications and Advantages  
Properties of Plated Plastics  
Moulding for Plating on Plastics  
Physical faults and their effects  
Faults caused by variations in machine parameters  
Simplas Process  
Equipment  
Swilling or Rinsing  
Cleaning  
Pre-etch  
Hot Alkaline Cleaner  
Etching  
Etch Composition for ABS Type Polymers  
Operating Conditions  
Solution Maintenance  
Analytical Standards  
Etch Composition: For PP co-polymers  
†Alternatives:  
Operating Conditions

Solution Maintenance  
Analytical Standards  
Neutralising  
Solution Composition  
Solution Maintenance  
Simplas Neutraliser  
Solution Composition  
Operating Conditions  
Activation  
Solution Composition  
Operating Conditions  
Solution Maintenance  
Acceleration  
Solution Composition  
Operating Conditions  
Niplas Electroless Nickel  
Equipment  
Solution Composition  
Operating Conditions  
Solution Maintenance  
Solution Life  
Analytical Standards  
Electroplating on Electroless Nickel Plated Surfaces  
Plating Jigs  
Barrel Plating of Plastics  
Barrel Plating Technique  
Silvering  
Spray Silvering  
Solution Composition  
Operating Procedure  
Sensitiser  
Immersion Silvering  
Operating Procedure  
Electroplating on Silvered Surfaces  
Jigging  
Special Techniques Used In Printing Applications  
Metallising with Copper Bronze Powder  
Preparation  
Metallising  
Electroplating  
Polishing with Powered Graphite  
Vacuum Evaporation and Electrical Sputtering

## 12. PHOSPHATING PROCESSES

Applications  
Pre-treatment Prior to Organic Coatings  
Protection against Corrosion  
Anti-wear Coatings  
Phosphating as a Production Aid  
Types of Phosphate Coating  
Iron Phosphate  
Zinc Phosphate  
Manganese Phosphate

Lead Phosphate  
Surfaces To Which Phosphate Coatings May Be Applied  
Preparation of Surfaces for Phosphating  
Specifications  
British Standard 1389: 1973 Phosphate Treatment of Iron and Steel  
DEF STAN 03-11/1 Phosphate Treatment of Iron and Steel  
Treatment of High Tensile Steels  
Equipment for Phosphating  
Immersion Phosphating Plant  
Spray Phosphating Equipment  
Tanks  
Solution Heating  
Fume Extraction  
Sludge Removal  
Phosphating Processes  
Key to Table  
Light Weight Iron Phosphate Processes  
Canphos 301  
Canphos 304  
Equipment  
Solution Composition and Operating Conditions  
Preparation of the 300 Range Phosphating Solutions  
Operating Sequences  
Solution Maintenance  
Heavy Zinc Phosphate Processes  
Equipment  
Canphos  
Canphos  
Solution Composition and Operating Conditions  
Preparation of the 400 Range of Phosphating Solutions  
Solution Maintenance  
Visual Control  
Calcium Modified Zinc Phosphate Processes  
Canphos  
Canphos  
Canphos  
Equipment  
Solution Preparation  
Operating Sequences  
Solution Maintenance  
Addition Rates  
Light Weight Zinc Phosphate Processes  
Canphos  
Canphos  
Solution Composition and Operating Conditions  
Solution Preparation  
Solution Maintenance  
Addition Rates  
Manganese Phosphate Processes  
Canphos  
Equipment  
Solution Composition  
Operating Conditions

Solution Preparation  
Operating Sequences  
Solution Maintenance  
Phosphating Process Sequences  
Pre-Treatment Processes  
Alkaline Cleaners  
Equipment  
Maintenance  
Defoaming  
Pickling and Derusting  
Conditioning  
Post Phosphating Treatments  
Sealing Treatment  
Chromic Rinse Solution (DEF STAN 03-11/1)  
Equipment  
Oils and Lubricants  
Black Finishes  
Sealphos 721 Black Stain  
Sealphos 708 Matt Black  
Aluminium Pre-Treatment  
Alibond 802  
Equipment  
Solution Composition  
Operating Conditions  
Operating Sequence  
Solution Maintenance  
Solution Analysis  
General Phosphating Information  
Sludge Removal  
Control of Solution Composition and Chemical Balance  
Effluent Treatment

### 13. ELECTROPAINTING OF ALUMINIUM

The Process  
Principles of Electropainting  
Process Details  
Jigging  
Pre-treatment  
Paint Application  
4 Rinsing and Ultrafiltration  
Stoving  
Costs  
Conclusion  
Developments  
The Future

### 14. POWDER COATING OF ALUMINIUM

Method of Application  
Equipment  
Electrostatic Generator and Gun  
Powder Recovery  
Stoving  
Powder Coating Production



Colour  
Thermoplastic Powder Coatings  
Polyethylene (Polythene)  
PVC  
Nylon  
Factors Affecting Use of Thermo-plastic Coatings

## 15. BRIGHT NICKEL ELECTROPLATING

Brighteners  
Levellers  
Stress Relievers  
Wetting Agents  
Properties of electro-deposited bright nickel  
Brightness  
Reflectivity  
Roughness and Pitting  
Porosity  
Corrosion Resistance  
Chromability  
Adhesion and Surface Preparation  
Ductility  
Internal Stress  
Hardness  
Effect of hydrogen absorption  
Properties of Bright Nickel Baths  
Stability  
Cathode and anode efficiencies  
Operating range  
Simplicity of operation  
Throwing power  
The incorporation and effect of organic addition agents  
Mechanisms of incorporation of organic compounds in electro-deposits  
Cathodic Reduction  
Interaction of organic additions  
Levelling  
Effect of additives on structure  
Grain size, orientation and brightness of electro-deposits  
Effect of additions on stress, ductility and hardness  
Stress first decreases, then rises as concentration is increased.

## 16. BIS SPECIFICATIONS

## 17. PHOTOGRAPHS OF MACHINERY WITH SUPPLIER'S CONTACT DETAILS

Electroplating Rectifiers  
Electroplating Process Tank  
Rotating Barrel  
Auto Stat  
Automatic Voltage Controller  
Automatic Powder Coating Plant  
ED Coating Plant / CED Coating Plant  
Control panels  
Advance Controller  
Painting Booth

Metal Finishing Machines  
Rotary Dryers  
Shot Blasting  
Vibratory Finishing Machines  
Polyamide (Glide) Coating  
Zinc Plating Plants  
Material Handling System  
Flocking Units  
Electric Oven  
Industrial Oven  
Plating Barrel  
Servo Stabilizer

## 18. PLANT LAYOUT AND PROCESS FLOW SHEETS

# About NIIR

**NIIR PROJECT CONSULTANCY SERVICES (NPCS)** is a reliable name in the industrial world for offering integrated technical consultancy services. NPCS is manned by engineers, planners, specialists, financial experts, economic analysts and design specialists with extensive experience in the related industries.

Our various services are: Detailed Project Report, Business Plan for Manufacturing Plant, Start-up Ideas, Business Ideas for Entrepreneurs, Start up Business Opportunities, entrepreneurship projects, Successful Business Plan, Industry Trends, Market Research, Manufacturing Process, Machinery, Raw Materials, project report, Cost and Revenue, Pre-feasibility study for Profitable Manufacturing Business, Project Identification, Project Feasibility and Market Study, Identification of Profitable Industrial Project Opportunities, Business Opportunities, Investment Opportunities for Most Profitable Business in India, Manufacturing Business Ideas, Preparation of Project Profile, Pre-Investment and Pre-Feasibility Study, Market Research Study, Preparation of Techno-Economic Feasibility Report, Identification and Section of Plant, Process, Equipment, General Guidance, Startup Help, Technical and Commercial Counseling for setting up new industrial project and Most Profitable Small Scale Business.

NPCS also publishes various process technology, technical, reference, self employment and startup books, directory, business and industry database, bankable detailed project report, market research report on various industries, small scale industry and profit making business. Besides being used by manufacturers, industrialists and entrepreneurs, our publications are also used by professionals including project engineers, information services bureau, consultants and project consultancy firms as one of the input in their research.

Our Detailed Project report aims at providing all the critical data required by any entrepreneur vying to venture into Project. While expanding a current business or while venturing into new business, entrepreneurs are often faced with the dilemma of zeroing in on a suitable product/line.

---

**NIIR PROJECT CONSULTANCY SERVICES** , 106-E, Kamla Nagar, New Delhi-110007, India. **Email:** [npcs.india@gmail.com](mailto:npcs.india@gmail.com) **Website:** [NIIR.org](http://NIIR.org)

Thu, 18 Apr 2024 16:24:43 +0530