Electroplating and Metal Finishing concerns itself with the development and applications of composites and non metallic coatings. These coatings are used for decorative, protective and functional application. Some of the other common metal surface finishing technologies are phosphating, pickling, electroforming, powder coating etc. Electroplating is the process of applying a metallic coating to an article by passing an electric current through an electrolyte in contact with the article, thereby forming a surface having properties or dimensions different from those of the article. Metal finishing has now come to be known as surface engineering. Surface engineering techniques are generally used to develop a wide range of functional properties. In addition to the decorative aspects, metal finishing aids the protection of metals and alloys from corrosion and rusting. A great potential exists for development of new materials involving, for example, coatings of metals composites particle incorporated anodic coatings and even films of sapphire like materials, porous files of niobium etc. and coating of refractory metals like molybdenum and tungsten. Phosphate coatings have a wide field of application in manufacturing industry, both as an aid to mechanical production operations and in surface finishing. The major applications for phosphate treatments fall into four areas; pre treatment prior to organic coatings, protection against corrosion, anti wear coatings and phosphating as a production aid. Powder coating of aluminium, extrusions in particular, has become an important feature in the finishing of aluminium. There are several advantages of powder; powder coating overspray can be recycled and thus it is possible to achieve nearly 100% use of the coating, powder coating production lines produce less hazardous waste than conventional liquid coatings, capital equipment and operating costs for a powder line are generally less than for conventional liquid lines. Surface finishing is a broad range of industrial processes that alter the surface of a manufactured item to achieve a certain property. Currently, the trend is towards surface treatments. Industries in developing countries like India have to be increasingly aware of the need not only for up gradation of existing technologies but also for indigenization of new technologies on a time bound basis.

The content of the book includes information about technology involved in surface engineering of metals; some of them are electroplating plant, barrel planting plant, electroplating equipment, cleaning, pickling and dipping, equipment for hot alkaline cleaners, electrolytic and chemical processes for the polishing of metals, canning stainless steel electro-polishing solution, electroforming in gramophone record production, silver plating, fluoborate plating, gold plating (gilding), cadmium plating, zinc plating, chemical finishing of
aluminium, powder coating of aluminium, bright nickel electro plating, copper plating, etc.
This book covers an intensive study of technology of electroplating, phosphating, powder coating and metal finishing. The first hand information on these technologies is dealt in the book and can be very useful for those looking for entrepreneurship opportunity in the said industry.

Contents

1. ELECTROPLATING PLANT
   Automatic Equipment
   Fixed Sequence Automatic Plating Plant
   Trojan and Gem Type Automatic Plant
   Vulcan Lattice Arm Type Automatic Plant
   Titan Type Automatic Plant
   Digit Pivoted Arm Type Automatic Plant
   Straight-through Type Automatic Plant
   The Glydo System
   Special Transporter Designs
   Methods of Transporter Control
   Programmed Controllers
   Programme Preparation
   Programming Systems
   Photo-Electric Cell Type Reader
   Microprocessor and Computer Control
   Semi-Automatic Plating Plant
   Barrel Planting Plant
   Suitability of Articles for Barrel Plating
   Barrel Types
   Immersed Perforated Plating Barrels
   Glydo/Glydette Barrel Plating Equipment
   Horizontal Barrels
   Barrel Perforations
   Cathode Contacts
   Current Control
   Voltage
   Speed of Barrels
   Anodes
   Types of Cathode Contacts
   Calculation of Work Loads
   Perforated Oblique Barrels
   Single Station Barrel Plating Units
   Horizontal Barrels
   Open-ended Plating Barrels
   Manual Planting Plant
   Modular Plant and Specialised Equipment for the Electronics Industry
   Uniplan
   Uniplan Barrel Plating

2. ELECTROPLATING EQUIPMENT
   Process Tanks
   Welded Steel Tanks
   Plastic Tanks
   Plastic Tanks Reinforced with Glass Fibre
Glass Fibre (GRP) Tanks
Stainless Steel
Tank Lining Materials
Rubber
Treatment of Rubber Linings
Key to Table
Polyvinyl Chloride
Ilex Grade Plastic Lined Tanks
Lead
Materials of Construction—Containers, Hooks, Dipping Baskets
Aluminium
Glass
Brass, Bronze and Copper
Monel Metal
Nichrome (â€œChromeâ€™ Wire)
Rods & Connections for Process Tanks
Solution Heating
Stem Heating
Steam Coils
Plain Steel Coils
Galvanised Steel Coils
Lead and Lead Alloy Coils
Titanium Coils
Zirconium Coils
Tantalum Coils
Incoloy 825 Coils
Stainless Steel Coils
Fluorocarbon Coils (Dupont Teflon Heat Exchangers)
External Heat Exchangers
Water Jackets
High and Medium Pressure Hot Water Heating
Liquid Phase Heating
Gas Heating
Electric Heating
Metal Cased Heaters
Teflon Immersion Heaters
Silica Cased Heaters
Earthing of Electrically Heated Tanks
Electric Heating of Plastic or Plastic Lined Tanks
Solution Level Control
Lagging and Heat Conservation
Chroffles
Calculation of Heating Requirements
Allowance for Heating Losses
Steam Boilers
Hot Water Boilers
Gas Heating
Electric Heating
Temperature Control
Temperature Indicators
Thermostatic Control Equipment
Solution Cooling
Solution Agitation
Air Agitation
Mechanical Work Movement
Fume Extraction and Shop Ventilation
Fume Scrubbers and Demisters
Filtration of Solutions
Sentinel Filter Units
Sieber Filter Units
Hendor Filter Units
Solution Circulation and Transfer
Filter Media & Filter Aids
Filter Media
Filter Aids
Pumps for Pressure Filtration
Pipework for Filtration
The Drying of Components
Centrifugal Dryers
Automated Centrifuge Units
Hot Air Ovens
Hot Sawdust and Grit-o-cobs
Jigs & Racks For Electroplating, Anodising and Other Surface Coatings and Treatments
Plating Jig Design
Jig Contacts
Anodising Jigs
Jig Insulation
Safety Precautions
Ohmax Coating Procedure
Equipment
Maintenance
Removal of the Insulated Coatings
3. ELECTRICAL EQUIPMENT
Rectifiers Rectifier Rating
Rectifier Installation and Maintenance
Single Phase Rectifier Units
Rectifier Control
Auto-transformers
Stepless Regulators
Thyristor controlled rectifiers
Constant Voltage and Constant Current Control
Controllers for Anodic Oxidation Processes
Automatic Control
Current Interrupters and Periodic Reverse Units
Periodic Control Units for use with separate rectifiers
Electrical Instruments
Ammeters
Voltmeters
Ampere Time Meters
Pre-setting Ampere-time Meters and Panels
Heavy Current DC Switch-gear
Connecting Up Plating Equipment
D.C. Wiring Systems
Busbars
Busbar Ratings
Busbar supports
Jointing with flat busbars
Copper Rod and Flexible Conductors

4. 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
Activax Cleaner
Equipment
Solution Preparation
Cleaning of Zinc Base Alloy Die Castings
Barrel Cleaning
Solution Concentration and Operating Conditions
Solution Maintenance
Cleaner
Equipment
Solution Preparation
Cleaning of Zinc Base Alloy Die Castings
Barrel Cleaning
Solution Concentration and Operating Conditions
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 Maintenance
10-55 Cleaner
Equipment
Solution Concentration and 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 Concentration
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
Sulphuric Acid Pickling
Equipment
Solution Concentration and Operating Conditions
Sulphuric Acid Pickling
Solution Maintenance
Hydrochloric Acid Pickling
Equipment
Solution Composition
Operating Conditions
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
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
Klenewell
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

5. 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
6. 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
Solution Maintenance
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

NIIR Project Consultancy Services (NPCS) 10/25
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
Solution Compositions
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
7. ELECTROFORMING
Applications of Electroforming
Materials for Electroforming
Nickel Solution
The Watts Solution
The Sulphamate Solution
The Ni-speeded 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
8. 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.

9. 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

10. TIN-NICKEL ALLOY PLATING
Properties and Applications
The Plating Baths
Chloride-Fluoride Baths
Chloride-Fluoride Solution Preparation
Solution Agitation
Anodes
Effects of Process Variables
Effects of Solution Contaminants
Table 4. Solution Composition and Control Limits for Pyrophosphate-Glycine Bath
Pyrophosphate-Glycine Bath
Troubleshooting Guidelines

11. 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
12. 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
13. 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
- 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
14. PASSIVATION PROCESSES FOR ZINC AND CADMIUM ELECTRODEPOSITS
Drying
Passivation Processes For Zinc and Cadmium
Full Passivation Processes
Zonax Passivating Salts
Equipment
Solution Composition
Operating Conditions
Process Sequence
Solution Maintenance
Chromate Passivation Solution To D.E.F. 130
Equipment
Solution Composition
Operating Conditions
Process Sequence
Analytical Standards
Solution Maintenance
Autopass Salts
Equipment
Solution Composition
Operating Conditions
Process Sequence
Solution Maintenance
Production of Blue Chromate Coating
Full Passivation Concentrate
Equipment
Solution Composition
Operating Conditions
Process Sequence
Solution Maintenance
Production of Blue Chromate Coating
Heavy Bronze Passivation
Solution Composition
Operation Conditions
Process Sequence
Solution Maintenance
Black Chromate Passivation For Zinc
Solution Composition
Operating Conditions
Process Sequence
Solution Maintenance
Olive Drab Chromate Passivation
Solution Composition
Operating Conditions
Process Sequence
Solution Maintenance
Black Finish
Light, Colourless or Blue Passivation Process
Blue Passivating Salts For Zinc
Equipment
Solution Composition
Operating Conditions
Process Sequence
Solution Maintenance
Bright Passivation For Zinc
Solution Composition
Operating Conditions
Process Sequence
Solution Maintenance
Zinc Chromate Passivation
Equipment
Solution Composition
Operating Conditions
Process Sequence
Solution Maintenance
Iridex
Colourless Passivation on Cadmium
Equipment
Solution Composition
Operating Conditions
Coloured Finishes
Black Dye for Olive Drab Passivation
Blue Identidye
Equipment
Operating Sequences
Test Procedure For Passivated Films
Spot Test Solution for Chromate Passivation Films
15. 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
â€“ 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
Solution Maintenance
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
16. PLATING FOR ELECTRONICS
Printed Circuits
Specialist Processes for Printed Circuit Production
Print and Etch Circuits
Applying the Resist
Producing the Circuit Pattern
Etching
Finishing
Plated Through Hole Circuits
Drilling
Pretreatment
Additive Circuitry
Semi-Additive circuits
Fully Additive Circuits
Gold Plating of Edge Connectors
65 Copper Etchant For Printed Circuits
Equipment
Solution Composition
Operating Conditions
Solution Maintenance
Analysis of 65 Copper Etchant
Estimation of Hydrogen Peroxide in Bath
Estimation of Copper in Bath
Copper Recovery
P.D. Activator for Printed Circuits
Solution Composition
Operating Conditions
Cuprasol PTH Copper Plating Process
Equipment
Solution Composition
Operating Conditions
Preparation of Cuprasol PTH Base Solution
Solution Preparation
Analytical Standards
PTH Tin/Lead Plating Solution
Equipment
Solution Composition
Operating Conditions
Solution Maintenance
Analytical Standards
Dekote PB/SN 1
Equipment
Solution Composition
17. PHOSPHATING PROCESSES

Applications
- Pre-treatment Prior to Organic Coatings
- Protection against Corrosion
- Anti-wear Coatings
- Phosphating as a Production Aid

Types of Phosphate Coatings
- 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
- Canphos 401
- Canphos 402

Solution Composition and Operating Conditions
- Preparation of the 300 Range Phosphating Solutions
- Operating Sequences
- Solution Maintenance
- Visual Control
- Calcium Modified Zinc Phosphate Processes
- Canphos 501
Canphos 504
Canphos 509
Equipment
Solution Preparation
Operating Sequences
Solution Maintenance
Addition Rates
Light Weight Zinc Phosphate Processes
Canphos 505
Canphos 508
Solution Composition and Operating Conditions
Solution Preparation
Solution Maintenance
Addition Rates
Manganese Phosphate Processes
Canphos 601
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
18. CHEMICAL FINISHING OF ALUMINIUM
Introduction
Etching
Alkaline Etching
Acid Etching
On-Site Etching
Bright Etching
Chemical Brightening
Electrobrightening

19. ELECTROPLATING ON ALUMINIUM

Background To Plating
Advantages of Electroplating Aluminium
Examples of Electroplated Aluminium
Alloys for Plating
Processing
Early Pre-treatment Methods
Preplating Procedures
 1 Polishing
 2 Jigging
 3 Cleaning
 4 De-smut
 5 Pre-treatment
Electrodeposition

20. CHEMICAL COLOURING OF ALUMINIUM

Introduction
Conversion Coatings
Thickened Oxide Coatings

21. 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

22. 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

23. BRIGHT NICKEL ELECTRO-PLATING

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.

24. ELECTROPLATING SOLUTIONS
Brass and Bronze Plating
White Brass
Bronze Plating
Cadmium Electro-plating
Alkaline Cyanide Baths
Preparation of the Plating Bath
Production Plating Conditions
Acid Sulfate Baths
Preparation of the Plating Bath
Production Plating Conditions
Neutral Chloride Baths
Preparation of the Plating Bath
Production Plating Conditions
Acid Fluoborate Baths

25. DECORATIVE CHROMIUM PLATING
Chemistry for Hexavalent Chromium
Chemistry of Trivalent Chromium
Operations
Equipment
Waste Treatment
Corrosion Protection
Decorative Black Chromium
Bulk Chromium Plating
26. FUNCTIONAL CHROMIUM PLATING
Chemistry
Operating Conditions
Power Supply
Anodes
Fixturing and Rack Design
Stop Offs
Tapes
Lacquers
Wax
Shields and Robbers
Specialty Chromium Baths
Trivalent Chromium
Black Chromium
Porous Chromium
Environmental Concerns
Air Handling
Impurity Removal From a Plating Bath
Regulations
27. COPPER PLATING
Copper Cyanide Baths
General Purpose Strike
Strike-Plate Bath
High-Efficiency Bath
Barrel Plating
Bath Preparation
Maintenance and Control
Constituents
Temperature
Agitation
Contamination
Carbonate
Copper Pyrophosphate Plating Baths
Strike
Typical Pyrophosphate Bath
Printed Circuit Bath
Maintenance and Control
Constituents
Temperature
Agitation
Contaminants
Orthophosphate
Other Alkaline Baths
Copper Sulfate Baths
Standard Acid Copper Plating
High-Throw Bath
Bath Preparation
Maintenance and Control
Constituents
Temperature
Agitation
Contaminants
Copper Fluoborate Bath
Maintenance and Control
28. GOLD PLATING
Decorative Gold Plating (Classes Aâ€“C and, sometimes, G)
Barrel Plating (Classes A and B)
Antique Golds (Classes A and B)
Heavy Decorative Gold (Classes C-1 and C-2)
Industrial/Electronic Gold Plating
Alkaline Cyanide Baths (Group 1, Class D)
Neutral Cyanide Solutions (Group 2, Class D)
Acid Cyanide Plating Solutions (Group 3, Class E)

Directory Section

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.


NPCS also publishes varies 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 Website: NIIR.org