

Electroplating, Anodizing & Metal Treatment Handbook

Author:- NPCS Board of Consultants & Engineers

Format: paperback

Code: NI63

Pages: 720

Price: Rs.1475US\$ 150

Publisher: NIIR PROJECT CONSULTANCY SERVICES

Usually ships within 5 days

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. Surface engineering techniques are generally used to develop a wide range of functional properties, including physical, chemical, electrical, electronic, magnetic, mechanical, wear-resistant and corrosion-resistant properties at the required substrate surfaces. In general, coatings are desirable, or even necessary, for a variety of reasons including economics, material conservation, unique properties, or the engineering and design flexibility which can be obtained by separating the surface properties from the bulk properties. Surface engineered products thus increase performance, reduce costs, control surface properties independently of the substrate and medium, thus offering an enormous potential in the finishing Industry.

Electro depositing of metals is a very significant industrial process. Electroplating is both an art and science. It entailed adhering a thin metal coating to an object by immersing it into an electrically charged solvent containing the dissolved plating metal. Electroplating served a number of functions, such as protecting from corrosion and wear, decoration, and electrical shielding. Anodizing most closely resembles standard electroplating. Anodizing or anodizing is an electrolytic passivation process used to increase the thickness of the natural oxide layer on the surface of metal parts. Anodizing increases corrosion resistance and wears resistance, and provides better adhesion for paint primers and glues than bare metal. Anodic films are most commonly applied to protect aluminium alloys.

The aim of this handbook is to give the reader a perspective on several metal surface treatment techniques which are generally followed in the finishing Industry. This is a unique compilation and it draws together in a single source technical principles of surface science and surface treatments technologies of plastics, elastomers, and metals along with various formulae of bath solutions, current density, deposit thickness, manufacturing processes, various ingredients used in these processes. It is a very useful guide for the readers, engineers, scientists, practitioners of surface treatment, researchers, students, entrepreneurs and others involved in materials adhesion and processing.

I. METAL SURFACE PREPARATION AND CLEANING

1. Basic Metal Surface

Nature of the Surface

Brightness

2. Polishing, Brushing and Buffing

Polishing

- Adhesives
- Lubrication
- Brushing
- Deburring
- Buffing and Polishing Equipment
- 3. Mass Finishing Methods
- Vibratory Finishing Equipment
- Centrifugal Barrel Finishing
- Parts to Media Ratios
- Mass Finishing Media and Compounds
- 4. Electropolishing
- The Electropolished Surface
- Types of Metal Electropolished
- Electropolishing Equipment
- 5. Solvent Cleaning
- Solvent Cleaning
- Diphase Cold Cleaning
- Stability
- Materials of Construction
- Design Consideration
- Location of Vapour Degreaser
- Shutdown Procedure
- Choosing a Vapour Degreasing Solvent
- Water Removal
- 6. Alkaline Cleaning
- Soils
- Machining and Forming Oils
- Alkaline Descalers
- 7. Oxide Removal
- Oxide Removal from Copper Alloys
- Equipment for Pickling and Bright Dipping

II. TYPICAL PROCESSING AND OPERATING SEQUENCES

- 8. Metals
- Pretreatments
- Preliminary Treatment
- Final Treatment
- Low-Carbon Steel
- High-carbon and Low-Alloy Steels
- Stainless Steels
- Cast Irons
- Copper and Copper-Base Alloys
- Zinc-Base Die Castings
- Magnesium and Its Alloys
- Lead and Lead Alloys
- Powder Metal Compacts
- Less common Metals
- Intermediate Electrodeposited Coating as Basis Metal Surface
- 9. Plastics
- Plating
- Electroless Plating
- 10. Wastewater Control and Treatment
- Water Supply

- Water and Chemical Conservation
- Chemical and Water Recovery
- Evaporative Recovery
- Reverse Osmosis
- Electrodialysis
- Ion Exchange
- Waste water Treatment-Segregation and Collection
- Hexavalent Chromium Reduction
- Pretreatment
- Neutralization
- Flocculation
- Special Treatment Methods
- Solids Management
- Maintenance
- 11. Plating Bath Compositions and Operating Conditions
- Effects of Hydrogen
- Stripping and Salvaging of Defective Plated Items

III. TESTING ELECTRODEPOSITED COATINGS

- 12. Thickness Tests
- Microscopic-Optical Methods
- Double-Beam Interference Microscope, Interferometry
- Magnetic Method
- Eddy Current
- Mass per Unit Area
- Weight Gain Method
- X-Ray Methods
- Beta Backscatter (BBS)
- Microresistance Technique
- 13. Corrosion Tests
- Outdoor Exposure Tests
- Electrolytic Corrosion (EC) Test
- 14. Inspection
- Factors in Visual Inspection
- Arriving at a Standard of Acceptability
- Degree of Finish
- Inspection of Coloured and Other than Bright Finishes
- Inspection Equipment
- Inspection Personnel

IV. SURFACE PROTECTION AND FINISHING TREATMENTS

- 15. Phosphate Coating Processes
- Amorphous Phosphate Coatings on Aluminum Surfaces
- Process Cycles
- Discussion of Process Steps in Practical Procedures
- Immersion Processes
- Spray Processes, with Solution Recirculation
- Design Features
- Simplified and Specialized Processes
- 16. Chromate Conversion Coatings
- Metals Commonly Chromated
- Control of Electroplating Solutions
- Coatings for Conversion Coatings

17 Sulfuric and Chromic Acid Anodizing of Aluminium

Sulfuric Acid Anodizing

Colouring

Power Supply

Coating Properties

Chromic Acid Anodizing

Processing Steps

Electrolyte Maintenance

Designation System for Anodic Coatings

Anodizing and Surface Conversion Treatments

for Magnesium

Pickling

Tank Equipment for Cleaning Acid Pickling

Anodizing Processes

18. Electroplating Formulae of Various

Electroplating and Allied Chemicals

Electroplating not aluminium

Gold Electroplating

Iron Electroplating

19. Principles of Electroplating

Polarisation

20. Properties of Electroplating 428

Conducting Salts

Plating Quality

21. Electroplating or Coatings on Silver, Copper and leads

Coating of Silver

Alkaline Bath

Plant and Machinery Details for Electroplating Baths Salts

22. Conservation of Materials and Energy in

Electroplating Industries with Effluent Treatment

Regeneration and Recovery Techniques Applications

for Waste Water Treatment

Techniques for Uniform Metal Distribution Chemicals

will exceed the costs associated with purchasing

Choice of Finish and Process

Plating From Low Concentrated Solutions at

Room Temperature

23 Black Chrome Plating for Solar Energy Conversion

Hull Cell Studies

Effect of Plating Time on Optical Properties

24 Pickling of Metals

Chemical and Electrolytic Pickling Compared

Tin and Lead Additions

Regeneration of Pickling Solutions

25 Pickling Conditions and Solution Compositions

Pickling of Cast Iron

Pickling in Salt Baths

Pickling of Copper and Copper Alloys

Pickling of Copper Alloys

Pickling of Aluminium

Acid or Cold Pickling

Pickling of Magnesium

Pickling of Silver

Pickling of Titanium
26 Cadmium Plating
27 Cobalt Plating
28 Copper Plating
Coppering by Simple Immersion
Bath Preparation
29. Iron Plating
30 Nickel Plating
Nickel fluoborate bath
Precautions
Semi-Bright Nickel Plating
Stabilisers
Barrel Nickel Plating
Heavy Nickel Plating
Nickel Electroforming & Electrotyping
31 Silver Plating
Application of silver Plating
32 Gold Electroplating
Stripping Gold
Current-Density, 0.15 Ampere
Gold Baths for Hot Gilding
Tanks for Gold Baths
For Gold-Plating in the Cold Bath the Process Is As Follows
Gold Thread
Methods of Plating Stainless Steel
33 Nonelectrolytic Metal Coating Processes
Non-Catalytic Chemical Methods
Maintenance of Immersion and Contact Baths
Sensitizing for Chemical Reduction
34 Vapour-Phase Methods
Vacuum Evaporation
Coating Properties
Sputtering
Range of Applicability
Apparatus Configuration
Ion Plating
Chemical Vapour Deposition (CVD)
Apparatus Configuration
35 Catalytic Methods
Catalytic Chromium Plating
Electroless Copper Plating
Reducing Agents
The Operation of Electroless Copper Baths
Electroless Copper Treatment Sequence
Solution Formulations
Analysis of Deposit
Corrosion Resistance of Deposits
Applications for Electroless Nickel
Boron Nickel Alloys
36 Electroforming
Mandrel Types and Materials
Mandrel Design and Fabrication
Preparation of Mandrel Surfaces

Electroforming Solutions and Deposit Properties
Control of Electroforming Processes
Machining and Final Finishing of the Electroform
37. Industrial Anodising of Aluminium and its Alloys
Impurities and Bath Control
38. Environmental-Regulatory Restrictions, Response of Paint Industry and Eco-Friendly Coating
Enactment of Rule 66 on the Use of Organic Solvents
Strategy of Paint Industry
Powder Coatings
39 Plating of Precious Metals
Silver Plating
Operating Conditions
Materials of Construction
Maintenance and Control of Solutions
40. Control of Electroplating Solutions Using Hull Cell Studies
Hull Cell
Case Studies using Hull Cell
Current Efficiency Test
41 Corrosion and their Preventive Measures and Pollution Control Consideration
The Mechanism of Basic Corrosion
Protection of Intergranular Corrosion

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

ving 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

Fri, 09 May 2025 06:30:37 +0000