Principles of Electroplating

- The Electro Chemical Series
- Electrodeposition
- Electrochemical Terms
- Using a Copper Anode
- Using an Inert Anode
- Ionic Dissociation
- Butters
- pH of a Solution
- Complex or Double Salts
- Rate of Deposition
- Faraday's Laws
- Relation Between the Faraday & Mass of Metal Deposited
- Current Efficiency
- Anode Efficiency
- Current Density
- Calculation of Plating Times
- Average & Minimum Thickness Values
- Specification requirements
- Polarisation
- Cell Voltage
- Anodes
- Insoluble Anodes
- Auxiliary & Internal Anodes
- Bi-Polar Electrodes
- Process Chart

Technology of Cleaning Pickling & Dipping

- Preliminary Cleaning & Degreasing Solvent Cleaning
- Common Solvents used in Metal Cleaning with Comparisons
- 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
- Oil Separation Units
• Barrel Cleaning
• Activax Cleaners
• Equipment
• Solution Concentration & Operating Conditions
• Solution Preparation
• Cleaning of Zinc Alloy Die Castings
• Barrel Cleaning
• Solution Maintenance
• Solution Concentration & Operating Conditions
• Solution Preparation
• Cleaning of Zinc Base Alloy Die Castings
• Cleaner 45
• Equipment
• solution preparation
• Solution Concentration & Operating Conditions
• Solution Maintenance
• Multiklense
• Anozyn
• 10-55 Cleaner
• Operating Conditions
• Emphax
• Equipment
• Operating Conditions
• Zonax Metal Cleaner
• Anodax Metal Cleaner
• Kelco Cleaner
• Solution Composition
• Operating Conditions & Procedure
• Maintenance of Metal Cleaners
• Additions of Metal Cleaner
• Pickling & Dipping
• Choice of Pickling or Dipping Solution
• Zonax Dry Acid Salt
• Equipment
• Solution Concentration & Operating Conditions
• Sulphuric Acid Pickling
• Solution Composition
• Operating Conditions
• Solution Maintenance
• Hydrochloric Acid Pickling
• Solution Composition
• Operating Procedure
• Skalene Pickle for Iron & Steel
• Alkaline Deruster Salts
• Addition Uses of Alkaline Deruster Salts
• Equipment
• Cyanide Free Solution for Rust Removal
• Solution Composition
• Treatment of High Tensile Steels
• Spray Suppression
• Effluent Treatment
• Hydrofluoric Acid Pickling
• Pickling of Magnesium Alloys
• Pickling of Stainless Steel
• Pickle Aid
• Bright Dipping of Copper Alloys
• Aqua Fortis Bright Dipping Acid
• Bright Dipping Procedure
• Chromic Acid Dip for Brass Copper & Its Alloys
• Nitric Pree Bright Dip C22924 for Copper & Its Alloys
• Barrel Pickling
• Cyanide Containing Cleaners
• Anodic Sulphuric Acid Etching or Iron & Steel
• Acid Etching of Steel & Iron Before Heavy Deposition
• Plating on Aluminium & Its Alloys
• Standard Process Sequence for Electroplating on Aluminium & Its Alloys
• Modification to the Standard Process
• Dips & Rinses
• Rinsing or Swilling
• Scouring

**Electrolytic & Chemical Processes for the Polishing of Metals**

• Electropolishing Solutions
• Aluminium & Aluminium Alloys
• Aluminium Electropolishing Solution
• Electropolishing of Mechanically polished Aluminium Process
• Stainless Steel
• Process Sequence
• Copper, brass & Nickel Silver
• Process Sequence
• Chemical Polishing of Aluminium
• Typical Operating Conditions
• Procedure

**Nickel Plating**

• Properties of Nickel
• Decorative Finishes
• Preparation of Nickel Plating Solutions
• Purified Nickel Base Solution & Brighteners
• Preparation of Nickel Solutions from Nickel Salts
• Preparation of Nickel Solution from Individual Chemical & Brighteners
• Purification of a New Solution
• Acidity pH Control
• Correction of Possible Operating Faults in Surfol Nickel Solution
• Black Nickel
• Nigrax Black Nickel Plating Solution
• Solution Composition
• Operating Procedure
• Preparation of Lettered Name Plates
• Dull Nickel Plating solutions
• Preparation of Dull Nickel Plating Solution
• Albo Nickel Solution
• Nickel Plating Procedure
• Immersion Processes for Zinc Base Die Castings

Chromium Plating
• Preparation of Chromium Plating Solution
• Decorative Chromium Plating Solutions
• Typical Operating Conditions for Chromium Plating Solutions
• Zonax Bright Chrome Solution
• Analytical Standards
• Chromium Plating Procedure
• Plating Procedure
• Processes After Plating

Hard Chromium Plating
• Typical Operating Conditions for Hard Chromium Plating Solutions
• Hard Chrome Solution
• Plating Procedure
• Treatment Prior to Hard Chromium Plating
• Plating Conditions
• Treatment After Deposition
• Heat Treatment of Steels After Plating
• Finishing Hard Chromium Deposits
• Grinding of Hard Chromium Deposits

Copper Plating
• Properties of Copper
• Decorative Applications
• Functional Applications
• Copper Plating Solutions
• Copper Solutions
• Solution Composition
• Operating Conditions
• Cyanide Copper Solutions
• Special Techniques Used in Printing Applications
• Building up Copper
• Cylinders
• Skin Deposits
• Cast Iron & Steel Cylinders
• Aluminium Cylinders

Electroforming
• Applications of Electroforming
• Materials for Electroforming
• Nickel Solutions
• Nickel/Cobalt Alloy solutions
• Copper Plating Solutions
• Sodium High Sulphate Nickel Solution
• Operating Techniques
• Mandrels for Electroforms
• Permanent Mandrels
• Electroformed Nickel
• Expendable Mandrels

**Prass Plating**

• Decorative Brass Plating
• Zonax Brass Solution for Decorative & General Plating
• Plating Procedure
• Barrel Brass Plating

**Silver Plating**

• Properties of Silver
• Applications
• Plating Solutions
• Rates of Deposition & Specification Requirements
• Thickness of Deposit
• Solution Composition
• Solution Preparation
• Operating Conditions
• Barrel Silver Plating & Zonax Silver Solution
• Analytical Standards
• Preparation of Articles for Silver Plating
• Silver Strikes
• Alternative Procedure Using Nickel Undercoat
• Silvering By Immersion

**Gold Plating (Gilding)**

• Properties of Gold
• Application of Gold Plating
• Rates of Deposition & Specification Requirements
• Rates of Deposition of Gold Solution in Minutes
• Gold Deposits & Solutions
• Ultra Pure Gold Deposits
• General Gold Plating Procedure
• Traditional Gold Plating Practice (Gilding)
• Stripping Gold Deposits
• Electrolytic Process for Stripping Flux & Oxide from Gold

**Cadmium Plating**
• Properties of Cadmium
• Applications & Corrosion Resistance
• Cadmium Deposits on Non Ferrous Metals
• Cadmium Plating Solutions
• Cadmium Plating Salts
• Zonax Cadmium Plating Solution
• Operating Conditions
• Cadmium Solution for Barrel Plating
• Analytical Standards
• Kadamax High Speed Bright Cadmium Plating Solution
• Equipment
• Solution Composition
• Operating Conditions
• Cadmium Plating Procedure
• Treatment After Cadmium Plating
• Chromic Acid Dip
• Stripping Cadmium Deposits
• Correction of Paults in Cadmium Plating

**Zinc Plating**

• Properties of Zinc
• Applications & Corrosion Resistance
• Specification Requirements & Rates of Deposition
• Thickness Requirements for Zinc Deposits
• Determination of Thickness of Zinc Deposit
• Rate of Deposition
• Zinc Plating Equipment
• Zinc Plating Solutions
• Cyanide Zinc Plating Solutions
• Cyanide Zinc Plating Procedure
• Cleaning & Preparation of Work
• Treatment After Zinc Plating
• Bright Zinc Plating
• Dilute Nitric Acid Bright Dip

**Tin & Tin Alloy Plating**

• Properties of Tin
• Applications
• Thin Plating Solutions
• Rates of Deposition & Specification Requirements
• Rates of Deposition
• Deposit Specifications
• Alkaline Stannate Tin Plating Processes
• Zonax Stannic Plating Solution
• Tin Alloy Plating
• Tin Lead Alloy Plating
• Equipment
• Solution Composition
• Operating Conditions
• Rate of Deposition
• Solution Maintenance
• Special Techniques used in Printing Applications
• Tin Zinc Alloy Plating
• Equipment
• Solution Composition
• Operating Conditions
• Rate of Deposition
• Solution Maintenance
• Special Techniques used in Printing Applications
• Tin zinc Alloy Plating
• Equipment
• Solution composition & Preparation
• Operating Conditions
• Solution Maintenance
• Chemical Passivation of Tin Zinc Deposit
• Tin Nickel Alloy Plating
• Tin Copper Alloy Plating
• Bronze Plating Solution
• Equipment
• Solution composition
• Operating Conditions
• Rate of Deposition
• Solution Maintenance
• Analytical Standards

Plating for Electronics

• Printed Circuits
• Print & Etch Circuits
• Specialist Processes for Printed Circuit Production
• Etching
• Finishing
• Plated Through Hole Circuits
• Additive Circuity
• Gold Plating of Edge Connectors
• 65 Copper Etchant for Printed Circuit
• Equipment
• Solution Composition
• Operating Conditions
• Solution Maintenance
• Analysis of 65 Copper Etchant
• Copper Recovery
• P.D. Activator for Printed Circuits
• Solution Composition
• Cuprasol PTH Copper Plating Process
• PTH Tin/Lead Plating Solution
• Dekote Pb/Sn 1
The Plating of Plastics & Other Non Metallic Materials

- Plating on Plastics
- Applications & Advantages
- Properties of Plated Plastics
- Moulding for Plating on Plastics
- Simplas Process
- Process Sequence
- Equipment
- Swilling or Rinsing
- Cleaning
- Pre Etch
- Hot Alkaline Cleaner
- Etching
- Etch Composition for ABS Type Polymers
- Etch Composition: for PP Polymers
- Solution Preparation
- Analytical Standards
- Neutralising
- solution Composition
- Acceleration
- Niplas Electroless Nickel
- Equipment
- Solution Composition
- Operating Conditions
- Electroplating on Electroless Nickel Plated Surfaces
- Barrel Plating on Plastics
- Corrections of Faults in the Simplas Process
- Silvering
- Spray Silvering
- solution Composition
- Operating Procedure
- Sensitiser
- Immersion Silvering
- Electroplating on Silvered Surfaces
- Special Techniques Used in Printing Applications
- Metallising with Copper Bronze Powder
- Preparation
- Metallising
- Electroplating
- Polishing with Powered Graphite
- Vacuum Evaporation & Electrical Sputtering

Anodic Oxidation of Aluminium

- Surface Treatment of Magnesium
- Anodizing Characteristics of Aluminium
- Alloy Types
- Applications of Anodising
Phosphating Processes

- Applications
- Types of Phosphate Coating
- Surfaces to Which Phosphate Coatings May be Applied
- Preparation of Surfaces for Phosphating
- Specifications
- Treatment of High Tensile Steels
- Post Phosphating Treatments
• Equipment for Phosphating
• Immersion Phosphating Plant
• Spray Phosphating Equipment
• Phosphating Processes
• Light Weight Iron Phosphate Processes
• Heavy Zinc Phosphate Processes
• Calcium Modified Zinc Phosphate Processes
• Light Weight Zinc Phosphate Processes
• Manganese Phosphate Processes
• Phosphating Process Sequences
• Pre Treatment Processes
• Alkaline Cleaners
• Spray Phosphating
• Pickling & Derusting
• Immersion Rack or Barrel Phosphating
• Post Phosphating Treatments
• Sealing Treatments
• Descalers & Rust Removers
• Oils & Lubricants
• Aluminium Pre-Treatment
• General Phosphating Information
• Effluent Treatment

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