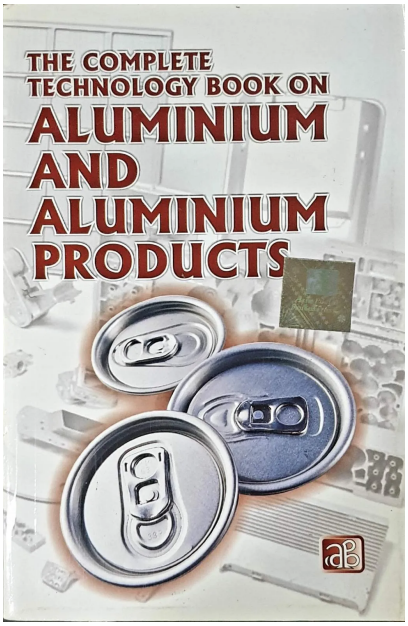
Entrepreneur India

106-E, Kamla Nagar, New Delhi-110007, India.
Tel: 91-11-23843955, +91 9097075054
Mobile: +91-9097075054
Email: npcs.ei@gmail.com, info@entrepreneurindia.co
Website: www.entrepreneurIndia.co



The Complete Technology Book on Aluminium and Aluminium Products

Code	NI186
Format	paperback
Indian Price	₹1450
US Price	$150
Pages	672
ISBN	8178330156

Publisher	Asia Pacific Business Press Inc.

Description

Aluminium, the second most plentiful metallic element on the earth, became an economic competitor in engineering applications as recently as the end of 19th century. It was become a metal for its time. Aluminium possesses many characteristics that make it highly compatible with recycling. It is resistant to corrosion and it thus retains a high level of metal value after use, exposure, or storage. Once produced, it can be considered a permanent resource for recycling, preferably in to similar products. It is essentially a soft and weak metal which has to be strengthened by alloying with suitable elements. The elements which are added to aluminium is appreciable quantities to increase its strength and improve other properties are surprisingly limited to only four, namely, magnesium, silicon, copper and zinc. These are added singly or in combination. It is theoretically 100% recyclable without any loss of its natural qualities. It is the most widely used non ferrous metal. The applications of aluminium are grown in many fields for example; electric conductors, windows and building components, aircraft, foil packaging etc. It has a major role in packaging industry especially in pharmaceuticals. It includes different types of packaging; unit packaging, bunch wrapping, strip packaging, thermoformed unit packaging and sachets Aluminium alloys with a wide range of properties are used in engineering structures. Aluminium alloys are divided into two major categories; casting compositions and wrought compositions. Further differentiation for each category is based on the primary mechanism. The most commercially mined aluminium ore is bauxite, as it has the highest content of the base metal. The primary aluminium production process consists of three stages. First is mining of bauxite, followed by refining of bauxite to alumina and finally smelting of alumina to aluminium. India has the fifth largest bauxite reserves with deposits 5% of world deposits. Indian share in world aluminium capacity rests at about 3%; it will touch almost 13% to 15% of the growth rate.

This book basically deals with aluminium production, heat treatable and non heat treatable alloys, properties of cast aluminium alloys, testing of liquid & soldification contraction of aluminium alloys, trends in the improving economic use of aluminium, laboratory investigation of carbon anode consumption in the electrolytic production of aluminium, alumina extraction from a pennsylvania diaspore clay by an ammonium sulfate process, the recovery of alumina from its ores by a sulfuric acid process, initial softening in some aluminium base precipitation hardening alloys, basic properties of aluminium foil, how to select a flexible foil packaging laminate, printing on aluminium foil, designing aluminium foil packs etc.

The present book covers the need within the industrial and academic communities for

up to date information about production of aluminium and extrusion process due to the ever increasing use of this technology. The book provides concepts in the different areas of extrusion technology. It is hoped that its presentation will be very helpful to new entrepreneurs, technocrats, research scholars, libraries and existing units.

Content

1. GENERAL INTRODUCTION
Aluminium Production
Production Statistics
Aluminium Alloys
Heat-Treatable and Non-heat-Treatable Alloys
Properties
Manufactured Forms
Standardized products
Engineered Products
Finishes
Mechanical Finishes
Chemical Finishes
Electrolytic Finishes
Non-Electrolytic Coatings
Product Classifications
Building and Construction Applications
Containers and Packaging
Transportation
Electrical Applications
Consumer Durables
Machinery and Equipment
Other Applications

2. PROPERTIES OF CAST ALUMINIUM ALLOYS
201.0
4.6Cu-0.7Ag-0.35Mn-
0.35Mg-0.25Ti
Commercial Names
Specifications
Chemical Composition
Applications
Mechanical Properties
Mass Characteristics

Thermal Properties
Electrical Properties
Fabrication Characteristics
204.0
4.6Cu-0.25Mg-0.17Fe-0.17Ti
Commercial Name
Applications
Mechanical Properties
206.0, A206.0
4.5Cu-0.30Mn-0.25Mg-0.22Ti
Specifications
Chemical Composition
Applications
Mechanical Properties
Mass Characteristics
Thermal Properties
Electrical Properties
Chemical Properties
Fabrication Characteristics
208.0
4Cu-3Si
Commercial Names
Specifications
Chemical Composition
Applications
Mechanical Properties
Mass Characteristics
Thermal Properties
Electrical Properties
Fabrication Characteristics
238.0
10.0%Cu-4.0%Si-0.3%Mg
Commercial Names
Specifications
Applications
242.0
4Cu-2Ni-2.5Mg
Commercial Names
Specifications
Chemical Composition
Applications

Mechanical Properties
Mass Characteristics
Electrical Properties
Thermal Properties
Fabrication Characteristics
295.0
4.5Cu-1.1Si
Commercial Names
Specifications
Chemical Composition
Applications
Mechanical Properties
Mass Characteristics
Thermal Properties
Electrical Properties
Fabrication Characteristics
296.0
4.5Cu-2.5Si
Commercial Names
Specifications
Chemical Composition
Applications
Mechanical Properties
Mass Characteristics
Thermal Properties
Electrical Properties
Fabrication Characteristics
308.0
5.5Si-4.5Cu
Commercial Names
Specifications
Chemical Composition
Applications
Mechanical Properties
Mass Characteristics
Thermal Properties
Electrical Properties
Fabrication Characteristics
319.0
6Si-3.5Cu
Commercial Names

Specifications
Chemical Composition
Applications
Mechanical Properties
Mass Characteristics
Thermal Properties
Electrical Properties
Fabrication Characteristics
332.0
9.5%Si-3.0%Cu-1.0%Mg
Commercial Names
Specifications
Applications
Mechanical Properties
336.0
12Si-2.5Ni-1Mg-1Cu
Commercial Names
Specifications
Chemical Composition
Applications
Mechanical Properties
Mass Characteristics
Thermal Properties
Electrical Properties
Fabrication Characteristics
339.0
12.0%Si-1.0%Ni-1.0%Mg-2.25%Cu
Commercial Names
Applications
354.0
9Si-1.8Cu-0.5Mg
Commercial Name
Specifications
Chemical Composition
Applications
Mechanical Properties
Mass Characteristics
Thermal Properties
Fabrication Characteristics
355.0, C355.0
5Si-1.3Cu-0.5Mg

Specifications
Chemical Composition
Applications
Mechanical Properties
Mass Characteristics
Thermal Properties
Electrical Properties
Fabrication Characteristics
356.0, A356.0
7Si-0.3Mg
Specifications
Chemical Composition
Applications
Mechanical Properties
Mass Characteristics
Thermal Properties
Electrical Properties
Radiation Effect on Properties
Fabrication Characteristics
357.0, A357.0
7Si-0.5Mg
Specifications
Chemical Composition
Applications
Mechanical properties
Mass Characteristics
Thermal Properties
Fabrication Characteristics
359.0
9Si-0.6Mg
Specifications
Chemical Composition
Applications
Mechanical Properties
Mass Characteristics
Thermal Properties
Fabrication Characteristics
360.0, A360.0
9.5Si-0.5Mg
Specifications
Chemical Composition

Applications
Mechanical Properties
Mass Characteristics
Thermal Properties
Electrical Properties
Fabrication Characteristics
380.0, A380.0 8.5Si-3.5Cu
Specifications
Chemical Composition
Applications
Mechanical Properties
Mass Characteristics
Thermal Properties
Electrical Properties
Fabrication Characteristics
383.0
10.5Si-2.5 Cu
Specifications
Chemical Composition
Applications
Mechanical Properties
Mass Characteristics
Thermal Properties
Electrical Properties
Fabrication Characteristics
384.0, A384.0
11.2Si-3.8Cu
Specifications
Chemical Composition
Applications
Mechanical Properties
Mass Characteristics
Thermal Properties
Electrical Properties
Fabrication Characteristics
390.0, A390.0
17.0Si-4.5Cu-0.6Mg
Specifications
Chemical Composition
Applications
Mechanical Properties

Mass Characteristics
Thermal Properties
Electrical Properties
Fabrication Characteristics
413.0, A413.0
12Si
Commercial Names
Specifications
Chemical Composition
Applications
Mechanical Properties
Mass characteristics
Thermal Properties
Electrical Properties
Fabrication Characteristics
443.0, A443,0, B443.0, C443.0
5.2Si
Commercial Names
Specifications
Chemical Composition
Applications
Mechanical Properties
Mass Characteristics
Thermal Properties
Electrical Properties
Fabrication Characteristics
514.0
4Mg
Commercial Names
Specifications
Chemical Composition
Applications
Mechanical Properties
Mass characteristics
Thermal properties
Electrical properties
Fabrication Characteristics
518.0
8Mg
Commercial Names
Specifications

Chemical Composition
Applications
Mechanical Properties
Mass characteristics
Thermal Properties
Electrical Properties
520
10Mg
Commercial Names
Specifications
Chemical Composition
Applications
Mechanical Properties
Mass Characteristics
Thermal Properties
Electrical Properties
Fabrication Characteristics
535.0, A535.0, B535.0
7Mg
Commercial Names
Specifications
Chemical Composition
Applications
Mechanical Properties
Mass Characteristics
Thermal Properties
Electrical Properties
Chemical Properties
Fabrication Characteristics
712.0
5.8Zn-0.6Mg-0.5Cr-0.2Ti
Commercial Names
Specifications
Chemical Composition
Applications
Mechanical Properties
Mass Characteristics
Thermal Properties
Electrical Properties
Fabrication Characteristics
713.0

7.5Zn-0.7Cu-0.35Mg
Commercial Names
Specifications
Chemical Composition
Applications
Mechanical Properties
Mass Characteristics
Thermal Properties
Electrical Properties
Chemical Properties
Fabrication Characteristics
771.0
7Zn-0.9Mg-0.13Cr
Commercial Names
Specifications
Chemical Composition
Applications
Mechanical Properties
Mass Characteristics
Thermal Properties
Electrical Properties
Fabrication Characteristics
850.0
6.2Sn-1Cu-1Ni
Commercial Names
Specifications
Chemical Composition
Applications
Mechanical Properties
Mass Characteristics
Thermal Properties
Electrical Properties
Fabrication Characteristics

3. PHYSICAL METALLURGY OF ALUMINIUM ALLOYS
Aluminium-Magnesium Alloys
Al-Si alloys
Al-Cu alloys
Hardness Data for Al-3.8% Cu Alloy
Aluminium-zinc alloys
Complex Alloys

Aluminium-Zinc-Magnesium Alloys
Al-Cu-Mg alloys
Al-Mg-Si alloys
Effect of Plastic Deformation on Precipitation
Intermetallic Compounds and their Effects
Corrosion of Aluminium Alloys

4. TESTING OF LIQUID & SOLDIFICATION CONTRACTION OF ALUMINIUM ALLOYS
1. Derivation of Correlations
2. Experimental procedure
3. Results and Discussion

5. TRENDS IN THE IMPROVING ECONOMIC USE OF ALUMINIUM
1. Reduction in Dimensions and Weight
2. More Efficient Use of Metal
3. Improvements in Methods of Protection
4. New Concepts in Design
Corrosion Studies Applied to Roofing Sheet and Water Pipes
Using Structural Aluminium Efficiently
Aluminium Electrical Conductors
Overhead Conductors
Underground Cable
Transformer Windings
Development of Welding Techniques and Weldable Alloys
Welding Processes
Development of Alloys
Conclusion

6. LABORATORY INVESTIGATION OF CARBON ANODE CONSUMPTION IN THE ELECTROLYTIC PRODUCTION OF ALUMINIUM
Introduction
Materials
Anode Carbon
Electrolyte Materials
Apparatus
Procedure
General
Operation at Different Current Densities
Operation at Different Temperatures
Operation at Different Electrolyte Compositions
Results

Effect of Anode Current Density
Effect of Electrolyte Temperature
Effect of Carbon Baking Temperature
Effect of Electrolyte Composition
NaF/AlF3 Ratio
Alumina Content
Calcium Fluoride Content
Sodium Chloride Content
Graphite and Coke
Mechanism of Anode Consumption
Erosion of Particles of Coke from the Active Anode Surface
Formation of CO

7. ALUMINA EXTRACTION FROM A PENNSYLVANIA DIASPORE CLAY BY AN AMMONIUM SULFATE PROCESS
Introduction
Related Literature
Raw Material
Procedure
Results and Discussion
Crushing and Grinding
Mixing and Pelletizing
Roasting
Leaching and Primary Crystallization
Alum Purification
Alumina Precipitation and Ammonium Sulfate Crystallization
Conclusion

8. THE RECOVERY OF ALUMINA FROM ITS ORES BY A SULFURIC ACID PROCESS
Introduction
The C.S.I.R.O. Process
Synopsis of Process
Experimental Procedures
Extraction Efficiency
Nature of Ore
Particle Size
Pulp Density and Liquor Concentrations
Temperature
Time
Excess Acidity
Control of Impurities

Silica
Titanium
Other trivalent Metals
Bivalent Metals
Univalent Metals
Phosphate
Recycling Operations
Digestionâ€“Modification
Reduction
Hydrolysisâ€“Calcination
Acid Regeneration
Calcination
Liquid-Solid Separations
Digestion
Modification Residue
Modified Liquor
Hydrolysis
Costing
Raw Materials
Energy
Equipment

9. AN IMPROVED ALUMINIUM CONDUCTOR
Electrical Properties of Aluminium
Experimental Work
The PM-2 Conductor
Corrosion Tests
Earthing Tests
Conclusion

10. INITIAL SOFTENING IN SOME ALUMINIUM BASE PRECIPITATION HARDENING ALLOYS
Experimental Procedure
Preparation of Alloys
Heat Treatment
Hardness Measurements
X-ray Diffraction Studies
Results
Dissussion
Quenched Hardness
Extent of Softening
Time to Reach Minimum Hardness

Range of Softening
X-ray line width
Conclusion
11. BASIC PROPERTIES OF ALUMINIUM FOIL
Introduction
Production of Aluminium
Manufacture of Aluminium Foil
Metal Purity
Alloying
Annealing
Soft Foil For Flexible Packaging
Safety of Foil For Food Packaging
Strength
Perforations or Pinholes
Foil Costs
Need For Standardization
Future of Foil in Packaging

12. HOW TO SELECT A FLEXIBLE FOIL PACKAGING LAMINATE
Introduction
Materials
Physical Properties of Foil
Physical Properties of Paper
Physical Properties of Films
Cellulose Film
Polyamide (Nylon)
Polyester (Terylene)
Polythene
Polypropylene
PVDC
Note
Laminating Processes
Wax
Hot Melts
Pastes
Polythene
Lacquers
Characteristics of Laminates
Physical Characteristics
Economic Characteristics
Briefing The Supplier

Typical Foil Laminates
For Sweets and Chocolates
For Cakes and Biscuits
For Dairy Trades
For Toiletries
Miscellaneous
General
The Future

13. DESIGNING ALUMINIUM FOIL PACKS
Introduction
Package Design Factors
Co-ordination of Design Policy
The Corporate Image
Packaging for Export
Aspects of Designing with Aluminium Foil
Methods of Rendering

14. PRINTING ON ALUMINIUM FOIL
The Printing Processes Used
1 Gavure
2. Letterpress
3. Flexography
4. Offset Lithography
5. Silk Screen
Special Requirements for Printing Aluminium Foil
Advantages and Limitations of the Printing Processes Used
Technical Considerations
Gravure
Flexography
Letterpress
Offset Lithography
Silk Screen
Economic Considerations
Other Printing Processes
Web Offset Lithography
Electrostatic Printing

15. HEAT SEALING FOIL PACKS
Importance of Heat-sealing
Principles of Heat-sealing

Sealing Coated Aluminium Foils by Heat
Determination of Optimum Heat-sealing Conditions
Factors Controlling the Heat-seal Strength
Failure by Peeling
Paper/Foil Laminates
Types of Thermoplastic Coatings
Sealing Temperatures of Typical Foil Laminates

16. AUTOMATIC PACKAGING IN FOIL

17. LIQUID PACKAGING IN ALUMINIUM FOIL
Introduction
Marketing and Economic Considerations
1. Economics
2. Convenience
3. Presentation
Types of Foil Pack that are Formed, Filled and Sealed from the Reel
Sachets
Two-cavity Sachets
Production of Sachets
Rectangular and Tetrahedral Packs Incorporating Aluminium Foil
For Milk and Cream
For Fruit Juice
Gusseted Bottom Packs
Other Liquids And Semi-liquids
The Value of Foil In Sealable Laminates
What of the Future?

18. ALUMINIUM FOIL IN PHARMACEUTICAL PACKAGING
Introduction
Aluminium Foil as a Cap Liner Facing for Rigid Containers
Unit Packaging
Bunch Wrapping
Strip Packaging
Thermoformed Unit Packaging
Sachets

19. STERILIZABLE ALUMINIUM FOIL FOOD PACKS
Introduction
Reasons for Using a Processable Pouch
Laminate Structure

Pinhole Damage in Foil
Sterilizing Techniques
Filling and Sealing Pouches
Pouch Integrity
Microbiological Aspects
Storage Testing and Heat Penetration
The Commercial Situation
Summing-up

20. BENEFICIATION OF BAUXITE
Experimental Procedure and Results
Evaluation of the Economics of Bauxite Beneficiation
A Proposed Scheme for Beneficiation by Dry Screening

21. ALUMINIUM IN ENGINEERING
Transport Industry
Air
Road
Rail
Marine
Automobile Ancillaries
Airconditioning and Refrigeration
Bearings
Electrical Machinery
Construction Industry
Mining Industry
Other Applications

22. ALUMINIUM DIE CASTINGS IN AUTOMOBILES
Automotive Applications
Recent Trends for Bigger Automotive Castings
Aluminium Die Castings in Indian Automobile
Conclusion
23. NON-FUSION JOINING OF ALUMINIUM
Soldering
Joint Design
Soldering Methods
Friction Soldering
Flux Soldering
Organic Flux Soldering
Chloride Fluxes

Reaction Soldering
Selection of Solders
Soft Soldering
Hard Solders
Brazing
Joint Types
Performance of Joints
Typical Applications
Cold Pressure Welding
Pressure Welding Technique
Butt Welding
Lap Welding
Applications
Ultrasonic Joining
Explosive Joining

24. SELECTIVE ABSORPTION OF FLUORINE FROM THE GASES FROM ALUMINIUM REDUCTION CELLS WITH VERTICAL SPIKE SODERBERG ANODES
Introduction
Theoretical Analysis
General Principles of Selective Absorption of Hydrogen Fluoride
A Continuous Process Based on Controlled Addition of Alkali
General Description
Absorption of Hydrogen fluoride
Absorption of Sulfur Dioxide
Process Working with Pure Water as Absorbent
General Considerations
Absorption of Hydrogen Fluoride
Absorption of Sulfur Dioxide
Pilot Plant Investigations
General
Process with Controlled Alkali Addition
Process Using Pure Water
Comparison of the Two Processes
Further Development of the Pure Water Process
General Considerations
A New Type of Gas Washer, Combining a very High Absorption Efficiency for Hydrogen Fluoride with Complete Selectivity and a High Dust Removal Efficiency
Results of Technical Scale Operation
25. THE FLUORINE PROBLEM IN ALUMINIUM PLANTS

About Niir

NIIR Project Consultancy Services (NPCS) is a reliable name in the industrial world for offering integrated technical consultancy services. Its various services are: Pre-feasibility study, New Project Identification, Project Feasibility and Market Study, Identification of Profitable Industrial Project Opportunities, Preparation of Project Profiles and Pre-Investment and Pre-Feasibility Studies, Market Surveys and Studies, Preparation of Techno-Economic Feasibility Reports, Identification and Selection of Plant and Machinery, Manufacturing Process and/or Equipment required, General Guidance, Technical and Commercial Counseling for setting up new industrial projects and industry. NPCS also publishes various technology books, directories, databases, detailed project reports, market survey reports on various industries and profit making business. Besides being used by manufacturers, industrialists, and entrepreneurs, our publications are also used by Indian and overseas professionals including project engineers, information services bureaus, consultants and consultancy firms as one of the inputs in their research.