

Logo

106-E, Kamla Nagar, New Delhi-110007, India.
Tel: 91-11-23843955, 23845654, 23845886, +918800733955
Mobile: +91-9811043595
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 & solidification 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
Discussion
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. Gravure
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

DIRECTORY SECTION

About NIIR Project Consultancy Services (NPCS)

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.

NIIR PROJECT CONSULTANCY SERVICES

106-E, Kamla Nagar, New Delhi-110007, India.

Tel: 91-11-23843955, 23845654, 23845886, +918800733955

Mobile: +91-9811043595

Email: npcs.ei@gmail.com, info@entrepreneurindia.co

Website: www.entrepreneurIndia.co