

# The Complete Technology Book on Aluminium and Aluminium Products

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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 in 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 diasporic 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.

## 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

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Corrosion of Aluminium Alloys



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General  
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Effect of Anode Current Density  
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NaF/AlF<sub>3</sub> Ratio  
Alumina Content  
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Graphite and Coke  
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Nature of Ore  
Particle Size  
Pulp Density and Liquor Concentrations  
Temperature  
Time  
Excess Acidity  
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Silica  
Titanium  
Other trivalent Metals  
Bivalent Metals  
Univalent Metals  
Phosphate  
Recycling Operations  
Digestionâ€™Modification  
Reduction  
Hydrolysisâ€™Calcination  
Acid Regeneration  
Calcination  
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Digestion  
Modification Residue  
Modified Liquor  
Hydrolysis  
Costing  
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Energy  
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Polythene

Polypropylene

PVDC

Note

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Polythene

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25. THE FLUORINE PROBLEM IN

ALUMINIUM PLANTS

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.

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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.

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