



SNS COLLEGE OF TECHNOLOGY

Vazhiampalayam, Coimbatore-35

(An Autonomous Institution)

Accredited by NAAC with A++ grade 3rd cycle, Accredited by NBA
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INTRODUCTION TO ALLOYS



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ALLOY



An alloy is a substance synthesized by combining two or more elements, where the primary component is a metal. Here are some key points about alloys:

Definition:

An alloy is typically formed by melting different elements together to create a homogeneous liquid, which then solidifies.

It cannot be separated using physical methods because it crystallizes into a solid intermetallic compound or mixture.





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Although an alloy may contain metalloids or nonmetals, it exhibits the properties of a metal.

Classification:

Binary Alloy: Consists of only two elements.

Ternary Alloy: Contains three elements.

Multi-Element Alloy: Involves more than three elements.





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Examples of Alloys:

Brass: Copper + Zinc (used in machined parts and plumbing fixtures).

Bronze: Copper + Tin (used in statues and musical instruments).

Stainless Steel: Iron + Chromium + Nickel (resistant to corrosion).

14k Gold: Gold + Silver + Copper + Zinc (harder and stronger than pure gold).

Cast Iron: Iron + Carbon (contains a nonmetal).

Sterling Silver: Silver + Copper (more durable than pure silver)

Alloy Definition and Examples
An alloy is a mixture of chemical elements where the primary component is a metal.

Alloy	Primary Component	Other Components
Bronze	Copper (78-95%)	Tin (5-22%)
18K Gold	Gold (75%)	Copper (12.5%), Silver (12.5%)
Brass	Copper (60-90%)	Zinc (10-35%)
Cast Iron	Iron (96-98%)	Carbon (2-4%)
Sterling Silver	Silver (92.5%)	Copper (7.5%)

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Based on Composition:

Interstitial Alloys: These alloys form when small atoms (usually nonmetals) fit into the gaps (interstices) between the larger metal atoms. Example: Steel (carbon atoms in iron lattice).

Substitutional Alloys: In these alloys, atoms of one element replace some of the atoms of another element in the crystal lattice. Example: Brass (zinc atoms replacing some copper atoms)



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Based on Phase:

Solid Solution Alloys: These alloys have a single-phase structure, where the components are uniformly mixed at the atomic level. Example: Stainless steel.

Eutectic Alloys: These alloys solidify at a specific composition and temperature, forming a mixture of distinct phases. Example: Eutectic solder (tin-lead alloy).



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Based on Heat Treatment:

Age-Hardening Alloys: These alloys can be strengthened by heat treatment (aging). Example: Aluminum alloys used in aircraft.

Annealed Alloys: These are softened by heating and slow cooling. Example: Annealed copper.



What Are the Different Types of Ferrous Metals?

1. Stainless Steel Stainless steel is an alloy that crucially includes chromium (over 10.5% by mass) along with iron and carbon. ...
2. Cast Iron Cast iron is a group of iron-carbon alloys with a carbon content greater than 2%
3. Wrought Iron
4. Carbon Steel
5. Alloy Steel



Ferrous Alloys



Ferrous alloys are metals that primarily consist of iron as their main component. Here are the different types of ferrous alloys:

Carbon Steels: These alloys contain iron and carbon. They are widely used due to their strength and affordability. Carbon steels can be further categorized based on their carbon content (e.g., low carbon, medium carbon, and high carbon steel).



Ferrous Alloys



Alloy Steels: Alloy steels include additional elements (such as manganese, chromium, nickel, or molybdenum) to enhance specific properties. Examples include stainless steels and tool steels.

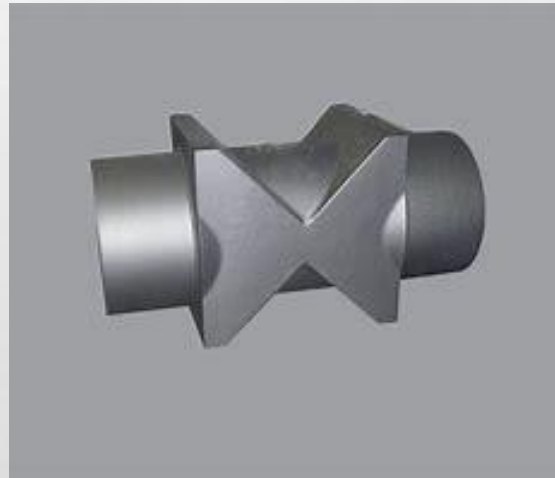
Stainless Steels: Stainless steels have high corrosion resistance due to the addition of chromium. They are commonly used in kitchenware, medical instruments, and construction.



Ferrous Alloys



Cast Iron: Cast iron contains a higher carbon content than steel. It is brittle but has excellent wear resistance. Types of cast iron include gray iron, white iron, and ductile iron.





Non-Ferrous Alloys



Non-ferrous alloys encompass a wide variety of metals that do not contain iron as their primary constituent. Let's explore some common types of non-ferrous alloys:

Aluminium Alloys:

Aluminium alloys are lightweight, corrosion-resistant, and widely used in aerospace, automotive, and construction. Examples include 6061-T6 (used in structural components) and 2024-T3 (for aircraft parts).



Non-Ferrous Alloys



Copper Alloys:

Copper alloys exhibit excellent electrical conductivity and are used in electrical wiring, plumbing, and artistic applications. Examples: Brass (copper-zinc alloy) and bronze (copper-tin alloy).

Zinc Alloys:

Zinc alloys are commonly used for die-casting and galvanizing.

Zamak (zinc-aluminum-magnesium-copper) is used for small parts like buckles and handles



Non-Ferrous Alloys



Precious Metal Alloys:

These include gold, silver, and platinum alloys.

Gold alloys (e.g., 18k gold) combine gold with other metals for durability and color variation.

Titanium Alloys:

Titanium alloys are lightweight, strong, and biocompatible.

Used in aerospace, medical implants, and sports equipment.



Non-Ferrous Alloys



Nickel Alloys:

Nickel-based alloys offer high-temperature strength and corrosion resistance.

Inconel (nickel-chromium) is used in jet engines and chemical processing





Non-Ferrous Alloys



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THANK YOU