



## ALLOYS

Alloy is a combination of two (or) more different elements

### **Properties of alloy:**

1. Alloys are hard material.
2. Alloy possesses low electrical conductivity.
3. Alloys resist corrosion.

### **IMPORTANCE (OR) NEED OF MAKING ALLOY:**

#### **(i) To increase the hardness of the metal:**

Pure metals are soft but by adding other metals it becomes harder. Eg: Gold and silver are soft but by adding copper to give hardness.

#### **(ii) To lower the melting point of the metal:**

By adding alloy substance, the metal becomes easily fusible Eg : Alloy of lead, bismuth having lower melting point

#### **iii) To increase the corrosion resistance of the metal:**

Metal in pure form it is quite reactive and easily corroded by surroundings

Eg : Pure iron gets corroded but it alloy with carbon (or) chromium it resists corrosion.

#### **(iv) To modify chemical activity of the metal:**

Chemical activity of the metal can be increased (or) decreased by alloying.

Eg: Sodium amalgam is less reactive than sodium. Aluminium amalgam is more reactive than Al.

#### **(v) To modify the colour of the metal:**

Metal makes the alloy, the colour of the metal is changed Eg : silver and zinc are white but it makes alloy it becomes pink Preparation of alloys

Two component or binary are manufactured as follows (i) Fusion method (ii) electro- deposition (iii) reduction method (iv) powder metallurgy.



(i)Fusion method: The component metal of the alloy with higher melting point is melted in a refractory bricks lined crucible or melting pot. This is followed by the addition of the component with lower melting point to the melt. Uniform mixing is done using graphite rods. The surface of the mixed molten metals is usually covered with a layer of powdered carbon to prevent the oxidation of the molten mass. Solid alloy will be obtained on cooling the molten mass.

(ii)Electro-deposition method: Here simultaneous electrolytic deposition of different mixed electrolytes by passing direct current that will result in the formation of the alloy at the cathode. Brass is obtained by the electrolysis of mixed solution of copper and zinc cyanides dissolved in KCN.

(iii)Reduction method: In this method a suitable composition of one component of the alloy is reduced in the presence of the other component metal. Al-Bronze is prepared by reducing alumina ( $\text{Al}_2\text{O}_3$ ) in the presence of Cu in an electric furnace.

(iv)Powder metallurgy: A finely divided powdered metals are intimately mixed and subjected to great pressure and temperature.

## CLASSIFICATION (OR) TYPES OF ALLOYS

1. Ferrous alloy
2. Non-ferrous alloy

**Ferrous alloys:** Steel is an alloy of iron and carbon. Also addition of small amount of one or more metals like Cr, Ni, Mo etc. imparts special properties to steel.

a)**Nichrome:** Ni-60% and Cr-12% called Nichrome. It give resistant to chemicals and heat, high melting point and high electrical resistance.

Used for making resistance coils, heating elements in iron box and other electrical appliances.

c)**Stainless steel:** These are alloy steels containing Cr with other elements such as Ni and Mo. Cr is effective if its content is 16 % or more. Carbon content ranges from 0.3 – 1.5 % stainless steel resists corrosion by atmospheric gases and other chemicals.

### Non-Ferrous alloys:

Non-ferrous alloys do not contain iron as the major element. Some of the important non-ferrous alloys have the major element Cu, Al, Ni, Zn, Sn and Pb. The important properties of non-ferrous alloys: high corrosion resistance, strength and workability, good machinability, appearance and colour.

**Example :** BRASS AND BRONZE



## Brass

### Composition

Primarily copper (55-95%) and zinc (5-45% }, with copper typically being the larger proportion.

### Properties:

- Good electrical conductivity.
- Good machinability.
- Anti-microbial.
- Malleable and ductile.
- Low friction.
- Good conductor of heat and electricity.

### Uses:

- Decorative hardware.
- Valves and pipe fittings.
- Musical instruments (e.g., trumpets, trombones).
- Plumbing.

### Bronze:

- **Composition:** Primarily copper (88%) and tin (12%), with other elements like aluminum, manganese, or nickel sometimes added.

### Properties:

- High strength and durability.
- Excellent corrosion resistance.
- Low friction.
- Ductile and malleable.
- Good electrical and thermal conductivity.



## SNS COLLEGE OF TECHNOLOGY



### Uses:

- Bearings and bushings.
- Pump valves and gears.
- Marine propellers.
- Sculptures and statues.