Metals

Metals are used for various engineering purposes. They are used for making structural members, doors, windows, roofing materials, pipes and many other products. In order to find the suitability of various metals to be used for a specific work, it is essential to study their composition and properties.

Classification of metals

All the metals used in engineering works can be classified into two categories:

a. Ferrous metals

Ferrous metals are those metals in which the chief constituent is iron. Besides iron, other constituents like carbon, Sulphur, manganese and phosphorus etc. also exist in varying proportions. The ferrous metals which find their common are:

1. Cast iron 2. Wrought iron 3. Steel

b. Nonferrous metals

Nonferrous metals are those, which do not contain iron, and are used widely in building industry. The important nonferrous metals are copper, lead, tin, zinc and aluminum.

Ferrous metals

1. Cast iron

Besides iron, cast iron contains carbon, silicon, Sulphur, phosphorus and manganese in varying proportions:

Iron – 92-95%

Carbon – 2- 4.5 %

Silicon- 1-3 %

Properties:

Cast iron possesses the following important properties:

1. It has fibrous crystalline structure.

2. Brittle and has low resistance to tension and high strength in compression. Tensile and compressive strength of an average quality of cast iron are 150 N/mm^2 and 500 N/mm^2, respectively.

3. Its melting point is about 1200 °C.

4. It cannot withstand sudden shocks.

5. Because of being brittle, it cannot be welded.

6. Its specific gravity is 7.5.

7. It cannot be magnitude.

8. It is neither malleable, nor ductile.

9. It does not rust easily.

Uses:

1. It is used for manufacture of steel and wrought iron.

2. Its high compressive strength makes it suitable for use in making such parts, which are subjected to compressive stresses such as supports of heavy machinery.

3. Since it does not rust easily, therefore it is used for parts generally exposed to atmosphere such as lampposts.

4. It is also used for making rail chairs and carriages wheels.

2. Wrought iron

It is the purest form of iron and it contains:

Iron about 98 %

Carbon – 0.1-0.25 %

Slag – 2-3 % Sulphur, manganese, phosphorus, silicon are present in traces.

Properties:

1. It has fibrous structure with a silky luster.

2. Its melting point is about 1500 °C.

3. It can withstand sudden shocks.

4. Its ultimate tensile strength is about 400 N/mm^2.

5. Its ultimate compressive strength is about 200 N/mm^2.

6. Its specific gravity is 7.25.