

## Q1. Explain B-H curve with respect to magnetic material?

→ A graph is drawn between the magnetic flux density 'B' and magnetic field intensity 'H'.

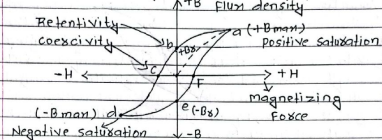


Figure: B-H curve.

- When the magnetic field intensity 'H' is increased from zero, the magnetic flux density 'B' is also increased.
- Further increased the value of 'H' the 'B' value is also increased and finally reaches the saturation point 'a' as shown in figure, i.e. B<sub>max</sub>.
- Then decreasing the value of 'H' the 'B' value is also decreased, but at a point H=0, but B ≠ 0. Now, the material retains some amount of magnetism is known as retentivity at point 'b'.
- Further increasing the value of 'H' in negative side the value of 'B' decreased at point 'c' the material is fully demagnetized.
- The force is required for remove the residual magnetism is called as coercive force (coercivity).
- The cycle is continue in opposite direction as shown in figure at point 'd' is saturation point 'e' is retentivity and 'f' is the coercive force. The cycle is completed it makes the hysteresis loop.

## Q2. Explain magnetic material? and its types?

Ans: Magnetic material:

→ The material which attracted or repelled by magnetic field when placed in magnetic field is known as magnetic material. e.g. Iron, Nickel, Cobalt etc.

→ A magnet is a material or object that produces a magnetic field. This magnetic field is invisible but is responsible for the most notable property of magnet.

Ans: Types of magnetic material are given below:

- Diamagnetic material:**
  - The material which repelled by a magnet such as zinc, mercury, lead etc. are known as diamagnetic material.
  - permeability is less than one, i.e.  $\mu < 1$ .
  - magnetic material which align against the magnetic field.
- Paramagnetic material:**
  - The material which weakly attract by a magnet are known as paramagnetic material.
  - For example: aluminium, tin etc.
  - permeability is small but positive.
  - The material which align with the magnetic field.
- ferromagnetic material:**
  - The material which strongly attract by a magnet are known as ferromagnetic material.
  - For example: Iron, steel, nickel, cobalt etc.
  - permeability is high (several hundred times to thousand times).
  - magnetic material that are highly magnetized in a magnetic field.

## Q3. Define corrosion? write its cause, effect and method of prevention?

Ans: Corrosion:

- Corrosion is the deterioration of materials by chemical interaction with their environment.
- Corrosion is a natural process of changing any engineering materials, product to natural state.
- Ans: Cause of corrosion:
  - Too much humidity or condensation of water vapour on metal surfaces are the primary causes of corrosion.
  - Metal corrodes when it reacts with substance such as oxygen, and hydrogen.

Ans: Effect of corrosion:

- It reduce the life of the materials.
- It decreases the quality of products.
- It loses its weight in cause of time.
- It reduce the original property of strength of the materials.
- It's appearance is converted from white blackish to brown colour.
- Due to rusted it behaves not like pure metal.
- Coating on ferrous materials is reduced.

Ans: Method of prevention:

- Painting.
- Galvanizing.
- Electro plating.
- Metals spraying.
- Coating.
- Alloying.
- Covering.
- Heat treatment.

## Q4. Explain the chemical corrosion characteristics of some commonly used ferrous metal?

Ans: Characteristics of some commonly used ferrous metal are given:

(i) Cast Iron:

- Hardness: material resistance to abrasion and indentation.
- Toughness: material ability to absorb energy.
- Ductility, Elasticity, malleable, and brittle.
- Good corrosion resistance.

(ii) wrought iron:

- Good magnetic corrosion-resistance and easily welded.
- High electricity and tensile strength.
- Soft, ductile and very malleable.

(iii) High carbon steel:

- Good corrosion resistance.
- Very high strength.
- Extreme hardness and moderate ductility.

(iv) medium carbon steel:

- Low hardenability.
- medium strength.
- medium ductility and toughness.

(v) stainless steel:

- Corrosion resistance.
- High tensile strength.
- very durable.
- Temperature strength.
- Environment friendly.

## Q5. Explain ferrous metal and write down electrical characteristics of ferrous metal?

Ans: Ferrous metal:

→ The material which contain iron as the main component are called ferrous metal. Example: steel, cast iron, wrought iron, etc.

Ans: properties of ferrous metal:

- Conductivity.
- Ability to conduct heat and electricity.
- Ductility: It can be drawn into fine wire.
- Malleability: can be hammered and prepared in shape.
- Elasticity.
- It can be regain its shape after being deformed.
- Brittleness:
- Extremely hard and therefore break easily.

Ans: Uses of ferrous metal:

- Nuts, bolts, car bodies and bike frames made.
- Spring and most tool such as hammer, drills, chisel and screwdrivers made.
- Industrial piping and automobiles bodies.
- Shipping containers, railroad tracks.
- Many commercial and domestic tools.
- Nails, garden fences and horse shoes etc.

Ans: Electrical characteristics of ferrous metal:

- Good conductor of electricity and heat.
- Low resistance to corrosion.
- usually magnetic.
- High tensile strength.
- Durable.
- Recyclable.

## Q6. What is steel? describe the types of steel with carbon composition and use.

Ans: Steel:

→ It is an alloy of iron and carbon with other element present as impurities.

Ans: properties of steel:

- It is very strong.
- It is long lasting materials.
- It can transfer heat and electricity.
- It is very shiny with very attractive finish.
- It has high corrosive resistance and ductility.

Ans: Types of steel:

- Low carbon steel.
- High carbon steel.
- Stainless steel.
- Properties of low carbon steel are given below:
  - It can be magnetized permanently.
  - It is malleable ductile.
  - It is hard and toughness.
  - It can be easily welded and forged.
  - Its specific gravity is 7.8 and melting point is 1400°C.

Ans: Uses of low carbon steel:

- It is used in roof covering.
- It is used in automobile body components.
- It is used in construction and bridge components, and food cans.
- It is also used in manufacture of various tools, equipment, machine parts, etc.

## Q7. Write the properties and uses of copper and its alloy?

Ans: Properties of copper:

- It is good conductor of heat and electricity.
- Good corrosion and biofouling resistance.
- Its colour is fresh pink colour.
- It is malleable and ductile.
- Its specific gravity is 8.95, melting point 1083°C and boiling point 2567°C.

Ans: uses of copper:

- It is used for speaker and microphone.
- It is used for making electrode.
- It is used for 'PCB' fabrication.
- It is used for making electrical cable and electrical appliances.
- It is used in power transmission, distribution and power generation etc.

→ copper alloys are:

- Brass:
  - Properties of brass:
    - Susceptibility to stress-cracking.
    - Malleability and formability.
    - High melting point (900°C).
    - Non-ferromagnetic.
  - Brass is still commonly used in electrical plugs & sockets, plumbing, lamp holders, gears, bearing & ammunition casings etc.
- Properties of Bronze:
  - Hardness and brittleness & reddish brown color.
  - High resistance to corrosion from saltwater.
  - High melting point (950°C).
  - Bronze are used in the construction of musical instruments, sculptures, medals, and industrial application such as bushing, and bearing etc.

## Q8. Explain properties and uses of aluminium?

Ans: Properties:

- Good conductor of heat and electricity.
- Good resistance against corrosion.
- It is very light in weight.
- It is ductile and malleable.
- Bluish white metal, specific gravity is 2.7 and melting point 660°C.
- Ans: Uses of aluminium:
  - Making automobile bodies.
  - It is used as to protect coating to structure steel.
  - Household and industrial appliances.
  - Power and transmission lines.
  - Aircraft and spacecraft component.

## Q9. Explain properties, use and characteristics of carbon?

Ans: Properties:

- It is soft and dull grey or black in colour.
- Density of carbon 2.2 and high melting & boiling point 3550°C and 4827°C respectively.
- Carbon is both nonmetallic and tetravalent.
- Catenation: it is ability to form bonds with other atom of carbon.
- Ans: Characteristics:
  - It has very high value of resistivity.
  - It is available in various shapes.
  - It has negative temperature coefficient of resistance.
  - Carbon can make single, double and triple bonding.
- Ans: Application (use):
  - It is also used in resistor.
  - It is also used for electrodes for electric furnaces.
  - One of the most important uses of carbon dating.
  - Graphite is used as the lead in your pencils.

## Q10. Define conducting materials? explain its band structure with energy gap in brief.

Ans: Conducting materials:

- The materials which conduct electricity due to free electrons when an electrical potential difference is applied them are known as conducting materials.
- The conducting materials play an important role in engineering and technology. E.g. gold, silver, copper, aluminium etc.

Ans: Band structure:

- Insulator:
  - Conduction band (C.B.)
  - It is next highest energy band level. The energy band which possess the free electron is called conduction band.
  - Electron in this band take a part in conduction.
- Semi-conductor:
  - Valence band (V.B.):
    - The band of energy occupied the valence electron is called valence band.
    - It may be completely or partially filled with electron but never empty.
  - Energy gap:
    - The gap between V.B. and C.B. is called energy gap (or forbidden energy gap).
    - Energy gap for silicon 1.12 eV and germanium 0.72 eV.