Explain alloys? Write some commonly used alloys of Nickel?

Ans: alloys:

⇒ A metal made by combaining two or more metallic elements, especially to give greater strength or resistance to corossion are called alloys.

⇒ An alloys is a substance made by melting two or more elements togethere.

Ans: Nickel alloys:

a) Nickel iron alloys:

⇒ Nickel iron alloys is a group of alloys that consist of the elements nickel (Ni) and iron (Fe).

→ Alloys containing 72-83% nickel have the best soft magnetic properties and are used in making plates of alternator, transformers, magnetic field to reduce energy loss, inductors etc.

b) Nickel chromium alloys:

⇒ By adding chromium to nickel the electrical resistance increase by three times than poor nickel such as alloys.

→ commonly used as resistance wire, heating elements in think like toalsters and space heater.

C) Nickel chromium Aluminium alloy:

⇒ Nickel chromium Aluminium alloy is one of the numerous metal alloys sold by American elements under the trade name AE Alloys™.

⇒ Generally, immediately aviable in most volumes, AE alloys are aviable as bar, ingot, ribbon, wire shot, sheet and foil.

Explain Semi-conductor and types of semi-conductor in detail?

Ans: Semiconductor:

Those material whose conductivities lies betⁿ conductor and insulator are known as semi-conductor.

They are neither good conductor nor good insulator. e.g. silicon and germinium etc.

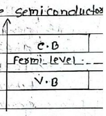
Ans: types of semiconductor:

1) Intrinsic semiconductor:

⇒ A semiconductor which is made up of the semi-conductor material in it's extremely pure form is called intrinsic semiconductor.

→ It is also called undoped or i-type semiconductor.

→ In this semiconductor the number of conduction electron is equal to the number of hole.



→ Fermi-level lies between middle of conduction and valence band.

→ e.g. Si, Ge. etc.

Fig: Intrinsic semiconductor

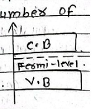
2) Extrinsic semi-conductor:

⇒ These extrinsic semiconductor to which some suitable impurity or doping agents has been added externally small amount are called extrinsic semiconductor.

→ In this semiconductor the number of conduction electron is not equal to the number of hole.

→ Fermi-level lies closer to conduction band not valence band.

→ It is also called doped semiconductor.



Explain properties of semiconductor materials?

i) Resistivity: 10^{-5} to 10^{6} Ωm.

⇒ Their resistivity is higher than conductors but lesser than insulator.

ii) conductivity: 10^{5} to 10^{-6} mho/m.

⇒ Their conductivity is lesser than conductors but higher than insulator.

iii) Temperature coefficient of resistance is negative.

⇒ The resistance of semiconductor materials decreases with increases temperature and vice-versa.

iv) Current flow: Due to electron and holes.

v) lesser power losses.

vi) small in size and posses less weight.

Explain the electrical conduction in semiconductor?

⇒ When dc voltage is applied to pure semiconductor the free electron move toward positive terminals.

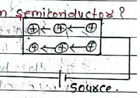
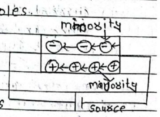


Fig: conduction in pure semiconductor.

⇒ As in pure semiconductor number of electrons are equal to the number of holes.

⇒ Therefore conduction in this semiconductor is due to both electrons and holes.

⇒ When dc voltage is applied to impure semiconductor the free electrom move toward the positive terminal and the holes move toward negative terminal.



→ As impure semiconductor the number of electrons and hole are not equal.

→ As impure semiconductor no. of hole are more Conduction, conductor majority charge carrie is holes.

Explain how electrical conductor takes place in semiconductor.

↳ semiconductor behave differently based on temperature, acting as insulators. at lower temperatures, while acting as conductors at the heigh temperatures.

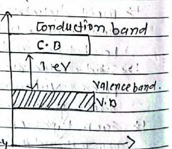
↳ At higher temperature, conductor occurs because the electron around the semiconductor atom can breack the covalent bond and move freely to lattice.

↳ A major effects is energy levels that the electrons can occupy and the way electron's move about the crystal lattice.

↳ At higher temperature, enough energy can be gained by electrons to escape from their bonds. If this happens the electrons becom free to move about the crystal lattice and participate in conduction.

↳ At normal room temperature, the semiconductor has adequate free electrons to make it conduct current. In this way electrical conductor takes a place in semiconductor.

↳ Even through a room temperature, while some heat energy is imparted to the valence electrons some of them cross over to the conduction band imparting minor conductivity to the semiconductor.



Ans: Ionic polarization:

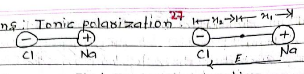


Fig: Ionic polarization.

→ Ionic polarization occurs due to relative displacement between positive and negative ions in an ionic crystal.

→ If a crystal or molecule consist of atoms of more than one kind, the distribution of charges around an atom in the crystal or molecules leans to positive and negative.

→ As a result, when lattice vibrations or molecular vibrations induce relative displacements of the atoms, the centre of positive and negative charge are also displaced.

→ The ionic polarizability (α_i) is difined in terms of local field experiment by ions as:

$$\text{Average dipole moment } (P_{avg}) = \alpha_i E_{loc} \quad \text{--- (I)}$$

$$\text{polarization } (P) = N_i P_{avg} \quad \text{--- (II)}$$

where, N_i = no. of ions.

put the value of eqⁿ (I) in eqⁿ (II) we get,

$$P = N_i \alpha_i E_{loc} \quad \text{--- (III)}$$

Also, $E_{loc} = E + \frac{P}{3\varepsilon_0}$ and $P = \chi_e \varepsilon_0 E$

Then, eqⁿ (III) becomes,

$$P = N_i \alpha_i \left(E + \frac{P}{3\varepsilon_0}\right)$$

$$\text{or } P = N_i \alpha_i E + \frac{N_i \alpha_i P}{3\varepsilon_0}$$

$$\text{or, } \frac{N_i \alpha_i}{3\varepsilon_0} = \frac{\chi_e}{3+\chi_e} \quad \text{--- (IV)}$$

This eqⁿ is known as clausis massoti equation.

Ans: Dielectric breackdown in liquid:

i) conduction mechanism breack-down:

⇒ It is by contaminants in the liquid. The contaminant in the liquids could conducting bridge across the electrodes their by facilitating and excess leakage current through the materials leading to the conduction mechanism breack-down.

ii) Bubble mechanism breack-down:

⇒ The electric stress on the liquid molecule could cause extreme ignition by heat or conduction.

→ such ionic chain carry conduction current which lead to heavy ionization and arcing through the liquid. result a breack-down.

Ans: Dielectric breack-down in gas:

⇒ There are always free electron in gas. IF the field sufficiently large then are these electrons can be sufficiently large kinetic energy to impact ionized materials gas molecule and produce additional free electron and positive charge ions.

Now,

⇒ The first one liberated electron are avaible to accelerate the field and again impact ionize more netural gas molecules and phenamena contineous on which breackdown occurs.

→ The breackdown in gas depend on pressure, High pressure, greater constration of the molecules leads to free path of the natural gas moleclue.

* Explain type of dielectric material?

⇒ Dielectric materials are split into types based on their state :- solid, liquid and gas. each type having different dielectric properties and application.

i) Liquid dielectric:

↳ One of the most common uses of liquid dielectric is in insulation and cooling for transformers, circuit breacker etc.

↳ Dielectrics in liquid form are used to prevent or slow downelectric discharge.

↳ The main disadvantage of many dielectrics is that they are higher flammable.

↳ examples:→ mineral oil hydrocarbons, Silicon Fluids etc.

2) Gass dielectric:

↳ Gas dielectric are commonly used in sealed transformers, gas insulated lines, voltage switch gears, circuit breacker etc.

↳ The most commonly insulating gas, sulfur hexafloride is high in flurrione, which is excellent at quenching discharged and has good cooling properties.

↳ It includes sulfur hexafloride, Nitrogen, air, carbon dioxide etc.

3) Solide dielectric:

↳ most dielectric material tend to be solid. They are used as insulation in high voltage transformers, switches, over head lines and labling.

↳ Solid dielectric material include :- plastic films, mica, fibers, vulcanized adhesive tapes. and Inoragenic material like glass & ceramic etc.

↳ each types of solid dielectric materials has its own physical and thermol properties that make it suited to a different type of application. some are obviously more flexible, durable, absorbe more or less moisture.

Explain properties and uses of (SF_6) Sulphur hexafloride?

Ans: properties:

i) colourless and odorless.

ii) Non-toxic and Non-inflammable.

iii) good cooling properties.

iv) chemically stable.

v) High dielectric strength than air.

v) good dielectric properties.

vi) Density at 20°c is 6.14 kg/m^3.

Ans: uses of (SF_6) gas.

i) commonly used in electrical switch gear.

ii) Transformer and substations as an insulating material.

iii) Arc quenching and cooling medium.

iv) electrical circuit interrupters, electric piping and as a gaseous insulator.

Properties of Fiber-glass?

i) highly resistance to the attack by most chemicals.

ii) high dielectric strength and low dielectric constant.

iii) good electrical insulator event at low thickness.

iv) good thermol properties.

v) product versatility.

properties of mica?

i) Flexible and elastic.

ii) chemically inert.

iii) good dielectric property.

iv) Light weight.

v) platy, reflactive, resilient.

vi) different in colours.

Explain magnetic permeability and susceptibility?

Ans: magnetic permeability:

⇒ The magnetic permeability (μ) is the ability of magnetic materials to support magnetic field development.

→ The magnetic permeability of free space is denoted by μ_0 and $\mu_0 = 4\pi \times 10^{-7}$ H/m.

→ It's SI unit is henry per meter (H/m).

→ The magnetic permeability is defined as the ratio of the magnetic induction to the magnetic intensity.

Ans: magnetic susceptibility:

⇒ The magnetic susceptibility may be determined by musuring the force exerted on a magnetic material when it placed in magnetic field.

→ The magnetic susceptibility is denoted by χ_m (Kai).

→ The magnetic susceptibility is define as the ratio of magnetization induced in the magnetic material per unit magnitizing field intensity

$$\chi_m = \frac{M}{H}$$

Explain Hysterisis loop:?

⇒ The loop which shows the relationship betⁿ the magnetic flux density and the magnetizing field strength is know as Hysterisis loop.

→ The loop is genereted by measuring the magnetic flux coming out from the magnetic substance while changing the external magnetizing field.