1.Mention the properties and applications of copper and aluminium .or comparison between copper and aluminium its applications.

S.no	property	Copper	aluninium
1	colour	Reddish	silver
2	conductivity	100%	75%
3	resistivity	1.72×10^{-8} ohm-m at 20^0 c	2.8×10^{-8} ohm-m at 20^0 c
4	Melting point	1084^0 c	655 ^{0}c
5	Tensile strength	more	less
6	Contact resistance	low	high

Applications of copper : Cables for transmission and distribution lines
Making of coils
Conductors in flexible wires.
Motor starter switches, control relay

Applications of Aliuminium : Transmission lines
Bus-bars
Aircraft industries
Making rotor bars

2. *Mention the properties and applications of A.C.S.R conductors and A.A.A.C conductors.*

Properties of A.C.S.R conductors : It is cheaper than copper
It has high tensile strength
It is lighter in weight.
Good electrical conductivity
It has high contact resistance.

Applications of A.C.S.R conductors : Over head lines ,stay sets ,Dead end and turning points.

Properties of A.A.A.C conductors : Good conductor of electricity
Good tensile strength
It is heat treated

Applications of A.A.A.C conductors : Over head lines for transmission and distribution of electrical power .
These are mainly used in urban areas.

3.list the properties and applications of high resistivity materials nichrome ,tungsten, carbon.

s.no	property	Nichrome	tungsten	carbon
1	Colour	Silver	Gray	Gray black
2	Melting point	1400^0C	3300^0C	3900^0C
3	Density	8400kg/m^3	18000-20000 kg/m^3	1700-3500kg/m^3
4	Current density	8.25 x 10^6 A/m²	10-12 A/cm^2	55-65 A/cm^2
5	resistivity	100-150 μΩ·cm	5.51 μΩ·cm	1000-70000 μΩ·cm
6	Working temperature	1100^0C	200^0C	300^0C

Applications of Nichrome : electric heaters , hair dryers , telecommunications , electric furnaces.

Applications of tungsten : filaments lamps , electrodes and heater coils , permanent magnets.

Applications of carbon : carbon resistors , carbon filament lamps ,electrical machines ,circuit breakers.

4. Distinguish between p-type and n-type semiconductors.

S.NO	*n-type semiconductors*	*p-type semiconductors*
1	Pentavalent impurity is added	Trivalent impurity is added
2	Impurity atom has one extra electron i.e five	Impurity atom has one short fall electron i.e
3	Doping agent is called donor	Doping agent is called accepter
4	Large number of electrons are produce by doping	Large number of holes are produce by doping
5	Current conduction is done by electrons	Current conduction is done by holes
6	Majority carriers are electrons	Majority carriers are holes
7	Ex: antimony , bismuth	Ex: boron ,indium.

5.Explain the formation of p –type and n-type semiconductor

N–type semiconductor

A small amount of trivalent impurity is added to pure semiconductor .ex indium, boron , gallium.

Each indium atom forms covalent bonds with surrounding germanium atom but one bond is left incomplete and gives rise a hole , it is positive carrier it can accept electron.

The energy required to move electrons from valence bond to conduction bond is 0.01ev for germanium and 0.08ev for silicon.

p-type semiconductor

A small amount of pentavelant impurity is added to pure semiconductor . ex: arsenic, antimony ,

Each arsenic atom forms covalent bonds with surrounding four germanium atoms, the fifth electron loosely bounded to the arsenic atom

hence it is easily to removed from the valance band conduction bond

the energy required to remove this fifth electron from the atom is order of 0.01 ev for germanium and 0.05ev for silicon.

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6.state the properties and application ns of i. impregnated paper ii. wood iii. Asbestos .

Property	Impregnated paper	wood	asbestos
Working temperature	85^0c	Low(15.5-32^0c)	400^0c
Dielectric strength	High (30 kv/mm)	10-20 kv/mm (dry wood)	Low(3-5kv/mm)
Tensile strength	good	700-1300 kg/cm^2	good
Hygroscopic	hygroscopic	hygroscopic	less hygroscopic
Dielectric constant	3-6	2.5-6.5	2-3
Density	800gm/cm^3	0.5-1.0gm/cm^3	Varies with material
Applications	covering of conductors, windings in electrical machines, capacitors , transformer windings	Handles for tools Electrical poles Equipment covers Terminal box , Switch boards	Arcing barrier in circuit brakers Insulation of wires and cables. Winding insulation for motors and generators.

7.state the properties and applications i. Mica. ii. Ceramic iii.Glass

property	Mica	Ceramic	Glass
Mechanical strength	good	Hard and strong	good
Working temperature	500^0c	1000^0c to1800^0c	250-500^0c
Dielectric strength	40-150 kv/mm	24kv/mm	25-50 kv/mm
Split into thin sheets	yes	yes	Difficult to prepair
hygroscopic	Non hygroscopic	Non hygroscopic	Non hygroscopic
Dielectric constant	6-7	5-9.5	3.8-14.5
resistivity	$9x10^{12}$ -$1x10^{14}$ ohm-m	10^{11}-10^{16}ohm-cm at 20^0c	10^6-10^{15}ohm-m
Applications	Capacitors , Coil frames and slot insulation in electrical machines, Taping the stator coils of alternators, Electric heaters	Transformer bushings Telephone insulators Capacitors and transistors Insulators in power lines Isolators and fuse units	Fuse bodies Electrical lamps Containers Line insulators Chemical industries

8.write the properties applications of PVC.

properties :
It never gets corrosion
It is less in weight and cheap
It has high resistance to chemical action
Its dielectric constant 5-6
Its dielectric strength 15kv/mm to 30kv/mm
It has good electrical and mechanical properties.
It is slightly hygroscopic.

applications:
Insulation for wires and cables.
Insulation for dry batteries.
Conduit pipes in electrical wiring.
Power installations
Insulation for wires in military ,radio and television.

9. state the effects of the following P V C

i. Fillers ii. stabilizres iii. plasticizer iv .additives.

The properties of can be improved by adding the following materials additives

Fillers : these are like wood ,cotton , asbestos, glass fiber , chalk etc the materials make the P V C cheap.

stabilizres : Different stabilizers like metal soaps, lead , calcium carbonate, calcium oxide etc are used to prevent the evolution of hydrogen chloride. due to exposed on sun light and heated to sun light.

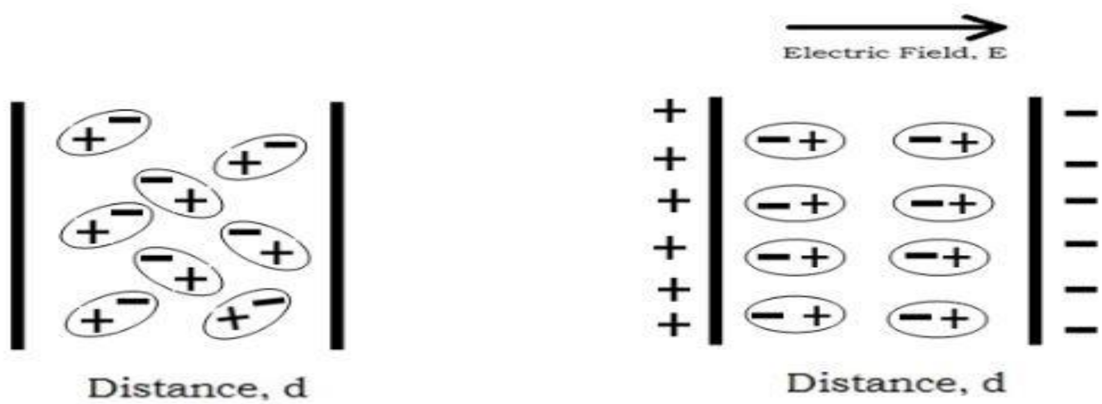
plasticizers : tricresyl phosphate ,dibutyl naphthalene these control the flexibility and rigidity of P.V.C

supplementary additions :these are used for colouring and lubricating purposes. different colouring pegments are added give desired colours , lubricating additives help in mouldings.

10. Explain polarization with neat sketch .

when a dielectric material is placed in an external electrical field , the positive and negative charges with in the material experience forces in opposite direction .

this separation of charges leads to the formation of electric dipoles, this phenomenon known as polarization



A. Polar molecules in dielectric without electric field

B. Polar molecules in the dielectric with the application of electric field

when a dielectric is in between the two plates , due to an external electric the negative charge will appear on the surface of dielectric facing the positive plate and the positive charge will appear on the surface of the dielectric facing on negative plate of the capacitor is shown in above fig.

when the plates are connected across a battery , charge will store in the capacitor.

As the potential difference between the two charged plates reduces due to the introduction of a dielectric material, the charge storing capacity of the capacitor increase .

polarization effect is depends upon the dielectric constant of the dielectric material.

11.Explain dielectric loss in dielectric materials with neat sketch.

The loss appearing in the form of heat due to reversal of electric stresses in the process of molecules rearrangement is known as **dielectric loss.**

Explanation: whenever a dielectric material is subjected to an ac voltage , the leakage current I dose not lead the applied voltage v by exactly 90^0

The phase angle θ is always less than 90^0 the complementary angle **δ = (90°- θ)**.is called **dielectric loss angle** .

when ac voltage v at a frequency of f Hz is applied to a dielectric material having a capacitance of C farads,

Dielectric power loss is given by P= VI COS θ

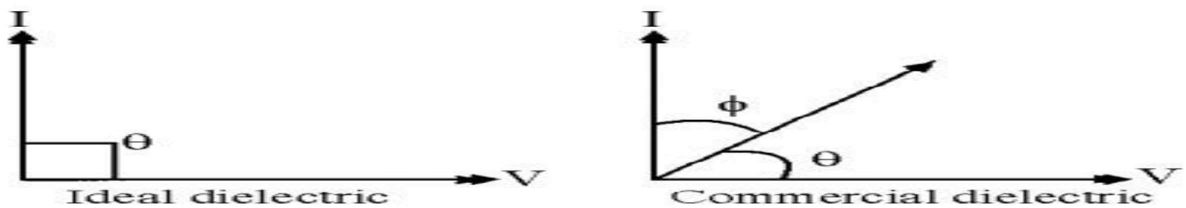


Fig. 4.10 Dielectric Loss

We know that $V = IR$ $\quad \because I = \frac{V}{R}$

Frequency $f = \frac{1}{2\pi RC}$

If the capacitance reactance is X_C , then we can write

$$I = \frac{V}{X_C}$$

Frequency $f = \frac{1}{2\pi X_c C}$

Where, $X_c = \frac{1}{2\pi fC}$

$$P = \frac{V^2}{2\pi fC} \cos(90° - \theta)$$

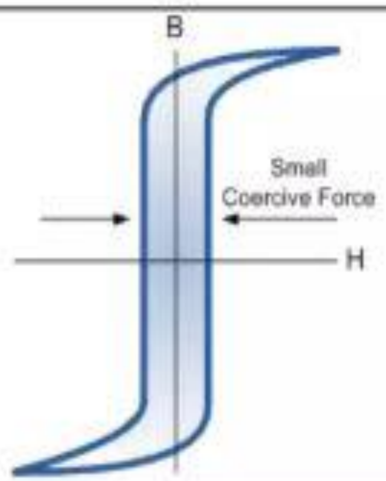
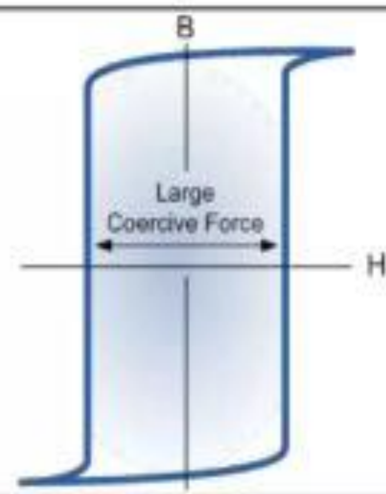
But, $[\phi = 90 - \theta]$ $P = V^2 2\pi fC \cos(90° - \theta)$

$$P = V^2 2\pi fC \sin\theta$$

In most of the dielectrics, the angle θ is very small ∴ $\sin\theta = \tan\theta$

$$P = V^2 2\pi fC \tan\theta$$

12.Explain soft and hard magnetic materials.

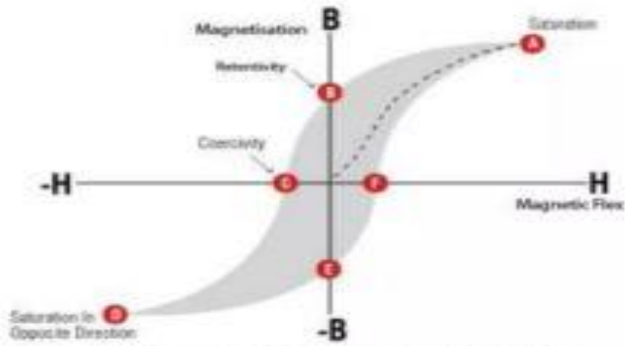
S.No	Soft Magnet	Hard Magnet
1	Easily magnetized and demagnetized	Cannot easily magnetized and demagnetized
2	It can be produced by heating and slow cooling	It can be produced by heating and sudden cooling
3	Hysteresis loop area is small	Hysteresis loop area is high
4	Retentivity is small	Retentivity is high
5	Coercivity is small	Coercivity is high
6	Energy product value is small	Energy product value is high
7	Eddy current loss is small	Eddy current loss is high
8	It's temporary magnet	It's permanent magnet
9	Ex. Iron – silicon alloy, Ferrous nickel alloy, Ferrites Garnets	Ex. Alinico, chromium steel, tungsten steel, carbon steel
10	Uses : Electromagnet, Computer data storage, Transformer core	Uses : DC magnets
11		

13. Explain the hysteresis loop with neat sketch .

Hysteresis:

Definition : Hysteresis means "Lagging". The lagging of intensity of magnetization (B) behind the intensity of magnetic field (H).

Explanation : A graph is drawn between the intensity of Magnetization (B) and intensity of magnetic field (H).



i) When the intensity of magnetic field H is increased from zero, the intensity of magnetism is also increased.

ii) Further increasing the value of H, the B value is also increased and finally reaches the saturation point A in figure. ie., B is constant.

iii) Then decreasing the value of H, the B value is also decreased, But at the point H = 0, But B = 0. Now the material retains some amount of magnetism is known as **Retentivity (or) Resudial magnetism**. (point B in fig.)

iv) Further decreasing the value of H in negative side, the B value is also decreased at point C the material is fully demagnetized. The force is required for remove the resudial magnetism is called as **Coercive force.** (point C in fig.)

v) the cycle is continue in opposite direction as shown in fig. D is saturation point, E is retentivity and F is the coercive force in negative direction. The cycle is completed, it make the hysteresis loop.

Hysteresis Explained by Domain theory:

OA - Reversible domain

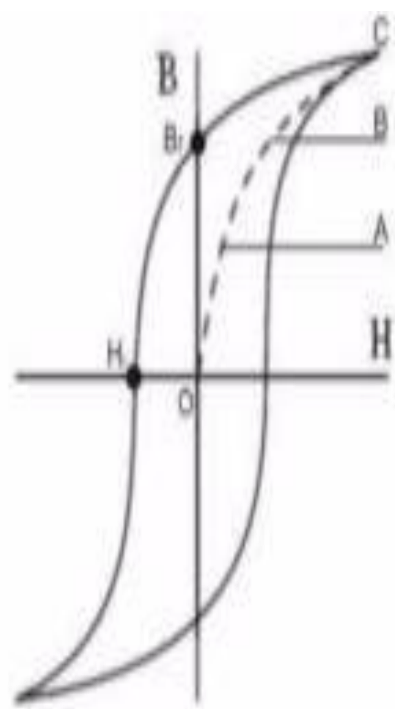
AB - Irreversible domain

BC - Domain Rotation

Br - Retentivity

Hc - Coercivity

ENERGY PRODUCT : $B_r \times H_c$



14.Explain hysteresis and eddy current losses.

Hysteresis Loss

When a magnetic material is subjected to cycle of magnetisation (i.e. it is magnetised first in one direction and then in the other), a power loss occurs due to molecular friction in the material

.Therefore, energy is required in the material to overcome this opposition. This loss being in the form of heat and is termed as hysteresis loss. The effect of hysteresis loss is the rise of temperature of the machin

The formula for the calculation of hysteresis loss is devised by Steinmetz, known as Steinmetz hysteresis law.

Hysteresis power loss, P_h=ηB1.6maxfVWatts.

Eddy Current Loss

When a magnetic material is subjected to a changing magnetic field, a voltage is induced in the material according to Faraday's law of electromagnetic induction.

Since the material is conducting, the induced voltage circulates currents within the body of the magnetic material. These circulating currents are known as eddy currents.

These eddy currents causes I^2R loss in the material, known as eddy current loss.

The eddy current loss also results in the increase in temperature of the material.

Eddy current power loss, P_e=KeB2maxf2t2VWatts

15 write the Requirement s of high resistive and low resistive materials.

Low resistive materials: these materials possessing very low value of resistivity, these materials are used where power loss and voltage drop should be low.
High resistive materials : these materials possessing very high value of resistivity, these materials are used for large value of resistance is required.

Low resistive materials	**High resistive materials**
Long service life	Low temperature co-efficient
Less power loss and voltage drop	High mechanical strength
High resistance to corrosion	Long service life
Low cost and easily available in market	High melting point
Low temperature co-efficient	
High resistance to corrosion.	