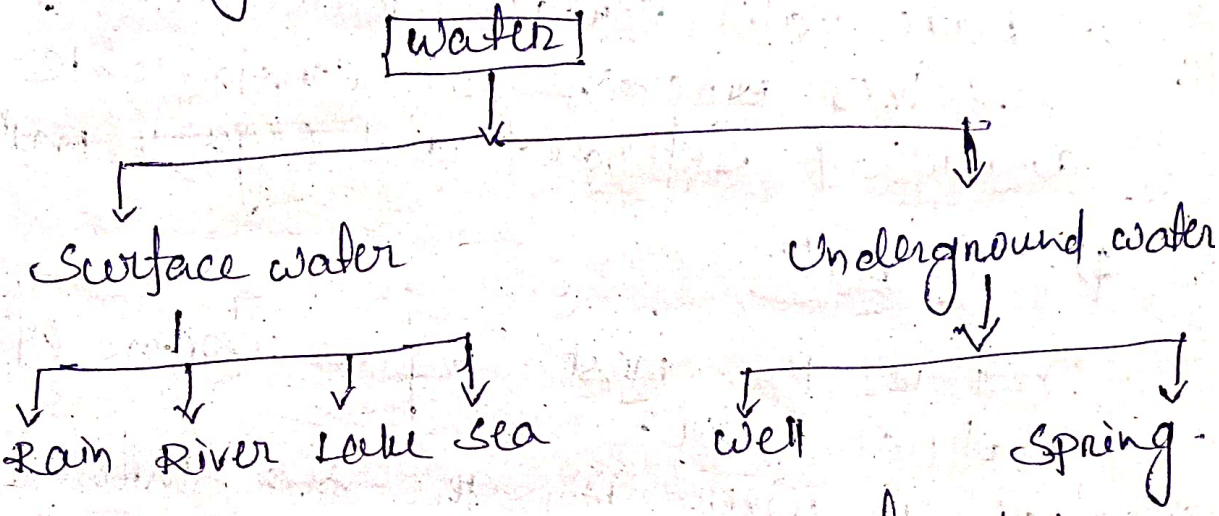
Water Treatment

The chemical formula of water is H_2O. It is an Industrial solvent. It is used in industries and domestic purposes.

Sources of water – The sources of water can be classified as (i) Surface water (ii) Underground water.



A. Surface water – Surface water found in a river, lake and other surface cavity.

(1) Rain water:

⇒ It is the most purest form of natural water as impurities and salts present in water on earth are left behind during vapourization by the sun.

⇒ But when the rain droplets fall, they dissolve gases like carbon dioxide, oxides of sulphur and nitrogen which make the rain slightly acidic.

(2) River water

⇒ River is a naturally flowing water course flowing towards a sea lake or another river.

=) It contains high percentage of dissolved minerals like NaCl, KCl, $NaNO_3$, $CaCl_3$, $NaHCO_3$ etc

3. Lake water:

=) Lake is relatively large body of slowly moving or standing water that occupies an inland basin of appreciable size.

=) Lake water contains lesser amounts of dissolved minerals but considerable amount of suspended and organic matters

4) Sea water

=) It is the most impure form of natural water.

=) When river join the sea throwin the impurities carried by them.

=) Sea water contains 3.5% of dissolved minerals and 2.6% of NaCl.

B. Underground water

Undergraind water is two types

1. Spring water

=) A spring is a natural outflow of water from an underground supply to the ground surface.

=) It is a clearer form of natural water.

=) It contains high percentage of

well water

=> It is clear in appearence due to filtering action of soil.

=> It contains many dissolved minerals and some organic matter.

Types of water

=> (i) Soft water (ii) Heard water.

Soft water

Produces

water produces good lather with soap solution is called soft water. It does not contains bicarbonates of calcium and magnesium.

Example - Rain water, distilled water etc.

Hard water

water does not produces good lather with soap solution is called hard water. This type of water contains bicarbones and carbonates of calcium and magnesium.

Example - Sea water, River water, pond water etc.

Types of hardness

Hardness of water is of two types.

(i) Temporary hardness (ii) permanent hardness

Temporary hardness

The bicarbonates of calcium and magnesium present in water can be removed on boiling.

$Ca(HCO_3)_2 \xrightarrow{heat} CaCO_3 + H_2O + CO_2 \uparrow$

$Mg(HCO_3)_2 \xrightarrow{heat} MgCO_3 + H_2O + CO_2 \uparrow$

The bicarbonates present in water decompose to give insoluble carbonates which settle down easily. Then the soft water is filtered off.

Permanent hardness

The sulphates and chlorides of Calcium and magnesium present in hardwater coen not remove on more boiling. Sometimes hardness is due to cations like Ferrous & ferric and anions like nitrates and silicates.

Removal of permeenent hardness

(I) Cold lime soda Process.

(II) Hot lime soda process

Cold lime soda process

Principle → when hardwater is treated with calculated amount of lime [$Ca(OH)_2$] and soda (NA_2CO_3) at room temperature 25°c, the soluble Ca & Mg salt present in hardwater

are chemically converted into ppt of calcium carbonate and magnesium hydroxide. This ppt are removed by filtration. Soft water is obtained.

$CaCl_2 + Na_2CO_3 \longrightarrow CaCO_3 \downarrow + 2NaCl$

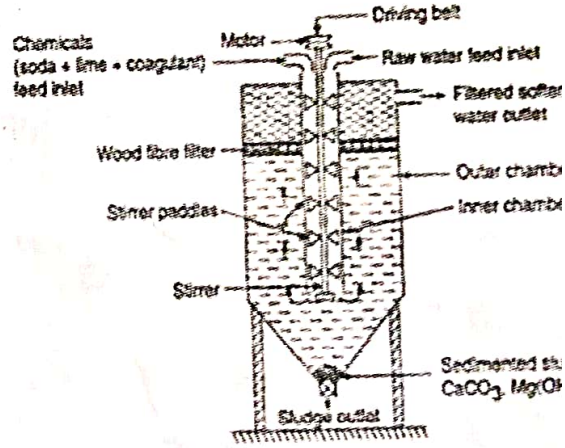
hard water soda ppt

$MgCl_2 + Ca(OH)_2 \rightarrow Mg(OH)_2 \downarrow + CaCl_2$

hard water lime ppt.

Process

The apparatus consist of a conical shaped steel tank. Raw water, lime soda and coagulants are added from the top inner vertical circular chamber which is fitted with rotating shaft carrying many paddles.



(Figure 10.1 Cold Lime-Soda Process)

The dissolved ~~salt~~ salts of Ca & Mg combine with lime soda and coagulants and form an insoluble precipitate as sludge. Soften water rises upwards and the heavy sludge settle down. Then the soften water passes through wood fibre filter and the filtered soft water is collected through the outlet. The sludge settling down at the bottom

is removed

The residual hardness left in this process is about 50 - 60ppm.

Dis-advantages

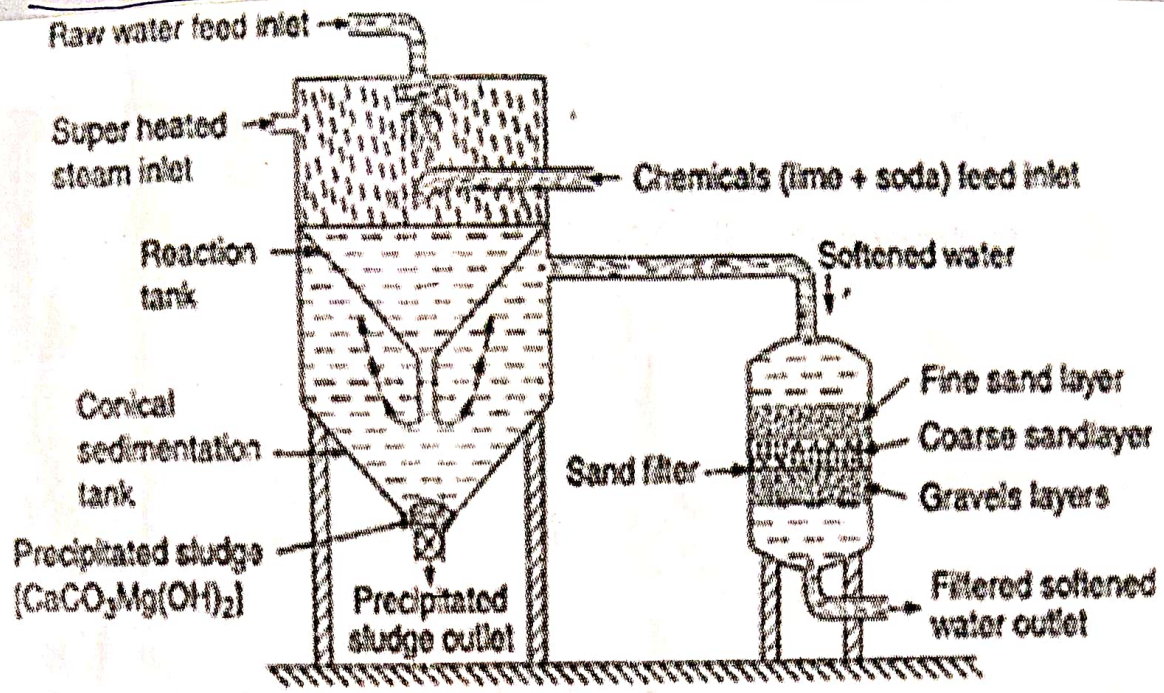
⇒ It is a slow process because reactions during water softening take place in very dilute solutions and room temp.

⇒ It requires coagulants for setting particles of ppt formed during reaction of water softening.

⇒ Softening capacity of this process is less.

⇒ Soft water obtained by this process consists of dissolved gases.

Hot Lime Soda process



(Figure 10.2 Hot Lime-soda Process)

Principle →

⇒ In this process hard water is treated with lime and soda at 80-150°C

⇒ This process is faster and reaction gets completed within 15 minutes.

⇒ Softening capacity is increased.

⇒ Precipitate settle down rapidly no coagulants are required in it.

⇒ Dissolved gases get removed in the process.

The apparatus consists of 3 main parts

(a) Reaction tank.

(b) Conical sedimentation vessel

(c) Sand filter.

Advantages

=) It is much economical
=) The reaction is completed within a short period.
=) The reaction proceeds faster. Hence the softening capacity is increased
=) No coagulants required.
=) Dissolved gases are removed.
=) Pathogenic bacteria are destroyed.
=) The residual hardness left in this process 15-30 ppm.

Dis-advantages

=) For efficient and economical softening careful operation & skilled supervision is required.
=) Disposal of large amount of sludge creates problem.
=) This can remove hardness only upto 15 ppm, which is not suitable for high pressure boilers.

Ion-Exchange process or Demineralization process or De-ionization process

Ion-exchange resins are insoluble cross linked long chain polymers with microporous structure the functional groups attach to this chains are responsible for ion-exchanging properties.

In this process ions present in hardwater are exchanged by ion-exchange resins which are complex organic molecules. They can remove all types of cations as well as anions present in hard water. The resulting water is known as demineralized water.

Ion-exchange resins are two types:

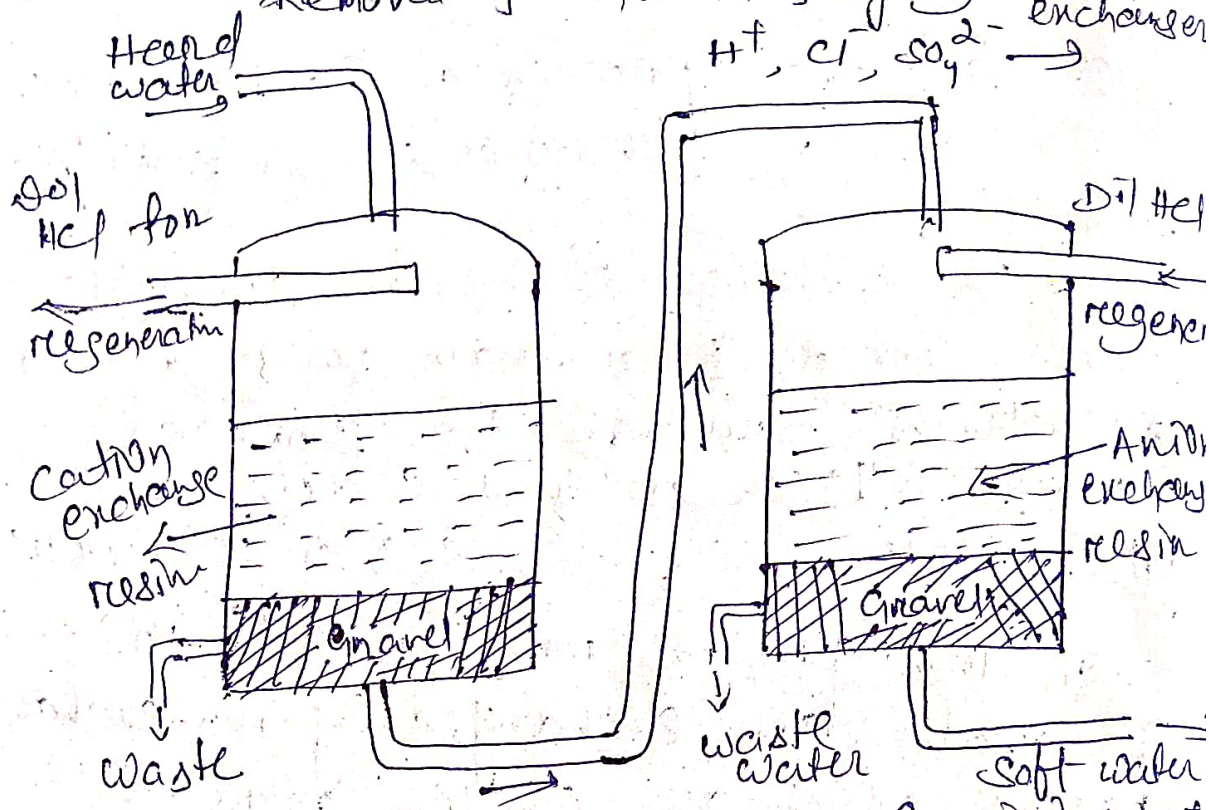
(a) Cation-exchange resins:-

First hard-water is passed through Cation ex-change column which remove all the cations like Ca^{++} or Mg^{++} ions and equivalent amount of H^+ ions are removed.

(b) Anion-exchange resins:-

Then hard water is passed through anion ex-change column which remove all the anions like Cl^- or SO_4^{2-} ions and equivalent amount of OH^- ions are removed.

Removal of hardness by ion-exchanger



$$Ca^{2+} + 2H^+(resin) \rightarrow Ca(resin)_2 + 2H^+$$

(in hard water) (cation exchanger)

$$Mg^{2+} + 2H^+(resin) \rightarrow Mg(resin)_2 + 2H^+$$

(in hard water) (cation exchanger)

and

$$Cl^- + Resin\text{-}OH \rightarrow Resin\text{-}Cl + OH^-$$

(in water) anion exchanger

$$SO_4^{2-} + 2\,Resin\text{-}OH^- \rightarrow (Resin)_2 SO_4^{2-} + 2OH^-$$

(in water)

Therefore, the H^+ ions from cation exchange column and OH^- ions from anion exchange column combine to form ion free or de-ionized or de-mineralized water.

Advantages

=) Highly acidic or alkaline water can be softened by this method.

=) In this method water produces a very low hardness. It is used for treating water for use in high pressure boilers.

Disadvantages

=) The equipment is costly & also more expensive chemicals are needed.

=) If water contains turbidity the output of the process is reduced. if it is more, it has to be removed first by Coagulation & filtration.

Fuel

Fuel is a combustible substance containing carbon, which on proper burning produces large amounts of heat, that can be used for domestic and industrial purposes

$$\text{Fuel} + O_2 \longrightarrow \text{Product} + \text{Heat}$$

Classification

On the basis of their occurence, fuel may be classified into two categories

1. Natural fuels :- Such fuels are found in nature.
   Ex - wood, coal, petroleum, natural gas etc
2. Artificial fuels :- Such fuels are prepared from natural fuels:
   Ex - Coke, kerosine, petrol, water gas, Producer gas etc

On the basis of their physical state, fuels are of three types: -

(a) Solid fuels
(b) Liquid fuels
(c) Gaseous fuels

1. Solid fuels

Fuels which are found in their solid state at room temperature are generally referred to as solid fuels.

Ex - wood, coal, charcoal, straw etc.

2. Liquid fuels:

Most liquid fuels are derived from dead plants and animals by exposure to heat and pressure in the earth's crust.

Ex: - petroleum, kerosene, petrol, Diesel, alcohol etc.

3. Gaseous fuels:

Gaseous fuels are composed of hydrocarbons, carbon monoxide, hydrogen or a mixture of them all.

Ex: - Natural gas, Coal gas, Producer gas, water gas, Hydrogen gas etc.

Calorific value of fuel

The amount of heat produced by the complete combustion of unit-

quantity of fuel.

Unit - cal/gm, kcal/kg.

Characteristics of good fuel

=> It should have high calorific value
=> It should be cheap and readily available.
=> Moderate ignition temperature.
=> Low moisture content
=> It should not produce much smoke
=> Require low storage volume.
=> Easy to transport.

Composition and Uses of liquid fuels

Diesel

C = 85% H = 12%. Rest = 3%.

Calorific value = 11,000 kcal/kg.

Uses:- It is used as a fuel in diesel engine.

Petrol or Gasoline

C = 84%. H = 15%. O+S+N = 1%.

Calorific value = 11,250 kcal/kg.

Uses:- It is used as a fuel for internal combustion engines of automobile.

It is used as dry-cleaning agent.

Kerosene C = 84%. H = 16%. S ≤ 0.1%.

Calorific value = 11,100 kcal/kg.

Uses:- It is used as a domestic fuel & ...

Composition and uses of gaseous fuels.

water gas

⇒ The average composition of water gas is H_2 = 51%. CO = 41%. CO_2 = 4% & N_2 = 4%.
Calorific value = 2800 kCal/m^3.

Uses ⇒ as a source of H_2 gas
⇒ as a fuel
⇒ as an illuminating gas
⇒ For welding purpose

Producer gas

⇒ The average composition of producer gas is CO_2 = 22-30%. H_2 = 8-12%. N_2 = 52-55% & CO_2 = 3%.
Calorific value = 1300 kCal/m^3.

Uses
⇒ Manufacture of muffle furnace in coke & ~~coal~~ coal gas
⇒ As a reducing agent in metallurgical operation.

Coal gas

The average composition of coal gas is H_2 = 40%. CH_4 = 32%. CO = 7%. C_2H_2 = 2%. C_2H_4 = 3%. N_2 = 4%. CO_2 = 1%. & rest = 11%.
Calorific value = 4900 kCal/m^3.

Uses.
⇒ As a fuel
⇒ As a reducing agent in metallurgical operations.
⇒ As an illuminent.

LPG (Liquified Petroleum Gas)

⇒ The average composition of LPG is n-butane = 27%. iso-butane = 25%. butene = 43%. Propene = 2.5%. & Propane = 2.5%.

⇒ Calorific value = 27,800 kcal/m3.

Uses

⇒ As a domestic fuel.
⇒ As an industrial fuel.
⇒ As a vehicular fuel.

CNG (Compressed Natural Gas)

⇒ The average composition of CNG is CH_4 = 70-90%. C_2H_6 = 4-9%. & traces of propane and butane.

⇒ Calorific value 1250 kcal/m3.

Uses

⇒ As a domestic and industrial fu
⇒ As a source of carbon in tyre industry.
⇒ For the production of H_2 gas needed in fertilizer industry.

Polymers

Polymers — Poly means many mers means units or parts. These are macromolecules built by linking together of largest number of smallest one.

Monomer — The smallest part of monomer is called monomer.

Polymerisation — The reaction by which monomers combine to form polymer is called Polymerisation.

Degree of Polymerisation ⇒ The number of repeating units in a chain form a polymer is called degree of polymerisation

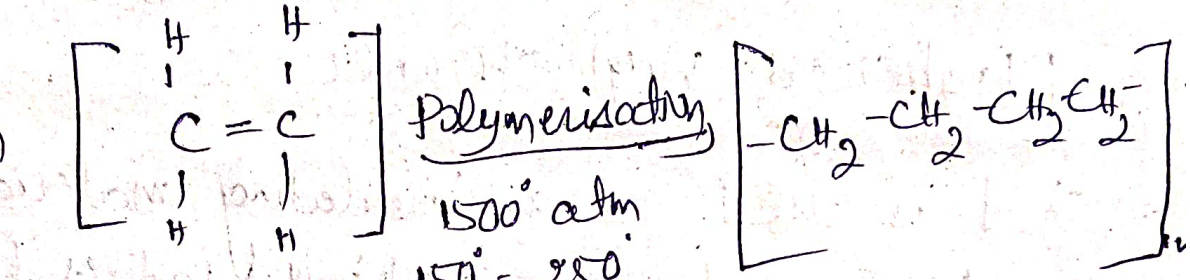
Homopolymer — Polymer consist of identical monomer is called homopolymer

Co-Polymer — Polymer having different chemical structure or different monomer is called Co-Polymer.

Thermoplastics	Thermosetting
1. They are formed by addition polymerisation	1. They are formed by condensation polymerisation.
2. They consist of long chain linear polymer without any cross-links	2. They have three dimensional network structure
3. They soft on heating	3. They do not soften on heating
4. They are soft, weak and brittle	4. They are hard, strong and more brittle.
5. They are generally soluble in organic solvent.	5. They are almost insoluble in all organic solvents.

Preparation and Uses of Polythene

Ethene gas is liquified under high pressure at 1500 atmosphere and is pumped into a heated pressure vessels maintained at 150° to 250°c in the presence of a trace of oxygen.



Ethene

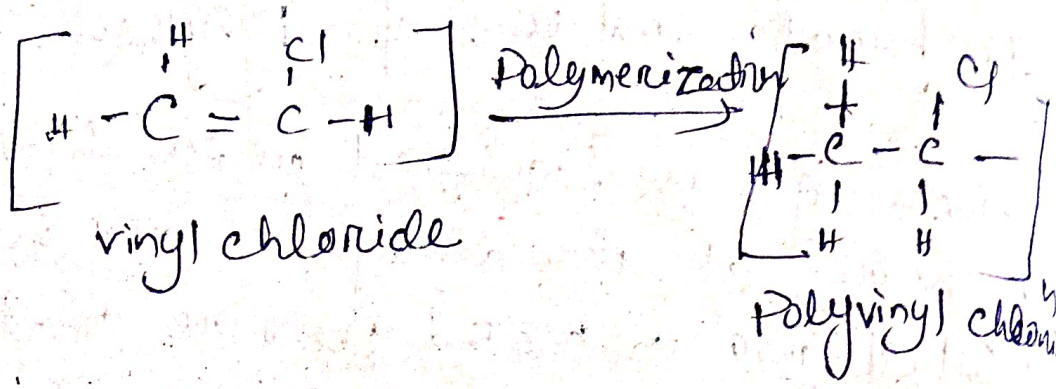
Polythene

Uses

⇒ High frequency insulator parts
⇒ Packing materials, bags
⇒ Toys, tubes, pipes etc.

Preparation and Uses of Polyvinyl chloride

Polyvinyl chloride is prepared by the polymerisation of vinyl chloride by heating its water emulsion in the presence of a small amount of benzoyl peroxide.



PVC is available in two general grad
i.e Plasticized & Unplaticired.

Plasticized Vinyl Chloride

⇒ It is used as an insulating material
⇒ It is used for making ladies hand bags, curtains etc.

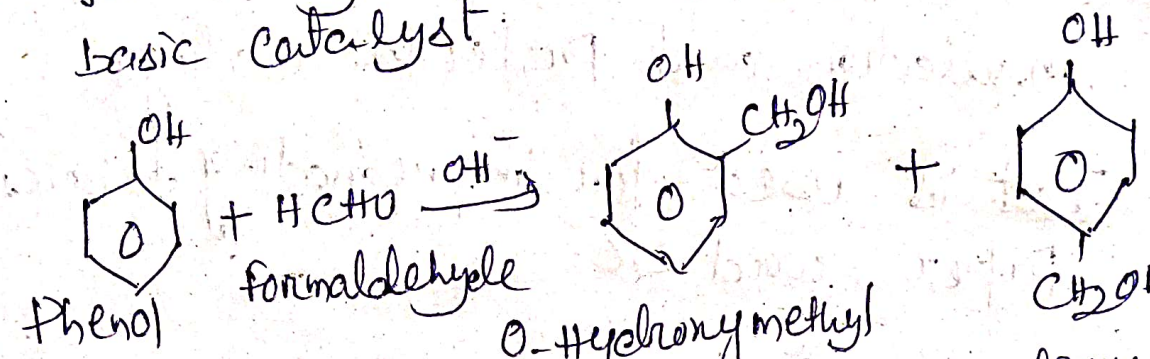
Unplaticired Vinyl Chloride

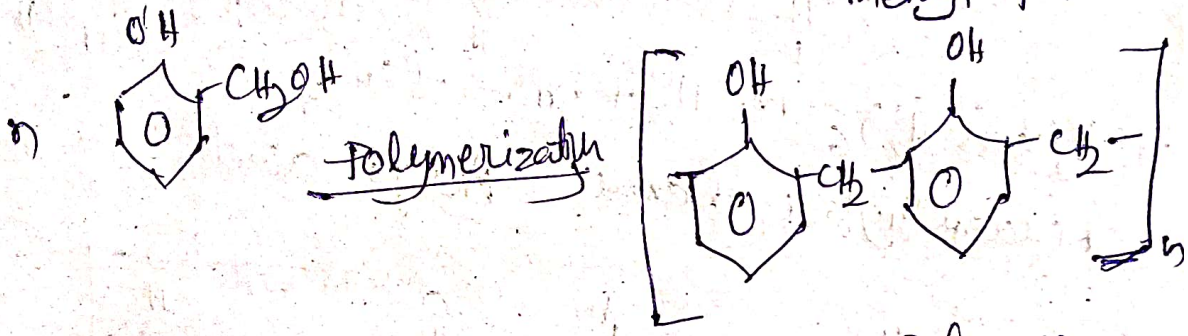
⇒ It is used as sheets for tank linings, safety helmets, mudguards.

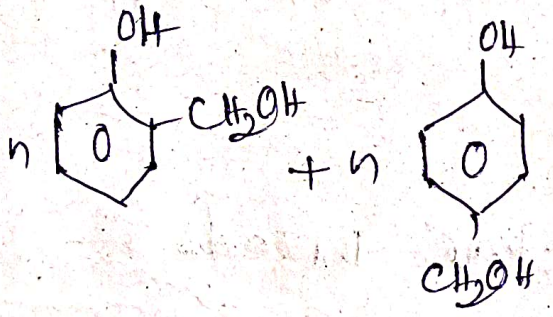
⇒ It is used for the manufacture of containers for detergents, cosmetics, mineral water.

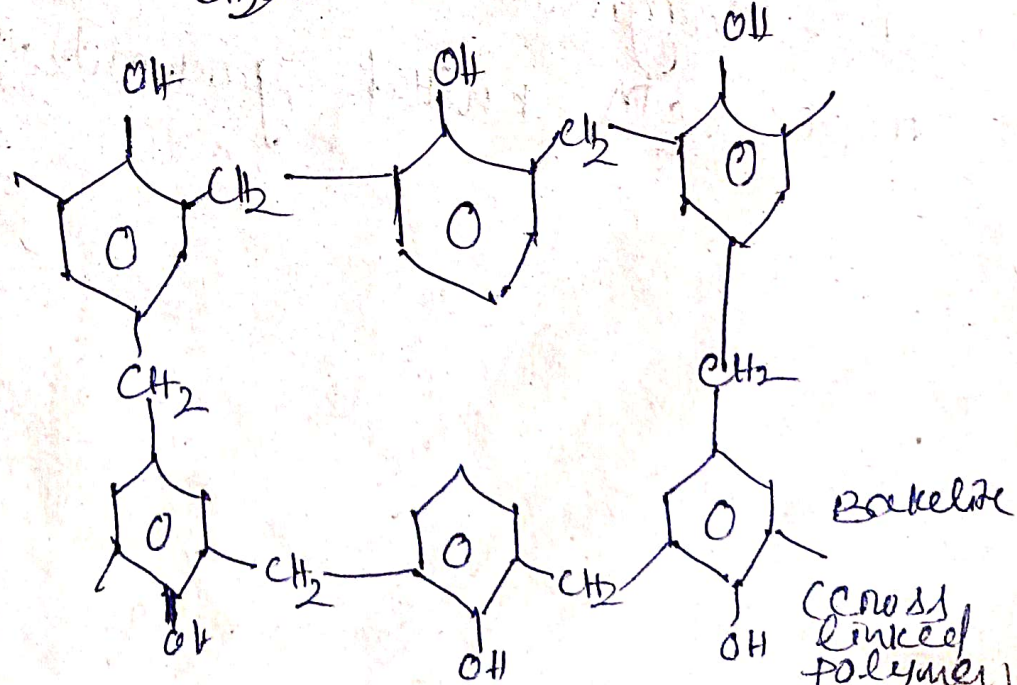
Bakelite

It is a condensation polymer and is obtained from phenol and formaldehyde in the presence of basic catalyst.









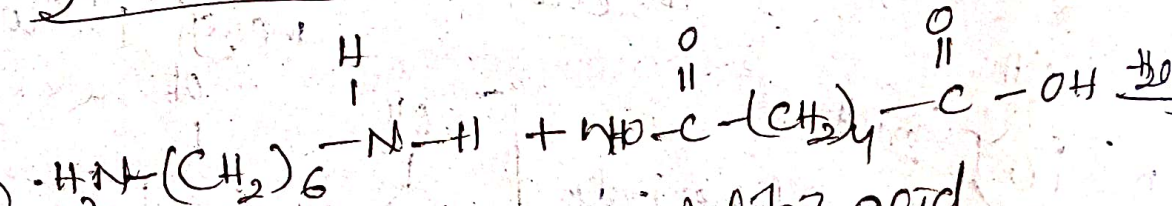
Uses

=) It is used for making handles of utensils.

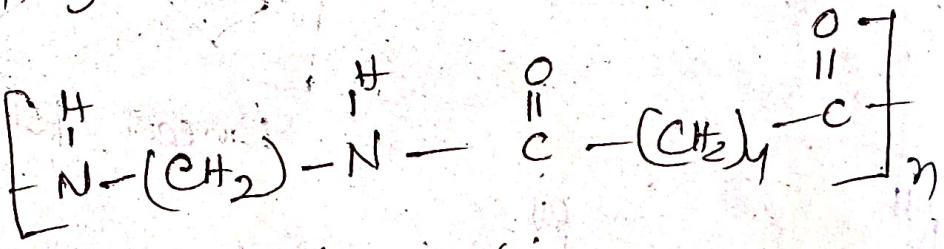
=) It is used for varnishes, electrical insulation and protective coatings.

=) It is used for impregnating fabric, paper, wood etc.

Nylon 6,6



Hexamethylene diamine Adipic acid



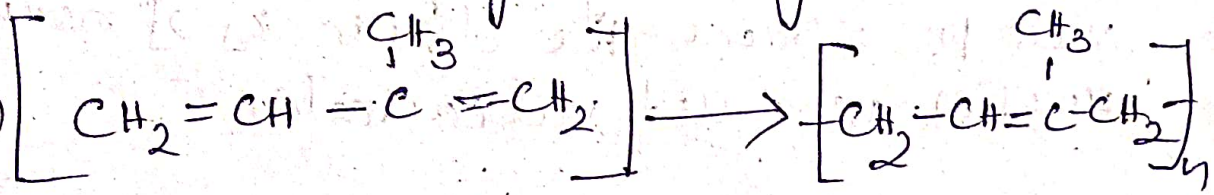
Nylon 6,6

Uses:- Surgical structure, threads, rope, nets, knitted garments.

Rubber

Rubber is a naturally occuring polymer. It is obtained as latex from rubber trees. It is highly elastic. It is also known as elastomer. In elastomers molecules are not in a straight chain but in a forms of coil.

Natural rubber consists of "isoprene" as the monomer units which is in the form of the polymer polycis-isoprene.



Isoprene

Poly-cis-isoprene
Natural Rubber

Draw backs of natural rubber

i. It has very low thermal stability.
ii. It has very low tensile strength.
iii. It has high water absorption capacity
iv. It is attacked by atmospheric oxygen and ozone
v. It is attacked by acids & alkalis.
vi. It has property of tackiness.

Vulcanization of rubber

The process of natural rubber can be modified and improved by the process of vulcanization. To improve the properties of natural rubber, it is heated with sulphur or sulphur containing compounds at a temp of 100-18

The chemical process in which natural rubber is heated 4 to 6% sulphur or sulphur containing compounds with a view to overcome the drawbacks of natural rubber are called vulcanization.

During vulcanization sulphur cross links are formed in between the long of polyisoprene at the carbon atoms containing double bond.

The formation of cross links makes rubber hard, tough with greater tensile strength. Although natural rubber is thermoplastic substance. On vulcanization, it is set into a given shape which is retained.

Advantages of Vulcanization.

=) It has higher thermal stability.
=) comparatively lower tensile strength.
=) low water absorption capacity.
=) not attacked by atmospheric oxygen and ozone.
=) resistant to acids and alkalis.

Lubricants

Definition of Lubricants :-

Any substance introduced between two moving or sliding surfaces to reduce the frictional resistance between them is called Lubricants. The process is known as Lubrication.

Purpose of Lubricant ⟹

⇒ It reduce wear and tear
⇒ It reduce loss of energy
⇒ Expansion of metal reduce
⇒ It reduces running cost.
⇒ It increases the efficiency of engines
⇒ Some times it acts as a seal

Types of Lubricants

Basic upon the physical states lubricants can be classified into three categories

1. Solid Lubricants

Solid lubricants are used where the working temperature is very high and where there is a chance of contamination of the

products with the lubricant.

Example - Graphite, Molybdenum disulphide

Uses of Graphite

⇒ Graphite is used to railway track joints, food stuff industries, ~~concrete~~ IC engines, open gears etc.

⇒ Graphite mixed with oil called oil dag is used in IC engines.

⇒ Graphite mixed with water called aqua dag is used in food industries.

2. Liquid lubricants → These are also known as lubricating oils.

Examples :- Petroleum oil, Animal and vegetable oil, Blended oil etc.

Uses of Liquid Lubricants

⇒ The operating temperature is high.

⇒ Speed of the roller is high.

⇒ Prevent the loss of oil.

3. Semi solid Lubricants

Semi-solid lubricants are gel-like substances which reduce friction between two moving surfaces.

Example - Greases, vaseline, waxes etc.

Uses of Grease

=> Used where oil cannot remain in place due to high load, low speed, sudden jerks like rear axle.

=> In bearing and gears which work at high temperature.

=> where dropping of oil affects the machine or products like production of paper, textile etc.

Chemicals in Agriculture

Examples and Uses of pesticides, insecticides, herbicides, fungicides.

Pesticides - DDT, Acephate, Boric acid
Destroying weeds and other unwanted vegetation.

Insecticides - Aldrin, Endrin
Used against insect eggs and larvae.
Used in agriculture, medicine.

Herbicides :- Diclofop, dinoseb, diquat
Used to kill unwanted plants.

Fungicides : Captan, sulfur, mancozeb
Used to kill or prevent the growth of fungi & their spores.

Bio fertilizers :-

Definition → These are the substance that contains micro-organisms living or latent cells. Increase the nutrients of hosts plants when applied to their seeds, plant surface or soil by colonizing the rhizosphere of the plant.

Examples :- Azospirillum, Azotobacter, Rhizobium
Uses :- Fix atmospheric nitrogen in the soil and root of legume crops and make it available to the plant.

Inorganic Chemistry

Metallurgy:

The process of extracting metals from their ores is called metallurgy.

Mineral — The natural substance in which metals occur either native state or combined state are called mineral.
Example - Bauxite ($Al_2O_3 \cdot 2H_2O$) & kaolin ($Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$)

Ore — An ore is a mineral from which metal can be profitably extracted.
Example - Bauxite is an ore of aluminium.

Gangue — The worthless earthy impurities like sand, clay etc associated with the ore are known as gangue.

Differentiate between Minerals & Ores

Minerals	Ores
⇒ The combined state occurences of metals are called Minerals	⇒ These are Minerals from which the concerned metals can be extracted easily & economically.
⇒ Minerals contain low percentage of metals and high percentage of impurities	⇒ Ores contain high percentage of metals but low percentage of impurities
⇒ All minerals are not ore Exa - Kaolin, Bauxite	⇒ All ores are minerals Exa - Bauxite is an ore of aluminium.

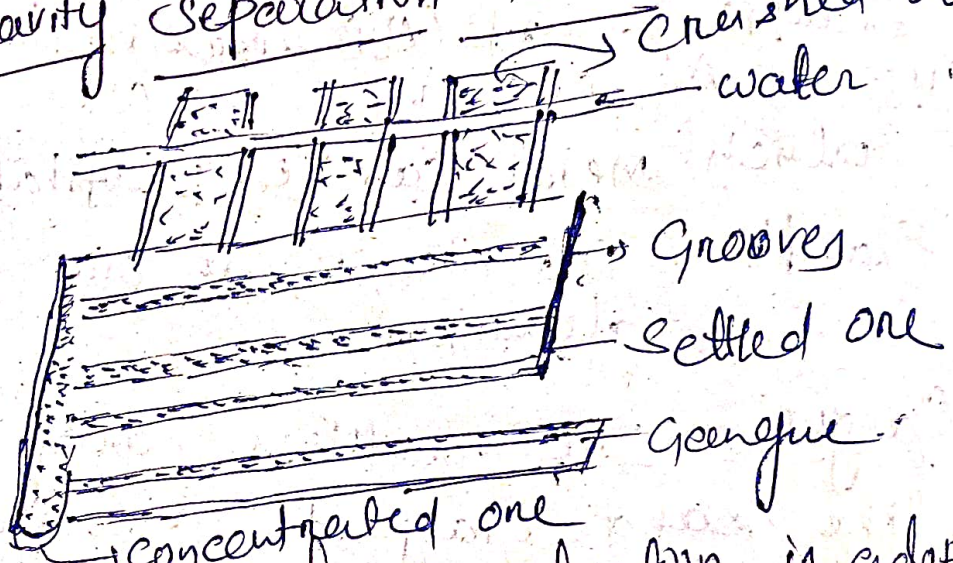
General methods of extraction of Meta

(i) Ore Dressing

The removal of unwanted earthy impurities from the ore is called ore dressing.

(ii) Concentration of the Ore

⇒ Gravity separation method

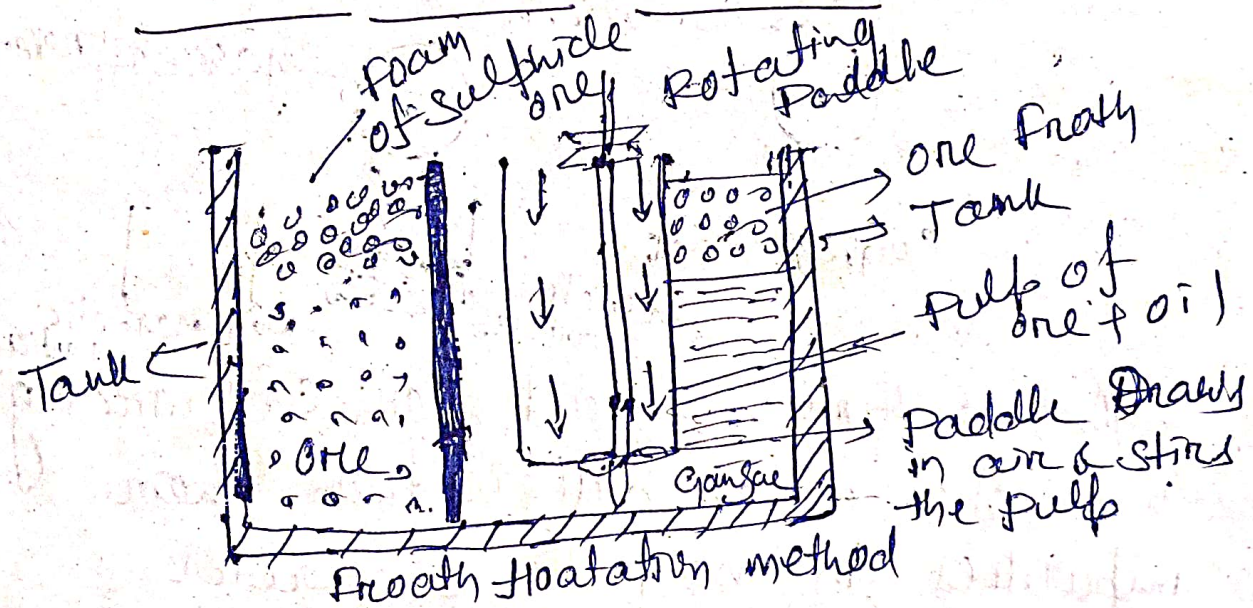


⇒ This method of concentration is adopted only when there is a gravity difference between the ore and impurities. Normally carbonate and oxide ores are heavier than the impurities associated with them and hence they are concentrated by this method.

In this method the powdered ores are kept in some containers over a specially designed table called wilfley table.

The table contains a number of horizontal grooves. The table is kept slightly inclined in position and is provided with a rocking motion. When water is spread over the ore, lighter impurities are washed away while heavier ore particles get deposited in the grooves, which are finally carried out into the main canal.

(ii) Frooth Floatation Method



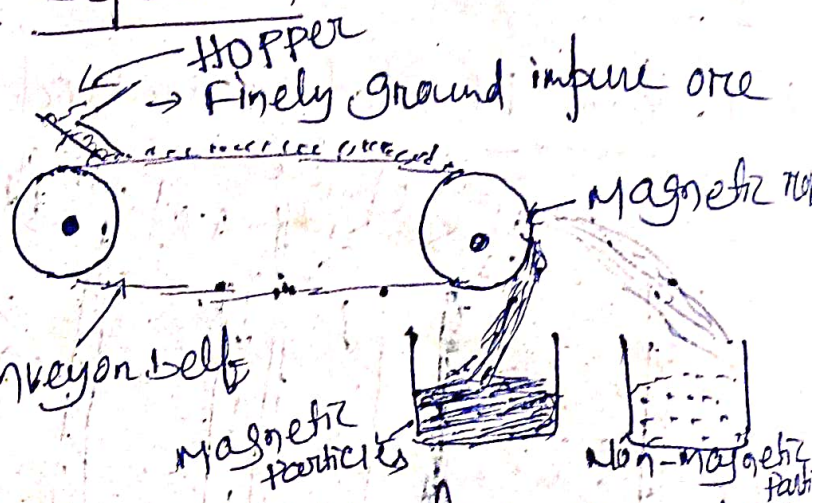
Frooth Floatation method

This method is employed for the concentration of sulphide ores only. In this method two interconnected tanks are used. In one of the tank, a mixture of ore, oil (Pine oil) water and a little quantity of mineral acid is agitated strongly by blowing air through it.

Due to the preferential wetting of the sulphide ores by oil than by

water, a layer of oil gets covered over the surface of sulphide ores. These sulphide ores become lighter and flow over the surface of the mixture, which are carried out into the second container along with the foam formed due to agitation.

(iii) Magnetic Seperation



This method is meant for concentration such ores which differ from their impurities in magnetic character. For example, the main impurity in tin stone (SnO_2) is ferrous tungstate ($FeWO_4$), called wolfram. Tin stone is diamagnetic in behaviour. The powdered ore is dropped over a belt revolving round to the rollers one of the rollers being a magnet.

The magnetic part of the ore is attracted by the magnetic roller and

form a heap near it, whereas the non-magnetic part of the ore forms a separate heap a little away from the magnetic impurities.

(iv) Leaching

This is a chemical method in which the impure ore is treated with a suitable solvent which dissolves the ore leaving behind the impurities. The solution is filtered, impurities are removed; and the mother liquor is treated with another suitable chemical reagent to get the pure ore.

Example — Impure bauxite ore is treated with dil NaOH solution which dissolves Bauxite to form soluble sodium meta-aluminate.

$$Al_2O_3 \cdot 2H_2O + 2NaOH \longrightarrow 2NaAlO_2 + 3H_2O$$

The solution is filtered to remove the impurities. The solution obtained is diluted with plenty of distilled water when a precipitate of $Al(OH)_3$ is formed.

$$NaAlO_2 + 2H_2O \longrightarrow Al(OH)_3 + NaOH$$

The precipitate obtained is dried and heated strongly to get pure alumina from which aluminium is extracted.

$$2\,Al(OH)_3 \xrightarrow{\Delta} Al_2O_3 + 3H_2O$$

Oxidation:-

In metallurgical operation, the concentrated ores are converted into their respective metal oxide. This is achieved by the following two methods:

Calcination:

The process of heating an ore strongly below its melting point in the absence of air or in the limited supply of air is called calcination.

$$ZnCO_3 \longrightarrow ZnO + CO_2$$
$$CaCO_3 \longrightarrow CaO + CO_2$$

Moisture is removed, volatile impurity are removed & carbonated ores get converted into oxides.

Roasting

The process of heating an ore strongly below its melting point in excess of oxygen is called roasting. Sulphur dioxide gas is produced along with metal oxide.

$$2PbS + 3O_2 \longrightarrow 2PbO + 2SO_2$$
$$2ZnS + 3O_2 \longrightarrow 2ZnO + 2SO_2$$

Moisture is removed
Volatile impurities are removed
Impurities like Sulphur, Arsenic, Phosphorous etc are removed in the form of their gaseous oxides.

Reduction

In metallurgical operation, the roasted ores are reduced to convert the metal oxides into the respective metals.

Smelting ⇒

The process of heating a roasted ore strongly above its melting point with a suitable quantity of coke or charcoal is called smelting. In smelting process metal oxides are reduced into their respective metals.

$$PbO + C \rightarrow Pb + CO$$
$$CuO + CO \longrightarrow Cu + CO_2$$

During the process of smelting an additional chemical substance called flux is added which combines with the solid impurities to form fusible slag.

Impurity + flux → slag.

Flux – A substance added during the process of smelting to convert the solid gangue into fusible mass is called flux.

Acidic Flux ⇒ It is used to remove basic impurities such as metallic oxides.

Example – $FeO + SiO_2 \rightarrow FeSiO_3$
impurity flux (slag)
(Basic) (Acidic)

Basic flux – It is used to remove acidic impurity such as sand.

$SiO_2 + CaO \longrightarrow CaSiO_3$
Impurity Flux Slag
(acidic) (Basic)

Slag ⇒ It is the fusible mass obtained during the process of smelting when flux combines with the solid impurities.

Example – $SiO_2 + CaO \rightarrow CaSiO_3$

Refining

The process of removal of impurities from crude metal is called refining. The following are the methods of refining.

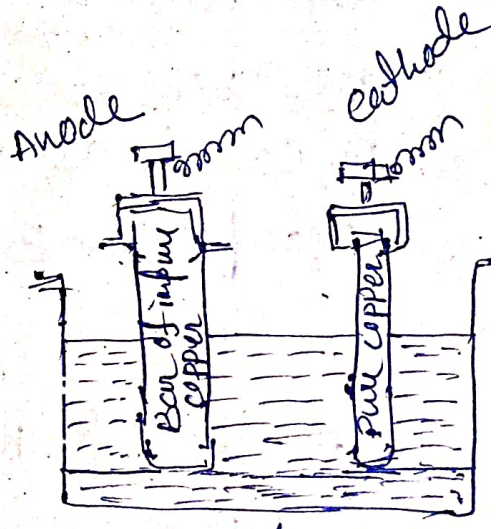
(i) Distillation Method – This method is suitable for volatile metals like Hg, Zn, Pb contaminated with a water condenser.

During heating the volatile metal gets evaporated and condensed which is collected in a separate container while non-volatile impurities are left at the bottom of the distillation flask.

(ii) Electro refining →

This method is employed to refine the less electropositive metals such as Zn, Pb, Cu, Al.

The impure metal bar is used to anode while a pure metal bar is taken as cathode. Both the electrodes are dipped in a suitable aqueous salt solution of the concerned metal. During the process of electrolysis, the impure metal dissolves in its aqueous salt solution providing metal ions which get discharged and deposited at the cathode.



Alloys

Alloy → The homogeneous material obtained by melting together metals or metals with non-metal or metals with metalloids is called an alloy.

Types of alloys :-

Ferro alloys :- The alloy containing iron as the main constituent is called a ferro alloy.

Example : Stainless steel, Manganese steel etc

Non-ferro alloys :- The alloy which does not contain iron as the main constituent is called as non-ferro alloy.

Example :- Brass, Bronze, Gun-metal etc

Amalgam :- Alloys containing mercury as one of the constituent is called amalgam.

Example :- Silver amalgam, Sodium amalgam, copper amalgam.

Composition and Uses of Brass, Bronze Alnico & Duralumin

Brass

Composition → Cu – 60–90%.
Zn – 10–40%.

Uses :– It is used in making Utensils, Jewellery, Musical instrument, Battery Caps, Name plates etc.

Bronze

Composition → Cu – 80–95%.
Sn – 5–20%.

Uses :– It is used in making Making imitation Jewellery, water fitting. Statues, Medals, Coins etc.

Alnico

Composition → Steel – 50%.
Al – 20%.
Ni – 21%.
Co – 9%.

Uses :– It is used in making Permanent magnet.

Duralumin

Composition – Al – 95%.
Cu – 4%.
Mn – 0.5%.
Mg – 0.5%.

Uses :– It is used in making Air ships, Light weight vehicular Parts etc.