

8th synthetic materials

- ⇒ Synthetic materials are kinds of materials obtained from the synthesis of chemicals.
- ⇒ The chemicals used for synthetic materials are obtained from petroleum and natural gas(methane)
- ⇒ Petroleum and natural gas is compound of hydrogen and oxygen called hydrocarbon.
- ⇒ Monomers are simple chemical molecules of hydrocarbon.
- ⇒ When monomers join end to end form a long chain of monomers called polymers. The process of the formation of polymers is called polymerization.
- ⇒ Cellulose [beet root] is polymers of glucose while Hemoglobin is polymers of amino acid.
- ⇒ Fibres are thin thread like materials used to prepared cloths.
- ⇒ Fibres obtained on mixing natural and synthetic fiber are called semi synthetic fibre. e.g. rayon

Rayon

- ⇒ Rayon is synthetic fibres obtained from cellulose.
- ⇒ Rayon are of three types: Viscose Cupreammonium (cupro) and acetate rayons.

Viscose Rayon

- ⇒ In industry cellulose dissolved in mixture of sodium hydroxide (NaOH) and CS₂ (carbon disulphide) to get Viscous liquid [semi solid] called viscose.
- ⇒ Viscose is forced to spinnerets [an apparatus having small holes like shower] into an acid bath [through solution of acid like H₂SO₄] . Thus filaments of rayon are obtained which is spun into thread.

Cupro Rayon

- ⇒ Cupro Rayon are obtained on dissolving cellulose into solution of CuSO₄ and NH₄ . The dissolve solutions forced to spinnerets into an acid bath to get filaments of cuprammonium rayon are obtained which is spun into thread.

Acetate Rayon

- ⇒ Acetate Rayon is obtained on dissolving cellulose into solution of Acetate and H₂SO₄.

Rayon in our daily life

- ⇒ Rayon mixed with cotton or silk to make smooth and silky cloth in textile industry.
- ⇒ Rayon mixed with wool to make carpet.
- ⇒ Rayon are also used for making reinforced tyre, bangles and surgical dressing
- ⇒ The name Nylon derived from the New York [NY] and London[LON] as Nylon was first produce in both places at same time.

NYLON

- ⇒ Nylon (polyamides) was first prepared in 1935 chemically.
- ⇒ Nylon are prepared using cyclic hydrocarbon Benzene(C_6H_6)
- ⇒ Nylon has silk like texture and high tensile strength[Drawn into long thin straps]

Nylon in our daily life

- ⇒ Nylon is mainly used for making ropes, woman's wear, fishing net, sari socks and tie

Polyster

- ⇒ Polyster is obtained from polymer of ethene called easter. It has maximum stretchable strength.
- ⇒ Terylene, Dacron are kinds of Polyster used for dress, cloth and curtain.
- ⇒ Terylene mixed with cotton and wood to produce terycot and terry wool respectively.
- ⇒ Polysters are also used for making sail for sail boat and conveyor belts.

Acrylics

- ⇒ Acrylics fibres are obtained on dissolving acetylene[C_2H_2] into suitable solvent like HCN and then forced to spinneret because acetylene decompose without melting.

Acrylics in our daily life

- ⇒ They are light and soft like wool. The y are crimp (wavy) and straight like Polyster thus appear to be bulky and look like wool.
- ⇒ They are resistant to weather as they are not easily acted upon by moisture.

Advantages of synthetic fibres

- ⇒ Having long lasting luster and do not turn yellow with age
- ⇒ Easy to clean and dry up quickly
- ⇒ Durable and do not shrink on washing
- ⇒ They are less expensive than cotton
- ⇒ They do not depend on plants or animal like cotton

Advantages of synthetic fibres

- ⇒ They get electrically charged in dry weather and cause skin irritation
- ⇒ They melt and form sticky beads on heating. There is always a risk of getting burn in kitchen
- ⇒ They are hydrophilic as do not absorb sweat and moisture thus uncomfortable to wear.
- ⇒ They are non bio degradable and cause pollution.
- ⇒ They are good absorber of radiant heat and not fit in summer.

Good to more good

To make wide spread use of synthetic material it is mixed with natural fibre .There are called blend fibre.

PLASTIC

- ⇒ Plastic : Any material which can be molded into any desirable shape on heating is called plastic

⇒ Petroleum product such that Ethane, propane, benzene, toluene etc are used for manufacturing plastic.

Plastic

Thermoplastic

Thermosetting

Thermosetting Plastic

- ⇒ Thermosetting plastics are kind of plastic which once moulded cannot be moulded again by heating.
- ⇒ Thermosetting plastics are kind of plastic whose polymers form highly cross linked chain on heating.
- ⇒ Bakelite, melamine, Formaldehyde are some of the examples of Thermosetting Plastic

Thermoplastic Plastic

- ⇒ Thermoplastic are kind of plastic which can be moulded again and again by heating and easily reused.
- ⇒ PVS, Polystyrene, nylon, polythene are some of the examples of Thermoplastic Plastic
- ⇒ Polymers of thermoplastic Plastic have long chain without cross linked to each other.

Characteristics of plastic

- ⇒ Plastic has much less toughness as compared to metal
- ⇒ having light weight
- ⇒ It is not affected by acids and bases.
- ⇒ Plastic are non bio degradable as it is weather resistant
- ⇒ Plastic are bad conductor of heat and electricity
- ⇒ Plastic melts on heating

Some of the common plastics are

a. Polythene

- ⇒ it is obtained from polymerization of ethene. it is non bio degradable .
- ⇒ it is a kind of thermosetting plastic
- ⇒ it is insoluble in any solvent
- ⇒ it is light weight
- ⇒ it is anti corrosion and insulator
- ⇒ it is used for making bag, adhesive tap, electric wire cover and can

b. Polyvinyl chloride (PVC)

- ⇒ it is use for making sole of shoe
- ⇒ it is use for making covering of electric wire
- ⇒ it is use for making sanitary fittings

c. Polystyrene

- ⇒ It is a polymer of polythene .
- ⇒ it is a kind of thermosetting plastic
- ⇒ it is highly transparent
- ⇒ it is use for making cups of hot drink , toy etc.
- ⇒ it is use for safe packaging of expensive items
- ⇒ it is use for making Styrofoam[themocole]
- ⇒ it is use as insulating material in refrigerator

d. Teflon

- ⇒ It is prepared by using tera- fluoroethene.
- ⇒ Heat and chemical are not effective on Teflon
- ⇒ it is use for making non stick cooking were
- ⇒ it is use for making corrosive proof coating in industry

e. Bakelite

- ⇒ it is a kind of thermosetting plastic
- ⇒ it is use for making electrical switches and plug
- ⇒ it is use for making gear wheel
- ⇒ it is use for making table top
- ⇒ it is use for making comb, pen bodies and photograph records

f. Melanin

- ⇒ It is hard and highly polished polymers used for making unbreakable kitchen were.

Some of the common synthetic polymers not used in textiles industry

| S. No. | Polymers | Use to make |
|--------|--------------------------|---------------------------------------|
| 1. | Polythene | Packaging material, carry bag, bottle |
| 2. | Polypropene | Bottles, Crates |
| 3. | PVC | Pipes, Insulation |
| 4. | Teflon | Non stick Kitchen were |
| 5. | Polystyrene | Foam, Thermocol |
| 6. | Bakelite | Electrical insulation, Button] |
| 7. | Lexan | Bulletproof glass |
| 8. | Melanin | Crockery |
| 9. | Perspex | Window of car, train and aircraft |
| 10. | Vinyl rubber | Rubber, eraser |
| 11. | Neoprene | Rubber |
| 12. | Poly[styrene -butadiene] | Rubbers ,Bubble gums |

Trend Setter Solve Questions

Q. What are the polymers used in bubblegum, Thermocol, and synthetic eraser

Answer: The polymers used in bubblegum, Thermocol, and synthetic eraser are Poly[styrene – butadiene], Polystyrene and Vinyl rubber respectively.

Q. Name the polymers obtained from chemical derived from natural gas?

Answer: Acetylene and Formaldehyde

Q. Why are acrylics not spun from the melts?

Ans: acrylics decompose without melting on direct heating so they are not spun from the melts.

Q. What are those material called that (a)attract water (b)repel water

Ans: (a)attract water – Hydrophilic (b)repel water- Hydrophobic

Q. Name some natural fibres?

Answer: Fibres obtained from plants or animals is called natural fibres for examples cotton, wool, silk, etc.

Q. What do you mean by synthetic fibres?

Answer: Fibres made by human beings using chemical substance is called synthetic fibre. A synthetic fibre is a chain of small unit of chemical substance joined together. These small units combine to form a large single unit called a polymer. The word 'polymer' comes from two Greek words; poly meaning many and mer meaning part/unit. So, a polymer is made of many repeating units.

Q. Name a polymer occurs naturally?

Answer: Polymers that occur naturally is cellulose. Cellulose is made up of a large number of glucose units.

Q. Name a fibre having properties similar to that of silk.

Answer: Rayon.

Q. Although rayon is obtained from a natural source, wood pulp, yet it is a man-made fibre. Why?

Answer: This is because rayon is obtained by chemical treatment of wood pulp.

Q. Why does Nylon become very popular for making clothes for mankind?

Answer: Nylon is the first fully synthetic fibre prepared from coal, water and air in 1931. Nylon fibres are strong, elastic and light. It is lustrous and easy to wash. So, it became very popular for making clothes.

Q. Is nylon fibre really so strong that we can make nylon parachutes and ropes for rock climbing?

Answer: Yes, It is because nylon thread is actually stronger than a steel wire.

Q. Why does polyester fibre quite suitable for making dress material?

Answer: Fabric made from Polyester fibre does not get wrinkled easily. It remains crisp and is easy to wash. So, it is quite suitable for making dress material. Terylene is popular polyester.

Q. Name a form of polyester which is used for making bottles, utensils, films, wires and many other useful products? Ans: PET Q.

Q. Name the chemical used to make polyester?

Answer: Esters are the chemicals used to make polyester.

Q. Why synthetic fibres are more popular than natural fibres?

Answer: Synthetic fibres dry up quickly, durable, less expensive, readily available and easy to maintain which makes them more popular than natural fibres.

Q. Identify the Synthetic fibre appears to resemble wool?

Answer: acrylic.

Q. is there any a disadvantage of using synthetic fibres?

Answer: Yes. Synthetic fibres melt on heating and sticks to the body of the person wearing it. We should, therefore, not wear synthetic clothes while working in in the kitchen or in a laboratory. It is non biodegradable and causes soil pollution.

Q. What are petrochemicals?

Answer: All the synthetic fibres are prepared by a number of processes using raw materials obtained from petroleum, called petrochemicals.

Q. Plastic articles are available in all possible shapes and sizes. Give reason?

Answer: plastic is easily mouldable i.e. can be shaped in any form. Plastic can be recycled, reused, coloured, melted, rolled into sheets or made into wires.

Q. Explain the difference between thermoplastic and thermosetting plastic?

Answer: Some plastic gets deformed easily on heating and can be bent easily are known as thermoplastics. Polythene and PVC are some of the examples of thermoplastics. some plastics which when moulded once, cannot be softened by heating. These are called thermosetting plastics. For examples: Bakelite and melamine.

Q. Name a plastic used for making electrical switches and handles of various utensils? Answer: Bakelite as it is a poor conductor of heat and electricity.

Q. Name a plastic which is used for making floor tiles, kitchenware and fabrics which resist fire?

Answer: Melamine because it resists fire and can tolerate heat better than other plastics.

Q. why plastic are used to store various kinds of material like food and chemicals?

Answer: This is because plastics do not react with water and air and not corroded easily.

Q. List some properties of plastic.

Answer: (i) Plastic is non-reactive (ii) Plastic is light, strong and durable (iii) Plastics are poor conductors

Q. Name a plastic which is used for nonstick coating on cook wares?

Answer: Teflon is a special plastic on which oil and water do not stick. It is used for nonstick coating on cook wares. Q. Name a special type of plastic used as Fire-proof plastics? Answer:

Melamine plastic. The uniforms of firemen have coating of melamine plastic to make them flame resistant. Special plastic cookware is used in microwave ovens for cooking food.

Q. Disposal of plastic is a major problem. Why?

Answer: Since plastic is non bio degradable takes several years to decompose, it is not environment friendly and causes environmental pollution. The burning process of the synthetic material is quite slow and it does not get completely burnt easily. In the process it releases lots of poisonous fumes into the atmosphere causing air pollution.

Q. As a responsible citizen what measures do you suggest to keep public places clean and free of plastic?

Answer:

(i) Do not throw plastic bags in the water bodies or on the road.(ii) Take a cotton carry-bag or a jute bag while going for shopping. (iii) Try to minimise the use of plastic materials e.g., use a steel lunch box instead of a plastic one.

Q. Describe an activity to show that thermoplastic is a poor conductor of electricity.

Answer: For this, take a discarded plastic toy, a torch which is in working order. Switch the torch on to check that it is in working condition. From the plastic toy, cut a small piece about the size of a coin. Now insert this coin between two cells of the torch. Then tighten the lid of the torch. Now, switch on the torch. You will notice that the bulb does not glow. This happens because the plastic coin; between two cells; does not allow current to pass between two cells.

This shows that thermoplastic is a poor conductor of electricity.

Q. why recycled plastics should not be used for storage of food?

Answer: The recycled plastics should not be used for storage of food materials because there are chances of contamination of unwanted substance residues that may present inside the plastic before recycling. Those contaminants may appear in the recycled products also. So it is better to use recycled plastics in non food purposes.

Q. Explain why storage of Acrylic needs no special care unlike woollen clothes ?

Answer: Acrylic is synthetic wool which is resistant to the action of moths and insects while woollen clothes need to be stored in naphthalene as they are attacked by insects.

Q. Give reasons -

Answer: a. Buckets are made of plastics these days - As plastics are light in weight ,strong do not rust

b. Bakelite plastic is used to make electrical switches.- As Bakelite is a poor conductor of heat and electricity.

c. Melamine is used to make crockery – As it is unbreakable, resist fire and tolerate heat better than other plastics.

d. Plastics are used in cars, aircrafts and space crafts – As they are light in weight, corrosion resistant, strong and durable. e. Chemicals are stored in plastic bottles – As they are resistant to the action of chemicals, light , unbreakable and corrosion resistant.