Synthetic Fibres and Plastics

Synthetic Fiber and Their Characteristics

❖ SYNTHETIC FIBRES: -

Those fibres which are synthetically man made, and are polymer of small units are called synthetic fibre.

• The word polymer is made up of two Greek words poly which means many and mer means unit.

• All the synthetic fibres are prepared from raw materials of petroleum origin called petrochemical. eg. Nylon, Polyester etc.

POLYMERISATION

Synthetic fibres are polymers. A polymer is a large molecule formed by the combining of many small molecules, each of which is called a monomer. The process of combining the monomers to form a polymer is called polymerisation. Polymerisation can be of various kinds, for example : addition polymerisation and condensation polymerisation.

Types of Synthetic fibres

1. Rayon

2. Nylon

3. Polyester

4. Acrylic

5. Spandex

1. RAYON

It was prepared by chemical treatment (viscose process) of wood pulp (cellulose). It is also called artificial silk because it resembles in appearance like natural silk.

Properties :

(i) Rayon can absorb sweat because of its tendency to absorb moisture. So it is preferred over other synthetic fabrics in summer season.

(ii) It is shiny and lustrous and resembles to silk.

(iii) It can be dyed in a wide variety of colours.

Uses :

(i) Rayon is mixed with cotton to make bed sheets and mixed with wool to make carpets.

(ii) Shirts, ties and linings are made up of rayon fibre.

(iii) It is used to manufacture tyre cords

(iv) It is used to make bandages and surgical dressings.

2. NYLON

- Nylon was first introduced in 1930s.
- It was developed in Newyork (Ny) & London (Lon) so it was named as Nylon.
- It was the first man made fully synthetic fibre.
- It is a polymer made from two monomers, a diacid and a diamine, by the process called condensation polymerisation.
- There are various nylons such as nylon 6, nylon 6-6 and nylon 5-10.

Properties :

(i) Nylon has high strength and high elasticity. It does not lose strength even after repeated use.

(ii) It is lustrous and easy to wash.

(iii) It absorbs very little water hence known to have drip-dry property.

(iv) It is wrinkle resistant and keeps permanent creases.

(v) It is moth and mould resistant.

(vi) It is light, fine and durable.

Uses :

(i) In making socks, sarees, shirts and other garments.

(ii) It is used to blend with wool to increase the strength & used in making carpets.

(iii) Used to make tents, parachutes, umbrella, fishing nets, climbing ropes, tyre cord, strings for sports goods.

(iv) It's fibres are used for making tooth brush, car seat belt, slipping bags and curtains.

(v) It is used to make machine parts.

MAKING NYLON 6-6 : Nylon 6-6 is a commerically successful variety of nylon made from adipic acid and hexamethylene diamine. First 6 in 'nylon 6-6' refers to the 6 carbons of adipic acid and the second 6 to the 6 carbons of the diamine.

Adipic acid + hexamethylene diamine $\rightarrow$ nylon 6-6 + water

The reaction is carried out at high temperature and pressure. The molten nylon 6-6 is then forced through a spinneret, with very fine holes into air where it hardens into filaments. The fibres are then stretched upon cooling.

3. POLYESTER

It is made of repeating units of a chemical called "ester" which has fruit like smell. Most polyester fabrics have excellent wash and wear characteristics and therefore requires minimum care eg. Terylene and Dacron.

Blended fibres :

Fabrics are sold by names like polycot, polywool, terrycot, etc. As the name suggests, these are made by mixing two types of fibres.

Polycot $\rightarrow$ Polyester + Cotton.

Terrycot $\rightarrow$ Terrylene + Cotton.

Polywool $\rightarrow$ Polyester + Wool

Properties :

(i) It absorbs very little water so dry quickly.

(ii) (ii) It is strong, light weight, wrinkle resistant and elastic fibre.

(iii) (iii) It is not attacked by moths and ordinary chemicals.

(iv) (iv) It can be drawn in to very fine fibres that can be woven like any other yarn.

Uses :

(i) Polyester fibres are used in manufacture of textiles.

(ii) (ii) Terry wool, a blend of terylene and wool, is used for making suits, Terrycot is used for making skirts, shirts and other dress materials.

(iii) (iii) It is used to make light weight sails, conveyor belts.

(iv) (iv) Polyester films, which is known as "mylar" are used for making magnetic recording tapes in audio cassettes, video cassettes and floppy discs.

Making Polyester : PET (polyethylene terephthalate), the commonly used polyester, is made from two monomers.terephthalic acid and ethylene glycol, by the process called condensation polymerisation terephthalic acid + ethylene glycol $\rightarrow$ polyethylene terephthalate (PET) + water.

4. ACRYLIC

Synthetic fibre prepared from acrylonitrile (Monomer unit). Acrylic fibre is also known as polyacrylonitrile ("PAN") or "Orlon" or Acrilan"

Properties :

(i) It is warm, soft, light and flexible fibre.

(ii) (ii) It closely resembles to wool in its properties & cheaper than natural wool.

(iii) (iii) Acrylic yarn can be easily knitted.

(iv) (iv) They are available in variety of colours.

Uses :

(i) Acrylic fibre is used for making sweaters, socks & shawls.

(ii) It is used for making carpets and blankets.

5. SPANDEX

Spandex is known for its high elasticity which makes it suitable for use in clothes, that require snug fitting eg swimming costumes. It is also known as "LYCRA" . When spandex is blended with cotton fabrics, stretched fabric is obtained which is used for making T-shirts and caps.

Uses :

It is used in the making of costumes, caps, T-shirts etc.

ADVANTAGES AND DISADVANTAGES OF SYNTHETIC FIBRES :

	Advantages	Disadvantages
1.	Its tensile strength is high and it can bear heavy loads without breaking	Synthetic fibres can absorb very little moisture. It becomes sticky when body sweats.
2.	These fibres are generally elastic in nature. It can regain its original shape after stretching or compressing to some extent.	These fibres have low melting points so melts easily, so it is dangerous to worn while working in the kitchen,
3.	These fibres are wrinkle resistant.	It requires very careful ironing.