

## **FIBRE:**

A fibre is a piece of material that is long, thin and flexible, like a length of thread. Plant fibres are the basis of fabric such as cotton. Silk and wool fibres come from animals. In the 20th century many artificial fibres were invented like nylon and polyester.

## **Natural and synthetic fibres**

The differences are as follows:

Natural Fibre	Synthetic Fibre
These fibres are from natural farming, animal husbandry and insects.	These fibres are generated by man. We do not get these fibres from nature but are generated from natural (cellulose and protein) and chemical substances.
Fibre length is given by nature that is, fixed.	Fibre length is not fixed and is controlled by man.
We get fibres as staple or filament (silk).	Generally we get fibres as filament but we can also get as staple or cut-length.
Fineness varies from one fibre to another fibre.	Fineness depends on the manufacturers.
Less strength and durability.	More strength and durability.
Strength increases in wet condition.	Strength increases in dry condition.
Some short fibres remain with long fibres.	There is no short fibre.
No need of spinneret.	Need of spinneret.
No need to mix chemicals to produce fibre or yarn.	Need to mix chemicals to produce filament or staple.
Apparels produced from natural fibres are comfortable.	Apparels produced from man-made fibres are less comfortable
More demandable in producing apparels.	More demandable in producing other textile end products rather than apparels.
Bears dust and trash.	Do not bear any dust or trash.
Bears crimp naturally.	We have to give crimp manually.
Generally fibres are hydrophilic.	Generally fibres are hydrophobic.
In most cases, scouring and bleaching is needed.	No need of scouring and bleaching but sometimes cleaning is needed.

Easy to dye.	Difficult to dye.
It is expensive.	It is cheaper.
Comparatively have less life time.	Comparatively have more life time.
Uses of natural fibre are limited.	Uses of man-made fibre are not limited.
We cannot change the structure.	We can change the structure.

## RAYON

This fibre is made from cellulose, i.e., it is a regenerated cellulosic fibre. Its raw material is wood pulp or cotton linters. Pure cellulose is extracted and is reprocessed under controlled conditions to form fibres once again.

The purified cellulose is treated with chemicals and a thick, viscous honey-coloured spinning solution is obtained. It is then forced through the holes of a spinneret into a suitable medium so that the liquid flowing continuously through the spinneret holes solidifies into filamentary fibres. Mainly three types of Rayons are known: Viscose Rayon, Cuprammonium Rayon and High-wet-Modulous Rayon. Different chemicals are used for obtaining above types of Rayons.

### (a) COMPOSITION:

Mainly it is cellulose in the regenerated form.

### (b) PROPERTIES:

(i) Microscopic Structure: Under the microscope, it is a rod-like structure having uniform diameter and smooth walls. A number of striations are visible in its longitudinal section. (Fig. 11.6)

(ii) Length: It is a long filament fibre.

(iii) Colour: It is transparent, but desirable colour can be imparted before forcing the solution through the spinneret. This dyeing is called solution dyeing.

(iv) Lusture: It is very highly lustrous. Its lustre can be reduced by adding a delustering agent (titanium dioxide) to the spinning solution.

(v) Strength: It varies from fair to excellent depending upon the process of manufacture. It loses its strength when wet.

(vi) Elasticity: It is generally low.

(vii) Absorption: Greater than natural cellulose fibres.

(viii) Thermal Properties: Burns very quickly with smell of burning paper. Ironing temperature is 275°F.

(ix) Chemical Resistance: Like cotton, Rayon is easily damaged by acids but it is resistant to normal alkalis.

(x) Dyes: It can be dyed easily with Direct, Vat or Sulfur dyes. It is colorfast to washing and sunlight.

The uses of Rayon are :

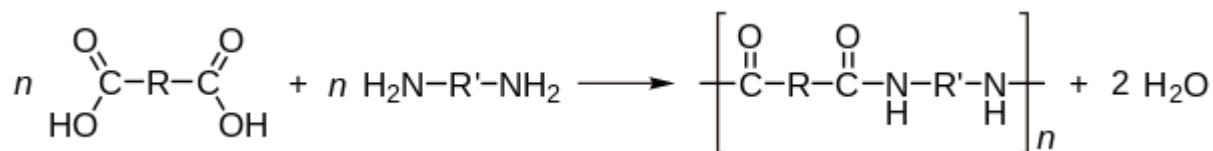
1. It is used in textile industry for making textiles.
2. Rayon is used for making tyre cords.
3. It is also used for making carpets and surgical dressings.

## NYLON

Nylons are condensation copolymers, formed by reacting di-functional monomers containing equal parts of amine and carboxylic acid, so that amides are formed at both ends of each monomer in a process analogous to polypeptide biopolymers. Most nylons are made from the reaction of a dicarboxylic acid with a diamine

Nylon are linear polymers, are the most useful, but it is possible to introduce branches in nylon by the condensation of dicarboxylic acids with polyamines having three or more amino groups.

The general reaction is:



Two molecules of water are given off and the nylon is formed. Its properties are determined by the R and R' groups in the monomers. In nylon 6,6, R = 4C and R' = 6C alkanes, but one also has to include the two carboxyl carbons in the diacid to get the number it donates to the chain. In Kevlar, both R and R' are benzene rings.

Industrial synthesis is usually done by heating the acids, amines or lactams to remove water, but in the laboratory, diacid chlorides can be reacted with diamines. For example a popular demonstration of interfacial polymerisation (the "nylon rope trick") is the synthesis of nylon 66 from a dipoly chloride and hexamethylene diamine

Uses :

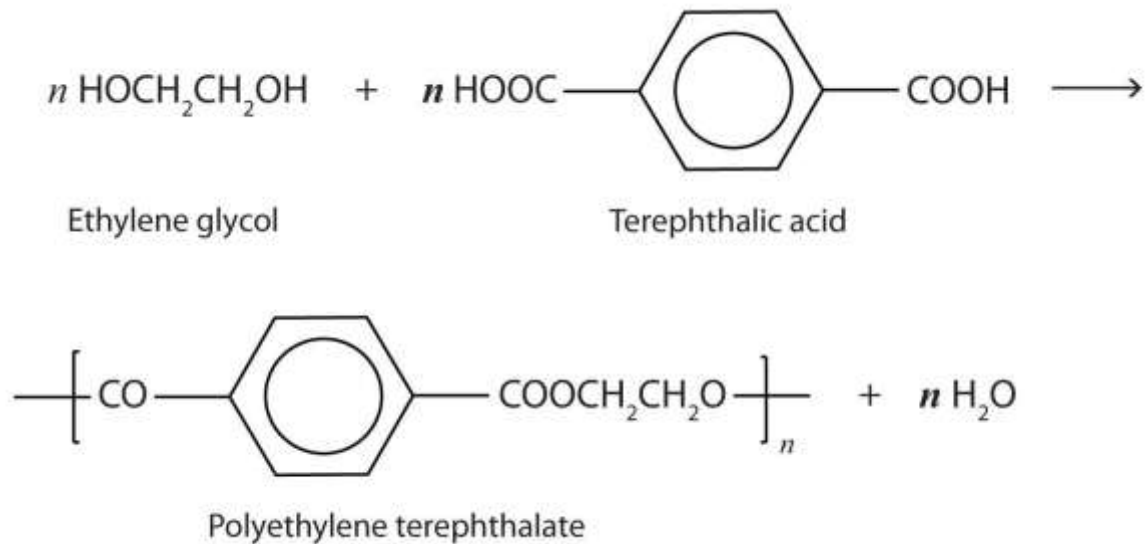
1. Nylon is a high strength fibre. It is used for making fishing nets, ropes, parachutes and tyre cords.
2. It is used for making fabrics in textile industry.
3. Crinkled nylon fibres are used for making elastic hosiery.
4. Nylon is widely used as plastic for making machine parts.

It is blended with wool to increase the strength.

## TERYLENE

### Definition:

Terylene is extensively used in textile industry to make hard wear clothes like sarees , taoestry and dress material. Terylene is made by a process of polymerizing ethylene glycol and terephthalic acid. It is also mixed with natural fibre like cotton and wool to make more variety of clothes.



### Properties and Use of Terylene are mention below:

#### Properties of Terylene:

- Terylene is a very strong fibre and will suffer very little loss in strength when wet.
- It is elastic in nature and possess the property of resist creasing.
- IT can be set into permanent pleats when subjected to the correct temperature, at the time of manufacturing.
- Terylene is easily washed and dries quickly.
- It is non-injured by acidic substances when used in the moderation process. Neither bleaches nor dry cleaning agents can harm it.

The dye uptake of Terylene subjected to dry and live steam heat can be characterized by a constant defined as the uptake divided by the square root of time ( $A/\sqrt{t}$ ), as in equation for diffusion. This constant is found to decrease to a minimum with increase in temperature of dry heating and then to increase to a value greater than that for the unheated yarn at high temperature of preheating.

Steam preheating also effects the constant and , at the higher temperature of steam heating, shows similar tendencies to those found for dry heat but to less extent. These result were obtained under the condition that allow free shrinkage during dyeing. However, if dyeing is carried out with the material under tension, although the general tendency is the same, the dye-uptake constant is greater than that for the corresponding samples dyed in the absence of tension and is greater than that of the unheated yarn for most of the samples.

Measurement of parameters indicative of structural changes in fibres, e.g. moisture regain, density, X-ray orientation shows that these variations in dyeing properties cannot be expressed on the basis of the fringe-micellar n/w theory of structure. An explanation in advance form which postulates a structure with rod-like morphological units separated by narrow voids, the size, amount and virtuosity of which govern the accessibility of the dye.

**Use of Terylene:**

- Terylene is mainly used in making plastic bottles and clothing.
- It is also used for making-
  1. Terylene fiber is used as polyester tricot knit as a fashion garments fabric.
  2. Used for the laundry usage as a automatic clothing vacuum packaging machine.
  3. It is used to make nonwoven needle punched carpet particularly for the exhibition use.