4. VISCOSE RAYON

Do you know?

Why do we like to wear silk clothes on special festive occasions?

Do you know of any other fibre which is near to silk in its looks and feel?

Have you ever wondered which fibre apart from cotton is used for making diapers, sanitary napkins and medicinal gauze?

Besides the natural fibres available to us, there are a number of other types of fibres made by mankind which we use for various purposes in our daily life, one of them is viscose Rayon.

The basic premise for making a man-made fibre is like that of a silkworm –

A. A solution is created by mixing and melting different chemicals.

B. This solution is then passed through tiny holes to get thin streams of the liquid on the other side.

C. These streams solidify to become filament which are then converted into yarns.

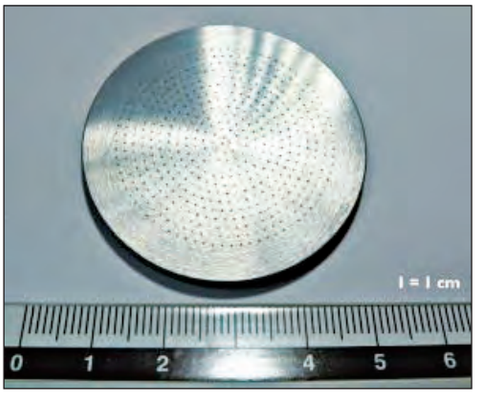
You should Know ?

A special device called spinneret was invented for making man-made fibres. It is made of steel and consists of number of tiny holes. The prepared solution is passed through the holes of this spinneret with pressure. It emerges on the other side in form of thin streams, which harden to become fibres.

A peek in the History!

As population grew, its demand of clothing also grew. The natural fibres were unable to meet this increasing demand as their production was limited and seasonal. This led scientists to find ways of creating fibres. The first written comment concerning the potential of creating man-made fibre is found in Robert Hooke's 'Micrographia' published in 1664. However, not until the 19th century did scientist actually make artificial fibres.

These new fibres are barely 140 years old but because of their durability, ease of maintenance and many other good qualities have become very popular in a short time. They have replaced natural fibres to a large extent and have become an integral part of our daily life. They are known as Man-made Fibres or Synthetic Fibres.



Picture no. 4.1 Spinneret

A great advantage of man-made fibres is that the manufacturer can decide many of the properties of these fibres –

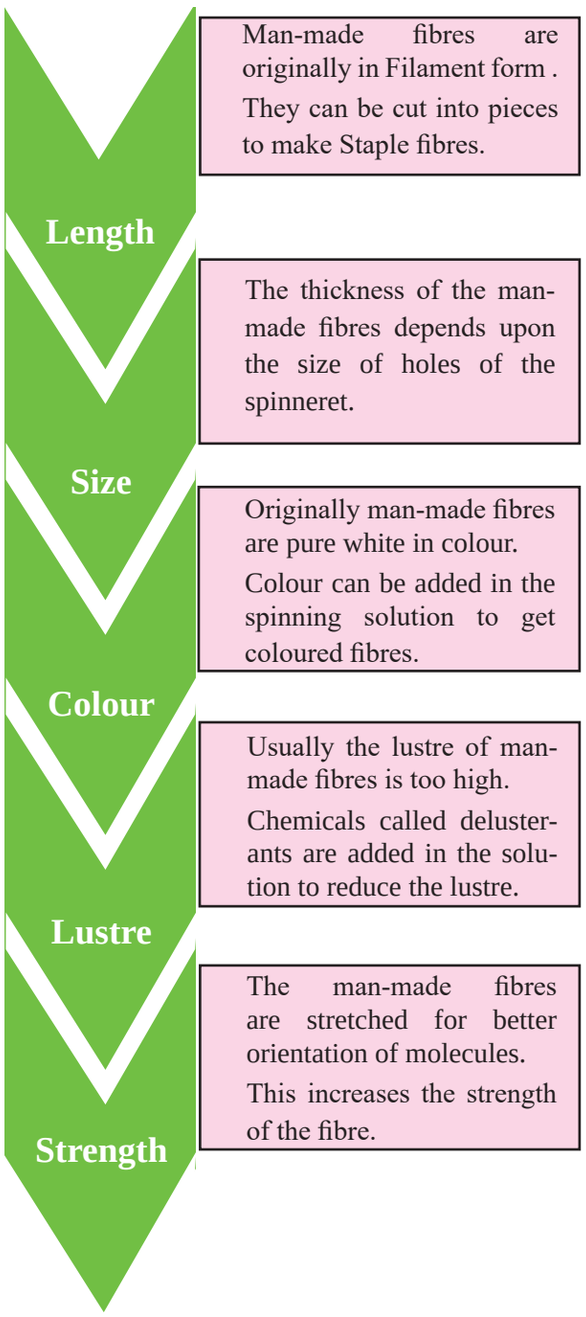
4.1 History of Rayon

Everybody liked to own and wear silk clothes because of their beauty but silk has

been very costly right from the time it was discovered. It was considered as a fabric for royalty because common men could not afford it. Scientists have been trying since a long time to make a cheaper substitute of silk. Count Hilaire de Chardonnet was the first person to successfully make such a fibre.

The Rayon produced by Count Hilaire de Chardonnet is now of historical importance only. The chemical used by him i.e. nitrocellulose is highly combustible and so large scale production of this rayon can be hazardous.

Chart No. 4.1 Controllable Properties of man-made fibres.



The beginning!

It was **Count Hilaire de Chardonnet,** a French chemist who produced the first man-made textile fibre in 1884 from nitrocellulose. This fibre was known as **Artificial silk.** In 1924 it was named as **'Rayon',** which means reflecting sunlight.

Amongst all the rayons, nowadays Viscose Rayon is the one which is produced and used maximum. The **viscose** process was discovered by the English scientist **C.F Cross and E.J Bevan** in 1892. The name viscose was derived from the word viscous, which means a thick liquid like honey. In this book, we will be studying about Viscose Rayon only.

You should Know ?

Rayon is the generic name of the family of fibres produced by same methodology but using different chemicals. There are many types of rayons like :

1. Nitrocellulose Rayon
2. Viscose Rayon
3. Cuprammonium Rayon
4. Acetate Rayon
5. Polynosic Rayon etc.

4.2 Making of Viscose Rayon

The principle raw material for viscose rayon is cellulose, obtained from **wood pulp and cotton linters.** As the raw material is cellulose, rayon is also known as **Regenerated Cellulosic Fibre.**

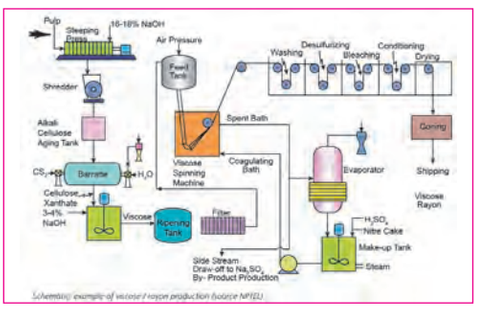
The cellulose is purified and treated with different chemicals and made to go through a number of processes to get a thick, orange

coloured liquid which looks and flows like honey. This is known as **Viscose Solution** (see Picture no. 4.2). This liquid is aged for some time, filtered and then it is ready to be converted into fibres.



Picture No. 4.2 Viscose Solution

The Viscose rayon spinning solution solidifies in water medium and hence, the process is known as Wet spinning method. The spinneret is fitted on the side of a water bath known as Spinning Tank having warm acidic water and streams of the spinning solution emerge into that water. By the time they reach the other side of the water bath, they coagulate to form Viscose filament fibres. These fibres are then collected on spools for further treatments.



Picture No. 4.3 Wet Spinning

4.3 Properties of Viscose Rayon

Microscopic Properties:

The longitudinal appearance of regular viscose rayon exhibits uniform diameter and internal parallel lines called **striations.** If the fibre has been delustered, it will have a grainy pitted appearance. Bright fibre is relatively transparent (For diagram of microscopic appearance of Viscose Rayon, refer to Practical No. 6)

Physical Properties:

1. **Length:** The length of viscose rayon fibre can be controlled as it is a man-made fibre. It is manufactured as a filament fibre but can be cut to staple length.
2. **Lustre:** Rayon fibre is highly lustrous and can cause glare to eyes. To control its lustre, delusterants like Titanium dioxide are added in the viscose solution.

Can you guess?

1. Rayon fabrics frail at knees and elbows. Why?

   Hint : Answer lies in the strength and elasticity of the fibre.
2. Rayon fibres are used in making diapers and sanitary napkins. Why?
3. Rayon is used in blended fabrics in place of cotton. Why?

   Hint: Answer lies in the texture and moisture absorption of the fibre.

3. **Strength:** It is a comparatively weak fibre and in wet condition, the strength decreases further. Therefore it should be handled carefully while using or laundering.
4. **Elasticity:** The elasticity of viscose rayon is low.
5. **Texture :** Very smooth and soft.
6. **Resiliency:** Rayon fabrics have low resiliency. The fabric creases easily and frequent ironing is required.
7. **Moisture Absorption:** The moisture absorption of viscose rayon is higher than those of natural cellulosic fibres such as cotton and linen. It loses 50% of its strength when wet and therefore requires special care while laundering.

8. **Density:** The density of viscose rayon is 1.5gm/cc which is similar to that of the natural cellulose fibres. It produces fabrics which are heavy in weight.

Biological properties:

1. **Effect of mildew:** Being a cellulose fibre it is harmed by mildew if left damp, but is not affected by it in dry condition.
2. **Effect of moth:** Viscose rayon is resistant to the damage caused by most moths and insects but can be damaged by silverfish.

Thermal properties

1. **Effect of heat:** Hot water for washing or hot iron while ironing will damage viscose rayon.
2. **Heat Conductivity:** It is a good conductor of heat.

Can you give reason?

Rayon fabric is considered very suitable for summer wear. Why?

Hint : Answer lies in the moisture absorption and heat conductivity of the fibre.

4.4 Uses of Rayon

Rayon fibres are absorbent, soft and comfortable. Fabrics made out of this fibre have good drapability. Rayon fibres are used in apparel, home furnishing, medical, surgical products and for nonwovens. Rayon is often used as a substitute to cotton, as it is cheaper than cotton. It is widely used in making blends with other fibres like cotton, nylon, polyester, acrylic etc. where it contributes softness, lustre and absorbency. Following are some of the uses of viscose rayon:

Apparel Uses: Casual and party wear, sarees, undergarments, sportswear etc.







Pic No. 4.4 Apparel Uses

Household Uses: Curtains, draperies, bed sheets, tablecloth, towels, blankets, mops etc.





Pic No. 4.5 Household Uses







Pic No. 4.6 Miscellaneous Uses

Miscellaneous Uses: The third most important use of rayon is in non-woven fabrics, where absorbency is important. Items include industrial wipers, medical supplies including bandages, diapers and sanitary napkins. These products are biodegradable.

Use Your Brain power

1. Complete the given flow chart :



2. Who am I ?

1. I made the first Rayon fibre.
2. My name means 'reflecting sun rays'.
3. I am the main raw material for making rayon.
4. I am the orange coloured solution used for making rayon fibres.
5. I am the common delusterant used for viscose fibres.

EXERCISE

Objective Type Questions

1. Match the following :

(i)

A		B	
1.	viscose solution	a.	cotton linters
2.	making viscose fibres	b.	artificial silk
3.	other name for rayon	c.	wet spinning
4.	raw material for viscose	d.	like honey
		e.	nitrocellulose

2. Select and write the most appropriate answer from the given alternatives for each question :

1. Rayon is also called
   a. Mineral fibre
   b. Regenerated Cellulosic fibre
   c. Synthetic fibre
2. Originally Rayon has
   a. Very high lustre
   b. Very low lustre c. No lustre
3. Rayon fibres are made by this method
   a. Melt spinning b. Wet spinning
   c. Dry spinning
4. Strength of Rayon is
   a. Good b. Moderate
   c. Bad

3. Write whether the given sentences are True or False :

1. Rayon is a weak fibre.
2. Delusterant is usually used while manufacturing Rayon fibres.
3. Rayon is usually used in blended form with other fibres.
4. Rayon starts melting beyond a certain temperature.
5. Rayon has low moisture absorption.

4. Name the following :

1. Raw material for making Viscose rayon.
2. Spinning method for Viscose Rayon.
3. Device used for making Rayon fibres.

Short Answer Type Questions

1. Define following terms:

1. Spinneret
2. Regenerated Cellulosic Fibre
3. Wet spinning

2. Give Reasons :

1. Rayon fabric frails at knees and elbows.
2. Rayon is used in making sportswear.
3. Rayon is considered good summer wear.
4. Wet spinning method is used for making Viscose fibres.
5. We should be careful while washing rayon fabrics.

3. Answer in short :

1. Uses of Viscose Rayon.
2. Microscopic structure of Viscose Rayon.
3. Biological properties of Viscose Rayon.