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FIBRES

CLASSIFICATION:

1. Vegetable origin – cotton, jute
2. Animal origin – wool, silk
3. Mineral origin – asbestos, glass wool
4. Synthetic origin – nylon, terylene
5. Regenerated from cellulose – rayon
6. Regenerated from protein – milk protein, groundnut

COTTON / RAW COTTON

BIOLOGICAL SOURCE: trichomes of seeds of cultivated species of gossypium herbaceum

Family: malvaceae

GEOGRAPHICAL SOURCE: India, Egypt

Collection:

The capsule of cotton consists contains large number of seeds covered with trichomes

The trichomes are separated

Long trichomes are used in preparation of fabric & short ones are used in preparation of surgical dressings

This non absorbent cotton when treated with dilute soda solution for 10 to 15 hours at a higher pressure gets free of fats

The resulting absorbent cotton is dried, sterilized with gamma radiation

Description:

White, soft to touch

Chemical Tests:

ABSORBENT COTTON:

1. Fibre when treated with N/50 iodine solution & 80% H₂SO₄ gives a blue stain

2. Fibre when treated with cuoxam reagent, swells & dissolves
3. Fibre gives a blue stain with chlorzinc iodide

NON ABSORBENT COTTON:

1. Fibre when treated with cuoxam reagent, swells & dissolves with ballooning
2. Fibre gives a violet stain with chlorzinc iodide

Uses:

Fabrics, surgical dressings

JUTE

BIOLOGICAL SOURCE: obtained from phloem fibres of corchorus capsularis

Family: tiliaceae

Description:

Brown, rough to touch

Chemical Test:

1. Fibre when stained with phloroglucinol & HCl gives a deep red colour
2. Fibre gives a yellow stain with chlorzinc iodide

Uses:

Preparation of jute bags

SILK

BIOLOGICAL SOURCE: obtained from secretion / cocoon of bombyx mori

Family: bombycidae

Description:

Yellow, smooth to touch

Uses:

Sutures & ligatures

Collection:

The larvae produces fibroin from the mouth glands which gets united with a gum like secretion known as sericin to form a cocoon
These cocoons are exposed to steam & finally plunged in boiling water to separate the gum & the fibres

Chemical:

Proteins & sub units made of alanine & glycine

Chemical Tests:

1. Fibre does not blacken on treatment with lead acetate
2. On treatment with millon's reagent it gives a brick red colour

WOOL

BIOLOGICAL SOURCE: obtained from fleece of sheep ovis aries
Family: bovidae

Description:

Soft, lustrous

Preparation:

Raw wool is washed with water followed by a second washing with soap solution & then treated with sulphuric acid
The wool fat is separated by extracting with acetone
Thus wool fibre is obtained

Chemical Test:

Fibre blackens with lead acetate

Uses:

Fabrication, ligatures & sutures

GLASS WOOL

Source: made up of silica, mixture of silica & oxides of aluminium, calcium, boron & magnesium

Uses:

Insulating material & in manufacture of filters

Chemical Tests:

1. Fibre is partly soluble in 60% sulphuric acid
2. Fibre on ignition forms a hard bead

ASBESTOS

Source: consists of hydrated magnesium silicates & occurs as white, yellow or green fibres

Uses:

Filtering media

Chemical Test:

Fibre insoluble in warm HCl

NYLON

Source: polymer of adipic acid & hexamethylene diamine

Description:

It is dull or lustrous, white in colour

Uses:

Preparation of sutures & ligatures, sieves & fabrics

Chemical Tests:

1. Fibre soluble in warm HCl
2. Forms a hard bead on ignition

TERYLENE

Source: polymer of ethylene glycol & terephthalic acid

Uses:

Preparation of artificial grafts

Chemical Tests:

1. Fibre is soluble in formic acid
2. Forms a hard round bead on ignition

RAYON / VISCOUS RAYON / REGENERATED CELLULOSE

Preparation:

Cellulose is treated with sodium hydroxide to yield sodium cellulose
This when treated with carbon disulphide in sodium hydroxide gives sodium cellulose xanthate

The solution is passed through fine nozzles in a bath of sodium sulphate & H₂SO₄ to yield filaments of viscous rayon
It is further made free of sulphur, bleached & washed

Uses:

Preparation of surgical dressings & fabric

SHORT NOTE ON CELLULOSE

Cellulose is obtained from wood or cotton

It is extracted using hot methanol followed by methanolic NaOH treatment

The solution is further exposed to an explosion process wherein the high pressure is cut down in a very short interval of time

The cellulose thus obtained is a polymer of glucose units linked together in a beta- 1,4 linkage

Derivatives:

1. Ester: esterification of cellulose yields products such as cellulose nitrate & cellulose acetate which are used in the preparation of films & plasticizers
2. Ether: etherification yields products such as methyl cellulose, CMC, HPMC, HPC. The solubility of these polymers depends on the degree of substitution of hydroxyl group

Uses:

Stabilizers, suspending agents & ophthalmic solutions