

Unit - Chemistry of Fibres, Textiles and Garments

2011/2012 6 Lectures

Introduction

And I have often thought, that probably there might be a way found out, to make an artificial glutinous composition, much resembling, if not full as good, nay better, then that Excrement, or whatever other substance it be out of which, the Silk-worm wire-draws his clew. If such a composition were found, it were certainly an earie matter to find very quick ways of drawing it out into small wires for use. I need not mention the use of such an Invention, nor the benefit that is likely to accrue to the finder, they being sufficiently obvious. This hint therefore, may, I hope, give some Ingenious inquisitive Person an occasion of making some trials, which if successfull, I have my aim, and I suppose he will have no occasion to be displeas'd.

Robert Hooke (1665), "Micrographia, or, Some physiological descriptions of minute bodies made by magnifying glasses, with observations and inquiries thereupon".

It took several hundred years following this suggestion from Hooke before an "artificial silk" (synthetic fibres) became available. Prior to that, all textiles were created from natural fibres.





Pictures from a Beijing silk factory

Classification of Fibres - the basic structural element of textile products, links to Wikipedia.

Natural	Vegetable	Abacá (Manila Hemp) , Bamboo , Coir , Cotton , Flax (Linen) , Hemp , Jute , Kapok , Kenaf , Piñ , Raffia palm , Ramie , Sisal , Wood
	Animal	Alpaca , Angora , Byssus , Camel hair , Cashmere , Catgut , Chiengora , Guanaco , Llama , Mohair , Pashmina , Qiviut , Rabbit , Silk , Sinew , Spider silk , Wool , Vicuña , Yak
	Mineral	Asbestos
Synthetic	Cellulose	Acetate , Triacetate , Artificial silk , Bamboo , Lyocell Rayon , Modal Rayon , Rayon
	Mineral	Glass , Carbon (Tenax) , Basalt , Metallic
	Polymer	Acrylic , Aramid (Twaron , Kevlar , Technora , Nomex), Microfiber , Modacrylic , Nylon , Olefin , Polyester , Polyethylene (Dyneema , Spectra), Spandex , Vinylon , Vinyon , Zylon

Natural Fibres

The various natural fibres include:

Vegetable Fibres

1. fibre occurring on the seed (raw cotton, java cotton)
2. phloem fiber (flax, ramie, hemp, jute)
3. tendon fibre from stem or leaves (manila hemp, sisal hemp etc)
4. fibre occurring around the trunk (hemp palm)
5. fibre of fruit/nut shells (coconut fibre - Coir)

cotton and linen are the most important among them and are forms of cellulose.

Cellulose is the most common organic compound on Earth. About 33% of all plant matter is cellulose (the

cellulose content of cotton is 90% and that of wood is 40-50%).

Animal Fibres

1. Silk - composed of amino acids linked by amide bonds (polymer)
2. Wool - protein like material containing polypeptide chains (spiral polymer)

Leather made from animal hides (skin)

Mineral Fibres

1. Asbestos is a natural mineral fibre.

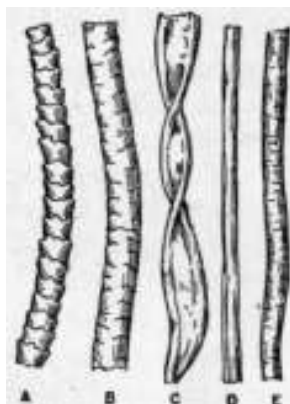
Synthetic Fibres

I-Semi-synthetic: Based on Natural Polymers.

- (i) Cellulose
- (ii) Cellulose Ester
- (iii) Protein
- (iv) Miscellaneous.

II-Synthetic Polymers.

- (i) Polyamides
- (ii) Polyesters fibres
- (iii) Polyolefin
- (iv) Poly-urethanes
- (v) Polyvinyl Derivatives like Poly-acrylonitrile (PAN), Polyvinyl Chloride (PVC), Polyvinylidene Chloride (Saran)



A comparison of Textile Fibres, A, Wool; B, Mohair; C, Cotton; D, Silk; E, Linen

The Fiber Reference Image Library (FRIL), a database of micrographs of textile fibers acquired through the use of multiple microscopic techniques, is available online at <https://fril.osu.edu/>.

Chemical treatment and modification of fibres.

Dyeing of fabrics.

- [Natural dyes](#)
[Logwood and Brazilwood](#)
- [Synthetic Dyes](#)

[Scotchgard](#)

[Dry cleaning](#)

[water repellants](#) and [water proofing](#)

[fire retardants](#) and fire proofing

[optical brighteners](#)

Acknowledgements.

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