Synthetic fiber & Plastic

Depending upon the type of chemical used for manufacturing synthetic fibres, there are four major type of synthetic fibres (or man-made fibres). These are:

(i) Rayon (ii) Nylon (iii)Polyester (iv) Acrylic

(i) Rayon

Rayon is often regarded as artificial silk. It is a manufactured regenerated cellulose fibre. It is made from purified cellulose, primarily from wood pulp, which is chemically converted into a soluble compound. It is then dissolved and forced through a spinneret to produce filaments which are chemically solidified, resulting in synthetic fibres of nearly pure cellulose. Because rayon is manufactured from naturally occurring polymers, it is considered a semi-synthetic fibre. Specific types of rayon include viscose, modal and lyocell, each of which differs in manufacturing process and properties of the finished product.

The cellulose required for making rayon is obtained from wood pulp. Wood pulp is dissolved in an alkaline solution (sodium hydroxide solution) to form a sticky liquid called 'viscose'. Viscose is formed to pass through the tiny holes of a metals cylinder into a solution of sulphuric acid when a silk like thread of rayon is formed.

Properties:

It is a semi-synthetic fibre. It is chemically identical to cotton but it has shine like silk, therefore, rayon is also called artificial silk. It can be blended with cotton or wool. Rayon is lustrous fibre that can be dyed in a variety of colours.

Uses:

(i) It is used in the textile industry for making fabrics, which are blended with cotton or silk to make smooth and silky clothes.
(ii) It is blended with wool for making carpet.
(iii) Used for making reinforced tyre.
(iv) For making bandages and surgical dressings.

(ii) Nylon

Nylon is a generic designation for a family of synthetic polymers known generically as aliphatic polyamides, first produced on February 28, 1935. The first approach to produce nylon was done by combining molecules with an acid (COOH) group on each end are reacted with two chemicals that contain amine (NH_2) groups on each end. Nylon is made up of the repeating units of a chemical called an amide. So nylon is a polyamide(Polymer). The chemical compounds used in making nylon are now obtained from petroleum products called petrochemicals. The NYLON comes from the fact that it was developed in New York (NY) and London (LON).

Properties

It is one of the strongest, most elastic, lustrous and light weight materials. It remains stable and strong when wet. It absorbs very little water. It does not get wrinkles. Nylon is not attacked by moths and ordinary chemicals. Hence they are used for making clothes.

Uses

(i) It is used for the manufacture of tyre cords, fabrics and ropes.
(ii) It is used for making fishing nets and parachute ropes.
(iii) It is used for making bristles for brushes.
(iv) It is used for making sarees, socks, neck-ties.

(iii) Polyester

Polyester is another synthetic fibre. Polyester is a category of polymers which contain the ester functional group in their main chain. Although there are many polyesters, the term "polyester" as a specific material most commonly refers to polyethylene terephthalate (PET). Polyesters include naturally occurring chemicals, such as in the cutin of plant cuticles, as well as synthetics through step-growth polymerization such as polycarbonate and polybutyrate. Natural polyesters and a few synthetic ones are biodegradable, but most synthetic polyesters are not.

Polyester is made up of repeating units of a chemical called an ester which are organic chemical substances that gives fruity sweet smell. The chemical compounds used in making polyester fibres are made from petroleum products called petrochemicals.

Properties:

Fabric made from this fibre does not get wrinkled easily. It remains crisp and it is easy to wash. So, it is quite suitable for making dress material. You must have seen people wearing nice polyester shirts and other dresses. Terylene is a popular polyester. It can be drawn into very fine fibres that can be woven like any other yarn.

Uses:

(i) It is used for manufacturing sarees, dress materials, curtains, clothes, etc.
(ii) It is used for making blends with other fibres, e.g., terylene with cotton gives terrycot, with wool it gives terrywool.
(iii) It is used for making sails of sail boats.
(iv) It is used for making conveyor belts.

PET is a very familiar form of polyester. It is Poly Ethylene Terephthalate. Can be made into a fibre or a plastic. PET as a plastic is very lightweight. It is colourless with high transparency. PET is strong and impact-resistant. As a plastic, PET is replacing material

like glass. Unlike glass, PET is shatterproof. PET is used for making bottles, jars and utensils.

(iv) Acrylic Fibres

Acrylic is a synthetic fibre.

Acrylic fibre is made from a chemical called acrylonitrile by the process of polymerization.

Properties

These fibres are very light and soft like wool. They are resistant to weathering. Acrylic fibres are strong and durable. It absorbs very little water so it has quick-dry quality.

Uses

(i) They are used for making thread for knit sweaters.

(ii) They are also used for making wool like blankets and shawls, which are very light and warm.

Characteristics of Synthetic Fibres:

Imagine that it is a rainy day. What kind of umbrella would you use and why?

Synthetic fibres possess unique characteristics which make them popular dress materials.

They dry up quickly, are durable, less expensive, readily available and easy to maintain.

Synthetic fibres are very strong.

These absorb very little water. They are wrinkle resistant.

These are quite lightweight and are extremely fine.

They are not attacked by moths do not shrink.

PLASTICS

A plastic is a synthetic material which can be moulded (or set) into desired shape when soft and then hardened to produce a durable article (the term plastic means easy to mould)

Like synthetic fibres plastics are also polymers.This means that plastics consist of very long molecular chains made by joining many small molecules together.

The starting materials for plastics are obtained, Poly-Vinyl Chloride (PVC), Bakelite, Melamine and Teflon.

Types of Plastics

Plastics are of Plastics:

(i) Thermosetting plastics (ii) Thermoplastics

(i) Thermosetting Plastics:

A plastic substance which once moulded cannot be remoulded heating. Bakelite, melamine, formaldehyde are thermosetting plastics. Cabinet of radius, television, telephone sets,

water tank are example of thermosetting plastics. Thermosetting plastics are suitable for making handles of kitchen utensils.

(ii) Thermoplastics:

A plastic which can be moulded and reused by giving desired new shapes. PVC, polystyrene, nylon. Polythene are some common thermoplastics. Thermoplastics are good for making pipes, etc.

Different between thermosetting plastic and thermoplastic

Thermosetting plastic	Thermoplastic
1. Thermosetting plastics are the polymers in which chains get highly cross-linked on heating	Thermoplastics are long chain polymers with no cross linking. Heating also does not produce any cross-linking between the chains.
2. Once moulded thermosetting plastics cannot be remoulded. Examples: Bakelite, Melamine-formaldehyde resin.	Thermoplastics can be remoulded repeatedly. Example: Polythene, PVC, Polystyrene, nylon, polyesters, etc.