Chapter 3

Synthetic fibres and Plastics

Points to Study

3.1 Synthetic fibres
3.2 Types of synthetic fibres and their properties.
3.3 Plastics
3.4 Classification of Plastics
- Thermoplastic
- Thermosetting

3.5 Uses of Plastics.
3.6 Plastic and Environment

3.1 Synthetic fibres :

Activity 1

You always wear a uniform while going to school. Have you ever think how your uniform is made. These are formed from clothes and clothes from fibres. From where do we get these fibres? Some fibre are obtained from nature called natural fibres and some are man made through different chemical reactions and are called synthetic or artificial fibres? List the different types of fibres in table 3.1.

Table 3.1 Things made up of different fibres.

Thing	Type of fibres
Parachute	
Brush	
Curtains	
Sweaters	

Fig 3.1 Products made up of different fibers.

Synthetic fibres or artificial fibres are also called manmade fibres as they are made by humans. Examples – Nylon, rayon polyester etc.

All these synthetic fibres are polymers. What are these polymers?

Let's study –

You have seen pearl necklace in which pearl beads are attached with each other. Likewise a train has many bogies lined to form a long chain. Both are formed from small units forming a long chain. This long chain of small unit attached to each other is called polymer.

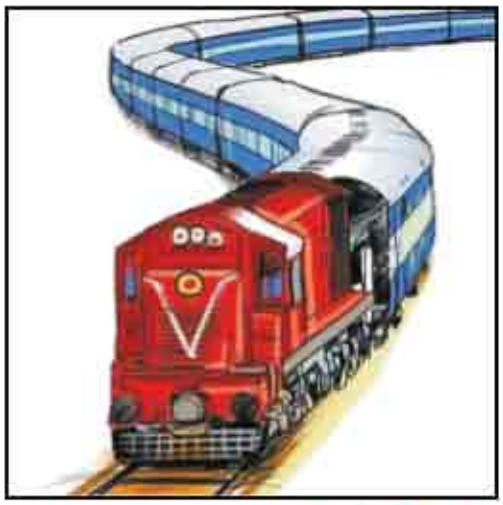

Fig.3.2 Products in the form of polymers

Polymer is a Greek word formed of Poly means many and Mer means single unit. Therefore a polymer is a long chain of repeated small unit is a chemical substance.

3.2 Types of Synthetic fibres and its properties –

(a) Rayon : Rayon is known as artificial silk also. This fibre is made by chemical reaction on cellulose which is obtained from plants. For this cellulose is first free from all waste and then mix with sodium hydroxide and carbon disulphide to form a thick liquid called viscose. This viscose is then passed through small pore sieve in dilute sulphuric acid to obtain fibre. Rayon seems like natural fibre.

This is cheaper than natural fibre and easy to weave. Cotton and rayon is mix with each other to make bed sheets and carpets.

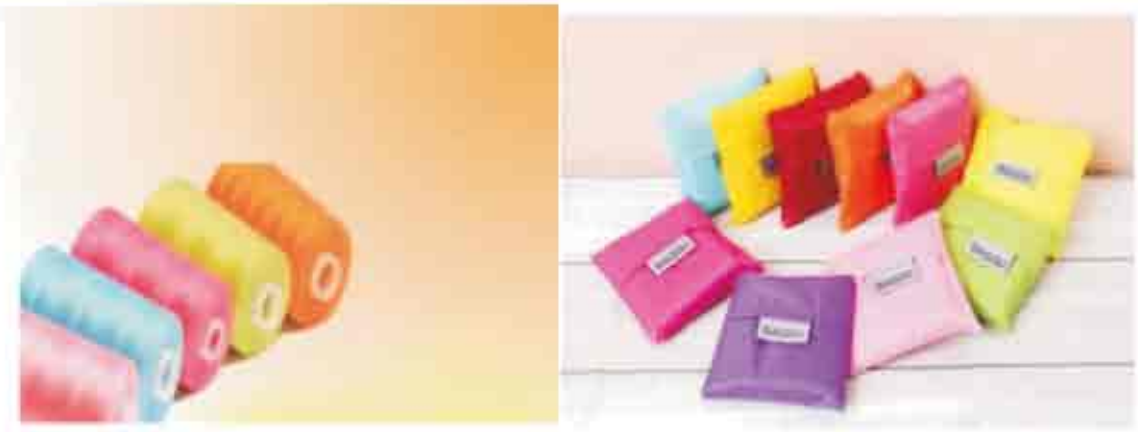

Fig.3.3 Products of Rayon fibers

(b) Nylon: Nylon is formed from adipic acid and Hexa methylene diamine. This is complete synthetic fibre.

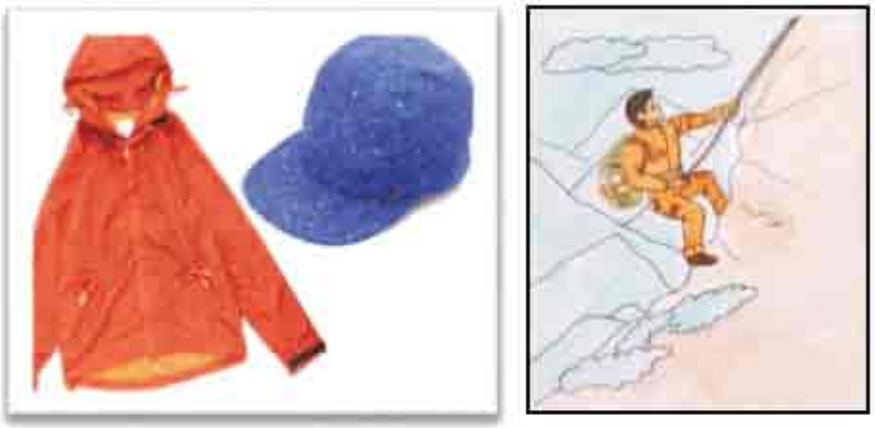

Fig.3.4 Various Products made up of Nylon fibers

Properties of Nylon: Nylon is strong, wrinkleless and light weighted. Its lustre is very shiny and easy to clean. Therefore it is mostly used to make clothes. Socks, tooth brush, tent, sleeping bag, curtains etc are made of nylon.

(c) Arlon : This is obtained from polymerisation of Aceto nitryl. This fibre seems like woollen fibre.

(d) Dacron: This is a polymer of ethylene glycol and terepathalic acid.

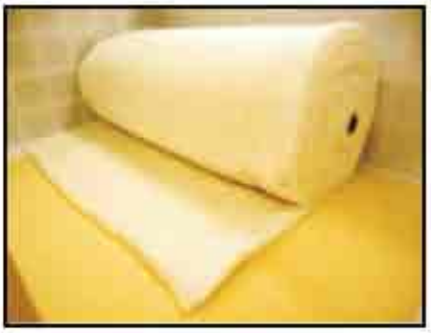
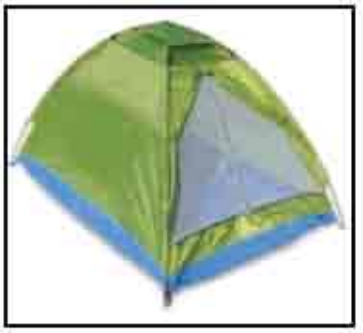

Fig.3.5 Products made up of Decron

This is also called polyester and used in making clothes.

Properties of Dacron or polyester

1) The clothes form this material does not wrinkle easily.

2) Easy to wash and dry quickly.

The rising demand of natural fibres cannot be fulfilled. Therefore the need for manufacturing artificial fibre came and it becomes popular due to their special properties. Let us study these properties.

Activity 2

Press different types of cloth in your hand. You will observe cotton cloth show wrinkle while Nylon, polyester and rayon do not.

The fibre of synthetic cloth does not contract while washing and hence not require regular ironing.

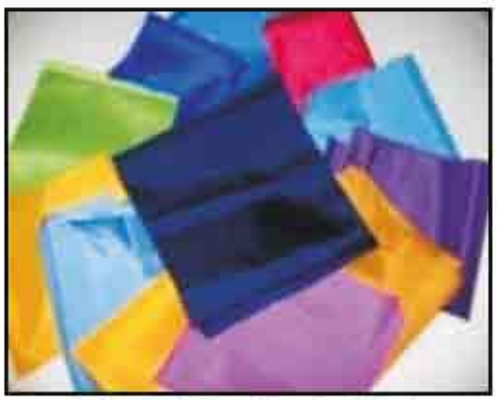
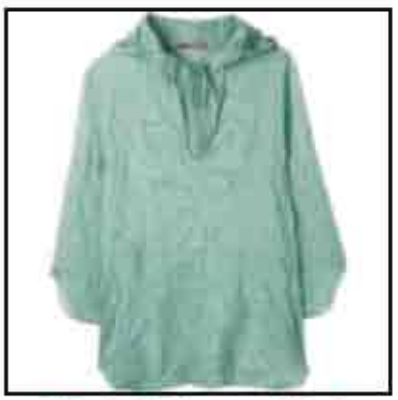

Fig.3.6 Synthetic Cloth Fig.3.7 Cotton Cloth

Let us do and experiment study the strength of man made fibres.

Activity 3

Stretch thread of different types of cloth. What you observe? You will observe that threads of nylon, rayon and polyester are difficult to stretch as compared to cotton threads. Therefore synthetic fibres are stronger and can be used for longer time.

Activity 4

Wash and dry clothes made up of nylon, polyester, terrylene and cotton fibre on a rope. You will observe that nylon, polyester and terrylene clothes dry

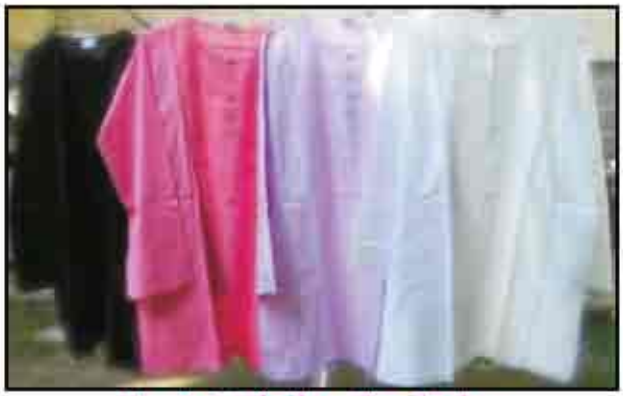

Fig.3.8 Clothes for drying

faster than cotton clothes. Hence we can say synthetic thread absorb less water absorbs water and dry faster. Synthetic fibres are more shiny and soft. Bugs do not damage these clothes. Use of synthetic fibre is easy and cheap. They are easy to maintain.

There are some disadvantages of synthetic fibre also.

Activity 5

Burn piece of different cloth one by one. Nylon, polyester and rayon catch fire easily. Therefore we can say that synthetic fibres catch fire easily. If somehow they catch fibre then they stick to body. They do not absorb sweat as absorbed by natural fibre. They stick to body during summer. To overcome these disadvantages now a day natural and artificial fibres are mixed together and this is called terecot.

3.3 Plastics :

Buckets, tooth brushes, containers are all mad from which material? They are all made up of plastics. What is Plastic? Small carbon molecule unit to form

higher molecular weight structures called plastics. Example–Baikelite, polyethene, Teflon, P.V.C. etc. Plastic is a type of synthetic polymer.

3.4 Classification of plastics :

On the basis of structure plastics are of two types, let us study about them.

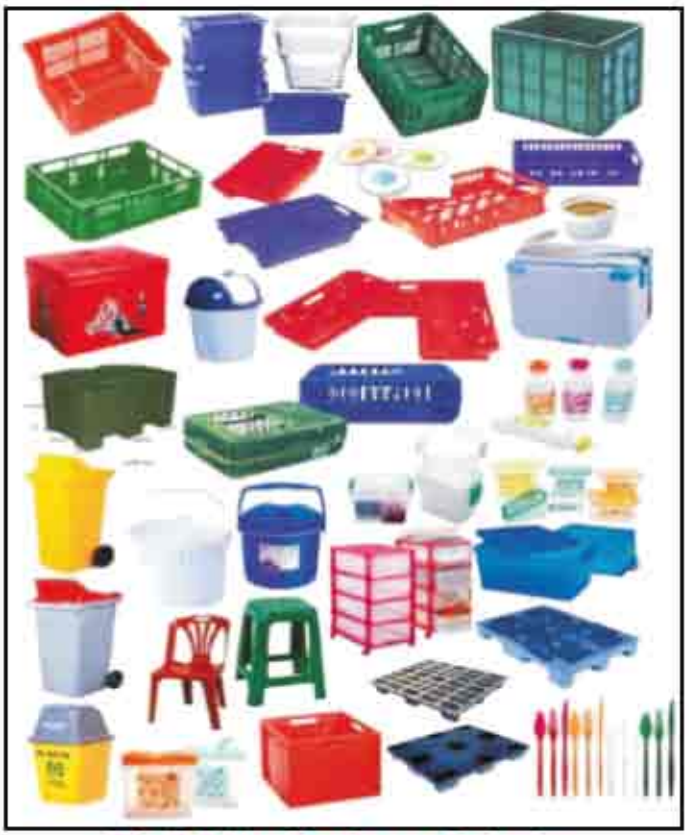

Fig.3.9 Applications of plastics

Activity 6

Pour hot water in a plastic bucket and try to compress it. What you observe? You will observe that plastic bucket is softer than before. Now touch and press the handle of pressure cooker. What you observe? You will find that the handle is neither hot not compressed. Means plastic bucket and handle of pressure cooker is made up of two different types of plastics and shows different properties. Therefore, plastics are of two types:-

(1) Thermoplastic

(2) Thermosetting

Thermoplastic: Those plastics which easily get moulded by heating and become hard when cooled are called thermoplastic. They can be moulded in any shapes.

Example: - polythene, PVC and polystyrene etc.

Fig.3.10 Materials made-up of Thermo plastics

The container and water pipes used at homes are made from PVC. Toys, comb, bucket etc are all made up of this plastic.

Thermosetting: Those plastic which become harder on heating and do not melt are called thermosetting plastics. Once they are moulded in any shape they cannot be moulded in other. Due to cross bonding in their structure they become insoluble and can resist much heat. Bakelite is used in electric switches, handles of utensils, batteries of car etc.

Fig.3.11 Materials made-up of Thermosetting plastics

Special properties of plastic: They are insulators of heat and light, inert, resist high temperature and are light weight. It is cheaper than metals and hence it use in daily life is very popular.

3.5 Uses of plastics -

- Used in covering of electric wires, so that they become insulators.
- Handles of kitchen utensils, pressure cooker, fry pan and electric appliances like iron, electric kettle etc.
- For storage in shops and home as chemical, pickle, spices, oil, acid etc.
- Plastic pipes used for irrigation in agriculture.
- Packing of medicine, syringe, thread used in surgery are all made from plastics.
- Utensils used in microwaves are also made of plastics.
- Teflon coating on non-stick utensils is also a plastic
- Clothes of workers of fire extinguishers are coated with melamine so that they do not catch fire.

3.6 Plastic and Environment

Uses of plastics in our daily life are prevailing day to day. This is not profitable to environment as the degradation of plastic is very slow and it may even years to degrade. In spite of so many uses of plastics, they are causing very harm to our environment. They are non biodegradable.

Non-biodegradation : Those substances which cannot be degraded by natural phenomenon are non-biodegradable products. At present plastic is one of the main reasons for environmental pollutions.

The high energy is required for burning plastics and in this process poisonous gases are liberated. These gases pollute the environment. How this problem is solved? We can use plastic in a very limited quantity.

Biodegradable and non-biodegradable waste should be collected separately and thrown then they decompose.

Give some idea with the help of which you can reduce the use of plastic in our daily life.

Protect our environment free from pollution, Recycling of plastic should be done. Therefore as responsible citizens we should follow 4R principle to stop pollution of environment.

These 4 R means:

1. Reduce – reduce the use of plastic.
2. Reuse – reuse the products.
3. Recycle – recycle them
4. Recover

What have you learnt

- Synthetic fibre is higher molecules of small units.
- Synthetic fibres are type of a polymer.
- They are highly shiny and soft. Insects do not seem these clothes.
- Synthetic fibres are strong and easy to wash and care.
- Synthetic fibres are wrinkle free.
- Plastic is a polymer.
- Plastics are of two types :
  1) Thermoplastic
  2) Thermosetting
- Plastic is used in homes and market for storage of chemicals, pickles, spices, oil, and acid and in medical and agriculture.
- We should follow 4R principle to prevent our environment from pollution.
  1) Reduce
  2) Reuse
  3) Recycle
  4) Recover

Exercise

Choose the correct options:-

1. The material used for making non-stick utensils of Kitchens is.
   (a) PVC (b) Polyether
   (c) Teflon (d) Rayon ( )
2. Which of the following group is of synthetic fibres?
   (a) Nylon, Terelene, Rayon (b) compound
   (c) Acrylic Silk, wool (d) PVC, Polyether, Bakelite ( )
3. The handles of utensils are made from.
   (a) polyether (b) Nylon
   (c) PVC (d) Bakelite ( )
4. Which is not the property of plastics?
   (a) Inert (b) Durable
   (c) light weight (d) conduction of electricity ( )
5. Thermoplastics is -
   (a) Bakelite (b) Melamine
   (c) Polyether (d) None of the above ( )

Fill in the blanks:

1. Synthetic fibres are also called _____ or _____ fibres.
2. Rayon is also called _____
3. The polymerisation of acetonitryl gives _____
4. Plastic is also a type of _____

Match coulmn A with column B:

Column A		Column B	
1.	Rayon	a.	Coating of non stick
2.	Nylon	b.	Artificial fibre
3.	Thermosetting Plastic	c.	Pipes
4.	PVC	d.	Clothes

Short answer type questions:-

1. Why it is not advised to burn plastics and synthetic fibres.
2. What are thermoplastics? Explain with example.
3. Terecot is obtained by mixing two types of fibres? Name these fibres.
4. What are non-biodegradable substances?
5. What is polymerisation?

Long answer type questions:

1. Write the uses of Synthetic fibre in our daily life?
2. Explain the statement "Do not use plastics in daily life as far as possible"
3. How Synthetic fibre nylon is formed? Write it different properties.

Activity

1. Collect plastics from your home and neighbour and list them under thermosetting and thermoplastics.
2. Stick samples of different Synthetic fibres in your scrap book.

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