

15. Materials we Use



Let's recall.

1. What is meant by natural and man-made materials?
2. Make a list of natural and man-made substances you see around you.

We have learnt that, a new substance produced by the chemical processing of natural substances is called a man-made substance. In this lesson, we will learn about some substances of daily use.



Can you tell ?

1. Which substances were used earlier, for cleaning teeth?
2. What do we use today to clean our teeth?

We have seen that in olden times in India, acacia bark, neem twigs, coal powder, ash, tooth powder, salt, pomegranate rind were used for cleaning teeth. Today, however, a variety of toothpastes and tooth powders are used for this purpose.

Toothpaste

The principal ingredients of a toothpaste, calcium carbonate and calcium hydrogen phosphate, remove the dirt on teeth. These ingredients also polish the teeth. A certain proportion of fluoride in the toothpaste helps prevent tooth decay. Fluoride is essential for the strengthening of bones and the enamel covering of teeth.



Do you know ?

In the period prior to 500 BC, in countries such as China, Greece, Rome, toothpaste was made by mixing the powder of bones and shells. Toothpaste, of which soap was the ingredient, came into use in the 19th century. Later, toothpaste was made using a chalk-like material. The first commercial toothpaste was made by the Colgate company in New York city in 1873.



Find out.

1. What is the source of the fluoride in a toothpaste or tooth powder ?
2. Note down all the information given on a tooth powder/ toothpaste container or carton and discuss.

Detergents

The word 'detergent' is derived from the Latin word '*detergere*' which means 'to wipe away'. A detergent is 'a substance that cleans or wipes away dirt.' Soap nut (*ritha*), soap pod (*shikekai*), soap, washing soda, washing powder, liquid soap, shampoo are all detergents.



Can you tell ?

1. What do we use for cleaning our body ?

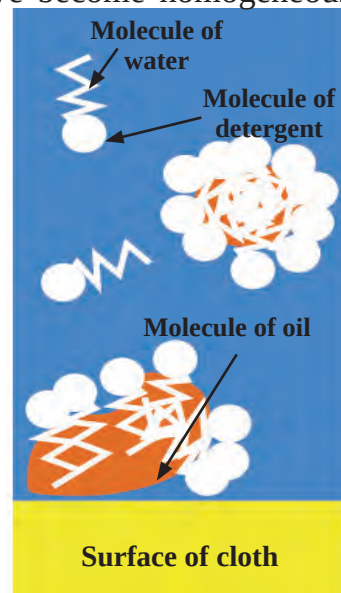
Apparatus : A clean glass bottle, water, oil, detergent, etc.

Procedure : Take some water in a clean glass bottle. Add some oil to it. The layer of oil will float on the water. Shake the bottle vigorously. After some time, when the liquid in the bottle settles, the oil will again be seen floating on the water.

Now add a few drops of the solution of a detergent to the above mixture. Shake the bottle vigorously. You will see that the water and oil have become homogeneous and the colour of the mixture appears milky.

Why does this happen ?

The molecules of a detergent are long and the properties of its two ends are different. A molecule of a detergent holds on to a water molecule at one end and an oil molecule at the other. As a result, the molecules of oil mix with the water. This is how soap acts when we wash ourselves or our soiled clothes. Our body and clothes become oily for various reasons such as applying gels or creams, oiling our hair, etc. The oily layer sticks fast to the criss-crossing threads of the material of our clothes. Soap is used for removing it. Due to the property of holding on to both oil and water, soap water spreads easily on many types of surfaces. The property of a substance of spreading on a surface is called **surface activity** and the substance is said to be a **surfactant**. Detergents are surface active. One effect of surface activity is lather formation.



15.1 Action of detergents

Natural detergent

Soap nut (*ritha*) and soap pod (*shikekai*) are the natural detergents in common use. They contain a chemical named saponin. Soap nut and soap pod do not have any harmful effect on human skin or on silk and woolen threads and cloth.

Man-made detergent

Soap : Soap is a man-made detergent which has been in use since ancient times. It is believed that soap was invented in the west about 2000 years ago. In those days, soap was prepared using animal fat and wood ash. Today we come across a variety of soaps.



15.2 Natural detergents

Types of soaps : Hard soap is used for washing clothes. It is a sodium salt of fatty acids. Soft soap is used for bathing. It is a potassium salt of fatty acids. It does not cause irritation of the skin.

In the hard water of a well or a tube-well, soap does not give lather but forms a scum. As a result, soap loses its cleansing property.

Synthetic detergent

Now synthetic detergents have taken the place of soap. There are several methods of producing these detergents. The long structural units in the synthetic detergents are obtained from raw materials which are mainly fats or kerosene. Detergents are obtained by subjecting these raw materials to a variety of chemical processes. Synthetic detergents are used in many types of cosmetics. Synthetic detergents can be used in hard water as well.

As per the use of the detergent, supporting additives such as perfumes, dyes, germicides, alcohol, anti-foaming agents, moisturizers, fine sand, etc. are mixed with different detergents to give them certain useful properties.



Try this.



15.3 Making soap

soap using the mould.

In the above process, fat and alkali combine to form salts of fatty acids. Chemically, soap is a sodium or potassium salt of fatty acids.

Cement



Can you tell ?

1. What are the materials used for construction?
2. Which of the houses seen in the pictures here have a strong structure? Why?



15.4 Houses



15.5 Cement

Preparation of soap

Material : 15g sodium hydroxide, 60 ml coconut oil, 15g salt, perfume, a glass rod, beaker, tripod, wire gauze, burner, water, mould, etc.

Procedure : Take 60 ml coconut oil in a beaker. Dissolve 15g sodium hydroxide in 50 ml water. Mix the sodium hydroxide solution in the oil slowly while stirring it with a glass rod. Heat the mixture, and boil it for 10-12 minutes, stirring it all the while. Take care that the mixture does not boil over while heating. Dissolve 15 g salt in 200 ml water. Pour this solution into the above mixture and stir. The soap formed by the chemical reaction now floats on the water. After some time, it becomes thick. Now, separate the thick soap and add the perfume to it. Shape the bar of

Cement production

Cement is an important material in construction. Sheets, blocks, pillars and pipes are made from concrete produced from cement. Cement is a dry, greenish grey powder with fine particles. It is made from silica (sand), alumina (aluminium oxide), lime, iron oxide and magnesia (magnesium oxide).

Portland cement is the most commonly used cement for construction work. It is made from raw material which consists of 60% lime (calcium oxide), 25% silica (silicon dioxide), 5% alumina. The rest is iron oxide and gypsum (calcium sulphate). Portland cement gets its name from the stone quarried from the Isle of Portland in England, which has a similar texture.

In ancient times, the Romans had made cement as well as concrete. They used to make aqueous cement by mixing volcanic ash in moistened lime. It was a very durable cement. With the decline of the Roman empire, this art of making cement was also forgotten. In 1756, the British engineer, John Smeaton developed the method of making aqueous cement.

Concrete

Concrete is prepared by mixing cement, water, sand and gravel. For making a strong and leak proof slab certain substances are mixed in concrete.



Find out.

1. Nowadays, why are the roads made of concrete?
2. What causes the hardness of water?



1. Fill appropriate terms in the blanks. (white cement, soap, detergent, wearing of bones, tooth decay, hard, soft, Portland, fatty acid)

- (a) The substance that helps water to remove dirt from the surface of materials is called
- (b) Fluoride is used in toothpaste to prevent
- (c) Soap is a salt of and sodium hydroxide.
- (d) Synthetic detergents can be used in water as well.
- (e) For construction purposes cement is the most commonly used cement.

2. Write answers to the following questions.

- (a) How does the use of a detergent help to clean soiled clothes?
- (b) How will you check with the help of soap powder whether water is hard?
- (c) What are the important ingredients of a toothpaste, and what is the function of each?
- (d) What are the ingredients of cement?
- (e) What will happen if cement is not used in making concrete?
- (f) Make a list of detergents that you use.
- (g) What should be expected from a detergent for delicate garments?
- (h) What is meant by 'surface activity'? Name three chemicals responsible for the surface activity of various detergents.

3. What are the similarities and differences between -

- (a) Natural detergents and man-made detergents
- (b) Soap and synthetic detergent
- (c) Bath soap and soap for washing clothes
- (d) Modern cement and ancient cement

4. Explain why -

- (a) Soap cannot be used in hard water.
- (b) Oil does not mix in water. However, oil and water become homogeneous if a sufficient quantity of detergent is added.
- (c) Synthetic detergents are superior to soap.
- (d) Often coloured spots are formed on clothes during washing.
- (e) Tobacco *masheri* should not be used for cleaning teeth.

Project :

1. Visit a cement factory. See how cement is prepared and discuss the process.
2. Write a conversation based on cement houses, mud-houses and wattle-and-daub houses.

