Chapter- 14 Chemical Effects of Electric Current

Chemical Effects of Electric Current

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Chemical Effects of Electric Current

The materials, which allow electric current to pass through them, are good conductors of electricity. On the other hand, materials, which do not allow electric current to pass through them easily, are poor conductors of electricity.

Metals are good conductors of electricity

Metals such as copper and aluminum conduct electricity whereas materials such as rubber, plastic and wood do not conduct electricity.

When electric current flows through a bulb then due to heating effect of current, the filament of the bulb gets heated up to a high temperature and starts glowing. Now for a liquid having low electrical conductivity, the current flowing through the circuit is very weak due to which the filament does not get heated sufficiently & hence the bulb does not glow. Therefore LED is used in place of bulb because LED glows even when weak electric current flows in the circuit.

Conductivity of Liquid

To test whether a liquid allows electric current to pass through it or not, we can use the tester. When the liquid between the two ends of the tester allows the electric current to pass, the circuit of the tester becomes complete. The current flows in the circuit and the bulb glows. When the liquid does not allow the electric current to pass, the circuit of the tester is not complete and the bulb does not glow.

In some situations even though the liquid is conducting, the bulb may not glow. Due to the heating effect of current, the filament of the bulb gets heated to a high temperature and it starts glowing. However, if the current through a circuit is too weak, the filament does not get heated sufficiently and it does not glow. Though a material may conduct electricity, it may not conduct it as easily as a metal. As a result, the circuit of the tester may be complete and yet the current through it may be too weak to make the bulb glow.

Most liquids that conduct electricity are solutions of acids, bases and salts.

Chemical Effects of Electric Current

The passage of electric currents through liquids causes heating just as it does in solids. More importantly, chemical activity may occur in the liquids around the electrodes.

Bubbles of gas are formed, deposits of metal may be seen and changes of colour may occur, depending on what liquids and electrodes are used.

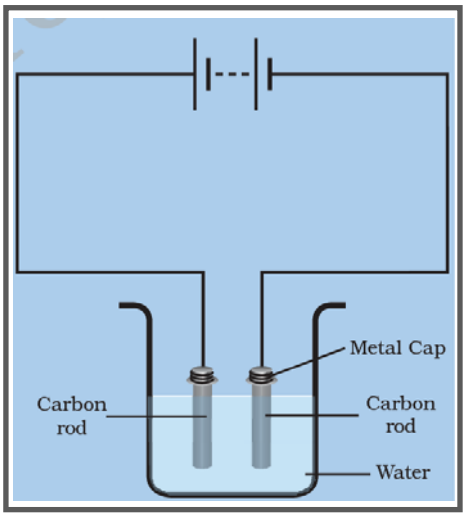
Electrolysis: The passage of an electric current through a liquid causes chemical changes. This process is known as electrolysis.

Activity

Take out carbon rods carefully from two discarded cells. Clean their metal caps with sand paper. Wrap copper wires around the metal caps of the carbon rods and join them to a battery. We call these two rods **electrodes**. Pour a cupful of water in a glass/plastic bowl. Add a teaspoonful of salt or a few drops of lemon juice to water to make it more conducting. Now immerse the electrodes in this solution. Make sure that the metal caps of the carbon rods are outside the water. Wait for 3-4 minutes. Observe the electrodes carefully. The passage of an electric current through a conducting solution causes chemical reactions. As a result, bubbles of a gas may be formed on the electrodes.

Electroplating

The process of depositing a layer of any desired metal on another material by means of electricity is called **electroplating**. It is one of the most common applications of chemical effects of electric current. Electroplating is a very useful process. It is widely used in industry for coating metal objects with a thin layer of a different metal. The layer of metal deposited has some desired property, which the metal of the object lacks. For example, chromium plating is done on many objects such as car parts, bath taps, kitchen gas burners, bicycle handlebars, wheel rims and many others.



Electroplating of copper

However, chromium is expensive and it may not be economical to make the whole object out of chromium. So the object is made from a cheaper metal and only a coating of chromium over it is deposited.

Advantages of chromium

It has a shiny appearance.
It does not corrode. It resists scratches.

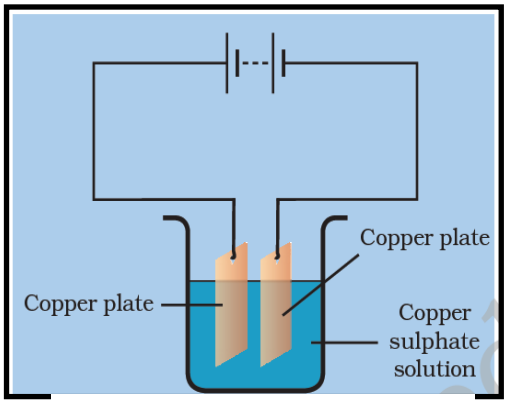
Tin cans, used for storing food, are made by electroplating tin onto iron. Tin is less reactive than iron. Thus, food does not come into contact with iron and is protected from getting spoilt.

Cutlery and jewellery items are often silver plated - they have the appearance of silver but are much less expensive.


Chromium plating on vehicles

Activity

Take two copper sulphate and two copper plates of size around 10 cm × 4 cm. Take 250 mL of distilled water in a clean and dry beaker. Dissolve two teaspoonfuls of copper sulphate in it. Add a few drops of dilute sulphuric acid to copper sulphate solution to make it more conducting. Clean copper plates with sand paper. Now rinse them with water and dry them. Connect the



Electroplating of copper

copper plates to the terminals of a battery and immerse them in copper sulphate solution. Allow the current to pass for about 15 minutes. Now remove the electrodes from the solution and look
at them carefully.

When electric current is passed through the copper sulphate solution, copper sulphate dissociates into copper and sulphate. The free copper gets drawn to the electrode connected to the negative terminal of the battery and gets deposited on it. From the other electrode, a copper plate, an equal amount of copper gets dissolved in the solution. Thus, the loss of copper from the solution is restored and the process keeps going. This means that copper gets transferred from one electrode to the other.