KEMEX EXPERIMENTS IN TANNING AND DYEING

ONE of the most interesting branches of industrial chemistry is tanning, or the preparation of leather from hides and skins. The changes that take place during this process are very complicated and are brought about by steeping the hides in liquids containing tanning extracts manufactured from vegetable sources. One of the best known tanning materials is oak bark, which for centuries has been used extensively by tanners.

An interesting series of experiments that will help to explain the chemistry of tanning can be made with oak bark and similar substances. Old oak bark should not be used, the young bark from the inner side of the covering of the tree being the most suitable. A portion of this is shaved off and cut into small pieces, and a dessertspoonful of the fragments is placed in the wide-necked flask, which is half filled with water. The flask is placed on the universal stand, as shown in the lower illustration on the opposite page, with the lighted spirit lamp or bunsen burner beneath it. When the water boils the flame is turned low to keep the liquid steadily simmering, and the heating is continued for about five minutes. Alternatively a smaller quantity of oak bark can be boiled with half a test tube full of water, the tube being held in the test tube holder, or in a folded strip of paper, with its lower end just above a small flame, and shaken gently in order to prevent violent boiling.

After the contents of the flask have cooled and the fragments of bark have settled to the bottom, a little of the extract or liquid obtained is poured off into a test tube, which may be filled to a depth of about 1 in. A solution of Iron Alum is then prepared by shaking one measure of this chemical with half a test tube full of water, and on pouring a few drops of this into the extract a deep black precipitate is obtained immediately.

Boiling a strip of silk in logwood extract in order to dye it black. The silk has previously been treated with chemicals to enable the dye to be applied effectively.

In order to explain what has happened in the experiment we have just described, one measure of Tannic Acid is dissolved in half a test tube full of water and to half of this solution a few drops of the solution of Iron Alum already prepared are added. Again a black precipitate is obtained. This is iron tannate and is exactly similar in appearance to that already obtained. The oak bark extract in fact contains tannic acid, or tannin as it is sometimes called, and this chemical is responsible for the changes that occur in tanning. The name really denotes a group of very weakly acid chemicals that are found in oak bark, and also in galls, the curious hard lumps, often resembling nuts in appearance, that form on plants where the eggs of certain insects are deposited.

It is interesting to test other barks besides that of the oak in order to find which contain tannic acid and to form an idea as to the one that is most likely to be valuable to the tanner. In all cases the hard outside bark should be stripped off before testing. Tea leaves also contain tannin. In order to test for the chemical in this source, a few tea leaves are boiled vigorously with half a test tube full of water, or they are boiled for five minutes or even more in the wide-necked flask half filled with water. The clear liquid left after the tea leaves have settled is poured into a tube and tested by the addition of a few drops of Iron Alum solution. The production of a black precipitate shows the presence of tannic acid. It must not be supposed from this experiment that tea as ordinarily made contains a large proportion of tannin. Pouring boiling water over the tea leaves and straining away the liquid formed is less drastic than boiling them with water for some time and is less effective in extracting tannin.

The action of tanning agents is best seen from an experiment with the white of an egg. The chemical name for this is albumen, which is a complex organic chemical. About a quarter of a teaspoonful of the white of an egg is dissolved in half a test tube full of water and to this liquid is added the remaining portion of the Tannic Acid solution already prepared. A thick white precipitate immediately forms and this becomes hard and leathery when it is separated from the liquid by filtering and left to dry. A gelatine solution also gives a precipitate when treated with Tannic Acid.

Similar changes take place when hides are steeped in tanning liquids, for these contain albuminous substances, that is chemicals resembling albumen or containing it. Ham rind provides a convenient subject for an experiment that forms a nearer approach to actual tanning than that with albumen itself. A small piece is freed from fat and grease and is then soaked in a solution of Tannic Acid, prepared as already explained. The action of this chemical on the albuminous substances in the rind is slow and sufficient time must be given to allow it to penetrate. This may require several days, and from time to time the rind should be carefully lifted out and washed in order to follow the changes in its appearance. Eventually it will be found to be hard and leathery.

The vegetable kingdom is a great storehouse of chemicals of all kinds and certain plants and trees yield dyes or colouring matters. Wood, indigo and madder are good examples of vegetable dyes, and the colouring matter obtained from the wood of the logwood tree can be applied with good effect by the Kemex experimenter. This tree is a native of Mexico and Central America, from which countries it is exported in logs. The heartwood of the tree is the source of the dye, and is included in the range of Kemex chemicals in a convenient form for rapid extraction of the colouring matter. When it is boiled with water, a red liquid is obtained that can be used as an indicator, for with acids it becomes a striking yellow colour and it is turned blue by alkalies.

Logwood as a dye is chiefly useful for giving a good black on silk. It seems strange that so many different colours can be produced from this single material, but in all cases chemical changes are responsible, new compounds being made, or new forms of these.