

great discoveries made in this direction is that of the aniline dyes, for which see ANILINE, and ROSANILINE.

**Dyeing**, (*dying*), *n.* (*Arts and Manuf.*) The object of this beautiful art is to fix certain coloring-matters uniformly and permanently in the fibres of wool, silk, cotton, and other materials. Coloring-matters which effect this without the intervention of a third substance, or mordant, are called *substantive colors*, while those which require such aid are called *adjective*. The exact way in which dye-stuffs act upon fibrous materials has not yet been investigated as fully as it deserves; the generally received opinion is that the fibre has an affinity for the coloring-matter in the case of substantive dyes, and for the mordant, which in its turn has an affinity for the coloring-matters of adjective dyes. Another opinion is, that the fibres contain pores which absorb the dye, forming an insoluble lake in the case of the mordanted dyes. However this may be, it is certain that different materials take dyes in different proportions. Thus silk and wool take the aniline dyes in the most perfect manner, but cotton requires the intervention of a powerful mineral or animal mordant. The operations that take place in dyeing are, mordanting, ageing, dunging, dyeing, and clearing. The principal mordants used are alumina, extensively employed for woollens and silks in the form of alum and cream of tartar; and peroxide of iron, which is much used in the form of protacetate for logwood and madder. Peroxide of tin and several other metallic oxides are used for the same purpose; also albumen, caseine, and other animal substances in different forms. After the fabric has been mordanted, it is generally hung up in a room through which a current of steam and air is passing, by means of which the union between the fibre and the mordant is quickened very considerably. The cloth is then dunged, in order to remove the superfluous mordant not absorbed by the fibre. This was formerly effected by passing the fibre through a mixture of cow-dung and water; but this filthy operation has been superseded in a great measure by the introduction of what are termed *dung substitutes*. The principal dung substitutes in use at present are the arsenic, arseniate, and silicate of soda, phosphate of lime, and caustic soda. The action of these is chemical; whereas that of the cow-dung was supposed to be merely mechanical, by supplying the unabsorbed mordant with a fibrous material in a firm state of division. Dunging is one of the most important processes in dyeing, great care being taken to keep the dunging-liquor at a proper strength and temperature. The next process is the dyeing proper, which is effected by running the fabric through the solution of the dye-stuff, the color being modified, more or less, by the nature of the mordant used. It would be impossible in a short space to give an account of the different methods adopted of dyeing different colors; but a description of the means used to produce the more common colors will be interesting to the reader. *Blacks* are generally produced by logwood or galls, with an iron mordant. Common black silks are dyed with logwood and fustic, iron being used as a mordant. The best silks are dyed black on a blue ground. Woollen goods are first dyed blue with indigo, and afterwards with sumach, logwood, and green copperas or sulphate of copper. Cotton and linen goods are dyed black in a very similar manner. Chromate of potash is also sometimes used with logwood; practical dyers say that it possesses no great advantages over blue or green copperas. *Blues* are produced from indigo, either in the form of sulphate or in aqueous solution. Prussian blue, with a persalt of iron or tin as a mordant, gives a very splendid dark blue; and, of late, several blues of novel shades have been produced from aniline. *Reds* are obtained by using cochineal, safflower, lac-dye, madder, or logwood, with a tin mordant. Fine crimson purples are obtained from aniline, and are known under the popular name of magenta. The most important *yellow dyes* are quercitron, fustic, turmeric, arnotto, and French or Persian berries. By combining these different colors, and by adapting the mordants, colors of every conceivable shade and hue are easily obtained. When the fabric has received the color intended, it is washed in a solution of soap to which a little alkali has been added, after which it is boiled in water with or without the addition of solution of tin or other brightening substance. It is then said to be fast, which means that it will not be washed out. The chemistry of dyeing has of late years attracted the attention of our greatest chemists, and has reached such perfection that a loose color is almost unknown. The matter has received the most minute investigation at the hands of such men as Hofmann, Stenhouse, Schmuck, Rochleder, and a host of others, who have not only benefited the art of dyeing by their researches, but have also discovered new facts leading to new theories of chemical philosophy. One of the last