Aniline Colors.

Dr. M. Reiman, of Berlin, Prussia, whose name is already known to the reader as a prominent savant in the field of industrial arts, contributes the following upon the above interesting topic.

The beginning of this decennium is marked by a general change in all departments of the art of dyeing. Instead of the coloring matters previously in use, and which had been extracted from wood and bark, it was attempted to employ those coloring matters that had recently been prepared from aniline, and the most perfect success attended this innovation.

The coloring substances obtained from aniline are decidedly preferable to those extracted from woods, barks, etc., by reason of their substantial character; that is to say, the fibres do not require the use of mordants before being dyed. Thus, neither wool nor silk requires to be mordanted before they are dyed in aniline colors, since these latter are capable of dyeing material without any previous preparation of the animal fibre. According to the old method, when dyeing with logwood, red-wood, cochineal, etc., it was always necessary to impregnate the fibre which was to be dyed with that mordant which, by combining with the pigment of the coloring matter, would cause it to adhere to the fibre; for these coloring matters become pigments only by combining with the mordants that are employed. Aniline colors, however, being true pigments, it is unnecessary to employ mordants with them. The aniline color is, as chemists say, always a salt; when it is dissolved, the animal fibre precipitates the salt, and is dyed by it. Therefore, whenever animal fibre is dipped into such a solution, the coloring matter adheres to the fibre. According as the fibre is allowed to remain a longer or shorter time in the bath, brighter or darker shades are obtained. Hence from a single bath, every shade of a color may be produced—a thing which was utterly impossible with the pigments formerly employed.

Aside from this great advantage, these aniline colors sparkle with a brilliancy that no other colors ever show. To this fact is due the extensive application of these colors in the manufacture of ladies' articles.

Who, ten short years ago, could have dreamed of a blue or violet such as is now daily produced in our dyeing establishments? To-day, however, the sparkling colors of birds and flowers are fixed on our textile fibres. Chemists have even discovered that the brilliant colors of many flowers are aniline colors, produced in the plant by nature. Thus in the dahlia has been found an aniline color, which is known in commerce by the name of "Hoffman's violet;" and M. Ziegler has shown that a colored liquid, consisting of a solution of an aniline color, is contained in some conchils found on the shores of Spain. After this, it can not excite astonishment that the aniline pigments are now of the greatest importance to dyers, who could not now exist without them. Especially the grays that are now in fashion are always prepared by aniline colors. Even in dyeing cloth, a reddish gray is frequently produced by treating the cloth in an aniline bath, after it has received the usual gray color. In a similar manner the violet shades of some cloths are produced.

Aniline colors are employed to as great an extent for dyeing cotton as for the materials already mentioned—wool and silk. The difficulties to be surmounted are, however, far greater in the case of cotton. Vegetable fibre will not take the colors from the bath unless it be previously prepared.

Animal fibre, when compared with vegetable fibre, possesses the advantage of containing nitrogen; and every substance that contains nitrogen can fix aniline colors. It was therefore deemed advisable by dyers to cover the vegetable fibre, which lacks nitrogen, with some substance containing this element. Then the substance containing the nitrogen will attract the aniline color, and through it as a medium the aniline color will be fixed on the cotton or any other vegetable fibre. The nitrogenous substances were taken from animals, and hence the process of covering the vegetable fibre with animal substances was called "animalizing." The albumen of eggs and of blood, as also the caseine from milk, while in solution, were brought into contact with the fibre, and when this was thoroughly impregnated with the animal solution, the albumen or caseine was by some chemical process rendered insoluble, and thus was fixed on the fibre. For instance, to cover cotton with the albumen of eggs, the latter substance was diluted with water, and the cotton impregnated with it in a diluted state. The cotton was then dyed, and put into an apartment filled with steam. Since the temperature of steam under ordinary pressure is 212° Fahrenheit—80° Réaumur or 100° Celsius—and albumen coagulates at from 70° to 80° Celsius, the albumen of course became insoluble after a short time, as it assumed the temperature of the steam. The cotton could then be washed with either hot or cold water, without any danger of its losing a particle of albumen.

Caseine was dissolved in ammonia, and the alkaline solution of the animal product thus obtained was employed to impregnate cotton or any other fibre that was devoid of nitrogen. Now, caseine, though readily dissolved in alkaline liquids, is insoluble in acids, and it can, therefore, be precipitated from its alkaline solution by the addition of any acid. The dyers, accordingly, in order to fix the caseine, dipped the cotton impregnated with the alkaline solution of caseine in an acid bath, and the caseine was instantly precipitated on the fibre by the acid. In such or a similar manner, any animal substance was fixed on the vegetable fibre; and this process is still employed in the printing of cotton. The animal substances spoken of are, however, too expensive for ordinary use; hence the dyers were soon obliged to resort to other mordants for fixing the aniline colors on vegetable fibre In preparing Adrianople red, an alkaline solution is employed, in which oil is divided into excessively fine drops, so fine, in fact, that the liquid looks like milk, which is also a colorless liquid, rendered nontransparent by small drops of fat, or butter. A similar fluid is obtained by mixing oil, alcohol, and sulphuric acid; it is known to dyers by the name of "oil mordant," and has the property of enabling the cotton to take up and fix the aniline colors. The abovementioned mixture may conveniently be diluted with water, and employed to impregnate the cotton, which will then take up and fix the aniline colors when dipped in a warm solution of these pigments. It was soon discovered that other substances containing fat might serve as mordants for aniline colors. Thus, soap, and especially barrel, or Dutch soap, when dissolved in water, fixes the aniline pigments on the cotton. This kind of soap is so cheap that it may be employed even for the cheapest cotton articles. It is necessary merely to put the cotton into a solution of Dutch soap, to wring the cotton, and to dye it immediately in a warm bath of any aniline color. Another substance used for fixing aniline colors is tannin or tannic acid, which, as is generally known, is contained in gall-nuts and other astringents. A decoction of gall-nuts or sumac enables the cotton which is dipped into it to take up and to fix the coloring matters. In practice, gall-nuts, or what is more frequently employed, sumac, is boiled in water, and the cotton is allowed to remain in the clear decoction for from twelve to twenty-four hours. The cotton is then taken out, wrung, and dyed as usual in a warm bath of any aniline color.

Sumac and soap are, at present, the mordants most frequently employed for fixing aniline colors on vegetable fibre. As aniline colors are effected by the influence of the atmosphere and by soap, dyers frequently dye the cotton, at first with the coloring matters formerly employed, and then also with the corresponding aniline color. Thus, aniline blue on cotton is, in its darker shades, always grounded with Prussian blue. The very slight cost of aniline pigments is of great importance to the dyer. It is true that they are dear enough, and formerly were still more so. But then, they are, beyond all comparison, more intense than the coloring matters formerly employed. Thus, one pound of magenta will dye 200 pounds of wool to quite a deep red shade. Could a pound of any of the old pigments have sufficed for such a quantity of material? The other aniline pigments have a similar intensity; so that, besides the increase in brilliancy, it is also economical to employ the new colors. In addition to all these advantages, the dyer can, with greater ease, produce shades after a given pattern with these colors. The pigment in solution looks exactly as the color produced by it on the fibre. Formerly the dyer was required to prepare a color which did not yet exist; now he procures it from the manufacturer. He chooses the shade which is to be produced, and can never fail, as was formerly the case when he was obliged to produce the *color* from the bath. How tedious were the former processes of mordanting, washing, hanging, dyeing, etc.! Now minutes suffice for that labor which previously required days.

It has been objected to the employment of aniline colors that they are unstable. This is true. But it must be observed that it is scarcely possible for such brilliant colors as the aniline pigments to be stable. The sparkling dahlia-violet, the brilliant red, and night-blue, as magenta, etc., can never bear the influence of the atmosphere, dust, acid, vapors, etc. Those of the formerly employed pigments that at all approached in brilliancy these aniline colors were fully as unstable as they. One need only mention the cudbear, that violet pigment which, though by no means imparting as fresh and sparkling shades as aniline violet, is almost as unstable. The red, violet, and blue colors produced by woods and other similar substances for dyeing were fully as fleeting as the aniline pigments. Even black, which is usually regarded as a firm color, is one of the most unstable ones. In fact, the black, as it is generally produced by logwood and iron salts, is so liable to change, that acid, vapors, or atmospheric influences are sufficient to make it disappear. The true reason why the black on cloths and finer materials *appears*, at least, to be durable is, that it lies on a surface of the most stable of all coloring matters—indigo. The black color of cloth and other expensive stuffs is produced by first dyeing the goods dark blue in the warm indigo vat. This is an expensive and uncomfortable process, but necessary for a stable black color. The indigo imparts to the wool a perfectly firm blue color, and upon this the dyer produces his black with logwood and iron. After some time, this black dye is partly or entirely destroyed; and the observer is prevented from noticing it by the dark-blue indigo lustre of the goods. A comparison with a piece of freshly dyed cloth will, however, show that the black has disappeared. It is a well-known fact that the black produced by logwood easily assumes a reddish hue, especially if there be but little indigo under the black.

But it must never be forgotten that aniline colors are to be employed mainly for articles of fashion. Articles which must, by all means, retain their color are never dyed with aniline. In such cases, indigo, madder, and other solid pigments must be employed. In summing up the advantages of the aniline colors, we must consider their brilliancy and freshness, rather than their durability. They are certainly at present the most important pigments for the dyer, as they combine facility of treatment and moderate costliness with a brilliancy never hitherto known—in short, all that the dyer wishes.