COLOR REACTIONS*.

E. A. RUDDIMAN.

The author presents reasons for variations in color reactions and refers to defective vision of individuals as one of the dangers for wrong conclusions from color tests.—[EDITOR]

Some years ago the writer made a compilation of color tests of thirty-five alkaloids and eighteen other organic compounds. In doing so it soon became evident that authorities differed widely in the statement of the color produced by a given reagent on a given compound. Recently I have been checking over these tests and have come to the conclusion that the following conditions will account for the variation.

1. There is a great difference in eye-sight and in the power to distinguish colors and shades of colors. What looks like a certain color to one person will resemble another color to a different observer. This defect in some people amounts almost if not entirely to color blindness.

2. There is no recognized standard adopted by chemists with which to compare colors. A certain color can be called a violet-red or a red-violet and both be correct. It is difficult to distinguish the shades, for instance, as they pass from yellow through orange to brown and it is still more difficult to describe them so that another person will catch them. It is to be regretted that there seems to be no convenient standard available for small laboratories so that one writer in describing a color could call it by the name and number of the standard color with which it agrees. The only book of which the writer knows gives about 4000 shades and costs $8.00. A few charts with perhaps 100 to 200 colors would be of great use, provided the colors could be made permanent.

3. The impurities occurring in alkaloids and other compounds will account for some variation. Principles as obtained from drugs and preparations in analytical work are frequently contaminated with foreign matter or are mixtures of several principles, as in case of sabadilla or pomegranate alkaloids. These impurities may modify the color, entirely cover it up, or destroy it. In some cases, as with digitalis glucosides or aconite alkaloids, manufacturers put up different compounds under identical names. Moreover, some chemicals change on keeping and give different results, as apomorphine and apocodeine.

4. Reagents sometimes have impurities in them which modify the colors, as iron or nitric acid in sulphuric acid.

5. Several reagents are made up with sulphuric acid as the solvent. Sulphuric acid being so hygroscopic, it will contain variable amounts of water. If the container of such a reagent is opened frequently for a week, enough water may be absorbed so that no color is obtained when there should be one. Reagents, like Froehde's formaldehyde in sulphuric acid, or ammonium selenite in sulphuric acid should be made up frequently.

*Presented to Scientific Section, A. Ph. A., San Francisco Meeting.

6. The variation in strength of reagents may give different results. Some workers in making up Froehde's reagent use 0.05 gm., others 0.1 gm. up as high as 1.0 gm. for every 10 cc. of sulphuric acid.

7. The actual amount taken of the compound being tested, the amount of the reagent applied, and the proportion of reagent to the compound in certain cases cause a variation. Occasionally where the weight of the compound is directed, it is so much larger than it is possible to get in commercial analysis, the test is of but little value.

8. The order of mixing, whether the reagent is added to the compound or the compound to the reagent, which is in excess, may cause some variation.

9. On adding a reagent the color produced may be permanent, or it may change slowly requiring several minutes or even hours, or it may change very rapidly. The amount of substance being tested will often cause a variation in the time required for the change. Different workers may catch these colors at different stages of change. In analytical work it is impossible to use the same amount of substance each time or as the original test called for.

10. Some tests require the application of heat. The degree of heat and the rapidity with which it is applied in some cases causes a variation.

Since we must depend so largely on color tests for the identification of alkaloids and some other organic compounds, it is unfortunate that so many factors must be considered. To eliminate these as far as possible I would suggest to those who report results from color reagents: That they test the reagents used; that they state the strength of the reagent; that the reagent be added to the compound being tested, or if any other order be followed, it be so stated; that the amount of substance being tested be small, approximating what might be expected in making an analytical examination; that the amount of reagent added be one or two drops from a small stirring rod or dropper, unless otherwise stated; that if heat is to be used, the mixture of substance and reagent be placed on a bath in which the water is already boiling; that the name of the manufacturer of the alkaloid be given, where there is any doubt as to its purity.

ESTIMATION OF ATOXYL.*

H. ENGELHARDT AND O. E. WINTERS.

Quite recently we have had occasion to examine tablets for the amount of atoxyl present. Several methods for estimating atoxyl have been proposed and in order to find out the most reliable one the following assay methods were tried.

I—Sulphurous acid method.[1]

II—The method proposed by Norton and Koch for estimating arsenic in presence of organic matter in a modified form.[2]

III—The method of the German Pharmacopœia.

IV—Method of the German Pharmacopœia modified.[3]

* Read in Scientific Section A. Ph. A., San Francisco meeting.

[1] Puckner and Clark (Journ. Amer. Med. Assn. 1907, p. 1041).

[2] Ibid, Norton and Koch (Jour. Amer. Chem. Sec. 1905, p. 1247).

[3] Rupp and Lehman (Apoth. Zeit. 1911, p. 203).