

Ten cc. of decinormal sulphuric acid are now carefully measured from a burette into the flask, which is rinsed round and warmed by immersion in a water-bath until the soluble alkaloids are dissolved, when the insoluble residue will show how much of this extract is not alkaloid.

Twenty cc. of hot water are added to the contents of the flask, and a definite quantity (ten drops) of logwood indicator. The color is then closely observed by transmitted light, and matched by a similar quantity of liquid in a similar flask. Decinormal potassium hydroxide is now dropped in from a burette until the color changes slightly to a pinkish tint or shade of the original yellow by transmitted light, and when this hardly perceptible change is now looked at by reflected light the pink tint is very distinct.

The number of cubic centimeters required subtracted from 10 (cubic centimeters of acid used) gives the number of cubic centimeters of acid saturated by alkaloids, and this number multiplied by the mean of the molecular weights of the two alkaloids ($0.0334 + 0.0394 \div 2 = 0.0364$), gives the amount of alkaloids obtained from ten grams of nux vomica, the strychnine and brucine being assumed to be present in equal proportions.

Then as 10 is to the product from 10, so is 100 to the percentage of the mixed alkaloids.

DETECTION OF CAMEL IN SPIRITS AND VINEGAR.

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HAVING had frequent occasion to determine the question as to whether a sample of spirits was colored with artificial coloring-matter or owed its color to a long age in wooden packages, one of us has for a long time endeavored to obtain some reliable test by which the presence of caramel could be definitely proved. The principal methods given in the books are (1) the reducing action of caramel on Fehling's solution, and (2) the precipitation of the coloring-matter by paraldehyde. Neither of these methods has given satisfactory results in our hands. Spirits extract from oak wood, especially when charred, substances which have nearly, if not quite, as high a reducing power on Fehling's solution as caramel. The test with paralde-

hyde, known as Amthor's test,¹ is given greater weight in most text-books, and is mentioned by Smith² in a recent article on vinegar analysis. This test has proved equally as unsatisfactory in our hands as the reduction of copper. When present in large quantities the caramel may possibly be obtained as a precipitate and identified by its action on phenylhydrazine, but in the small amount present in artificially colored spirits, for example, the precipitation is imperceptible.

In searching for a more reliable test, our attention was drawn to the action of fuller's earth upon coloring-matters, and especially to the article by Geisler,³ showing the effect of fuller's earth upon the artificial azo-dyes used in butter or oleomargarine.

Upon adding this earth to samples of spirits colored in the natural way by contact with charred or uncharred wooden packages, we found the color but slightly affected, while using the same quantity upon spirits colored artificially with caramel, a very large part of the color was discharged. In other words, the earth seemed to have a much stronger affinity for the artificial than for the natural coloring-matter. By means of Lovibond's tintometer the difference in color before and after the treatment may be determined with a considerable degree of accuracy, and in this way more than twice as much color was found to have been absorbed from artificially colored spirits as from the natural.

The test was applied to all the samples of both kinds which were available, some fifty-eight in number, and no exceptions found. A series of forty samples of spirits known to be naturally colored gave the following figures :

	Color removed. Per cent.
Maximum.....	25.0
Minimum.....	8.3
Average.....	14.6

A series of eighteen samples of spirits known to be artificially colored gave the following figures :

¹ Koenig : *Nahrungs- und Genussmittel*, Band II, p. 1026.

² This Journal, 20, 3 (1898).

³ *Ibid.*, 20, 110 (1898).

	Color removed. Per cent.
Maximum	54.1
Minimum	40.0
Average	44.7

It will be seen that the margin is ample for detecting a sample colored artificially; the average per cent. of color removed from the factitious samples being about three times as great as the average per cent. removed from the genuine samples, while the maximum and minimum of the two sets are fifteen points apart. It must be remembered that all the artificially colored samples have, besides the added color, a small amount of natural color derived from wood, and this varies in different samples. If this were not the case, a much greater disproportion would be shown between the results before and after the treatment. A sample of water-white spirits which we colored ourselves with caramel, and then subjected it to the usual treatment, lost seventy per cent. of its color.

The test must be made strictly comparative, of course, the same amount of the absorbent material being used in each case, and allowed to remain in contact with the liquid a certain length of time at normal temperatures. A sample of spirits colored naturally may be used as a standard which should not be too far removed from the suspected sample or samples in depth of color, though if a colorimeter be used it is not at all necessary for the standard to be the same depth of color as the suspected sample. The method of procedure followed in our work was as follows: Twenty-five grams of fuller's earth was added to fifty cc. of the spirits under examination, the mixture beaten up in a beaker, allowed to stand covered half an hour at room temperature, and filtered. The determination of the figure representing the color was made with the tintometer upon the liquid before and after treatment, and the difference between the two results gave the percentage of color absorbed. It is scarcely necessary to say that the same earth must be used in all cases. We have only been able as yet to examine two different samples of this material, and these differed considerably in their power of absorbing the caramel coloring. It is known that some varieties of fuller's earth do not have the property of absorbing color at all.

The test was also applied to two samples of cider vinegar known to be pure, that is, with no artificial coloring-matter added, and the result showed that but a slight effect was produced upon this coloring-matter by the earth. Caramel was then added to these samples and they were again treated with the earth, with the result that the added coloring-matter was almost entirely removed and the samples restored to practically their original color. Acetic acid diluted to vinegar strength and colored with caramel gave up its color when treated. These few experiments seem to show that the test is applicable to vinegar, but we have not had the facilities for extending it to a large number of factitious samples as we have done in the case of spirits.

The color-absorbing power of fuller's earth is a most interesting subject, which does not appear to have been investigated to any extent. Whether it is due to chemical or physical action, and the connection, if any, between the composition of the earth (which seems to be anything but uniform) and its effect upon various coloring-matters, are questions which should receive attention and would doubtless yield interesting and valuable results to investigation. If any work has been done along this line no results have been published, as the journals make little or no mention even of the fact that fuller's earth possesses such properties. Yet it is well-known that a very extensive industrial use has been made of it within recent years in the refining of both vegetable and mineral oils. We have been informed that filtration through or treatment with fuller's earth has entirely superseded all other methods of bleaching in the cottonseed oil industry. Our results showing its affinity for caramel coloring would seem to indicate that it might be substituted for bone-black in sugar clarification, but we are not aware that such application has been made. Perhaps it would be considered too much like a return to the ancient method of "claying" sugars.
