

## THE COLOR OF MORPHINE SULFATE.\*

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Inspection of several market brands of morphine sulfate has revealed that these products appear to be of somewhat different shades of whiteness as judged by the unaided eye. Solutions of some of these different products also appear to be distinctly grayer than solutions of some of the others. These differences, for both solids and solutions, are usually not large and probably would be overlooked entirely by the casual observer. When, however, the cubes of the several brands are observed carefully side by side, or large volumes of their solutions are compared simultaneously, these differences become definitely discernible.

Such differences in color, both among the solid samples of the drug and among their aqueous solutions, show that these products are not all of uniform quality.

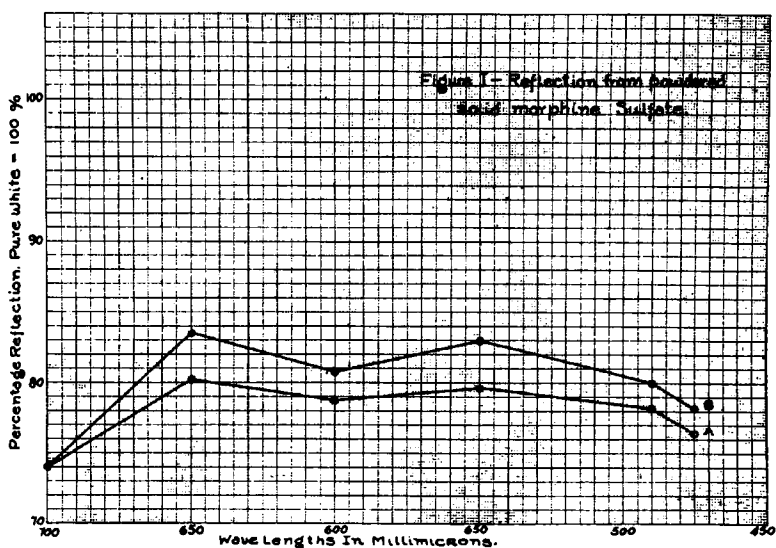


Fig. 1.

The first impulse is, of course, to assume that the cubes which look the whitest are the purest morphine sulfate. However, it was considered advisable to investigate this point since the unaided eye can be deceived as to the comparative qualities (both color and intensity) of different beams of light which reach it after being reflected or transmitted by any material which absorbs some of the light incident upon it. (Fig. 1.)

In order to determine the real nature of the light which is reflected by the various samples of morphine sulfate studied, or transmitted by their solutions, spectrometric analyses of such light were made. Figure 1, for example, gives curves showing the per cent reflection from two of the market brands of morphine sulfate studied, designated A and B, and Fig. 2 shows the transmission curves for solutions of the same products.

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It can be seen that the solid morphine sulfate of brand B reflects a little more light throughout the visual spectrum than does brand A morphine sulfate. A pure white solid would, of course, reflect 100% of the light of all wave-lengths incident upon it. This part of the color analysis simply confirms ordinary visual observation. Since about 80% of the light was reflected by both these samples throughout the range of color in which the human eye is most sensitive, it is obvious that both samples should appear as approximately white or grayish white solids. However, when closely examined side by side, brand B appeared the whitest.

When, now, the transmission curves of Fig. 2 are examined, an apparent inconsistency is noticed. Solutions of brand A transmit the most light throughout the visual spectrum; a perfectly transparent material would, of course, transmit 100% of the light of all wave-lengths passing into it. This can only mean that solutions of brand B contain certain impurities which absorb light and which are

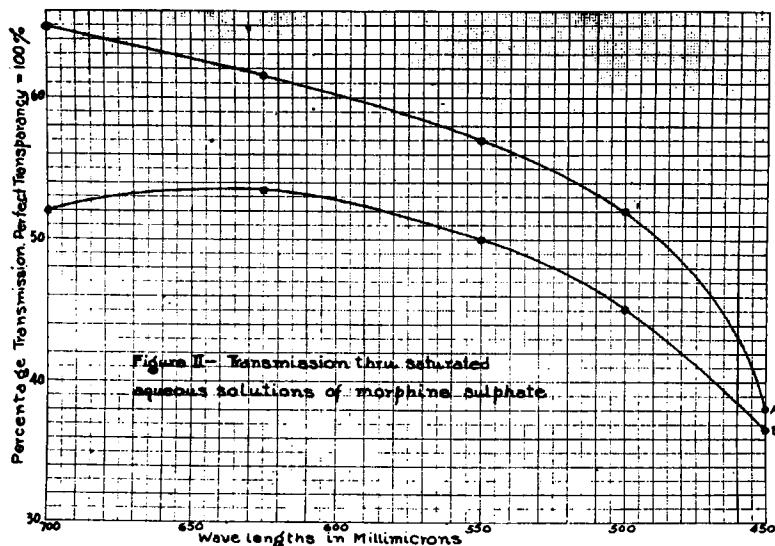


Fig. 2.

either absent from solutions of brand A or present in smaller amounts. If, then, brand B is slightly less pure than brand A the question arises as to why the solid brand B appears the whiter of the two.

Individual crystals of morphine sulfate, when examined under the microscope, of course, appear colorless. The market cubes are formed by compressing together a countless number of small crystals. They appear white only because each cube has myriads of small crystal faces from which light of all wave-lengths is reflected. Their whiteness is the same as the whiteness of snow which is composed of crystals of ice, each one of which, if inspected singly, is clear and not white.

From this it follows that the finer the average size of the individual crystals in the cubes the whiter the cubes should appear, all other things being equal. Microscopic inspection of the crystals of both brands showed that both were composed of crystals of widely different sizes. Brand B, however, was seen to have a greater percentage of finer crystals than brand A. In making up the solutions for the

transmission studies, the rates of solution were also found to be in this order; *i. e.*, brand B was completely dissolved considerably before brand A. It is evident, then, that brand B, which transmission curves show to be less pure than brand A, owes at least some of its slightly purer white appearance to the fact that the crystals of its cubes are, on the average, smaller.

Still further consideration of the curves of Fig. 2 shows that while there is an appreciable difference in the amount of light transmitted by the two solutions at the red end of the spectrum, both solutions transmit about the same amount of light at the violet end. In other words there is relatively more blue light passed by the solution of B than by the solution of A.

This lesser proportion of blue light transmitted by solutions of A can hardly be due merely to the presence of an impurity in A that absorbs blue light. As stated above, the total lesser transmission throughout the entire visible range indicates that solution B is the one that is the less pure morphine sulfate. The same effect could, of course, have been realized by adding a trace of a blue dye to product B. Such an addition would tend to offset a comparatively dirty, slightly yellow or brown color, making the absorption at all wave-lengths more nearly uniform. To the eye such a solution or solid would then appear more nearly plain gray than before, and if the crystals of such a product were finer the bulk solid could actually be made to look whiter than another product which is definitely the purer of the two.

The use of a blue dye to whiten materials of dirty color is, of course, common practice in the laundry. Although the presence of such a dye actually cuts down the total reflection of light, it does make the reflection throughout the entire visible range more nearly uniform. Hence, although the material is grayer than before, it appears whiter because the eye is more sensitive to differences in color than to differences in intensity of light in objects substantially white in color. Gray materials, of course, are merely those which reflect or transmit all wave-lengths equally but absorb some of all of them.

The evidence strongly suggests, therefore, that brand B morphine sulfate is contaminated by a trace of blue dye which aids in obscuring the dirty color which it otherwise would have because of impurities shown to be present by absorption studies. The whiteness of this product is also enhanced by the fineness of its individual crystals. Still other brands were examined, some of which owe their apparent slightly superior whiteness solely to the comparative fineness of the crystals of which they are composed.

We conclude, therefore, that it is unsafe to judge the purity of market brands of morphine sulfate solely by comparing the whiteness of the cubes in which form the various brands are usually marketed. All are naturally approximately white-appearing cubes to be marketable at all. The slight differences in the apparent purity of their whiteness may or may not be directly related to the chemical purity of the morphine sulfate in the cubes.

We wish to acknowledge the kindness of the Keuffel and Esser Company in placing at our disposal one of their Color Analyzers on which instrument the various color analyses alluded to above were made. The reflection measurements were made by gently crushing the cubes and packing the powder behind a plane glass window upon which white light could fall and be reflected back through the instru-

ment for analysis and measurement. The absorption studies were carried out on solutions contained in the 10-cm. tubes supplied with the instrument. The light emerging from these tubes was matched against the light from similar tubes filled with distilled water. Thus for both the reflection and the absorption measurements the differences between the various samples of morphine sulfate are significant rather than the absolute values.

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### MAKING YOUR NAME WORTH SOMETHING.\*

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I have often marveled at that strange complex of pharmacists which makes them seek to bury their personalities under an impersonal name. For instance, why does John Smith, pharmacist, present himself to the world as the Crescent Pharmacy, or the Broadfront Drug Company as the case may be? It seems incredible that either of these designations can have the same appeal, the same drawing power, or the same value, as the name of the pharmacist himself.

The whole thing seems all the more strange when it is recalled that everything underlying the existence of the Crescent Pharmacy revolves around the personal and individual attainments of the pharmacist himself. The pharmacist has been compelled to undergo an exacting period of training in order to fit himself for the practice of pharmacy and the operation of a drug store. The pharmacist has also been required to pass a State Board examination so that he, himself, may be declared competent to carry on the work for which he has prepared himself. In addition to all of this, he is dealt with on the basis of his personal qualifications and personal integrity in the matter of being licensed to deal in narcotic drugs. On all sides, and in all of his activities he is hedged about and controlled by what he personally and individually is and does.

In spite of this, when this same pharmacist comes to making a place for himself in the business world, a place in which he will exercise his personal talents and will make the public the beneficiary of his personal competency and skill, he blossoms forth under the thoroughly impersonal designation of the Crescent Pharmacy.

Not only does the Crescent Pharmacy become the name behind which the pharmacist loses his identity, but he resorts to the same means and methods when designating the prescriptions which he himself develops and prepares in consequence of his personal professional skill. The label which is placed on the prescription which he himself compounds, the product which permits him to make a professional reputation and build up a professional practice, also fails to carry his name.

The usual imprint line, in the event the store goes in for this type of preparations, is also developed under the name of the Crescent Pharmacy. Many pharmacists utilize imprint goods as a means of building up a business of their own. Products of this kind have no consumer appeal or consumer acceptance other than that which the pharmacist himself can give them. However, once these products become accepted the business in them belongs exclusively to the pharmacist himself. This is a type of professional pharmaceutical practice and, it would appear,

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\* Section of Commercial Interests, A. P. H. A., Dallas meeting, 1936.

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