MAGNESIA MAGMA—MILK OF MAGNESIA, N. F.

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While the formula for Magnesia Magma (Milk of Magnesia, N. F.) is calculated upon the basis of chemical equivalence, that is to say, the magnesium sulphate and sodium hydroxide are in molecular proportion; yet owing to the method of procedure given in the National Formulary, the resulting precipitate forms a semi-translucent, viscous mass, difficult to pour from a bottle, and far from being the snow-white cream which it is intended to obtain.

President George M. Beringer, published an article, about a year and a half ago, in the *Journal of the A. Ph. A.*, in which he laid down the fundamental principles necessary for success in the manipulation of this process and I am indebted to his article, for the success I have had in the manufacture of this preparation.

The principal features of Mr. Beringer's process are as follows:

First—That the solutions of magnesia sulphate and sodium hydroxide must be brought to the boiling point before mixing.

Second—That the solutions should be mixed in reverse order to that given in the National Formulary; the magnesium sulphate solution being slowly added in a fine stream, with continued stirring, to the solution of sodium hydroxide.

Third—That the sodium hydroxide must be in excess to the extent of 10%.

Fourth—Distilled water is directed.

My experience in the manufacture of this preparation has led me to make two changes in the process, first, with respect to the percentage of sodium hydroxide used, and second, as to the nature of the water employed for the purpose of washing the precipitate.

In the course of my experience, I first observed that the amount of the precipitate obtained, was not constant. The cause of this I traced to a variation in the strength of the sodium hydroxide that I was using, this being the product of three different manufacturers.

I then found that in order to wash the precipitate with distilled water until the supernatant liquid should no longer become cloudy upon the addition of a drop of T. S. Barium Chloride, would increase the cost of production to such a point as to make its use prohibitive.

I, therefore, increased the amount of sodium hydroxide to 12%, and on some occasions to 15%, and also adopted the use of water supplied by our artesian well, which is of exceptional excellence, and which furnishes one of the best potable waters to be found anywhere.

The foregoing reasons have therefore prompted me to make the following modifications.

First—Owing to the variations in yield of precipitate obtained by the use of different samples of sodium hydroxide, I have increased the amount indicated by the theoretical molecular formula, from 12 to 15%. This ensures that when

the residual product is reduced to a volume of 1000 Cc., as directed by the National Formulary, each fluid ounce will contain 24 grs. of magnesium hydroxide $Mg(OH)_2$.

Second—Artesian water is used for washing the precipitate to the amount that each gallon of magma is washed with about twenty-eight gallons of water.

In preparing the solutions necessary for one gallon of magma the magnesium sulphate is first dissolved in one gallon of water, the solution filtered and then boiled. The sodium hydroxide is dissolved in 6 pints of water, and this solution filtered and boiled. The solution of magnesium sulphate is then poured, in a thin stream, and with constant stirring, into the solution of sodium hydroxide, and the resulting mixture boiled vigorously for 15 minutes or more. There is no danger of over-heating the mixture, for the reason that the magnesium element can be exposed to a far greater degree of heat than can be imparted by boiling, without injury.

After the mass has been thoroughly boiled, the mixture of the solutions is diluted with water to 5 gallons, and allowed to stand for twenty-four hours, or until subsidence has taken place to about the one gallon level, which should be previously marked on the container. The exact level is unimportant, however, as my experience demonstrates that the quantity indicated above, will reach its maximum level in twenty-four hours. The supernatant liquid is then carefully drawn off by means of a rubber tube syphon; fresh water is added, and the washing continued in this manner for the requisite time.

The reaction which takes place in this process is represented by the following equation:

$$MgSO_4 + 7H_2O + 2NaOH + 3H_2O = Mg(OH)_2 + Na_2SO_4 + 10H_2O.$$

The following equation indicates that the molecular quantities of the N. F. are theoretically correct, but the peculiarities of mass-action were evidently not considered; these however, are governed by concentration, temperature and various other influences, which can only be overcome by experience in operative work.

	Grams		Combined Mol. Wt.	Water
$Mg\,SO_4 + 7H_2O$	250	=	244.69 +	$3\,H_2O$
$2NaOH$	81		79.52	

A striking illustration of chemical action bearing upon this subject is revealed during the preparation of zinc iodide ZnI_2. If we take the atomic weight of metallic zinc 64.9, and mix it with the combining atomic weight of iodine 125.9 $\times 2$, introducing these two substances into a flask together with a half fluid ounce of distilled water, there will be an immediate re-action, shown by the color which will deepen and become more and more intense as the re-action proceed ; followed in a few minutes by an appreciable increase in temperature, up to a certain point, when the heat of the re-action is suddenly enormously increased, and a portion of the iodine is volatilized, as is indicated by the violet-colored vapor which is evolved; the whole mixture in the meantime, becoming involved in violent ebullition. The temperature then gradually subsides, the mass be-

comes cold, chemical action ceases, and no amount of subsequent agitation will discharge the color of the iodine, although it is still in the presence of uncombined metallic zinc.

The cause of the suspension of chemical reaction in the above mixture is due to three conditions, namely, concentration of the solution, diminution of the area of the surface of the metallic zinc, and absence of heat.

If, on the other hand, we employ a considerable excess of metallic zinc, using the atomic weight of iodine as before, the very largely increased area of zinc-surface exposed to the action of the iodine, enables combination to proceed regardless of concentration, up to the point of the complete discharge of the iodine color, thus indicating complete chemical union of the two elements.

In the case of Magnesia Magma, for the same reason, chemical equivalents should not be used; but we must have an excess of sodium hydroxide, in order that the magnesium sulphate may be completely decomposed. This is evident from the amount of that salt found in the supernatant liquid when less than an excess of sodium hydroxide is employed.

URINE ANALYSIS; QUANTITATIVE ESTIMATION OF GLUCOSE.

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Any one who has occasion to make many quantitative determinations of sugar in urine, is aware of the necessity of having a rapid, accurate and easily applied method of analysis.

Shortly after the publication of Benedict's paper, "The Detection and Estimation of Glucose in Urine" I began experimenting with the object of ascertaining the accuracy of the method.

The sugar in a sample of urine was determined volumetrically by employing the following modification of Benedict's method, which I suggested in a paper read at the last annual meeting of the American Pharmaceutical Association (Journal A. Ph. A., May, 1914, page 687).

Into a 100 cc. Erlenmeyer flask, with cord wrapped around the neck to prevent burning the fingers, pour 25 cc. of accurately measured Benedict's Quantitative Solution, add a few grammes of crystallized sodium carbonate and place on the hot plate. When the solution is boiling, gradually add the sugar solution from a burette, with sufficient slowness to allow the reaction to proceed, putting the flask back on the hot plate until disappearance of color.

The sugar in this same sample, was then determined gravimetrically, by the following method of Defren-O'Sullivan (Leach, Food Inspection and Analysis, 2nd edition, page 564):

Mix 15 cc. of Fehling's Copper Solution with 15 cc. of the Tartrate Solution in a quarter liter Erlenmeyer flask and add 50 cc. distilled water, place the flask and its contents in a boiling water bath and allow them to remain five minutes, then run rapidly from a burette into the hot liquor in the flask, 25 cc. of the sugar solution to be tested (which should contain not more than one-half percent

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