ADDITIONAL DATA CONCERNING THE PREPARATION OF MAGMA MAGNESIA, MILK OF MAGNESIA.

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In my previous communication upon this subject which appeared in the August, 1914, issue of the Journal of the A. Ph. A., I gave an amount of water required to wash the precipitate which was based upon the instructions given in the National Formulary to "wash it until free from saline taste."

This investigation was therefore begun to determine more definitely the extent to which it is necessary to carry the washing of the magma in order to secure the practical elimination of the sodium sulphate and excess of sodium hydroxide contained in the supernatant liquor.

For the purpose of this experiment the same system originally employed was established; this consisted of,

First: A well annealed glass precipitating bottle, the exact capacity of which was found to be three gallons, six pints and a half, the ordinary measures employed in the store being used for measurement.

Second: Metathesis was effected in the manner described in my former paper, and the resulting mass introduced into the bottle for subsidance.

Third: A record was kept providing for observations made at intervals of 24 hours, of the supernatant liquor. At the expiration of each period 500 cc. (mils) of the liquor were taken for examination.

Fourth: The solid content of the 500 cc. (mils) thus taken was determined gravimetrically, this method having been selected as the quickest and most practical for the average pharmaceutical laboratory, the volumetrical analysis of the supernatant liquor requiring too much time in the absence of the requisite standardized solutions.

The results obtained, considering the means at my disposal, are remarkably accurate, as I shall presently show.

I subsequently made a third experiment, for the purpose of comparison with the following results, this time using a Beaumé hydrometer, for the determination of the solid content of the solution, as shown in experiment No. 3.

The following observations were made:

SEDIMENTATION RECORD (SUPERNATANT LIQUOR)

Temperature 25 degrees Centigrade.

		Grains per	Per cent.
24 hours	Solid content Na_2SO_4 and NaOH	500 cc. (mils)	
1st period	" " " "	357	
2nd period	" " " "	171	48
3rd period	" " " "	83	48.5
4th period	Gravimetric limit	——	
5th			
6th			
7th			

SECOND EXPERIMENT.

Period	Grains per 500 cc. (mils)	Per cent.
1st	374	
2nd	186	49.7
3rd	90	48.2
4th Gravimetric limit	——	

The term gravimetric limit is used upon this occasion to indicate the point at which it was difficult with the instruments at my command to make a further gravimetric measurement.

An inspection of the above observations will show that there is a uniform decrement in the solid content of the solution, and that this is a constant, approximating 50 per cent, and a measure for all subsequent decantations.

Reasoning by analogy it will be seen that after the fourth decantation the solid content will be reduced to approximately 20 grains for the whole system, and since the sedimented magma after 48 hours will occupy one-fourth of its volume (that is, the volume of the precipitating bottle), there can be only 5 grains of sodium sulphate and sodium hydroxide remaining in the interstices of the magma. Obviously if the washing had been carried to the end of the seventh washing, the solute would have attained a very high degree of attenuation.

THIRD EXPERIMENT.

In this experiment a Beaumé hydrometer was used, and the following observations made:

Period	Solid Content Per cent by Weight	Specific Gravity	Degrees Beaumé
1st	8.0	1.03187	4.5
2nd	4.0	1.01173	2.3
3rd	2.0	1.00779	1.1
4th	1.0	1.00388	.6
Limit of physical measurement by this instrument	——		

We have in the above measurements results which compare very closely with the results of the first two experiments, and which again indicate a uniform decrement which indicates a constant of 50 per cent.

It will be seen from the inspection of the above tables, that the limit of ponderable content is reached at the fourth decantation, and in view of the harmless nature of sodium sulphate its presence is absolutely negligible, and the application of the $BaCl_2$ T.S. to this preparation is too severe and impracticable, since it would require the washing to be continued to infinite dilution to find a point at which a cloud would cease to be given.

While the writer is not insensible of the fact that the facilities at his command at the time this investigation was conducted were crude, the results obtained are so close to the calculated theory, as to be practically correct.

For the convenience of the readers of this paper, I herewith give the equation representing the reaction which takes place during matathesis, and which was part of my previous paper:

$$\underset{246}{MgSO_4+7H_2O} + 2NaOH+3H_2O = \underset{58}{Mg(OH)_2} + \underset{322}{Na_2SO_4+10H_2O}$$

The manufacture of this product has been conducted many times by the writer during the past eighteen months and it has been a constant source of interest;

but it was not until he attempted this quantitative work that the significance of much that he has observed has become apparent.

Upon the examination of the first 500 cc. (mils) of the supernatant liquor, he tried to balance the total ponderable solids found, with the molecular weights as indicated by the "law of constancy of composition." He found, of course, that the 357 grains found in the 500 cc. (mils) of solution fell far short of the total molecular weight of the reacting bodies.

He then had recourse to the modern theory of electrolytic dissociation, for which we are indebted to the physical chemist, and here he found the cue which led to the explanation.

From the solubility point of view, as taught by this branch of chemical science, the dissolved magnesium sulphate (salt) and sodium hydroxide (base) in dilute or moderately dilute solution, are dissociated into their constituent ions; the ions only becoming chemically active in such diluted solutions, the molecules of water released by the magnesium sulphate remaining in the solution only as potentialities of subsequent water of crystallization.

As shown by the above equation, 10 molecules of water of crystallization have entered into combination and exist in the solution as potentialities of the crystal form of sodium sulphate, $Na_2SO_4+10H_2O$.

In solution, the water so constituted being of the same specific gravity as the solvent, nothing but the ions Na_2SO_4 and the NaOH contained in the supernatant liquor are ponderable. The total molecular weights of all the reacting bodies could only be determined by the investigation of the whole system employed in effecting metathesis; in other words the 14430 cc. (mils) or the volume of the precipitating bottle employed for sedimentation.

The following calculation will show the ratio of the reacting bodies before and after metathesis according to theory:

$$\frac{Mg(OH)_2}{MgSO_4+10\ H_2O} = \frac{58}{246} \times 44 \text{ equals } 10.4 \text{ ounces } Mg(OH)_2.$$

$$\frac{Na_2SO_4+10\ H_2O}{MgSO_4+7\ H_2O} = \frac{322}{246} \times 44 \text{ equals } 57.6 \text{ ounces } Na_2SO_4+10\,H_2O$$

Total	68.0
Less 55.9% water of crystallization	24.59
	43.41

Found as shown by experiment No. 3

$Mg(OH)_2$	10.4
$Na_2SO_4+10H_2O$	32.5
And excess NaOH	42.9 difference of 0.5ounces.

This may be accounted for in part by the loss attending the four decantations.

MAKING THE INITIAL SOLUTIONS.

Before closing this article I would like to say a few words in reference to making the solutions.

Great care must be exercised in making the solution of sodium hydroxide, as the temperature rises rapidly to 210 degrees Fahrenheit at this elevation (Denver), which is equivalent to a reading of 220 degrees at sea level.

All utensils used should be of granite iron ware.

Filtration of the sodium hydroxide solution must not be attempted with ordinary filtering paper for the reason that the causticity of the solution weakens the fiber of the paper, and at the same time acts on it in such a manner as to discolor the solution.

A very convenient way is to adjust two layers of plain gauze of suitable dimension by means of a rubber band to a ½ gallon funnel, then place a layer of absorbent cotton 1 inch in thickness and 5×5 squarely in the center and pour the solution carefully upon it.

The solution of magnesium sulphate may be filtered through absorbent cotton or ordinary filter paper.

COLLECTION OF THE MAGMA.

After the fourth decantation, it is not necessary to drain the whole mass of magma, but only such an amount as will remove the required volume of supernatant liquor necessary to bring the mass to the requisite density.

The draining at this point should be done on filter paper, and the magma thus collected should be removed by means of a silver or silver plated spoon and returned to the precipitating bottle, the whole mass then vigorously shaken. By this method the minimum amount of magma is at any time exposed or brought in contact with other bodies.

Rubber stoppers should be employed for the container, as the magma will in a short time act on cork and discolor both it and the mass.

THE PHARMACIST'S WORK TODAY.*

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We are living in an age of unrest which extends to all branches of human activity. Just at present, mankind is passing through a period of acute excitement which is manifest, the world over. At one time, pharmacy was a quiet, studious occupation with well fixed scope and definite limitations. Pharmacy was caught by the wave of unrest at a date prior to the memory of this generation. The pharmacist of today is so accustomed to chaotic conditions in his own vocation that he is not surprised by the perturbations that are found in other lines of trade and professions nor by the heavy head lines in the daily press that but faintly reflect the present great upheaval in the political world of Europe. Only the patient and even-tempered care to remain in pharmacy, with its trials, tribulations and uncertainties. Pharmacy, as we find it, calls for men and women of evenly balanced minds to think right and well developed bodies to resist disease. The future of pharmacy must be worked out by successive generations of the kind of persons who accomplish results in spite of difficulties. We, of today must be followed by those who are peculiarly strong and competent.

It is not my purpose on this occasion to diagnose the diseases that beset pharmacy today. Nor shall I outline a course of treatment nor even indulge in that innocent and inexpensive pastime of prognosing future conditions. What I have

*Address before the Colorado Pharmacal Association, at Boulder, June 23, 1915.