

This material was diluted to 4 liters and allowed to settle over Sunday. It was then drained down to about 2 liters and transferred to a 4-gallon cylinder and 2 gallons of water added. It was washed in this cylinder, using 2 gallons of water per washing, until it passed the U. S. P. test for free alkali. It was again transferred to a 4-liter beaker and after it had settled sufficiently to a 2-liter cylinder, where it was allowed to settle for six days. It was then drained off and bottled and then had a volume of 1300 cc.

This had a  $p_H$  of 10.58 at 22.4° C. It therefore contained only an extremely slight amount of alkali, about 0.00004 N. Nevertheless, a U. S. P. test for free alkali required nine drops of *N*/10 acid instead of five, the upper limit. This shows the unreliability of the U. S. P. test, and the much greater delicacy of the electrometric  $p_H$  determination.

### THE ALKALINITY OF MAGMA MAGNESIÆ. III. THE EFFECT OF MAGNESIUM CARBONATE.

BY R. B. SMITH AND P. M. GIESY.

In previous investigations by the same authors<sup>1</sup> the  $p_H$  of pure milk of magnesia was determined. Samples were prepared by mixing solutions of  $MgSO_4$  and  $NaOH$  in such proportions that in some samples there was an excess of  $MgSO_4$  and in the others an excess of  $NaOH$ . The  $p_H$  of the pure milk was determined by washing these samples with distilled water to constant  $p_H$ .

It was determined as a result of these experiments that the  $p_H$  of pure milk of magnesia was 10.52. During the course of this work several samples washed from high  $p_H$  values did not come to the  $p_H$  which we had reason to believe was that of pure Magma Magnesiæ; their  $p_H$  values continued to fall off, so that values as low as 10.03 were obtained. We were unable to explain this at the time.

A later investigation was made on the washing of milk of magnesia in which  $p_H$  and soluble matter determinations were made to follow the washing. During the washing of several samples which had had an initial  $p_H$  of above 10.52, it was noticed that the  $p_H$  continued to drop even after a  $p_H$  of 10.52 was attained, while the soluble matter shortly became constant.

A consideration of the solubilities of  $MgCO_3$  and  $Mg(OH)_2$  which are given by Seidell, "Solubilities of Inorganic and Organic Compounds," Second Edition, as  $MgCO_3 = 0.18$  Gm. per liter, solution in equilibrium with air at 20° C.;  $Mg(OH)_2 = 0.009$  Gm. per liter, gave us the idea that the  $p_H$  of a  $Mg(OH)_2$  suspension might be considerably affected by the presence of  $MgCO_3$ . This  $MgCO_3$  could be introduced into the solution by the carbonate impurities of the  $NaOH$  used for precipitation, by  $CO_2$  in the distilled water, or by absorption of  $CO_2$  from the air by the alkaline solutions as they were being washed. Since magnesium carbonate is relatively insoluble, its removal by washing would be a slow process and a saturated solution of it would always be present until all the solid  $MgCO_3$  was washed out. This dissolved magnesium carbonate would be expected to depress the solubility and therefore the  $p_H$  of the magnesium hydroxide suspension by its mass action effect.

<sup>1</sup> J. A. PH. A., 12, 955 (Nov., 1923).

To test this hypothesis, a sample of Magma Magnesiae which had been washed down to a  $p_H$  of 10.52 was treated with an excess of  $MgCO_3$ , stirred and allowed to stand over night. Its  $p_H$  was then determined to be 10.18.

This lowering is much less than the calculated lowering which would be produced by adding such an excess of Mg ions to a suspension of pure  $Mg(OH)_2$ . The reason for this appears to be that  $MgCO_3$  itself is considerably hydrolyzed, giving hydroxyl ions. A well-washed suspension of magnesium carbonate had a  $p_H$  of 10.00 at  $25^\circ$ . When magnesium hydroxide was added, the  $p_H$  of the mixture was raised to 10.17, which checks well with the earlier value of 10.18.

It is therefore evident that while magnesium carbonate lowers the  $p_H$  of Magma Magnesiae to some extent, it does not do so sufficiently to explain our earlier difficulties.

#### ABSTRACT OF DISCUSSION.

Dr. I. M. Kolthoff assumed that the authors preferred to determine the  $p_H$  of the solution rather than use the titration method; he thought it was rather difficult to determine the  $p_H$  with the potentiometer because of the conductivity of the solution, the sharpness of the measurement was not so definite; he preferred to determine the electric conductivity or titrate.

Mr. Giesy feared the conductivity method would not be of great value because there may be sodium sulphate in the preparation; it is easier, in practice, to wash out all of the caustic than all of the sodium sulphate which is formed during the precipitation. As to the time for a  $p_H$  determination when everything is in readiness—it only requires about five minutes. His objection, however, to the U. S. P. method was not the time required, but the results were not sufficiently accurate.

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#### CINARA, CARDUUS AND SCOLYMUS OF THE ANCIENTS.\*

BY E. V. HOWELL.

In 1921, in Paris I purchased some artichoke seed. I planted these in the fall. In the spring the plants promptly appeared, flourished through the summer and fall, resisted a good deal of cold, but died down during the winter. I was puzzled, however, as I seemed to have two varieties, differing in the leaves and spines. The next spring the plants with the more dissected leaves bloomed. I ate the scales and calyx of the flowers of this plant with oil and vinegar or drawn butter sauce, after the French custom. The other variety did not bloom until the third year. During this time, I thought it was another but similar plant, which was not the case, as it was the same plant with different leaves. I became interested in the plant and its history.

To identify plants of to-day with those of ancient times is a difficult task and is done frequently without any degree of absolute surety. Until the later and more scientific classification of plants, we guess in our identification mainly by comparisons and descriptions and observations that may have been faulty or merely incomplete. The illustrations of them in the older botanical works are frequently of but little aid.

This plant, useful and ornamental, so highly thought of in Europe is not so well known generally in America. It deserves a place in our gardens as a vegetable. It

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