comparison is made should be stated, because different oils respond with unequal intensity, and the depth of color increases after cooling.

(10) When the color-producing substance is once deposited in the fat of hogs, it is exceedingly persistent, as illustrated in the case of animals Nos. 7 and 8 in lot III, No. 7 being killed July 26th, three months after it had received its last ration of cottonseed meal, and lard rendered from its fat showing a coloration equivalent to 4 per cent. of cottonseed oil and No. 8 being killed September 20th, having eaten no meal for five months, and a composite sample of its fat yielding lard which showed a coloration equivalent to 3 per cent. of oil.

(11) Other investigators have shown that the three different color-producing substances in cottonseed oil, to which are due the reactions with Halphen's and Becchi's reagents, and also with nitric acid, are deposited unchanged both in the body fat of different animals and in the secreted fat of cows. A number of experiments with the feeding of cottonseed meal have shown its effect to be a marked modification of the properties of the body fat, while others indicate that a large amount of these color-producing substances may find their way unchanged into the body fat, while its chemical and physical constants remain the same, one investigator finding in lard a coloration with Halphen's reagent equivalent to 30 per cent. cottonseed oil, and yet its analytical numbers were normal. While the evidence is somewhat conflicting, we are rather unwillingly led to the conclusion that probably the color-producing principles are separated from the cottonseed oil by metabolic processes, and that the effects of metabolism are so profound that its final products, if they find their way into the fat, do not modify it in any important degree.

ACTION OF SOAP ON CALCIUM AND MAGNESIUM SOLUTIONS.

By V. H. Gottschalk and H. A. Roesler.

Received May 12, 1904.

While working with Clark's well-known method for the determination of hardness of water, certain phenomena were observed, which it is the object of this paper to describe.

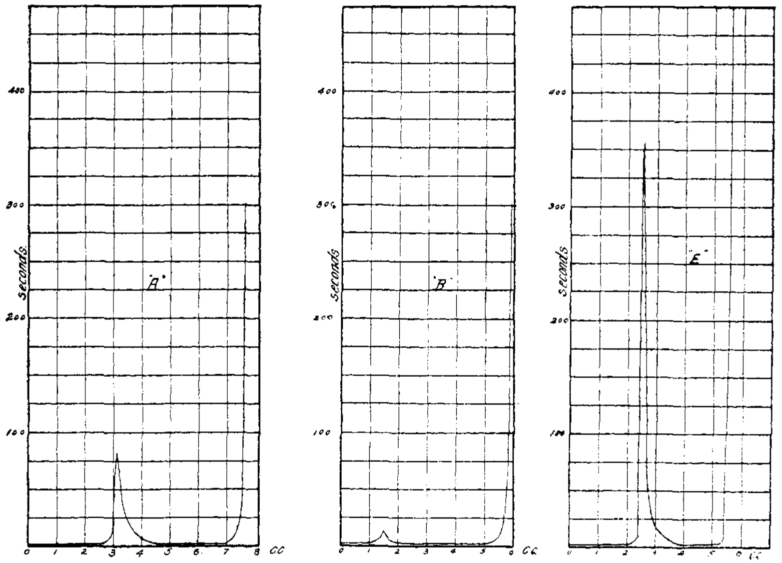
"A"
"B"
"E"
seconds
400
300
200
100
0 1 2 3 4 5 6 7 8 CC
0 1 2 3 4 5 6 CC
0 1 2 3 4 5 6 CC

Fig. 1.

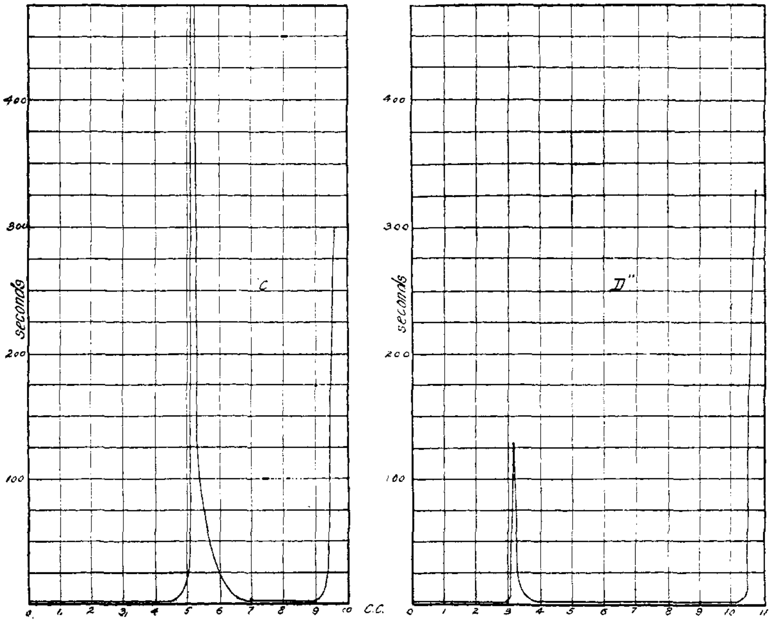
"C"
"D"
seconds
400
300
200
100
0 1 2 3 4 5 6 7 8 9 10 C.C.
0 1 2 3 4 5 6 7 8 9 10 11

Fig. 2.

If the soap solution be added in portions of 0.5 cc. or less, the duration of the lather noted after each addition, and the data plotted, curves will be obtained which possess certain well-defined characteristics. Thus, in the absence of magnesium salts there is a line horizontal from the origin nearly to the end-point where it rises abruptly. A similar curve is obtained when the water contains magnesium, but no calcium salts, the end-point not being so marked in this case, however; but when the compounds of both metals are present a maximum point is formed in the curve long before the end-point is reached, the position of this maximum depending on the relative amounts of calcium and magnesium salts in solution.

The following is a record of experiments showing that the peculiarities of this latter curve are due to the presence of calcium and magnesium salts; they also show that there is an approximate quantitative relation between the position of the maximum and the amounts of calcium and magnesium present.

The water in which this was first noted is obtained from a well in the cellar of this laboratory. In determining the hardness it was found that at a certain point in the titration the persistency of the lather, formed on shaking, increased considerably and again decreased on further addition of soap solution.

This suggested the observation of the persistency throughout the titration and the plotting of the same, which yielded curve "A." Two hundred cc. of the water were then boiled, filtered and made up to the original volume and a portion titrated under the same conditions, giving curve "B."

It will be noticed that there is also a maximum in this curve, coming at 1.5 cc., and that if the number of cubic centimeters between the maximum and the end-point be calculated it will be found to be the same in both cases, *viz.*: In "A," 7.6 — 3.2 = 4.4 cc.; in "B," 5.9 — 1.5 = 4.4 cc.

Data for Curve "A."

cc.	Sec.	cc.	Sec.	cc.	Sec.	cc.	Sec.
0.0	2	2.7	4	3.3	50	5.5	2
0.5	2	2.8	6	3.4	30	6.0	2
1.0	2	2.9	10	3.5	25	6.5	2
1.5	2	3.0	40	4.0	10	7.0	3
2.0	2	3.1	70	4.5	4	7.4	15
2.5	3	3.2	85	5.0	5	7.5	60
						7.6	300

DATA FOR CURVE "B."

cc.	Sec.	cc.	Sec.	cc.	Sec.	cc.	Sec.
0.0	2	1.5	13	3.0	3	5.0	2
0.5	5	1.6	7	3.5	2	5.5	8
1.0	4	2.0	5	4.0	2	5.7	30
1.4	8	2.5	4	4.5	2	5.8	85
						5.9	300

Ten cc. of the water diluted to 100 cc. with pure water were used in each case.

A mixture was then made consisting of 10 cc. of the water and 90 cc. of a calcium sulphate solution of such a strength that this amount requires 2 cc. of the soap solution. On titrating this we get curve "C." It will again be noticed that in the interval between the maximum and the end-point 4.4 cc. have been used, and also that this maximum comes at a point which is the sum of the cubic centimeters required for the calcium sulphate and the volume necessary to titrate from the origin to the maximum for the well water alone, *viz.*: 3.2 + 2.0 = 5.2 cc.

DATA FOR CURVE "C."

cc.	Sec.	cc.	Sec.	cc.	Sec.	cc.	Sec.
0.0	2	3.0	2	5.2	540	7.5	3
0.5	3	3.5	2	5.3	125	8.0	3
1.0	2	4.0	2	5.4	80	8.5	3
1.5	2	4.5	3	6.0	20	9.0	3
2.0	2	5.0	9	6.5	6	9.4	40
2.5	2	5.1	60	7.0	4	9.5	180
						9.6	300

A solution of calcium carbonate in water, saturated with carbon dioxide, acted in the same way, from which it would seem that the presence of calcium salts moves the maximum a distance away from the origin equivalent to the amount of calcium salt added.

Next a mixture of 10 cc. of well water, 10 cc. of magnesium solution and 80 cc. of pure water was tried, the 10 cc. of magnesium solution requiring about 3.1 cc. of the soap solution (see curve "D").

DATA FOR CURVE "D."

cc.	Sec.	cc.	Sec.	cc.	Sec.	cc.	Sec.
0.0	2	3.1	10	5.5	2	9.0	3
0.5	3	3.2	130	6.0	2	9.5	3
1.0	3	3.3	35	6.5	2	10.3	3
1.5	2	3.5	11	7.0	2	10.5	15
2.0	2	4.0	4	7.5	2	10.6	180
2.5	3	4.5	3	8.0	2	10.7	300
3.0	5	5.0	3	8.5	2		

Here the volume used between the maximum and the end-point is that which is needed with the well water (4.4 cc.) plus the amount used up for the magnesium salts, *viz.*: 10.7 — 3.2 = 7.5 cc.; 4.4 + 3.1 = 7.5 cc.

The above clearly shows that the position of the maximum point depends on the amounts of calcium and magnesium salts present and that it is approximately quantitative. An excess of the calcium will move the maximum point farther along; more magnesium will do the same to the end-point without affecting the position of the maximum point.

When a mixture of pure solutions is tried we get the following curve, "E":

DATA FOR CURVE "E."

cc.	Sec.	cc.	Sec.	cc.	Sec.	cc.	Sec.
0.0	2	2.3	4	2.8	25	5.0	2
0.5	2	2.4	180	3.0	20	5.4	10
1.0	2	2.5	390	3.5	10	5.5	200
1.5	2	2.6	70	4.0	4	5.6	Over 300
2.0	3	2.7	52	4.5	3		

Here also the quantitative relation is shown.

	cc.
Volume used between maximum and end-point.. 5.6–2.5 =	3.1
Volume used from origin to maximum	2.5
Amount required by $CaSO_4$	2.0
Amount required by 100 cc. of pure water	0.5
Total to maximum.................	2.5

The numerical data here presented were selected from about one hundred and fifty titrations, all of which show the same characteristic curves. In a number of these the duration of the lather at the maximum point was greater than the five minutes which is supposed to indicate the end-point. From this we can see the possibility of error in an ordinary hardness determination, especially when the water comes from a dolomitic region and is heavily charged with magnesium; curve "C" is a good example.

As a suggestion, it might be well, after the end-point has been reached, to add 0.5 cc. more of soap solution. This would be sufficient to carry the titration safely past the maximum point.

The further discussion of other peculiarities of the curves will be reserved for a later time, in connection with the explanation of the causes of the phenomena above described. Experiments along this line are in progress.

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REVIEW.

A Report on Some Recent Work in Organic Chemistry.

BY H. W. HILLYER.

ACCORDING to statistics obtained from the *Chemisches Centralblatt* the volume of chemical publication in its chief lines reviewed in that journal in the year 1902 is as follows:

	No. of references.	Columns of references.
General and physical	499	224
Inorganic	559	250
Organic	1775	1309
Physiological	503	209
Analytical	753	273
Technical	323	113

During the year 1903 the volume of the output has undoubtedly been at least as great. From this it may be seen how difficult it is to obtain such a view of the field as to give any just idea of the relative value of individual pieces of work. To, in any way, meet the request of the editor of this Journal for a report on organic chemistry for the period since the last general report was given in December, 1901, the reviewer must severely limit himself and in the limited field hope to please none of those who are specially interested in the pieces of work not reported. Since the work of American chemists is abstracted in this Journal, it has been decided not to mention any American work in this article. From the work of foreign chemists a few articles are chosen which contain matter of general interest, or which serve to show the kind of studies now engaging the attention of organic chemists.

A method of preparation has become prominent recently which is of such wide application that it deserves notice. It seems to have already displaced the older method of Butlerow and to be reaching out into new fields. In 1900 Grignard first published the method.[1] When metallic magnesium is brought into a solu-

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[1] *Compt. Rend.*, **130**, 1322.