and sulfur-free" acid chlorides by the action of silicon tetrachloride on the corresponding organic acid.

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NOTES

Action of Ethylene on Pure Starch.—It has been found that fruits and vegetables treated with ethylene have a higher sugar content than the same kind of fruits and vegetables not treated with the gas.[1]

Because ripening is known to be accompanied by change of starch into sugar the attempt to change pure starch into sugar by the use of ethylene was made.

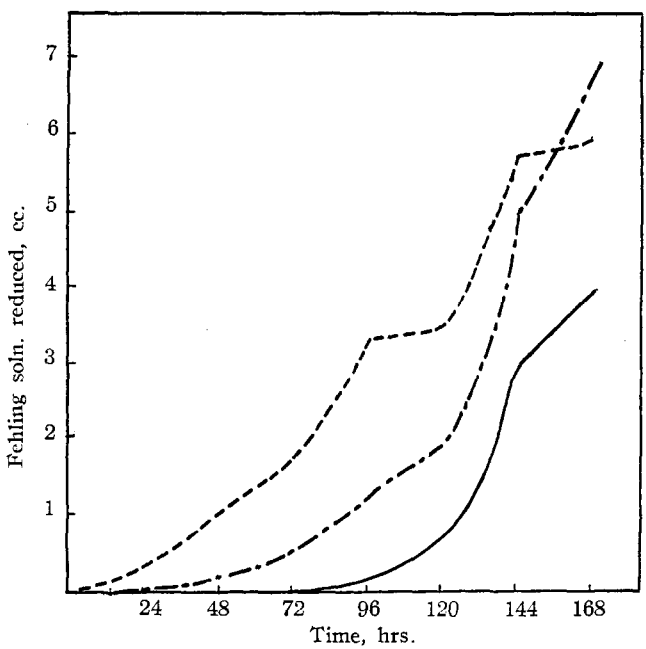

Fig. 1. ----, 10-min. boil; — — —, 5-min. boil; —— 1-min. boil.

Dry starch (both corn and wheat starch were used) was placed in an atmosphere of ethylene at 21° and atmospheric pressure and, as shown by the Fehling test, was partially changed into a reducing sugar. The action was slow and was accompanied by a change in color from pure white to a pale, yellowish tint. No quantitative determination of the rate of conversion of dry starch was made, merely a qualitative test. Untreated starch showed no change in the same length of time. The same kind of

[1] Harvey and Regeimbal, "Physiology of Blanching Celery," *Proc. Am. Assoc. Advancement Sci.*, Washington Meeting, vol. 79, **1924.**

starch, when made into an emulsion with water, was converted into sugar much more rapidly. A similar starch emulsion free from ethylene showed only a minute change even upon long boiling or upon standing for several weeks. The temperature varied from 21 to 24°. Water saturated with ethylene did not reduce Fehling solution. The starch emulsion absorbed about as much of the gas as did pure water, and no further absorption took place when the emulsion was allowed to stand, although the percentage of reducing sugar increased steadily.

Three starch emulsions of different "boiling times" but of the same concentration (1 g. of starch in 100 cc. of water) were saturated with ethylene at approximately 22° and allowed to stand. The first had been boiled one minute, the second five and the third ten minutes and all were allowed to cool to room temperature before they were saturated with the gas. The temperature varied between 20 and 24° while the emulsions were standing.

The rate of conversion of the starch to sugar was found to be affected by the time of boiling; for example, the ten-minute boil was changed more rapidly than the one-minute. The rate was slow at the beginning of the action, but such was to be expected. This "period of incubation" is especially noticeable in the data for the one-minute boil.

TABLE I

CONVERSION OF STARCH TO SUGAR

	Fehling soln., cc.						
Time, hrs.	24	48	72	96	120	144	168
No. 1	0.0	0.0	0.0	0.1	0.4	3.0	4.0
No. 5	.0	.2	.5	1.2	1.9	5.0	7.0
No. 10	.3	1.0	1.8	3.3	3.5	5.8	6.0

No. 1 boiled one minute, No. 5 boiled five minutes, No. 10 boiled ten minutes, before saturation with ethylene. In each case a 10cc. sample of the well-stirred emulsion was used for the titration. No. 5 showed 57% of reducing sugar at the end of 168 hours, when these observations were discontinued.

The presence of the plateaus in the curve for the ten-minute boil has not been explained at the present time.

It seems demonstrated that an enzyme need not be present, as has been thought, for the conversion of starch into sugar by the action of ethylene. The presence of ethylene alone seems sufficient. The chemistry of the reactions is not known, but it is thought that the gas acts as a catalytic agent, since no absorption was noticed even upon long standing.

This work will be continued at higher temperatures and pressures.

CONTRIBUTION FROM THE
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HELEN E. REA
R. D. MULLINIX

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The Boiling Point of Para-Cresol.[1]—In my article on *p*-cresol,[2] the literature citations omitted a determination by Clemmensen[3] which has just been found in his article entitled "Über eine allgemeine Methode zur Reduktion der Carbonylgruppe in Aldehyden und Ketonen zur Methylengruppe."

He describes (p. 61) the preparation of *p*-cresol from *p*-hydroxybenzaldehyde but makes no statement concerning the source of the *p*-hydroxybenzaldehyde or its purity. The product, after several distillations, finally boiled at the constant temperature of 201°, at 750 mm. pressure.

From these meager data I have calculated the boiling point at 760 mm. pressure by means of Equations 1 and 2 of my previous article. The values found are (1) 201.50° and (2) 201.54°. They afford no basis for modifying my views previously expressed and the boiling point of 202.32° given in my paper.

The object of this note is to complete the literature citations since Clemmensen's determination is one that might be indefinitely overlooked because of the title of his article.

CONTRIBUTION FROM
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H. D. GIBBS

High Vacuum Distillation.—Sufficient glass wool is placed in the distilling flask to extend slightly above the surface of the liquid. The vacuum distillation of very heavy sirups may be carried out in this way smoothly and without bumping.

CONTRIBUTION FROM THE
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ST. LOUIS, MISSOURI
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EDWARD S. WEST

New Fermentation Tube.—In the determination of the qualities of different micro-organisms it is of fundamental significance to know whether the micro-organism is capable of growing in oxygen-containing, oxygen-free or other atmospheres.[1] Up to the present, different bothersome processes have been in use for this purpose. It was found that it is possible to avoid

[1] Published by permission of the Surgeon General, United States Public Health Service.

[2] Gibbs, THIS JOURNAL, **49**, 839 (1927).

[3] Clemmensen, *Ber.*, **47**, 51 (1914).

[1] Nord, *Protoplasma*, **2**, No. 2 (1927).

these difficulties in a simple manner through an appropriate reconstruction of the saccharimeter of Einhorn.

When one found it necessary to grow micro-organisms on a suitable nutrition medium in a nitrogen-containing or other atmosphere, it was not possible to carry out this investigation in the present form of the saccharimeter because it does not allow the passing through of another gas. If, therefore, we add a stopcock (Fig. 1) to the longer arm of this tube, it will be possible, by simultaneously inserting a single-holed rubber stopper in the shorter end of the tube, to pass through the nutrition medium and, if necessary, to keep in the space above it whatever gas is wanted. The open surface of the liquid has to be covered simultaneously with liquid paraffin. In the case of nitrogen, the purification of this gas by passage through an alkaline pyrogallol solution is not satisfactory enough for biological purposes. Such nitrogen still oxidizes reduced methylene blue and therefore it is necessary for this purpose to pass it over hot (dark, gleaming) copper spirals.

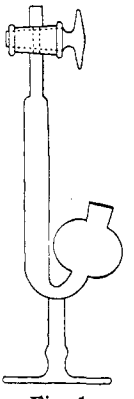

Fig. 1.

A fermentation tube constructed in this way can of course also be used as a common saccharimeter; with such a tube, a fermentation may be carried on during which the expected quantity of carbon dioxide produced exceeds several times the capacity of the long arm of the tube. A repeated simple opening of the stopcock renders this possible. It also enables one to investigate the capacity of micro-organisms for nitrogen fixation.

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F. F. NORD AND
MOLLIE G. WHITE

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NEW BOOKS

Magnetism and Atomic Structure. By EDMUND C. STONER, Ph.D., Lecturer in Physics at the University of Leeds. E. P. Dutton and Company, 681 Fifth Avenue, New York City, 1926. xiii + 371 pp. 56 figs. 22.5 × 14.5 cm. Price $5.00.

According to the author's statement, this book is to be regarded as a supplement to ordinary works on magnetism, rather than a comprehensive treatise. The general method adopted is "to give tolerably complete outlines of representative researches, and to base discussions on these. Prominence is given to work which is thought to be of most importance and lasting value, but the selection involved is necessarily arbitrary." This mode of treatment makes possible the logical discussion in a book of moderate size of those phenomena of magnetism which bear most directly upon the problems of atomic structure. A more