by this method the acidity has only been reduced about half. On the other hand, the acidity of plot 24 to which ammonium sulphate has been applied is materially increased, but Dr. Thorne writes me that the red clover grown on this plot is not visibly less than that grown on nearby plots to which nitrogen in linseed meal or dried blood was applied.

No explanation can be offered at this time of the behavior to both methods of plots 8 and 19 limed.

It appears then that while sodium nitrate and basic slag have diminished acidity, no fertilizer or combination of the fertilizers used has measurably increased acidity on this soil except where ammonium sulphate was applied. We can not apply this conclusion, however, to soils of different character. While the acidity due to the residue left by the taking up of plant food may reasonably be supposed to be irrespective of the nature of the soil, the acidity produced by decomposition reactions between the soil components and added salts is not. While in this soil the attack of neutral salt solutions upon what I have elsewhere called 'non-acid silicates' is small, with other soils it is very great, rising to 4,000 parts per million, and this fact must be kept in mind in attempting to measure the changes in soil reaction caused by the use of fertilizers.

F. P. Veitch.

CARBONATED MILK.

In the course of an investigation relating to the chemistry of kumiss made from cows' milk, the question arose as to whether there is any action of carbon dioxide on milk-casein. No action appears to take place when carbon dioxide is passed through milk simply at atmospheric pressure; but, since in kumiss the gas is present under considerable pressure, it was decided to approximate this condition by treating fresh milk with carbon dioxide gas under pressure. Without stating here the detailed results of the work, it was noticed that the milk thus treated did not sour or curdle readily, keeping ten days to two weeks at a temperature of 60° to 70° F., when the pressure used was sixty to seventy pounds. Pasteurized milk keeps still longer. In addition to prolonging its keeping power, milk, when carbonated, makes a very palatable, refreshing beverage. Before the detailed results are published, further work is being done, carbonating the milk at higher pressure and keeping it at different temperatures.

L. L. Van Slyke,
A. W. Bosworth.
New York Agricultural Experiment Station, Geneva, N. Y.,
April 16, 1906.

NOTES ON ORGANIC CHEMISTRY.

PREPARATION OF PURE ETHYL ALCOHOL BY MEANS OF METALLIC CALCIUM.

Metallic calcium having now become a regular article of commerce, several chemists have investigated its properties, in order to discover what advantages are likely to result from its use in chemical reactions. For example, in the chemical laboratory of the Johns Hopkins University, experiments are in progress to determine how far it may be of service in promoting the condensation of ketones with esters (Claisen's reaction).

L. W. Winkler[1] has examined its behavior towards mixtures of alcohol and water. As is well known, there is no special difficulty in removing water from alcohol—say by means of quick lime and copper sulphate—until it is 99.9 per cent. pure, but the elimination of the last 0.1 per cent. of water has been attended, hitherto, with considerable labor. By Winkler's process commercial 'absolute' alcohol, containing usually several per cent. of water, is boiled for a short time with calcium and then distilled from it. About 20 grams of the metal, in the form of turnings, to each liter of alcohol should be used. The product contains only 0.1 per cent. of water, which is removed by another treatment with calcium, in the proportion of 0.5 per cent. of the weight of alcohol. A curious point about the behavior of calcium and alcohol is that, if the latter contains less than 5 per cent. of water, the metal is attacked the more vigorously the *less* water is present, but, on the other hand, ordinary alcohol, containing more than 5 per

[1] *Ber. d. Chem. Ges.*, **38**, 3,612.

cent. of water, also attacks calcium with considerable rapidity. Alcohol absolutely free from water is not nearly so hygroscopic as is usually supposed; when 200 c.c. of it were exposed in a beaker to the air of a laboratory, during fifteen minutes, less than 0.1 per cent. of water was absorbed.

Almost all commercial alcohol contains aldehyde in varying proportion. The usual method of removing it is to boil the alcohol with potassium hydroxide until the aldehyde is converted into a colored resin, and then fractionate the liquid, the process being repeated, if necessary. Obviously, this plan involves a great expenditure of time and material and yet aldehyde-free alcohol is often needed, for example, it is indispensable in the analysis of fats and oils. Winkler removes the aldehyde by adding to the alcohol a little dry silver oxide, and then a small quantity of potassium hydroxide. The aldehyde is oxidized to acetic acid and this is neutralized by the alkali. F. L. Dunlap,[2] in a paper which followed Winkler's, suggests that the silver oxide should be formed *in* the alcohol. This is accomplished by dissolving silver nitrate in a very little water, mixing the solution with the alcohol to be purified, then adding, without shaking, cold alcoholic solution of potassium hydroxide. In this manner a finely divided precipitate of silver oxide is obtained which, in the course of a few hours, completely oxidizes the aldehyde. The alcohol may be separated from the silver compounds by decantation or distillation; it gives no color with potassium hydroxide.

NOTES ON ESTERIFICATION.

THE constant use in the laboratory of the esters of organic acids renders any improvements in their methods of preparation a matter of considerable general interest. Two papers on the subject containing results of some importance, have been published recently. In the first A. Bogojawlensky and J. Narbutt[1] record their experiments made to test the action of various dehydrated metallic sulphates on mixtures of alcohol and certain organic acids. Of the nine sulphates tried, potassium pyrosulphate and copper sulphate were found to be of the most service and, consequently, the majority of the experiments were made with them. The former salt acts equally well with both aliphatic and aromatic acids, the latter one is best suited for work with the aliphatic acids.

One of the most interesting results brought out in the paper is the relatively great effect on the yield of ester, of even small quantities of free sulphuric acid or anhydride, such as are almost always formed when a metallic sulphate is dehydrated. This is illustrated by the fact that in an experiment using ordinary dehydrated ferrous sulphate, the yield of ethyl succinate was 85 per cent., whereas, when the salt, before use, was repeatedly extracted with absolute alcohol, so as to remove traces of sulphuric anhydride, the yield of ester was only 34 per cent.

In general, the best yield of esters was obtained by the use of a dehydrated salt to which about 3 per cent. of its weight of concentrated sulphuric acid had been added; next in order comes the use of the dehydrated salt alone and, finally, sulphuric acid alone, as in the ordinary procedure. Another interesting point investigated was to see if a dehydrating agent, which is not acid and can not yield an acid under the conditions of experiment, is, nevertheless, capable of affecting the esterification. They selected the zeolite chabasite for this purpose, but found it to be without apparent influence on the course of the reaction.

The method here sketched offers several other advantages besides the question of yield. It can be applied to substances which are decomposed by concentrated sulphuric acid, and the ester, when formed, may be removed by simply pouring from the salt, without the rather tedious process of neutralization being necessary.

The esterification reaction has been investigated in another direction by J. Wade.[2] He finds that the process may be made continuous,

[2] *J. Amer. Chem. Soc.*, **28**, 395 (1906).

[1] *Ber. d. Chem. Ges.*, **38**, 3344.

[2] *J. Chem. Soc.*, **87**, 1656.

just as in the ordinary method for the preparation of ether. The essential condition for success consists in maintaining the mixture under experiment at a temperature of 100°, thus quickly removing the water which is continuously formed in the reaction. The directions for the preparation of ethyl acetate will serve to illustrate Wade's process: Three volumes of alcohol are mixed with two volumes of acetic acid, and two volumes of this mixture are added to one volume sulphuric acid, in an Erlenmeyer flask which is *immersed in* a water-bath. As soon as distillation commences, more of the mixture of alcohol and acetic acid is added by means of a funnel with a fine stem. Most of the excess of alcohol is recovered from the distillate. The process may be interrupted at any time without detriment, and there is no delay in restarting once the materials have regained the necessary temperature.

In the case of esters having boiling points above 100° the operation is conducted under reduced pressure. The presence of a strong mineral acid is essential to the success of the process, but more than a small proportion is detrimental. Charring seldom takes place.

J. Bishop Tingle.
Johns Hopkins University.

CURRENT NOTES ON METEOROLOGY.

MONTHLY WEATHER REVIEW.

The number of journals devoted to the different branches of science has become so large that most men of science can with difficulty, if at all, keep up with the periodical literature of their specialties. Yet there are none of us who do not frequently, or at any rate occasionally, wish to refer to some note or article, published in some journal devoted to another science than our own. It is convenient, for that reason, to have brought to our attention from time to time the more important articles, or at least the articles of most general interest, which are appearing in the various scientific periodicals of the world. It is with this feeling in mind that the compiler of these 'Current Notes on Meteorology' attempts to point out, from time to time, what there is of interest to scientific men in the meteorological publications of the various countries. It is impossible to devote much space in Science to these notes, for they obviously concern primarily only a single subject. But they may, perhaps, serve to help a fellow scientist, now and then, to learn of some meteorological publication which he has not seen or heard of, and which he may, at some time, find useful in his own work.

The *Monthly Weather Review* of our own Weather Bureau becomes more valuable with each succeeding year, as a meteorological journal covering a wide field, and essentially of a 'popular' nature. So prominent has the portion of the *Review* devoted to articles and notes become that with the first number for 1906, these articles occupy the first pages, instead of following, as they have done, summaries of climate and crop conditions, and accounts of the forecasts and storm warnings of the month. The last three numbers of the *Review* (November, December, 1905, January, 1906) contain the following articles of general interest:

'The Rainfall of China and Korea,' by T. Okada; reprinted from the Journal of the Meteorological Society of Japan; an important study of the climatic conditions of a region which is analogous in many respects to the eastern coast of North America.

'The Development of Meteorology in Australia,' by Andrew Noble; prepared at the request of Professor Cleveland Abbe, under the direction of the acting meteorologist of New South Wales.

'Indian Summer,' a note in which the sound and sane statement is made: "Indian summer is an extremely indefinite season as to its date and its character. There has never been any determination of its average date and duration so far as we know. It is often described as a warm, dry, hazy period after the first severe frost in autumn, but it often fails to come at all."

'A Mistake about Atmospheric Dust'; commenting on a statement which is going the rounds of the newspapers to the effect that 'rays of light go straight through all kinds