

machines a certain "efficiency," as a percentage. As I remember, this is never done with multiple-effect evaporators, but instead a certain evaporation per pound of steam supplied is specified. This it will be seen is practically identical with the "performance" proposed by Mr. Lewis.

As regards the last portion of Mr. Lewis' letter, treating of the evaporation of solutions, I frankly confess that I utterly fail to understand. He assumes a solution boiling under a definite pressure,  $p$ , which is less than the pressure,  $p_0$ , of the pure solvent at the same temperature. The vapor from the boiling solution is to be compressed isothermally and "can be introduced into the coils of the same effect from which the vapor itself came and there condensed at a temperature *differentially higher* (italics are mine) than that of the solution on the other side of the heating surface. The heat of condensation will thus be available for the evaporation of more water from the original solution."

Now the temperature of the vapor is that of the pure solvent boiling at the assumed pressure and is *lower* than that of the boiling solution, owing to the lowering of the vapor tension by the substance in solution. This vapor is compressed isothermally, that is, it remains at the same temperature, but it is required to give up its "heat of condensation" (? latent heat) to a solution at a temperature higher than its own.

Unless I have misread this passage, it looks like a flagrant violation of the second law of thermodynamics, and indeed involves the direct transfer of heat from a lower temperature to a higher.

I hasten to say this is not criticism and that my failure to understand the mechanism of the described process is undoubtedly due to my personal weakness in the science of thermodynamics.

BAYONNE, NEW JERSEY  
June 24, 1916

W. E. WADMAN

#### ACTIVE AND LATENT SOIL ACIDITY *vs.* IMMEDIATE AND CONTINUED LIME REQUIREMENT

Editor of the Journal of Industrial and Engineering Chemistry:

Recently there appeared an article in THIS JOURNAL, 8 (1916), 572, entitled "Immediate and Continued Lime Requirement *vs.* Active and Latent Soil Acidity," by W. H. MacIntire, of the University of Tennessee. In this article the inference is made that the present writer in a report in THIS JOURNAL, 8 (1916), 341, has not given sufficient credit or prominence to MacIntire's recognition of his so-called "Immediate and Continued Lime Requirement" as given in THIS JOURNAL, 7 (1915), 864. In regard to the statements that are made and the questions that are raised the writer deems it appropriate to state as follows:

Although possibly unknown to MacIntire, the writer published an article in *Science*, 42 (1915), 505, in which the distinction is made between *active* and *inactive* soil acidity. This article appeared in the issue of October 8, 1915, and MacIntire's article, in which he gave the expressions *immediate* and *continued lime requirement*, appeared also in the October, 1915, number of THIS JOURNAL. In the *Science* article, the writer used the term *inactive*, for which was later substituted the term *latent*, since that seemed more desirable.

It is well to note further that Veitch, in an excellent discussion of the nature of soil acidity in the *Am. Chem. Jour.*, 26 (1904), 659, used the terms *active* or *actual acidity* and *inactive* or *negative acidity* to designate different kinds of soil acidity. Veitch states that the total *active* and *inactive* acidity is estimated by his lime-water method. This distinction of Veitch is thus plainly a different one than that made by the writer in THIS JOURNAL, 8 (1916), 341, since the lime-water method does not estimate even all the acidity that is designated by the

writer as *active* acidity, to say nothing of the acidity designated as *latent* acidity.

Possibly other references could be given in which a recognition has been made of differences in the *activity* of the acids causing soil acidity. One of the most significant facts in regard to the various methods proposed for determining soil acidity is that the results by any one method are seldom the same as by any of the others. These differences have been recognized and attributed by some to differences in the nature and activity of the acids causing soil acidity. The writer used the term *active* acidity and recognized differences in *activity* of soil acids in *Wis. Sta. Bull.* 249, p. 15. This bulletin appeared eight months before MacIntire's publication in which was used the expression *immediate lime requirement*.

Perhaps the expressions chosen by MacIntire are superior to those chosen by the writer. If such is the case the criticism may be made that the writer should have changed his expressions in the subsequent publications after MacIntire's article appeared. The writer is as yet not convinced of this superiority, and even if this superiority is granted other difficulties arise as follows:

Determinations made lately indicate that MacIntire's method for his so-called *immediate lime requirement* does not indicate the same amount of acidity as the method given by the writer for *active acidity*. The methods thus clearly do not indicate the same point in the complete neutralization of the soil acids. The writer would thus have been open to serious criticism had he stated, subsequent to the publication in *Science*, that the method proposed measures the so-called *immediate lime requirement* as defined by MacIntire. In fact, the writer wishes to state definitely that the method proposed does not measure this *immediate lime requirement* as apparently defined by MacIntire.

Whatever practical or scientific meaning MacIntire may wish to convey by the expression, *immediate lime requirement*, it may be well to state clearly that the method (in which is used a solution of  $\text{Ba}(\text{OH})_2$ ) proposed by the writer for *active acidity* does not, and never was intended to indicate, in any way, the amount of lime that should be used under practical field conditions. It simply indicates the amount of acid substances present which are sufficiently active to react quickly with bases like  $\text{Ba}(\text{OH})_2$  or  $\text{Ca}(\text{OH})_2$ . The expression, *amount of active acidity*, has no connection or relation to the expression, *lime requirement*, in the sense in which the latter expression has been used in the past.

The writer confesses that he does not clearly understand what MacIntire means by *continued lime requirement*. It has not been possible to find a description of a laboratory method for the determination of this so-called *continued lime requirement* and hence had the writer appropriated the expression *continued lime requirement* in place of *latent acidity*, or stated that the two expressions mean the same thing, he would again have been open to serious criticism.

Further than mentioning that MacIntire had described a method in which a solution of  $\text{CaCO}_3$  in carbonated water is used, the writer purposely avoided either favorable or unfavorable comments. Since MacIntire did not present data, the relation of *immediate lime requirement* to *active soil acidity* could not be intelligently discussed at that time. The field was left clear, and as far as the present writer is concerned, MacIntire should have little trouble in getting full recognition for the merits of his work.

MacIntire states that he is unable to find in the writer's article in THIS JOURNAL, 8 (1916), 341, any data which indicate that soil acidity is due to true acids and not selective ion adsorption by colloids. The writer believes that this is entirely possible. For further explanations the reader is referred to an article by the writer entitled "The Cause and Nature of Soil

Acidity with Special Regard to Colloids and Adsorption," *Jour. Phys. Chem.*, 20 (1916), 457.

In the past several theories have been advanced regarding the nature of soil acidity; numerous methods have been proposed for determining a part or the whole of the acidity; and various names have been proposed for designating this or that part or kind of the acidity. MacIntire has seen fit to use the terms *immediate* and *continued lime requirement* for designating what he believes are certain soil conditions; the writer has seen fit to use the terms *active* and *latent* soil acidity for what he believes designate certain other soil conditions; and undoubtedly investigators in the future will see fit to use still other terms for designating what they may think are certain kinds of soil acidity, for it seems quite certain that no one as yet has a monopoly on the ideas regarding soil acidity or names that are suitable for designating certain aspects or phases of this subject. It seems reasonable to believe that investigators of this subject in the future will be as versatile and ingenious as those of the past.

In conclusion, the writer wishes to state that he has always entertained a high regard for the work of MacIntire and his associates and hopes this may continue in the future.

MADISON, WISCONSIN  
June 20, 1916

E. TRUOG

#### NOTE REGARDING DETERMINATION OF ALKALINITY OF ASH IN ANALYSES OF ORGANIC MATERIALS

It is frequently recommended that the alkalinity of ash of various food materials be determined in order to gain an idea as to the nature of the ash and the probability of adulteration of the sample.

In this connection there is room for considerable error in that sodium chloride may be dissociated, the chlorine driven off and the sodium appear at the end as sodium carbonate. Indeed, if care is not taken to avoid too high temperature or too prolonged heating all the chlorine may be thus driven off and the alkalinity of the ash is then no criterion as to organic combination of elements.

That chlorine is lost is shown by the following results obtained on corn syrup:

Sample.	Per cent chlorine by titration.	PER CENT CHLORINE IN ASH Ashed with excess Na <sub>2</sub> CO <sub>3</sub>	Ashed straight
No. 1.....	0.180	0.180	0.065
No. 2.....	0.185	0.185	0.070
No. 3.....	0.190	0.190	0.071

In order to observe the effect of ashing pure granulated cane sugar to which a small percentage of salt had been added the following tests were made: Ten grams sugar were ashed with 0.025 g. salt (1 cc. of solution containing 2.5 g. NaCl in 100 cc.).

A—Straight ignition at lowest heat practicable.

B and C—Charred, extracted with hot water, char ashed, extract added, evaporated and heated to redness.

D—A few drops of sulfuric acid added and then sample ignited as A.

Test:	A	B	C	D
Ash (added NaCl).....	0.25%	0.25%	0.25%	0.25%
Ash found.....	0.18	0.20	0.22	0.24
Alkalinity of ash as Na <sub>2</sub> CO <sub>3</sub> .....	0.12	0.20	0.19	0.03

These results illustrate the point made above, *viz.*, that too much weight should not be placed on alkalinity of ash when it is possible that chlorides of the alkalis may have been present in the original material.

CLINTON SUGAR REFINING COMPANY  
CLINTON, IOWA, April 24, 1916

A. P. BRYANT

## PERSONAL NOTES

The Illuminating Engineering Society will hold a lecture course at the University of Pennsylvania, Philadelphia, from September 21 to 28, inclusive, immediately following the Annual Convention of the Society, to be held in that city.

This is the second time in its history that the Illuminating Engineering Society has decided to conduct a series of lectures, the first having been held in the fall of 1910, in coöperation with the Johns Hopkins University, Baltimore. Whereas the 1910 course emphasized the *science* of illumination, the new course will emphasize the *art* of illumination. This course will include about twenty lectures by men selected on account of their qualifications, to deal authoritatively with the several phases of the subject. The preliminary list of lecture subjects will appear in the September issue of THIS JOURNAL. Associated with the lectures will be an exhibition, at the University of Pennsylvania, of the latest developments in illuminating appliances, together with novel applications of light. In connection with the lecture course there will be organized an inspection tour which will include visits to manufacturing establishments, laboratories, lighting companies and notable installations. The price of tickets, which include admission to all lectures and functions connected therewith, has been fixed at \$25.00. The *Chairman* of the Sub-committee on Publicity of the Illuminating Engineering Lecture Course, is Mr. H. K. Mohr, Philadelphia Electric Company, Tenth and Chestnut Streets, Philadelphia.

The 1916 Directory of the American Chemical Society was issued July 1st. Members of the Society can secure copies by request to the Secretary, accompanied by twenty-five cents, and the statement that "The Directory will not be loaned or disposed of to any firm or individual for advertising purposes." This issue is revised to June 1, 1916, and shows a membership of 8057. The officers of the Society, of the divisions,

and of the local sections are listed separately on the first pages. Corporation members, honorary members, and life members are grouped separately immediately following the officers.

The National Fertilizer Association elected the following officers at their 23rd Annual Convention held in Hot Springs, Va.: *President*, Horace Bowker, New York City; *Vice-President*, W. D. Huntington, Baltimore; *Treasurer*, Irvin Wuichet, Dayton, Ohio (reëlected); *Secretary*, W. G. Sadler, Nashville, Tenn. (reëlected); *Assistant Secretary*, John D. Toll, Philadelphia.

The United States Civil Service Commission announces the following open competitive examinations: *Assistant Physicist (Male) Qualified in Physical Metallurgy*, on August 23, 1916; *Junior Chemist*, Departmental Service, and *Laboratory Apprentice (Male)*, Bureau of Standards, on September 13, 1916; *Laboratory Assistant (Male)*, Bureau of Standards, on October 11, 1916. Further information may be had from the U. S. Civil Service Commission, Washington, D. C.

The Thirtieth General Meeting of the American Electrochemical Society will take place this fall, in New York City, in the week of the Second National Exposition of Chemical Industries. Sessions will be held at the Chemists' Club, 52 East 41st Street, on September 28, 29 and 30, 1916.

Mr. F. L. Craddock has been appointed manager of the New York office of The Pfaunder Company, 110 West 40th Street, to succeed Mr. George M. Kendall, a notice of whose death appeared in the July issue of THIS JOURNAL. Mr. Craddock has long been associated with The Pfaunder Company, both as erection engineer and as salesman, and enjoys a wide acquaintance among the trade.