THE AMERICAN CHEMICAL SOCIETY

II

ORGANIC DIVISION

J. R. Bailey, *Chairman*

H. L. Fisher, *Secretary*

Some oxidation reactions: H. D. GIBBS and C. CONOVER. The investigation of the cause of coloration of some compounds begun some years ago by the writers while in the tropics was described. Since all of the reactions which were encountered were catalyzed by light, the studies were greatly facilitated by the intense sunlight of the tropics. These investigations are now being extended to other catalytic reactions which promise some commercial importance.

The action of aluminum chloride upon aromatic hydrocarbons: GUSTAV EGLOFF and ROBERT J. MOORE. Benzene, toluene, xylene, cumene and cymene were distilled over a period of twenty-four hours with ten per cent. by weight, of aluminum chloride in order to determine the percentage yields of reaction products. The results in terms of percentages, were as follows:

Hydrocarbons Used	Benzene	Toluene	Xylene	Cumene	Cymene
Benzene	93.4	15.0	5.6	1.5	0.8
Toluene	...	60.0	19.0	2.7	14.3
Xylene	...	3.5	30.0	26.5	7.0
Cumene	...	...	...	63.6	...
Cymene	...	...	...	...	28.5
Naphthene	...	0.8	0.6	0.6	0.5
Tar	6.8	20.0	44.0	4.0	49.4

The naphthene formed during the above reactions proved to be hexahydrotoluene. Traces of phenol were noticed in all the reactions, the toluene, in particular, yielding one per cent.

A study of the nitrogen distribution in different soil types: C. A. MORROW. The study was made on two peats, one muck, seven mineral surface soils and one subsoil, all from Minnesota. The method of Van Slyke's protein analysis was used throughout the investigation because the nitrogen could be separated into a larger number of fractions than by the employment of earlier methods. The most significant fact brought out by this study is that the organic nitrogen distribution in *different soil types* is very uniform. This is to be expected, since the nitrogen distribution in soils is an average distribution of all the plant and animal nitrogenous products that find their way to the soil.

New derivatives of arsanilic acid: OLIVER KAMM. A new series of acyl derivatives of arsanilic acid has been prepared; viz., the halogen-benzenesulfonyl derivatives, and their physiological action has been studied. The introduction of halogens increases the toxicity of these arsenic compounds.

Tetraphenylmethane: OLIVER KAMM. The action of phenylmagnesium bromide upon various ethers of triphenyl carbinol has been studied. This reaction was found very convenient for the preparation of tetraphenylmethane, the yield in the case of the phenyl ether being 20 per cent.

Oxidation products of alkaline copper sulphate on lactose: W. LEE LEWIS. The products are mainly galactasido acids whose hydrolysis yields galactose and acids containing from one to six carbon atoms. One hundred grams of anhydrous lactose gave 9.65 gms. of carbon dioxide, 3.06 grams of formic acid and 97 grams of nonvolatile syrupy acids. The hydrolysis of these later gave 29.30 gms. of galactose, 52.90 gms. syrupy acids and 0.486 gms. of oxalic acid. The analysis of these syrupy acids has so far yielded 14.26 gms. of mannonic lactone, 4 gms. of glycollic acid and the residue gives evidence of trioxy butyric acid and d-l glycerinic. The origin of these acids is found in the explanation of Nef. Intermediate galactasido hexose dienols are formed whose dissociation and oxidation logically account for the products. The presence of such large amounts of mannonic lactone, obtained also from maltose, must originate in a benzillic acid rearrangement of galactasido-glucosone, and sharply differentiates the oxidation of the simple hexoses from the reducing disaccharoses. The glucosido acids clearly explain the lesser reducing power of the latter.

The oxidation of ethyl alcohol by means of alkaline potassium permanganate: WM. LLOYD EVANS and JESSE E. DAY. In neutral aqueous solutions of potassium permanganate at 25°, 50° and 75°, ethyl alcohol is oxidized exclusively to acetic acid; in alkaline solutions of the same reagent, acetic, oxalic and carbonic acids are the reaction products. A continuous increase in the concentration of the potassium hydroxide produces a corresponding increase in the yield of oxalic and carbonic acids, and a diminution in the yield of acetic acid. An increase in the temperature of the reaction tends to increase the yield of oxalic and carbonic acids and a diminution in the yield of acetic acid.

The oxidation of acetaldehyde by means of alkaline potassium permanganate: WM. LLOYD EVANS and HOMER B. ADKINS. The same general results

were obtained in the oxidation of acetaldehyde in alkaline potassium permanganate solutions as are described for ethyl alcohol in the previous abstract.

DIVISION OF WATER, SEWAGE AND SANITATION

E. H. S. Bailey, *Chairman*

H. P. Corson, *Secretary*

Seasonal distribution of soil and fecal strains of the colon-aerogenes group in surface waters: Myrtle Greenfield and W. N. Skourup. A survey was made of five surface water supplies, equipped with rapid sand filters, with the object of determining the variation of the organisms of the colon-aerogenes group during wet and dry weather, and their response to treatment. During rainy weather, the soil strains of the colon-aerogenes group predominated in raw water. During extremely dry weather, fecal strains of the colon-aerogenes group predominated in raw water, particularly if there was much sewage pollution. There seemed to be no difference between soil and fecal strains isolated from raw water in their resistence to treatment.

Legal status and work of the water and sewage laboratory of the state board of health: C. C. Young. The laboratory was for many years dependent for support upon direct appropriation to the university by the legislature and there never were adequate funds with which to do the work demanded. The 1915 legislature passed a law requiring annual analyses and inspections of water supplies and providing for rules and regulations to be drawn up by the State Board of Health and fees to cover the cost of the work. There has been practically no objection to the law, which has been in operation since July 1, 1915. Six thousand samples were examined last year and abundant data have been collected on the operation of the purification plants of the ground-water supplies.

The problems of water supply of a great railroad system: Orton T. Rees. Railroads have to deal with all sorts of water conditions, dependent upon the location of their lines. As the road develops old sources of water supply become inadequate or are found harmful. Water surveys become necessary in order to secure the best possible supplies. The relatively small number of suitable waters for boiler use make it necessary to treat the greater number of waters in order to render poor water supplies suitable for boiler use. The extent of water treatment as practised by the A. T. & S. F. Ry. system. The means employed to furnish pure drinking water to the traveling public and the employes of the railroad system.

Well waters of Chicago: Edward Bartow. An investigation was made of the source, quality and method of obtaining the thirty million gallons of well water used each day in Chicago and the effect of removing this quantity of water. Water can be obtained from wells in the Chicago area in sufficient quantities for many manufacturing purposes. Amounts of water up to 20 gallons per minute can be obtained from wells less than 500 feet deep. For larger amounts, wells should be sunk to a depth of 1,600 feet. Salt water is reached at about 1,700 feet. Water from less than 500 feet can be used satisfactorily in boilers, but the water from the deeper wells can not be used without softening. For cooling purposes water from 350 feet having a temperature of 52° Fahrenheit and from 1,600 to 1,700 feet having a temperature of 57° Fahrenheit is available. Hydrogen sulfide is found only in water from the Niagara limestone. Water free from hydrogen sulfide can be obtained by casing off the Niagara limestone, extending the casing through the Maquoketa shale.

The vertical distribution of dissolved oxygen and the precipitation by salt water in certain tidal areas: J. W. Sale and W. W. Skinner. It was shown that the lower layers of certain tidal waters under investigation contain less dissolved oxygen than the upper layers. Evidence is presented to show that this phenomenon is caused by the stratification of the water due to the specific gravity of the under-run of sea water which cuts off vertical circulation, and to the subsequent depletion of the oxygen in the lower layers by natural agencies. The depletion of oxygen is found to be greatest in September. The precipitation and sedimentation of matter in tidal areas by sea water is presented in graphic form. Those data are considered to be of particular interest from the viewpoint of fish and shell fish life.

DIVISION OF PHARMACEUTICAL CHEMISTRY

L. F. Kebler, *Chairman*

George D. Beal, *Secretary*

The volatile oil of Monarda fistulosa: Emerson R. Miller. In addition to the compounds previously identified in this oil the presence of *d-a-pinene* (nitrol benzylamine, m.p. 123°–124°) has been proved and probably *butyric* and *valeric aldehydes* (p-nitrophenyl hydrazones).

The volatile oil of Nepta cataria: Emerson R. Miller. Two samples of this oil had the density

reported by Schimmel & Company, namely 1.04. It is very different from most volatile oils in that it dissolves to the extent of 90–92 per cent. in 5 per cent. sodium carbonate solution.

The action of phenol on tin containers: HARPER F. ZOLLER. This investigation had its origin in the analysis of a precipitate occurring in the preservative used in connection with the hog-cholera serum prepared in the Serum Plant of the Kansas State Agricultural College. This preservative consisted of 5 per cent. C. P. phenol; 10 per cent. C. P. glycerol, and 85 per cent. distilled water by volume.

Some constituents of the American grape-fruit (Citrus decumana): HARPER F. ZOLLER. The object of the investigation was to determine the major constituents of the American-grown grape-fruit, and the possibilities of recovering valuable by-products from its culls. Citric acid to 75 per cent. of the amount found in lemons—an oil, similar to orange-oil, in amounts larger than in lemons, and pectin in large quantities—can be extracted from the culls in one process, as described. Glucoside can also be secured in the same process with slightly increased expense.

A laboratory method for the preparation of benzoquinone from aniline: C. E. BOORD and E. H. LOEB. A detailed description of a method for the oxidation of aniline to quinone by manganese dioxide and sulfuric acid. A cheaper and more convenient method for the preparation of quinone.

The preparation of α-acetyl arylhydrazines: C. E. BOORD and C. E. SENSEMANN. The preparation and properties of α-acetyl-p-tolylhydrazine, α-acetyl-o-tolylhydrazine and α-acetyl-α-(1 naphthyl)hydrazine were described in detail.

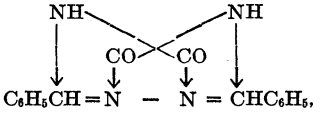
A study of the constitution of hydrazino-quinones: EDWARD SCHMIDT and C. E. BOORD. The condensation products of α-benzoyl phenylhydrazine with trichlorquinone, 2, 6-dichlorquinone and 2, 5-dichlorquinone and their derivatives are described in detail and their constitution is discussed. The evidence gained from four lines of attack seems to indicate that these substances are derivatives of orthobenzoquinone phenylhydrazone.

A further study of chloro ethers: FRIEND E. CLARK and E. MACK. Continuing the work of Clark, Cox and Mack (*J. A. C. S.*, April, 1917) the action of chloro-dimethyl ether on salts of aromatic acids has been undertaken. Methyxymethyl benzoate is a colorless liquid, boiling at 140° under 36 mm., decomposes when distilled under ordinary pressure. Molecular weight determinations and decomposition reactions indicate its formula to be

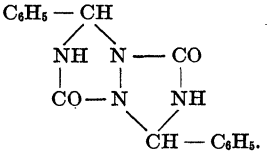
$$C6H_5COOCH_2\text{-}6\text{-}CH_3.$$

At — 35 it becomes viscous and at — 80 very viscous. Its density has been determined at 0, 18 and 25. No actions with sulphonates. Physical constants have been obtained on ethyl methyl chloro ether and chloromethylbenzyl ether is being studied.

The crisscross addition on conjugate systems: J. R. BAILEY, N. H. MOORE and A. T. MCPHERSON. This paper represents a continuation of the work of Bailey and Moore published in *Jour. Am. Chem. Soc.*, 39, 279, 1917, under the title, "The use of cyanic acid in glacial acetic acid, II., The addition of cyanic acid on benzalazine." The new work includes an investigation of the action of sulfocyanic acid and phenyl isocyanate on benzalazine, and besides the investigation has been extended to other azines. The authors interpret these reactions, as exemplified by the action of cyanic acid on benzalazine, as follows:



and suggest for this new type of reaction for a conjugate system the name, "crisscross addition." In the crisscross addition binuclear, five atom rings result. Cyanic acid and benzalazine, for example, yield,



DIVISION OF AGRICULTURAL AND FOOD CHEMISTRY

T. J. Bryan, *Chairman*

Glen. F. Mason, *Secretary*

A study of the Reichert-Meissl process with a view to its modification: A. HAYES and W. F. COOVER. Difficulty is usually experienced in obtaining closely agreeing results in determining the Reichert-Meissl number of butter fat by the present method. The authors have studied the factors which cause the variations such as method of saponification, amount of sulphuric acid used in excess, rate and temperature of distillation, shape and size of flask, temperature of condenser water and size and amount of pumice. The study has shown the influence of certain factors and that

closely agreeing results can be obtained by using the proper method.

A method for estimating starch: W. S. Long. A method is proposed for the estimation of small quantities of starch in food products, and is based upon the precipitation of starch as the iodide. The method yields results of a fair degree of accuracy with weak starch solutions, and has been found applicable to the determination of small quantities of starch in jellies and jams.

The use of alfalfa flour in human nutrition: Elizabeth C. Sprague. Alfalfa flour is the finely powdered leaves of the dried plant. It contains practically no starch and is not a flour within the meaning of the term as applied to cereal flours. It can, however, be blended with cereal flours. In its unpurified state it is rank in flavor and imparts to the mixture an undesirable dark green color. A method is described by which the color is removed and the flavor materially modified. The proportions in which the purified product can be added to other flours are given. The blending of alfalfa and wheat flours increases considerably the nitrogen and the mineral contents of the preparations in which it is used. Samples were shown of breads in which the blended flour was used.

The effect of prolonged production of alfalfa on the nitrogen content of the soil: C. O. Swanson. Kansas has a number of fields in which alfalfa has been growing continuously for twenty to thirty or more years. While most of the fields are found in the middle and western part of the state, a few old fields are also found in the eastern part. Near most of these fields is found soil of the same type which has been continuously cropped to grain, usually wheat and corn, for thirty to forty years or more, and soil in native sod, used either as pasture or hay land. By sampling such fields close together and analyzing the soil, data are obtained that show the rate at which nitrogen disappears from the soil continuously cropped to grains; the nitrogen content of the soil which has never been broken; and by comparison it is possible to calculate the amount of increase or decrease in nitrogen in the soil on which alfalfa has been growing for a long time.

Variations in the ether extract of silage: L. D. Haigh. The analysis of a sample of corn silage some months after the first analysis shows that the composition of the dry matter has changed. There has been a loss in the amount of ether soluble material and crude fiber, especially the former constituent. Also the percentage of moisture and ether extract of silage at any one time will vary according to the method of drying. The acidity of silage seems to be largely the cause of change of composition on standing and the varying results on drying. The conclusions are that the corn silage should be analyzed promptly to obtain the composition of the silage as used. Also variations due to drying may be avoided by the use of the vacuum method throughout.

The occurrence and action of molds in soils: P. E. Brown and W. V. Halversen. Attention is directed to the importance from the fertility standpoint of the occurrence and action of molds in soils. These organisms have been found to occur in practically all soils, not only in a spore state, but also in an active form. In general, the numbers present have amounted to about one tenth of the total number of bacteria present. Their action is varied, but they have been definitely shown to bring about the destruction of cellulose and the breaking down of protein, producing in the latter process much ammonia. Inorganic compounds in the soil are also affected by mold growth and available phosphorus and sulfur are both produced in considerable amounts by these organisms.

Sulfofication in manures and its influence on the production of available phosphorus from floats: P. E. Brown and H. W. Warner. Mixtures of flowers of sulfur with compost, horse manure, or cow manure allowed to ferment for varying lengths of time showed a rapid oxidation of the sulfur with the production of sulfuric acid. These manures evidently possess a vigorous sulfofying flora. Rock phosphate when composted with horse manure and cow manure is reduced in availability, evidently due to an increased development of phosphorus-assimilating organisms. The reverse is true when the floats are mixed with compost. When sulfur and floats together are composted with the various manures there is an enormous increase in the production of available phosphorus, which continues up to fifteen weeks. A practical method for producing acid phosphate on the farm is suggested by composting sulfur, floats and manure in the proper proportions.

Identification of added colors in butter and oleomargarine: H. A. Lubs. The various tests for the detection of added color in butter and oleomargarine are discussed and their limitations are described. Suggestions are made for the improvement of the various tests. A method is described for the isolation of o-toluene-azo-β-naphthylamine and benzene azo-β-naphthylamine from butter and oleomargarine and a method for their identification is given.