and the hyphæ and spores have been found in the cotyledons on the inside of the seed while the seeds were still in a dormant condition. So far, no treatment has been reported which will kill the fungus without killing the seed. Our hot water treatment studies were made with a view of determining whether or not the fungus could be killed by hot water without injuring the seed. Our results so far are very encouraging and are considered to be of sufficient importance to warrant publication at this time of this preliminary statement.

To begin with, we placed cotton seed in water at different temperatures and for different lengths of time and then germinated them between blotters in the ordinary way in incubators with a view of determining how high a temperature cotton seed would stand without injury. As a result of these tests we find that cotton seed can remain in water at 70° Centigrade for fifteen minutes without injuring the germination. 50 per cent. of the seed germinated that were allowed to stand in water at 75° Centigrade for fifteen minutes. In a few cases more than 50 per cent. of the seed germinated that had been treated five minutes at 80° Centigrade, but in the majority of cases a very small per cent. of the seed treated for five minutes or longer at 80° germinated.

The fact that cotton seed which had been allowed to stand in water at 70° Centigrade for fifteen minutes germinated as well as the untreated checks prompted us to germinate a large number of treated seed under sterile conditions and to examine the seedlings for anthracnose. We used for this purpose the method which has been in use in this laboratory for the past four years for testing seed for disease by germinating them in sterile test tubes.[1] These tests seem to show conclusively that the fungous hyphæ and spores in the seed are killed when cotton seed is allowed to remain in water at 70° Centigrade for fifteen minutes and the germinating power of the seed is not injured. An average of 22 per cent. of the seedlings in the checks from the same lot of seed and germinated under the same conditions were diseased. We now have two fields on the college farm planted with seed which were given this treatment and so far there is no indication of disease in the seedlings, while in the fields planted with the same lot of seed but not treated diseased seedlings are abundant. The field tests will, of course, not be complete until the end of the season when the plants are all mature.

H. W. Barre,
W. B. Aull

Clemson College, S. C.

THE AMERICAN CHEMICAL SOCIETY. IV

WATER, SEWAGE AND SANITATION SECTION

Edward Barton, Chairman
H. P. Corson, Secretary

A Sanitary Survey of White River: John C. Diggs.

During the summer of 1913 a sanitary survey was conducted on the West Fork of White River, an Indiana stream 388 miles in length. A knowledge of the condition of this river is of great importance because this stream is used as a public water supply and means of sewage disposal for cities whose population totals over 300,000. A great part of the work was conducted from a floating laboratory, which served also as the living quarters of the members of the surveying party. Private and public water supplies of cities bordering the river were also examined and sanitary surveys conducted in towns visited.

Hypothetical Combinations in Reporting Water Analyses: Richard B. Dole.

Various common methods of making hypothetical combinations were illustrated in order to show the wide divergence of practise in America, and the combinations were interpreted in order to show the similarities and differences of opinion as to the quality of a given water. The author emphasized the advisability of distinguishing between the facts of analysis and the opinions expressed as hypothetical combinations. He also showed how the value of water may be deduced from the ionic statement without reference to hypothetical combinations and quoted the opinions expressed by several authors and scientific associations as to the advisability of reporting water analyses in ionic form and omitting the report in hypothetical combinations in order that analyses by different chem-

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[1] Twenty-fourth annual report of the South Carolina Experiment Station, page 43.

ists may be compared and the error of analysis may not be concealed. As the order of making hypothetical combinations is purely conventional the author strongly urged that no scheme of making such combinations be included in the report of the Committee on Standard Methods of Water Analysis but that the data of the analysis be reported in ionic form.

New Apparatus for the Determination of Hydrogen Sulfide in Water: GEORGE B. FRANKFORTER.

Sanitary Survey of the Ohio River by the U. S. Public Health Service: W. H. FROST AND H. W. STREETER.

The Use of Liquid Chlorine in Treating the Water Supply of Indiana Harbor, Ind.: H. E. JORDAN.

The Adaptation to Water Analysis of the Determination of Potassium as the Perchlorate: CLARENCE SCHOLL.

A detail comparison of the platinic chloride and perchlorate methods of determining potassium is given. The cost of the latter is about 0.7 per cent. of the former. The ease in manipulation is also much greater in the perchlorate method. The results obtained are accurate. The perchlorate method is then given in detail. The sulphate and ammonium ions and all volatile acids must be removed. The residue is evaporated to dryness with perchlorate acid until all the salts are perchlorates. The perchlorate salts of all the common elements except potassium are soluble in 96 per cent. to 97 per cent. alcohol containing 0.2 per cent. $HClO_4$. The potassium perchlorate obtained is weighed in Gooch crucibles after drying one hour at 120°–130°. The method was used on many waters containing known amounts of potassium. The errors are small. The phosphate radicle has no effect on the determination. The perchloric acid is now available to every chemist. The method can be recommended for use in water analysis and probably for all other analytical work where the content of potassium is desired.

The Preparation of Standards for the Determination of Turbidity of Water: FRANCIS D. WEST.

Report of the Committee on Standard Methods of Water and Sewage Analysis.

Chemical Studies of the Pollution of the Ohio River: EARLE B. PHELPS.

The investigation of the Ohio River now being conducted by the U. S. Public Health Service under the direction of Passed Assistant Surgeon Wade H. Frost has for its object the determination of the extent and character of present pollution, the capacity of the stream to care for this and future pollution, and the effect, if any, upon the public health of riparian communities. It is hoped in addition to obtain data for a general discussion of the principles of self-purification of streams. The capacity of a stream for re-aeration determines its capacity to dispose of pollution. The general laws of re-aeration are known but their application to a stream requires the determination of certain constants, characteristic of each stream type.

Investigation Relating to the Use of Calcium Hypochlorite as a Disinfectant for Water Supplies: W. G. TICE AND C. H. BLANCHARD.

Some Further Results of the Hypochlorite Disinfection of the Baltimore City Water Supplies; A Comparison of the Reduction of the Different Members of the B. coli Group: J. BOSLEY THOMAS AND EDGAR A. SANDMAN.

The hypochlorite treatment of the Baltimore city water supplies was instituted in June, 1911, pending the erection of a filtration plant. In one supply the hypochlorite was added at the impounding reservoir; in the other supply, constituting about three fourths of the consumption, it was found feasible to apply the disinfectant at the effluent of the first storage reservoir, after the water had received a preliminary treatment with aluminum sulfate. The treatment effected a reduction of 99 per cent. of the organisms growing at 20° C. in the sedimented water of one supply, and 83 per cent. in the other supply, where no coagulant was added previous to the disinfectant. The reductions in the numbers of organisms growing at 37° C. were 85 per cent. and 76 per cent. respectively. There was but little difference in the relative reductions of the members of the *B. coli* group, these reductions being between 97 and 99 per cent., based upon about fifteen hundred isolations. The number of cases of typhoid fever occurring in Baltimore during 1913 was seventeen per cent. less than an average of the number of cases occurring during the five years from 1906 to 1910 before the treatment was instituted.

Filtration and Softening of the Cleveland Water Supply: HIPPOLYTE GRUENER.

The Cleveland water situation is marked by a comparatively high grade of raw water, both as respects its hardness and bacterial content. The increase of the typhoid rate resulted in 1911 in the use of bleaching powder. Popular objections to this combined with the conditions after the flood of 1913 led to the decision to filter. The rapid sand method was adopted and a test filter put into operation at once. Lime and iron were used, particularly with reference to softening. The dosage was determined in the end empirically. The results have been absolutely satisfactory. Turbidity, zero. Bacterial count, low, with absence of gas formers. Hardness, reduced from 116 p. p. m. to 55. Laundry and boiler tests have also been made with satisfactory results. Further plans for the filter plant, as also for sewage treatment are nearly completed.

The Relation between Aluminum Sulphate and Color in Mechanical Filtration: Frank E. Hale.

Filter alum and alkalinity combine at ordinary temperature to form monobasic carbonate of aluminum, at 100° F. probably dibasic.

Color in water is acid and combines with the hydroxide radicle of the alum precipitate. The direct aluminum compound is soluble (boiling reaction). Neutral color combines directly with alum to form probably $AlR_2(OH)$ and residual acid color. This has resulted in removing double amounts of color per same amount of alum, neutralizing excess alum by raw water. High alkaline waters form soluble aluminates and require more alum. Acidity of color shown by removal of expected acidity proportional to removal of color, by residual acidity not removed by aeration or boiling, by neutralization of acidity preventing alum reaction, by removal of color of different waters proportional to color acidity, by deepening of color by alkali, by prevention of alum reaction by combined iron, by removal of color by magnesium hydrate, and lastly definite chemical action is indicated by definite color removal by definite amounts of alum.

DIVISION OF ORGANIC CHEMISTRY

F. B. Allan, Chairman

C. G. Derick, Vice-chairman and Secretary

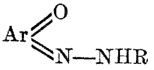
The division of organic chemistry held its meetings Wednesday morning and all day Thursday, the 8th and 9th of April, respectively, with Chairman F. B. Allan presiding. Of the twenty-four papers listed in the program, nineteen were presented. The symposium on "The Teaching of Organic Chemistry" was held according to the program. These meetings were marked by a very thorough discussion of each paper, with a very few exceptions, and all organic chemists present agreed that the division meetings were the most interesting that they had attended. The average attendance at each meeting was fifty. Dr. R. R. Renshaw was appointed by the division as a committee to draft a questionnaire concerning the teaching of organic chemistry which should be submitted to the division at the Montreal meeting in September.

The Chemistry of Enzymic Action: J. U. Nef. (One hour.)

The Constitution of Acetylacetone-thiourea: W. J. Hale.

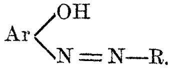
A Contribution to the Study of the Constitution of Hydroxyazo Compounds: Wm. McPherson and George W. Stratton.

The authors discussed the methods used in attempting to isolate isomeric compounds of the general formulas



$$\mathrm{Ar}\begin{array}{l}\diagup\!\!\!\diagup\,\mathrm{O}\\ \diagdown\,\mathrm{N{-}NHR}\end{array}$$

and



$$\mathrm{Ar}\begin{array}{l}\diagup\,\mathrm{OH}\\ \diagdown\,\mathrm{N{=}N{-}R.}\end{array}$$

The Preparation and Properties of Some New Orthobenzoquinones: Cecil Boord and Wm. McPherson.

β ethyl-, β *n*-propyl-, β *t*-butyl- and β *t*-amylorthobenzoquinones have been prepared. The method of Jackson and Koch, using anhydrous ether as a solvent, and also that of Willstätter and Pharmensteil have been used in each case.

The two crystalline forms observed by Willstätter in the case of orthobenzoquinone itself, have been observed in each case. Also with an increase in the size of side chain the stability of each of the crystalline forms is increased.

The Oxidation of Propylene Glycol: Wm. Lloyd Evans, E. J. Titzemann and P. R. Cottringer.

A Study of the Mechanism of the Grignard Reaction: Lambert Thorp and Oliver Kamm.

Evidence is furnished leading to the conclusion that the Baeyer-Villiger oxonium structure for the Grignard compounds is to be preferred to the structure assigned by Grignard and Stanikoff. The authors do not, however, believe that an oxonium structure need be assumed in order to account for the behavior of the Grignard compounds.

The Structure of the Three Dihydro-β-naphthoic Acids: C. G. Derick and O. Kamm.

Two dihydro-β-naphthoic acids having an unsaturated linking in the ring carrying the carboxyl have previously been prepared and the structure of one of them demonstrated. In the present work the preparation of the third isomeric acid is described and a demonstration of the structure of all three isomers, based upon the reactions of their respective dibromides, is offered.

The Rearrangement of Trioxylmethyl Azids: JAMES K. SENIOR.

The rearrangement of triphenylmethyl azid $(C_6H_5)_3—C—N_3$ by the action of heat into phenylimidobeerzopherone was made extremely likely by the discovery of this rearrangement in the case of triphenylmethyl hydroxylamine under the influence of dehydrating agents, and of triphenylmethyl halogen amines under the influence of alkalies. Experiment proved the correctness of the anticipation.

The Action of Trioxymethylene on the Various Hydrocarbons in the Presence of Aluminium Chloride: GEO. B. FRANKFORTER AND V. R. KOKATNUR.

This work was begun with the idea of extending the use of anhydrous aluminium chloride as a dehydrating reagent, at the same time throwing light, if possible, on the constitution of trioxymethylene. So far, little knowledge has been added to the molecular structure of the latter. However, the use of aluminium chloride as a dehydrating agent has been extended. It has been shown, by treating benzene and trioxymethylene with aluminium chloride, that diphenylmethane and anthracene were obtained; with toluene, ditoluylmethane and dimethylanthracene; with xylene, dixylylmethane and tetramethylanthracene, and finally with mesitylene, dimesitylmethane, tetramethylanthracene and durene.

Studies on Organic Periodides. I. Periodides of Methacetin, Phenacetin and Triphenin: W. O. EMERY.

Periodides of Antipyrin: W. O. EMERY AND S. PALKIN.

Molecular Rearrangements of Hydrazines: JULIUS STIEGLITZ AND JAMES K. SENIOR.

Rearrangements of hydrazines corresponding to the rearrangement of oximes (Beckmann) and of hydroxanic acids are not described in the literature. Attempts are made by the authors on a number of hydrazones and hydrazines on account of the fundamental analogy between hydroxylamine derivatives and those of hydrazine, but until recently the attempts were unsuccessful. A source of the failure was thought to lie in the existence of two possible *electronic* structures for hydrazines and hydrazones. To avoid this possible difficulty the rearrangement of symmetric di-triphenylmethylhydrazine

$$(C_6H_5)_3C\cdot M_2{}^{+-}\cdot M_2C(C_6H_7)_3$$

was tried and was found to proceed successfully under the influence of zinc chloride. The results promise to throw light on these rearrangements and on the electronic structures of the compounds involved.

The Phosphates of Destearin: R. R. RENSHAW AND R. R. STEVENS.

Electromers and Stereomers with Positive and Negative Hydroxyl: L. W. JONES AND L. F. WERNER.

Halogen Substituted Hydroxamic Acids: L. W. JONES AND L. F. WERNER.

Formyl-β-benzylhydroxylamine: L. W. JONES AND M. C. SNEED.

The Addition Compounds of Dimethylpyrone with Organic Acids: JAMES KENDALL.

The addition compounds of monobasic aliphatic and aromatic acids, and also of phenols, with dimethylpyrone have been investigated by the freezing-point method. Thirty-two substances were examined, and the existence of thirty-seven compounds, most of which have not previously been described, has been demonstrated. The compounds obtained were of three general types: $C_7H_8O_2$, Hx; $2C_7H_8O_2$, 3Hx; and $C_7H_8O_2$, 2Hx. A consideration of the results leads to the view that the reaction is ionic, and that the compounds formed are true oxonium salts. The method is of general application for the study of organic addition reactions.

Errors in the Dumas Method for determining Nitrogen Due to Occluded Gases in Copper Oxide: C. A. TAYLOR AND A. C. FIELDNER.

The Isomeric Octacetates of Lactose: C. S. HUDSON AND JAMES M. JOHNSON.

The octacetate of lactose already known was purified until a m. p. of 90° (uncorr.) and a specific rotation in chloroform of $(L)^{20}_{D} = -4.3°$ were obtained. By means of zinc chloride in acetic acid at room temperature, this compound was rearranged into a new isomeric octacetate which was obtained crystalline with a m. p. of 152° C. (uncorr.) and a specific rotation in chloroform of $(L)^{20}_{D} = +53.1°$. Lactose was regenerated from both isomers.

Substitution in the Benzene Nucleus and in the Side Chain from the Standpoint of the Electronic Conception of Positive and Negative Valences: H. S. FRY.

The Salts of the Acridines: L. H. Cone.

Free radicals analogous to triphenylmethyl have been isolated from the salts of diphenylacridol and N-methylphenylacridol. These free radicals behave in every way analogous to triphenylmethyl, yielding peroxides on exposure to air and adding on halogens, etc. From these facts the conclusion is drawn that in all probability the salts of the acridines are quinocarborium salts analogous to the quinonoid form of triphenylchloromethane from which triphenylmethyl comes, at least in part. This conclusion is at variance with the accepted ammonium formulation of the salts of the acridines.

The Action of Halogen on 4-Nitro-m-Cresol: L. Chas. Raiford.

The experiments of Kehrmann and Tichvinsky on the chlorination of 4-nitro-m-cresol have been repeated, and the experiments varied so as to use pure chlorine as well as mixtures with carbon dioxide. Instead of 6-chlor-4-nitro-m-cresol only, as reported by K. and T., 75 per cent. of the product was found to 2-chlor-4-nitro-m-cresol, and but 5–10 per cent. of the compound with chlorine para to methyl. Chlorination with mixtures furnishing so-called nascent chlorine, gave nothing but 2-6-dichlor-4-nitro-m-cresol.

A Simple Method for the Determination of the Accuracy of the Conductance Data of Organic Electrolytes: C. G. Derick.

The use of the linear plotting functions to test the precision and presence of constant errors in conductance data has been found unsatisfactory in the hands of beginning research men. In the case of the weak and transition electrolytes, the calculation of the molar conductance at zero concentration has been found to be a very satisfactory criterion for both precision and constant errors of the conductance data of organic electrolytes. Its sensitiveness may be varied and no mechanical skill is necessary in its application. Its application to existing measurements on the conductance data of weak electrolytes shows that these data are very inaccurate as a rule.

The Ionization Constant of Pyroracemic Acids: C. G. Derick and St. Elmo Brady.

The unsatisfactoriness of the use of the ordinary criteria of purity of organic compounds is emphasized. Organic chemists are urged to use additional criteria such as the ionization constants. This statement was emphasized by the measurements of the conductance data on pyroracemic acid. Also the application of its calculated molar conductance at zero concentration as a criterion of the precision and constant errors in the measurements was illustrated.

On Cyanoacetic Ester: John C. Hessler.

The alkylation of cyanoacetic ester by means of sodium ethylate and alkyl haloids gives large amounts of di-alkyl cyanoacetic ester. Methyl iodide gives 12.3 per cent., ethyl iodide 30 per cent., ethyl bromide 28 per cent., normal propyl iodide 35 per cent., isoamyl iodide 28 per cent., of the di-alkyl cyanoacetic ester. The heating of these di-alkyl esters with concentrated hydrochloric acid in sealed tubes is an unsatisfactory method of saponification. Caustic potash in pure methyl alcohol reacts ideally in the cold, giving the di-alkyl cyanoacetic acids in theoretical quantity. The salts of these acids, and their acid chlorides, amides, anilides, etc., have been prepared.

The Conrad-Limpoch reaction has also been carried out in methyl alcoholic solution. The yields are small, yet the alcohol is as anhydrous as it seems possible to make it. The products are *methyl* esters, not ethyl esters, owing to an exchange with the methyl group of the alcohol. When benzyl chloride is used in place of the alkyl haloids a large amount of di-benzyl cyanoacetic methyl ester is obtained. This is a beautifully crystalline solid melting at 78°–79° C.

The investigation is being continued with the use of propyl, isobutyl and isoamyl alcohols as solvents.

On Thursday a symposium on the teaching of elementary organic chemistry was held with the following papers:

I. *Theory of Elementary Organic Chemistry:* J. B. Allan, Chairman.

"The Teaching of Elementary Organic Chemistry without the Use of Atomic and Molecular Hypotheses."

II. *Theory of Organic Chemistry for Graduate Students:* R. R. Renshaw.

"What shall be the Character of the Advanced Instruction in Organic Chemistry?"

III. *Laboratory Teaching of Organic Chemistry:* L. W. Jones.

"The Teaching of Organic Chemistry in the Laboratory."

Charles L. Parsons,
Secretary