checked by carefully controlled experiments. Folsom[5] has stated that *Pseudococcus trifolii* will kill clover plants. The possibility of mealy bugs becoming a menace to the nitrogen-fixing functions of some of our common economic legumes leads to the belief that a wider and more thorough investigation of this question should be made.

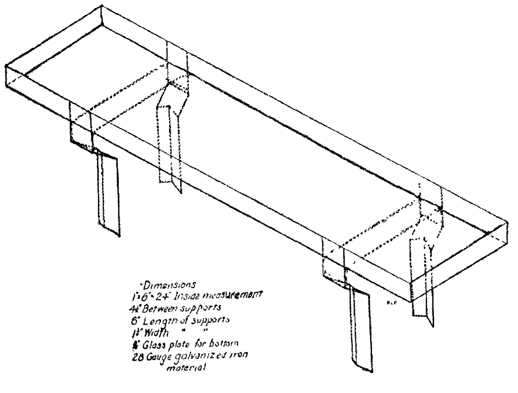
Lewis T. Leonard
U. S. Department of Agriculture

A HISTOLOGICAL SLIDE DRYING PLATE

Experimenting with a piece of plate glass balanced on top of a steam radiator as a drying plate for histological slides and having this knocked onto the floor and broken is rather disappointing. As a consequence the following piece of apparatus was devised and manufactured.

This slide drying plate is after the fashion of a shallow oblong pan with legs or supports to fit over the coils of a steam radiator. Galvanized sheet iron of number 28 gauge is the material used. The dimensions are as follows: long shallow pan twenty-four by six inches and one inch deep, inside measurement. To the sides of the pan are fastened the supports which fit over the radiator.

These supports are made of the same material as the pan and are one and one fourth inches wide by six inches long. They are fastened to the sides of the pan and to a strip of metal the same width (one and one fourth inches) which goes down the sides and across the bottom of the pan. These are riveted and soldered to the pan. The lower extremities of the supports are bent in the center line to fit more closely to the coils of the radiator for support. The edges of the pan and the legs are turned over five sixteenths of an inch to do away with sharp and rough edges (plate 1).



The pan is one inch deep in order that a glass plate may be fitted to make a smooth and level surface at the bottom below the rim of the pan. The rim or sides of the pan are to hold the slides in place. Five sixteenths of any inch plate glass is used. This is a means of tempering or evenly distributing the heat to all parts of the plate. It does not require much time to heat and retains the heat. Tests showed that the variations in temperature of the center and the sides were only one or two degrees Centigrade.

This slide drying plate does not get too hot for all ordinary drying purposes. Tests which were made averaged the following degrees of temperature with the room temperature between 21°-24° C. or 70°-75° F.

Centigrade	Fahrenheit
45°-55°	113°-131°

The capacity of this plate is forty-six slides.

The advantage of this as used with a steam radiator is that it can be left there and no regulation of the intensity of heat is necessary. The cost of this device is very little as compared to the various types on the market to-day and any tinsmith can manufacture this piece of apparatus. Many modifications are possible to fit one's needs.

Ralph L. Parker
Iowa State College
Ames, Iowa

THE AMERICAN CHEMICAL SOCIETY

(Continued)

DIVISION OF ORGANIC CHEMISTRY

Frank C. Whitmore, *chairman*
B. B. Renshaw, *secretary*

Special Program on Catalysis

Photochemistry and catalysis: Wilder D. Bancroft.

Negative catalysis: Hugh S. Taylor.

Preparation of platinum black. Effect of the addition of certain salts on the reduction of aldehydes by hydrogen in the presence of platinum black. (Lantern): Roger Adams with Wallace H. Carothers. A systematic study of the effects of varying amounts of ferrous and ferric chloride on the catalytic reduction of benzaldehyde has been made. The catalyst employed was the platinum oxide described in a recent paper by Voorhees and Adams. The optimum effect is observed when the amount of iron chloride corresponds to a concentration of approximately 0.0001 gr. mol. in 100 c.c. of the reaction mixture. Certain abnormalities occur in the experiments where large amounts of ferric chloride are used. This is due to the fact that the ferric chloride is first reduced to ferrous chloride and hydrogen chloride and this latter substance affects the reaction. Ferrous chloride shows no abnormalities in the higher concentrations. The explanation for the difficulty in reducing aldehydes with hydrogen and platinum black is simple. The aldehyde is rapidly oxidized by the oxygen in the platinum black, thus rendering the latter inactive as a catalyst. Acting as an anticatalyst, the ferrous chloride specifically inhibits this oxidation.

The relation of enzyme actions to other catalytic actions: K. GEORGE FALK. Specific examples of chemical relations which are catalyzed by enzymes and by hydrogen or hydroxyl ions were given, together with differences and similarities shown by the two sets of actions. Specificities of enzyme actions were compared with specificities of chemical reactions in general. The general chemical nature of enzyme actions was emphasized.

The mechanism of the reactions of esters, acids, alcohols, ethers, amides and alkyl halides at the surface of alumina, titania and thoria: HOMER ADKINS. The subject indicated in the title has been investigated by studying the effect upon the reactions caused by (1) modifying the spacing of the atoms upon the surface of the catalyst (J. A. C. S., October, 1922, March, 1923), (2) diluting the reacting material with water, alcohol, acetic acid, ethyl acetate, phenyl acetate, phenol, acetone, ethylene or heptane. The mechanism of the reactions is concluded to be as follows: Esters attach themselves directly to the catalyst without any preliminary rupture of the molecule, and then rearrange and react with adjacent molecules, to give varying proportions of acid, ketone, olefin, alcohol, carbon dioxide and water, depending upon the spacing of the atoms of the catalyst. Alcohol and ether are equally stable towards alumina and react by a mechanism similar to that of the esters. Acetic acid attaches itself to the surface of the catalyst and then reacts with a second molecule impinging upon it to give acetone, carbon dioxide and water. Formic acid rearranges, as do the esters, to give either water and carbon monoxide or carbon dioxide and hydrogen.

Oxide equilibria in catalysis: J. M. WEISS, C. R. DOWNS and R. M. BURNS. A study was made of the composition of vanadium oxide which exists during the catalytic oxidation of organic compounds such as benzene, naphthalene, anthracene, etc., in the vapor phase. Of the five possible oxides only two, that is, the tetroxide and pentoxide, are present during the reaction. The proportions of these oxides depend upon the ratio of the hydrocarbon to the oxygen. The results of runs using various ratios of air to benzene from 2 to 1 to 15 to 1 are given in a graph. Some speculations are also given concerning the process of catalytic oxidation.

Keto-enol tautomerism: F. O. RICE. The reaction studied was $CH_3COCH_3 + I_2 = CH_3COCH_2I + HI$, in dilute aqueous solution. It is catalyzed both by H^0 and OH^1. The mechanism of this reaction and of keto-enol tautomerism will be discussed in the light of the following results: The velocity of the reaction in presence of buffer solutions has been measured and it was found that in a neutral buffer solution ($H+ = 10^{-7}$) the reaction went as fast as in 0.01 N HCl. The velocity fell as the H° concentration increased up to $H^\circ = 10^{-4}$ at which point the velocity was a minimum. This behavior may be explained by assuming that the catalytic activity of the OH^1 is 10^4 times that of the H° ion. If, however, we assume that dry H^0 and dry OH^1 are the catalysts, they may be present in minimum concentration when the total $H^\circ = 10^{-4}$. Hence at this point catalytic activity would be a minimum.

The application of catalytic reduction to the pyrimidine series: ELMER B. BROWN and TREAT B. JOHNSON. In a study of the application of catalytic reduction to the pyrimidine series using hydrogen in the presence of colloidal platinum or palladium it has been found that uracil and cytosine readily absorb hydrogen at 75° C. and two atmospheres pressure and yield quantitatively dihydrouracil. Dihydro-cytosine was not identified. Thymine and 4-Methyl-uracil are not reduced under similar conditions. Sodium, potassium, calcium and magnesium chlorides did not retard the progress of the reduction. Traces of sulphur compounds greatly retard the reduction process. Neither pepsin, trypsin nor gum tragacanth can be substituted for gum arabic as a colloid support.

The dehydration of alcohols: A. B. BROWN and E. EMMET REID: A study has been made of the composition of ethyl and butyl alcohols by passage over silica gel, thoria, blue oxide of tungsten and alumina at temperatures from 250 to 500 degrees. Complete analyses of the gases have been made. Alumina gives the best yields and the purest ethylene and butylene and the blue oxide of tungsten the next best. Silica gel is about as active as thoria and gives less aldehyde than thoria. Appreciable amounts of carbon dioxide are produced by all the catalysts, especially by thoria.

The catalytic condensation of acetylene with benzene and its homologues: Joseph S. Reichert and J. A. Nieuwland. In the presence of concentrated sulfuric acid and a mercury salt as a catalyst acetylene combines with benzene to form diphenyl ethane. The reaction is highly exothermic so that cooling is necessary. The best yields are obtained by maintaining a temperature of ten to twenty degrees C. A small amount of dimethylanthracenehydride is also formed in the same reaction by the condensation of two molecules of acetylene with two molecules of benzene. In a similar manner toluene, xylene, mesitylene and ethyl benzene were found to combine with acetylene to form the homologues of diphenyl ethane.

The catalytic combination of ethylene and hydrogen in presence of metallic copper: Robert N. Pease. The kinetics of the catalytic combination of ethylene and hydrogen in presence of metallic copper has been investigated at 0 degrees and 20 degrees, measurements of reaction velocity and of adsorption isotherms of ethylene, hydrogen and ethane having been made. The velocity is approximately proportional to the hydrogen concentration, but increases with decreasing ethylene concentration. Adsorption measurements show that all three gases are adsorbed, the order of adsorption at low pressures being ethylene, hydrogen ethane and at atmospheric pressure ethylene, ethane, hydrogen. The results indicate that both ethylene and hydrogen must be adsorbed before reaction can take place, but that ethylene is preferentially adsorbed from the reacting mixture. The temperature coefficient of reaction velocity between 0 and 20 degrees is 1.7 per 10 degrees. This makes it improbable that diffusion is of primary importance.

The rôle of the catalyst in reactions involving the carbonyl group: Harold Hibbert.

Some considerations about the reactivity of groups in benzene derivatives: A. F. Holleman. Results of the measurements of reaction velocities of chlorobenzenes, nitrobenzenes and chloronitrobenzenes with sodium methoxide are discussed.

A method for the estimation of the meta isomer in a mixture of ortho, meta and para nitrobenzoic acids: A. W. Francis and A. J. Hill. The method involves first a quantitative reduction of the nitro groups by titration with N/4 titanous chloride, followed by titration with a standard potassium bromide-bromate solution. The meta compound takes up three substituent bromine atoms, while the ortho and para isomers receive but two. The amount of the former may then be calculated after applying a small empirical correction. It is more rapid than most physical methods and may be applied directly to solutions, thus avoiding losses incurred by isolation of the substances. Investigations, designed to extend the generality of this method, are now in progress.

The bromination of 2-amino-p-xylene: A. S. Wheeler and E. W. Constable. Fisher and Windhaus state that in the bromination of 2-amino-p-xylene (formyl derivative) the halogen atom "probably" enters position 5. We have proved that this is the position occupied as follows: The bromination of the acetaminoxylene gives a new compound, flat needles, m. 186. Hydrolysis with hydrobromic acid gives the hydrobromide, scales, m. 245°. The Sandmeyer reaction converts this into 2.5-dibromo-p-xylene, m. 75°. The proof was made stronger by oxidizing the last compounds with nitric acid in a sealed tube to 2.5-dibromoterephthalic acid, m. 314 and conversion of the acid into its ethyl ester, m. 125°. The last three compounds are known.

The action of sulfur upon p-toluidine in presence of litharge. Thio-p-toluidine; its constitution and some new derivatives: M. T. Bogert and M. R. Mandelbaum. The interaction of sulfur and p-toluidine, in presence of litharge (or similar substances) at 140-145° results in the formation first of 3-mercapto-4-aminotoluene. This amino thio cresol then, through the oxidizing influence of the sulfur and litharge, unites with more p-toluidine to thio-p-toluidine, while smaller amounts are oxidized to the corresponding disulfide. The constitution of thio-p-toluidine is proven to be bis (2-amino-5-methylphenyl) sulfide, elimination of the amino groups giving di-m-tolyl sulfide, which latter was also prepared by direct synthesis from m-iodotoluene and m-thiocresol. Incidentally, some new methods of preparation are described, as well as various new derivatives of thio-toluidine.

The reactions of the formamidines XI. The 2-thio-4-thia zolidones. Rhodanins: F. B. Dains and S. I. Davis. Rhodanine $\underline{\text{S—CSNHCOCH}_2}$ and its 3-aryl-substitution products (aryl=phenyl, p-tolyl, etc.) contain a grouping CH_2 which shows the usual reactivity of methylene hydrogen. Other investigators have found that it condensed readily with aldehydes and in addition the present work has shown that it reacted readily with the diaryl formamidines and gave products of the type: (A) $\underline{\text{S—CSNRCOC}}$ = CHNPh, or (B) $\underline{\text{S—CSNHCOC}}$ = CHNHPh. B. contains the grouping—CSNH—which evidently exists also in the tautomeric form C—SH—N—. This was shown by the fact that the methylene substitution products $\underline{\mathrm{S{—}CSHN{—}COC}} = \mathrm{CHX}$, where X is an aryl or NH aryl, easily formed thio ethers with alkyl or benzyl halides, which have the constitution, $\underline{\mathrm{S{—}C{—}SRNCOC}} = \mathrm{CHX}$. This is in harmony with the behavior of the thio-imidazolones, previously described.

Production of imido thiol esters by the condensation of thio cyanides with resorcinol or phloroglucinol: R. J. KAUFMAN and ROGER ADAMS. Many reactions have appeared in the literature tending to show that the cyano grouping in organic thiocyanates reacts similarly to the cyan grouping in nitrites. This similarity has been shown to exist also in the condensation of thiocyanates with resorcinol and phloroglucinol in the presence of hydrogen chloride and zinc chloride. Whereas the nitriles yield imidohydrochlorides which hydrolyze to ketones, the thiocyanates yield imido thiol ester hydrochlorides having the following general formula: $1.3{—}(\mathrm{HO})_2\mathrm{C}_6\mathrm{H}_3(4)\mathrm{C}(=\mathrm{NH{—}HCl})\mathrm{SR}$. The reaction takes place with both aryl and alkyl thiocyanates. The imido thiol ester hydrochlorides, by the action of sodium bicarbonate, yield the imido thiol esters. These latter substances, upon treatment with alcohols, are converted into the corresponding imido oxygen esters, which in turn may be hydrolyzed to carboxylic esters. The imido thiol ester hydrochlorides may be hydrolyzed to thiol esters which, upon saponification, yield carboxylic acids.

The preparation of alkylguanidines: ROSS PHILLIPS and H. T. CLARKE. Methyl iso-thiourea sulfate, a reagent recently diescribed by Arndt for the preparation of methyl mercaptan, reacts readily with aliphatic primary and secondary amines to yield the sulfates of mono and dialkyl guanidines in almost theoretical yield. This reaction does not take place with aromatic amines. Methylguanidine sulfate and dimethylguanidine sulfate form colorless crystals readily soluble in water but insoluble in alcohol.

The influence of sulphur on the color of azo dyes: D. G. FOSTER and E. EMMET REID. A series of azo dyes has been prepared by coupling various alkyl ethers of o. amino-thio-phenol with standard intermediates with a view to contrasting the dyes containing sulphur and the sulphone group with the corresponding oxygen dyes. The colors of the dyes are related in the same way as in the corresponding para compounds, though the ortho are lighter. The methoxy group deepens the color more than methyl and the methyl-thio ether still more, while this effect is lost by oxidation to the sulphone.

A study of irreversible organic reductions: J. B. CONANT and R. E. LUTZ. The irreversible reduction of certain unsaturated compounds, aromatic nitro compounds and azo compounds has been studied in aqueous, alcoholic and acetone solutions. Each compound was tested with reducing agent of known potential, an electrochemical method being employed to determine whether or not reduction had occurred. The potential at which the irreversible reduction first occurred at an appreciable rate was thus estimated within fifty millivolts. The "apparent reduction potentials" thus determined for a series of compounds in acetone-hydrochloric acid were: $\mathrm{C_6H_5COCH = CHCOC_6H_5} = +0.270$, $\mathrm{C_6H_5COCH = CHCOOH} = +0.080$, $\mathrm{HOOCCH = CHCOOH}$ below -0.130; $\mathrm{C_6H_5N = NC_6H_5} = +0.360$, $\mathrm{C_6H_3(NO_2)_3} = +0.270$, $\mathrm{C_6H_4(NO_2)_2} = +0.162$; $\mathrm{C_6H_5NO_2} = +0.080$. The change in apparent reduction potential with change in $\mathrm{P_H}$ is approximately parallel to the change in potential of the quinones under similar conditions.

Diplumbic hexæthide, a new organometallic compound: THOMAS MIDGLEY, JR., CARROLL A. HOCHWALT and GEORGE CALINGAERT. On heating any alloy of lead and sodium with ethyl iodide no reaction takes place unless water be present, when lead tetraethyl is formed. On treating this successively with hydrochloric acid and sodium hydroxide, first triethyl lead chloride and then triethyl lead hydroxide are produced. When this last compound is electrolyzed in alcoholic solution, a good yield is formed of an oil whose properties agree closely with the formula $\mathrm{Pb_2(C_2H_5)_6}$. This compound is entirely different from that of Klippel, whose description indicates that he had undoubtedly produced lead tetraethyl.

CHARLES L. PARSONS,
Secretary

THE AMERICAN MATHEMATICAL SOCIETY

THE two hundred and twenty-ninth regular meeting of the American Mathematical Society was held at Columbia University, New York City, on Saturday, April 28. The attendance included fifty-seven members of the society.

The secretary announced the election of twenty persons to membership and the entrance into the society since the February meeting of three additional members of the London Mathematical Society under the reciprocity agreement.

At the meeting of the Council, Professor Edward Kasner was elected a member of the