silver protein solution failed to relieve the condition. However, when as little as 1 to 2 per cent. of an extract containing the so-called fat-soluble A vitamine was added to the ration, the eyes were speedily cured and the rats increased in weight, indicating that this extract was a specific cure for xerophthalmia.

We therefore agree with McCollum, that xerophthalmia is primarily a dietary deficiency disease, due to a lack of the fat-soluble vitamine. The certainty of the prevalence of the disease depends on the high purity of the essentials that enter into the ration, and on the length of time of feeding, younger animals showing the symptoms much sooner than older ones.

Acknowledgement should be made of the assistance rendered by Miss Marguerite Sturtevant in carrying on this project.

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THE AMERICAN CHEMICAL SOCIETY

The fifty-ninth meeting of the American Chemical Society was held at St. Louis, Mo., Monday, April 12, to Friday, April 16, 1920. The council meeting was held on the 12th, a general meeting on the 13th, both in the morning and in the afternoon, divisional meetings all day Wednesday and on Thursday morning, and excursions Thursday afternoon and Friday. Full details of the meeting and program will be found in the May issue of the *Journal of Industrial and Engineering Chemistry*. The registration was slightly over one thousand, eight hundred and twenty-five enjoying the smoker.

General public addresses were given by Paul W. Brown, editor and publisher of "America at Work," on "The Physical Basis for the Economical Development of the Mississippi Valley," by Chas. H. Herty on "Victory and its Responsibilities." The chief public address was given in the assembly room at the Central High School on "Chemical Warfare" by Colonel Amos A. Fries, director of the Chemical Warfare Service.

The following divisions and sections met: Agricultural and Food, Biological, Industrial Chemists and Chemical Engineers, Organic, Pharmaceutical, Physical and Inorganic, Rubber and Water, Sewage and Sanitation Divisions and the Dye, Leather and Sugar Sections. Further details of their meetings will be found in the May issue of the *Journal of Industrial Chemistry*.

The banquet, held on Thursday evening, April 15th, filled the large banquet hall of the Hotel Statler. Excursions to Laclede Gas Works, Monsanto Chemical Works, East St. Louis plant, and Laclede-Christy Clay Products plant, automobile tour for ladies to parks, Art Museum, Washington University, Missouri Botanical Garden and tea at Bevo Mill and excursion to Standard Oil Refinery, Wood River, Ill., and Illinois Glass Company, Alton, Ill., were enjoyed by all.

A general business meeting was held on Tuesday morning, at which resolutions on the death of Professor Alfred Werner were read by Dr. Chas. H. Herty. Ernest Solvay was unanimously elected an honorary member of the society.

Charles L. Parsons,
Secretary

GENERAL PROGRAM

Tuesday, April 13

10 A.M.

Address of welcome: Hon. Henry W. Kiel, mayor of St. Louis.

Response: Dr. W. A. Noyes, president, American Chemical Society.

General Addresses

The chemical industry and legislation: Hon. E. P. Costigan, tariff commissioner.

Victory and its responsibilities: Dr. Chas. H. Herty, editor, *Journal Industrial and Engineering Chemistry.*

General Meeting

The prediction of solubility: J. H. Hildebrand.

Selenium oxychloride a neglected inorganic solvent: Victor Lenher. Selenium oxychloride is a liquid whose properties have hitherto been almost wholly neglected. The raw material, selenium, is at present a waste by-product from the electrolytic refining of copper. From the crude material selenium oxychloride can be produced at a very low figure and by the most simple chemical procedure, the actual procedure being to bring in contact selenium dioxide and selenium tetrachloride in carbon tetrachloride solution. Its chemical properties are such that it will probably prove a valuable reagent to the chemist. It is an excellent solvent for many of the inorganic oxides which are commonly considered to be very refractory in character. Molybdenum trioxide, for example, can be readily separated from the oxide of tungsten. The solution of molybdenum trioxide in selenium oxychloride shows a deep indigo blue color when exposed to bright light, the solution again becoming colorless when placed in the dark. The reagent is an excellent solvent for unsaturated organic substances. The unsaturated hydrocarbons and aromatic hydrocarbons dissolve readily in the solvent while the paraffin hydrocarbons do not. Bakelite, redmanol, the waterproof insoluble casein glue used in airplane construction, pure rubber, vulcanized rubber, asphalt and bitumen, dissolve with ease. The bituminous material can be dissolved from soft coal, leaving a carbonaceous residue. The vegetable oils mix readily with the reagent while with raw linseed oil a rubber-like mass is formed, quite similar to that produced by the action of chloride of sulphur on certain oils. The chemical behavior of the reagent is quite selective. Many inorganic oxides are completely insoluble in it, while others dissolve with ease, making possible many separations. Metallic sodium is not acted on by the reagent, even at 175° C., while with metallic potassium a violent explosion takes place.

Studying plant distribution with hydrogen ion indicators: E. T. WHERRY.

Adsorption of alkaloids: G. H. A. CLOWES.

The chemical resources of the St. Louis district: O. H. PIERCE.

DIVISION OF PHYSICAL AND INORGANIC CHEMISTRY

Wm. D. Harkins, *chairman*

H. N. Holmes, *secretary*

Wednesday and Thursday

A new form of active nitrogen: GERALD L. WENDT and A. C. GRUBB. This form is produced by the corona discharge at 20,000 volts from a fine wire through pure nitrogen at atmospheric pressure. Under most favorable circumstances as much as four per cent. of the nitrogen is transformed into an active form which reacts readily with hydrogen to form ammonia; with oxygen to form oxides; and with lithium, sodium, potassium, magnesium, aluminium, iron and zinc to form nitrides, and with sulfur to form a sulfide. It is probably different from Strutt's nitrogen in that the latter gave neither ammonia nor oxides of nitrogen. Whether it is atomic or an ozone form has not been determined, but on account of its extreme stability the latter is more probable. It forms very slowly in the discharge and persists for hours afterwards, unlike the ozone forms of oxygen and hydrogen. It has a distinct odor resembling formaldehyde.

The ozone form of hydrogen at atmospheric pressures—the formation of ammonia: GERALD L. WENDT, A. C. GRUBB and ROBERT S. LANDAUER. The ozone form of hydrogen has now been prepared by three methods—the action of alpha rays, in the vacuum electrical discharge, and in the corona at atmospheric pressure. Attempts to produce activation by means of Schumann light failed. The ozone hydrogen, or hyzone, is extremely unstable, reverting to the usual inactive form in less than a minute. Figures are given in a detailed study of the formation of ammonia from the hyzone and nitrogen, activated nitrogen and ordinary hydrogen, active nitrogen and hyzone, and mixtures of the two plain gases activated together and reacting in the corona.

New determination of the absolute value of the radium: uranium ratio: S. C. LIND and L. D. ROBERTS.

A general theory of chemical reactivity, calculations of reaction velocities, equilibrium constants and vapor pressures: S. DUSHMAN and IRVING LANGMUIR.

The direct combination of nitrogen and chlorine: W. A. NOYES and GEORGE H. COLEMAN.

The causes and prevention of after-corrosion on the bores of firearms: WILBERT J. HUFF.

The binary system, Akermanite-gehlenite (lime, magnesia, alumina, silica): J. B. FERGUSON and A. F. BUDDINGTON.

The system Fe_2O_3-SO_3-H_2O: E. POSNJAK and H. E. MERWIN. This paper treats the general equilibrium relations in this system from 50° to 200° and comprises the determination of the compositions and properties of the solid phases, as well as the compositions of the solutions in equilibrium with the various solid and vapor phases within the above temperature range.

The ionization of strong electrolytes: JAMES KENDALL.

Changes in the analytical ratios of sugars during refining: A. F. BLAKE. The clerget sucrose value for sugars, as pointed out by Browne at the Cleveland meeting, normally exceeds the polarization by about one third the percentage of invert.

This is true of raw sugars as shown by numerous analyses, but in the products of a refinery, soft sugars and syrup, the value of the ratio SP/I is very low. Analyses of sugars at all intermediary stages of refining are given, in order to determine where the changes takes place. It is concluded that some change takes place during defecation and filtration of low test material and in the handling of the muds and scums, but that by all means the principal cause of the reduction of the value of this ratio is boneblack filtration. The factor is strongly negative for the first material coming off the boneblack, but increases in following portions until in the last portions it is about equal or slightly exceeds material going on. The average of all material going on is much higher than the average coming off. Since boneblack absorbs invert from first material and gives it up to later material it is supposed that by selective action it might absorb more levulose than dextrose. This is proved by tests on invert sugar. A high value of the ratio in refined products indicates inversion during refining. Losses of sucrose figured upon clerget values exceed those figured on polarization.

Heats of vaporization: J. H. Mathews.

Vapor pressure of lithium nitrate-ammonia system: R. O. E. Davis, L. B. Olmstead and F. O. Lundstrum. A number of substances known to be soluble in liquid ammonia were subjected to the action of a stream of dry ammonia gas, and several were found to liquefy and form a solution. This property is well known for ammonium nitrate and ammonium thiocyanate, but has not been heretofore reported for several here recorded. Lithium nitrate is one of these. The vapor pressure of solutions of different concentrations of ammonia, lithium nitrate and water were determined. As the solution is non-corrosive to iron and has a low vapor pressure around zero and over an atmosphere at about thirty-five degrees, it is suggested that it may be utilized for absorption of ammonia from a mixture of gases and the subsequent recovery of the pure ammonia.

Vapor pressure of ammonia-calcium nitrate system: R. O. E. Davis, L. B. Olmstead and F. O. Lundstrum. Calcium nitrate forms a solution with ammonia similar to that formed by lithium nitrate. The vapor pressure is somewhat lower and the ammonia absorbed is not quite so great. This solution is also non-corrosive, but becomes corrosive as carbon dioxide is dissolved in it.

Magnetic properties of dilute solutions of certain metallic oxides in silicate glasses: R. B. Sosman and H. S. Roberts.

Pressure measurements of corrosive gases. The vapor pressure of nitrogen pentoxide: Farrington Daniels and Arthur C. Bright. A new all-glass manometer is described in which a platinized glass diaphragm is arranged to close an electrical indicating circuit. A measured air pressure is thus balanced against the unknown pressure without the aid of optical systems. A convenient method for preparing pure nitrogen pentoxide is given. Determinations of the vapor pressure of nitrogen pentoxide up to an atmosphere are presented. They were obtained by a static method in which corrections were made for the decomposition occurring in the gaseous phase.

The formation of ozone and nitric acid from air in the high frequency corona: F. O. Anderegg.

Electrometric titration of iodides and a practical potentiometer for such work: W. S. Hendrixson. Hydrogen iodide is titrated in 2-normal sulfuric acid with standard permanganate. Sharp end points are obtained and the method seems accurate. Other oxidizing substances and also interfering substances are discussed, and further work is in progress. The potentiometer is a long tube-form rheostat, contact wound with oxidized resistance wire. The beam carrying the slide contact is graduated in millimeters; the instrument has been calibrated, and measurements with it and with a standard potentiometer show practically identical results.

The existence of the nucleus of the meta-hydrogen, the possible presence of meta-hydrogen in hydrogen, and the evidence which indicates that the elements magnesium, silicon, nickel, copper, zinc, and other elements of the atomic numbers from 28 to 80 (mercury), are mixtures. The function of binding and cementing electrons: William D. Harkins.

Welding thermo-couples in the electric arc: James C. McCullough. Base metal thermocouples may be welded in a 15 ampère electric arc providing oxidation of the wires is prevented by directing a stream of illuminating gas against the arc.

The solubility of helium: Hamilton P. Cady, Howard McKee Elsey, Emily V. Berger. The authors found the absorption coefficient of helium to decrease steadily with rising temperature from 0.00938 at 2° to 0.00836 at 30°. The only previous series of measurements was made by Estreicher, who found a minimum at 30°, but Antropoff showed that Estreicher had omitted a correction which changed his solubility nearly 100 per cent. in some cases, and shifted the minimum to 10°. The authors find no evidence of a minimum at 10° and that Estreicher's results are about 65 per cent. too high and the recalculated ones from 16 to 93 per cent. too high.

Washing in hard water in the presence of colloidal organic hydrosols: I. N. KUGELMASS.

Mineral oil-soap jellies as a foundation for greases: HARRY N. HOLMES.

A photometric method for the study of colloids and some applications to gelatine: S. E. SHEPPARD and FELIX A. ELLIOTT.

Protoplasm and fuller's earth: G. H. A. CLOWES.

On colloidal absorption: the heterogeneous equilibrium between colloids and ions: A. MUTSCHELLER. The subject matter of the paper consists of two parts; the first is experimental and the second part is theoretical. The experimental data given are those of changes caused by the addition of zinc sulphate in increasing concentrations to uniform solutions of gelatine. The experiments performed are on (1) The migration velocities of the ions; (2) the changes of the concentrations of the anions and cations; (3) the velocity of motion of colloidal particles; (4) the surface tension of the solutions; (5) the viscosity of the solutions; (6) the swelling of gelatine. The conclusions from these experiments are compared with the process of ion adsorption by oil drops as studied by Millikan and from the kinetic theory and Einstein equation, adsorption equations of the type generally employed (H. Freundlich & C. G. Schmidt) are derived. Various types of adsorption and the general properties of colloids are reviewed as expressed by the equations derived. (1) Swelling, (2) Hofmeister series, (3) Valency rule, (4) the exponent, (5) the constant and temperature coefficient.

A new form of hydrogen electrode apparatus: FELIX A. ELLIOTT and S. F. ACREE.

Preliminary note on the use of the hydrogen electrode for measuring the separate ionization constants of polyacids and bases; specifically tartaric acid: FELIX A. ELLIOTT and S. F. ACREE.

The use of the hydrogen electrode in measuring the ionization of acid salts: FELIX A. ELLIOTT and S. F. ACREE.

A surface condensation error in certain measurements of vapor pressure by the gas current saturation method: ALAN W. C. MENZIES. The condensation of saturated water vapor on the surface of not too drastically steamed and washed glass-wool, and also asbestos, was investigated under conditions arranged to parallel as closely as possible those that have obtained in the case of many published investigations in which the gas current saturation method was employed. The results indicate that certain annoying irregularities, which, indeed, appear to have led some investigators to abandon their work by this method, become completely explicable if the importance of this neglected source of error is fully realized.

The explanation of the Tammann-Schottky-Partington anomaly: ALAN W. C. MENZIES. Tammann found values, by the gas current saturation method, for the dissociation pressure of salt hydrates from 2 to 5 per cent. higher than Frowein had found by the tensimetric method. Partington by new measurements confirmed Tammann's anomalous results, in harmony with Schottky's finding that the initial readings in tensimetric measurements are higher than the equilibrium readings. Explanations of the anomaly by Tammann, Nernst, Campbell, Partington and Brereton Baker are discussed. Mindful of notorious precedent in the case of Charles II. and the Royal Society of London, the author re-examined the facts experimentally, and found that the real facts exhibit no anomaly.

A differential thermometer: ALAN W. C. MENZIES.

The crystallization of glass: a surface phenomenon. The repair of crystallized glass apparatus: ALBERT F. O. GERMANN.

The separation of the element chlorine into chlorine and meta-chlorine: WILLIAM D. HARKINS and C. E. BROEKER.

A force, apparently due to mass, acting on an electron, and the non-identity of isotopes in spectra and other properties: WILLIAM D. HARKINS and LESTER ARONBERG.

A study of the system ammonia, magnesium, mercury: ALBERT G. LOOMIS.

The influence of pressure on the electrolytic conduction of aqueous solutions: RALPH E. HALL.

A new form of portable standard cell: C. J. ROTTMANN.

Hydrous oxides: II. Hydrous aluminum oxide: HARRY B. WEISER.

Factors determining the degree of reversibility of precipitation of colloidal hydrous oxides: HARRY B. WEISER.

Spontaneous evaporation: Harry B. Weiser and Everett E. Porter.

Negative surface energy: William D. Harkins and Y. C. Cheng.

The formation of ammonia from nitrogen and hydrogen in the corona: William D. Harkins and A. Morton.

The electrical conductivity of dilute aqueous solutions of the alkali hydroxides: Merle Randall and C. C. Scalions.

The partial molal volume of the constituents in solutions of electrolytes: Merle Randall.

A revision of the atomic weight of antimony. Preliminary report: H. H. Willard and R. K. McAlpine.

A separation and volumetric determination of cobalt: H. H. Willard and Dorothy Hall.

A new form of filtering crucible: H. H. Willard.

Notes on the determination of chromium as chromic oxide: Wm. H. Blanchard.

The preparation of colloidal selenium: Victor E. Levine.

A theory of catalytic action: Chas. W. Cuno.

Radiation and chemical reactivity: Eric K. Rideal. The radiation theory of chemical physical action as developed by Trausy Marcelin Price and more recently by Mc. Lewis, Bernouilli and Perrin, in the light of the Rutherford Bohr atomic structure offers a tangible interpretation for the mechanism of chemical and physical change; calculation from radiation data leads to results for the latent heats of evaporation; electrode potentials and heats of reaction of various elements and compounds in close agreement with experimental results. Catalytic action on the radiation theory admits of various interpretations as to the possible modes of mechanism; these are briefly described and answered.

Quantitative measurement of fluorescence: L. J. Desha. The radiation from a mercury arc in quartz tube, separated from most of the visible rays by a glass screen of the "Uviol" type, is allowed to fall upon solutions contained in the cups of the Kober nephelometer. Fluorescent substances emit light which may be compared in the eye piece as in nephelometry. Solutions containing one half to two parts of quinine sulphate per million in normal sulphuric acid yield readily comparable results which are almost if not quite directly proportional to the concentrations. Applications as an analytical procedure are suggested. The work is being continued.

Some applications of sodium peroxide in analytical chemistry: W. M. Sternberg. Some applications of sodium peroxide to analytical processes in particular fusions of lead and zinc ores in iron crucibles have been studied. The decomposition is very rapid and complete in every case. When the usual proportion of sodium peroxide to ore (5 to 8 times the weight of the ore) has been used. If smaller amounts of the peroxide be taken the reaction in case of sulphide ores is rather violent. The results in case of lead ores were uniform but low unless the standard solution has been standardized against a standard ore run by the fusion method. The procedure consisted in fusion one half gram ore in an iron crucible with about 3 to 4 grams of sodium peroxide, dissolving the melt in water, adding 0.7 gram oxalic acid to reduce the lead peroxide. The solution was acidified with sulphuric acid boiled, cooled, lead sulphate filtered and washed with 5 per cent. sulphuric acid. The impure lead sulphate was dissolved in ammonium chloride, or ammonium chloride-sodium acetate mixture, heated to boiling and titrated with ammonium molybdate. In the case of zinc ores the peroxide fusion was dissolved in ammoniacal ammonium chloride solution heated to boiling, filtered and washed with hot ammonium chloride solution, acidified with hydrochloric acid, heated to boiling and titrated with potassium ferrocyanide, after the addition of 50 c.c. of hydrogen sulphide water. Here also good results have been obtained if the solution has been standardized against the standard zinc ore D, or against zinc oxide, both fused and treated in the way described.

Charles L. Parsons,
Secretary

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