ing some relation between the acidity of the soil and adsorption. This work is giving most interesting results.

Many of these results speak for themselves, but a discussion together with a full report of all results is being published elsewhere.

NEIL E. GORDON,
R. C. WILEY,
E. B. STARKY,
A. L. FLENNER,
D. C. LICHTENWALNER

UNIVERSITY OF MARYLAND

THE AMERICAN CHEMICAL SOCIETY.

(Continued)

Luminescence of parabromophenyl magnesium bromide and related compounds: W. V. EVANS AND R. T. RUFFORD.

A simplified titrating hydrogen electrode and its use in a plant laboratory: FELIX A. ELLIOTT. The hydrogen electrode previously described by the author has been modified for use in titrations. It has been possible to meet the three important conditions of (1) working in a hydrogen atmosphere, (2) efficient and quick mixture of the solution being titrated with the acid, alkali or other solution, and (3) eliminating the contact potential and at the same time maintaining a constant volume of the solution under investigation, without undue complications in the design and without mechanical agitation. The internal resistance of the cell has been kept very low, thus insuring ample sensibility with the more rugged types of measuring instruments. The apparatus is portable. When fitted with platinized platinum electrodes this cell may be used to determine the content of lime and magnesia in limestone, the amount of acid or alkali in various plant liquors, examples being given. With bright platinum electrodes the cell may be used for such titrations as I with sodium thiosulphate, Fe with sodium dichromate and other titrations involving similar reactions with a change in the charge on one of the ionic species in solutions.

High frequency ozone production: F. O. ANDEREGG. To eliminate the dielectric, which is the greatest weakness with commercial ozonizers, advantage was taken of the fact that it is impossible to maintain a high frequency arc. An aluminium tube 5 x 190 cm. with a concentric wire was used for the discharge. Current was supplied up to half an ampere and 7000 volts at about a million and a half cycles frequency by a small Tesla coil which was designed so as to give the best discharge with the tube used. The highest yields were secured with a rather large wire provided with numerous small points so that the discharge should be made up of many brushes. The ozonized air contained but small amounts of nitrous oxides although on raising the voltage till the discharge was filled with sparks about 0.02 per cent. was obtained. Numerous curves have been worked out showing the relationships between the different variables which are usually similar to those obtained in low frequency ozone production. Maximum concentration was 15 gram per cubic meter. The greatest efficiency obtained was 17 gram per kilowatt hour which in view of the wasteful method of producing the high frequency current is encouraging.

The reaction between tungsten and hydrocarbon vapors: SAUL DUSHMAN.

The activity of ions in mixed electrolytes: C. E. RUBY, T. W. BARTRAM AND Y. L. YEH. The electromotive-force of cells of the type H_2 (1 atm.), HCl (c_{10}) + MCl (c_2), AgCl, Ag were measured, in which MCl was, in the two sets of experiments, KCl and NaCl respectively, and the sum of the weight-normal concentrations ($c_1 \pm c_2$), was held constant in each set of measurements, c_1 being varied ten-thousand-fold. Four sets of measurements were made, employing the values of .2, and 1.0 weight-normal for the sum of c_1 and c_2. The results obtained in these experiments are interpreted in the light of the theory of independent ion-activity.

The atomic structure: Upon the subtlety of directed particle motion hang all the properties of matter: H. K. KIPPER. By our theory we postulate that: Light is a wave motion of the particles of the ether. Electricity is a helical or screw motion of the particles of the ether (whether atomic or unorganized). Magnetism is a compensated helical or screw motion of particles. Gravity is a function of rotatory motion. Chemical affinity or valency is based on the forces derived from the specific groups of electrons. Solution affinity is based on the forces derived from all groups—that is, such forces taken as a field. All atomic forces are mechanically or mathematically derivable and interpretable from motions of particles in themselves representing simply energy and matter.

The cryoscopy of boron trifluoride solutions: VI: System with methyl chloride: ALBERT F. O. GERMANN AND MARION CLEAVELAND. P. F. G. Boullay

pointed out, early in the nineteenth century, that ethyl chloride prepared by the method of Dumas and Peligot contains ethyl ether as an impurity. In a paper presented at the last meeting of this Society (see SCIENCE, 53, 582 (1921)), we showed that methyl chloride prepared by the above method (that is from salt, sulfuric acid and methyl alcohol) could not readily be separated from methyl ether which it contains as impurity, and that the presence of methyl ether can be detected by addition of boron trifluoride, which forms the molecular compound $(CH_3)_2O.BF_3$, boiling at 126° C., and remaining as a slightly volatile residue after evaporation of the excess of either gaseous constituent. At the present time, methyl chloride prepared by chlorination of natural gas is available and a sample was obtained through Roessler and Hasslacher. This sample appeared to contain methane, which is somewhat soluble in liquid methyl chloride. A large sample was collected and fractionally distilled five times, after which it distilled at a uniform pressure. Tested by addition of boron trifluoride, the product was completely volatile, showing that the sample was free from methyl ether. The freezing point curve obtained shows a sharp eutectic at 30 per cent. of methyl chloride, where the freezing point was about 137 degrees below zero. There is no indication of the formation of a compound between methyl chloride and boron trifluoride.

The application of a differential thermometer in ebullioscopy: ALAN W. C. MENZIES AND SYDNEY L. WRIGHT, JR. The differential thermometer, perhaps 12 cm. long, is extremely simple but of novel type, consisting essentially of a stout glass U-tube containing only water and its vapor, and measures the difference in temperature between the solution and the pure solvent. Both limbs of the thermometer are located in the vapor phase; one of them is laved continually with the solution by means of a Cottrell pump, while the other is laved only by condensed solvent. The apparatus uses neither corks nor stopcocks, is rather insensitive to draughts and to changes in heating, and is unaffected by barometric fluctuation. Results are consistent to one half of one per cent.

The decolorizing action of boneblack: CLAUDE H. HALL, JR. The author has repeated and confirmed the work of Patterson. By extraction of hydrochloric acid washed boneblack with sulfuric acid an extremely active decolorizing agent may be prepared. By precipitating this compound on wood charcoal, or other porous substances, a material identical in chemical action with boneblack is ob-

tained. This is the final link in the chain of evidence proving that the decolorizing action of boneblack is due to certain nitrogeneous compounds, the empirical formula and some of the properties of which are described in the previous reference.

Effect of electrostatic potential on the activity of a catalytic surface: A. S. RICHARDSON.

The selenides of ammonium: C. R. MCCROSKY AND A. J. KING. Pure dry NH_3 and H_2Se were admitted to a special weighing tube, free from oxygen. White crystals form when H_2Se is in excess—analyzing from 76 per cent.[1] to 80 per cent. Se, corresponding closely to NH_4HSe. This salt dissociates without melting at 100° to 120°. When NH_3 is in excess and the temperature of the tube is kept at from 20° to 30°, a liquid forms, practically colorless. (The heat of formation of NH_4HSe is great enough to prevent the formation of the liquid unless the tube is cooled to room temperature.) The analysis of this liquid shows Se 68 per cent. agreeing with the theoretical for $(NH_4)_2Se$. It freezes at approximately 10° and decomposes at 30° to 40° leaving the white crystals of the hydroselenide. Bineau (1838) claims that $(NH_4)_2Se$ is a white solid, also that NH_4HSe is a white solid. Lehner and Smith (1898) prepared a dark-colored crystalline solid from water solution, which corresponded to $(NH_4)_2Se$. Further definite data are lacking in the literature.

The correlation of compound formation and ionization in solutions: JAMES KENDALL AND PAUL M. GROSS. The complete specific conductivity-composition curves for 14 systems of the types: acid-ester, acid-ketone, acid-acid and acid-base have been determined. The conductivities of mixtures of the above types are, in general, considerably in excess of those of the pure components, and increase uniformly with increasing diversity in chemical character of these components. The results obtained have been correlated with those derived from freezing-point measurements upon similar systems, and the validity of the fundamental connection between compound formation and ionization in solutions, postulated in previous articles, has been confirmed.

The prediction of solubility in polar solutions: JAMES KENDALL, ARTHUR W. DAVIDSON AND HOWARD ADLER. The influence of compound formation between solvent and solute on the degree of

---

[1] Errors in the method, found later, in all probability account for the low values. These errors were overcome in later determinations.

solubility is critically discussed. It is shown that: (*a*) for a *fixed* solute in a series of *different* solvents, increasing solubility and increasing compound formation proceed in parallel; (*b*) for a series of *different* solutes of high melting-point in a *fixed* solvent, solubility and compound formation also proceed in parallel at low temperatures. Salts of a very weak base exhibit increasing hydrate formation and increasing solubility in water as the acid radical X diverges from OH; salts of a very weak acid show the same behavior as R diverges from H. The increase in the solubility of a difficultly soluble salt in water on addition of a second salt containing a common ion, due to complex salt formation, is dependent upon the diversity of the variable radicals. The extension of these rules to non-aqueous solutions and their importance in analytical chemistry are noted.

The complete analysis of an insoluble silicate with a single fusion: F. P. DUNNINGTON. Fuse the powdered silicate with six parts of lithium carbonate in a gold crucible. The melt is dissolved in dilute acid, evaporated, heated and the silica separated as usual. To the solution of chlorides add ammonia, etc. To remove alumina, iron and manganese, precipitate lime as oxalate; magnesia by ammonium phosphate and then, with little calcium chloride and ammonium carbonate remove all excess of phosphoric oxide; evaporate filtrate, volatilize ammonium salts. The residue is digested in a mixture of absolute alcohol and ether, which readily dissolves the lithium chloride; filter off the potassium and sodium chlorides, weigh and separate them.

Alizarine-iron lakes: A. W. BULL AND J. R. ADAMS.

Adsorption of tannin by gelatine: A. W. BULL AND J. R. ADAMS.

The theory of molecular-compound formation: V. R. KOKATNUR AND H. W. STIEGLER. This theory is based on an observation that molecules in molecular compounds invariably contain elements that belong to 5, 6, 7, 8 groups of the periodic system. Assumptions: (1) Molecules combine through unsaturation or through latent valences of elements, especially non-metallic, belonging to aforesaid periodic groups. (2) These elements exhibit their highest capable valence and combine through these by single or double bonds. But all their valences may not be satisfied. (3) Active groups and conditions of molecules may influence this latent valency and give rise to chain-compounds and consequent isomerism.

The diffusion of hydrogen through metals: H. G. DEMING AND B. C. HENDRICKS. Sheet metal of 0.15 mm. thickness was clamped between heavy steel blocks in an electric furnace, the diffusion area being circumscribed on the face of each block by a pair of concentric circular knife-edges. The channel between the knife-edges in the block on the incoming side was connected to a vacuum-pump; on the outgoing side to compressed nitrogen. The diffusion was thus limited to a definite area of metal or perfectly uniform temperature, even though the blocks were never pressed against the metal tight enough to make a gas-tight joint. Aluminum is impervious to hydrogen up to its melting point. Quantitative data have been obtained for copper, iron, and other metals.

The adsorptive property of fullers earth: STUART J. BATES AND ALFRED STAMM.

CHARLES L. PARSONS,
Secretary

AMERICAN MATHEMATICAL SOCIETY

THE two hundred and seventeenth regular meeting of the American Mathematical Society was held at Columbia University, on Saturday, October 29, 1921, extending through the usual morning and afternoon sessions. The attendance included forty members of the society. Thirty new members were elected.

The following papers were read at this meeting:

Total geodesic curvature: J. K. WHITTEMORE.

On the composition of polynomials: J. F. RITT.

Complete determination of polynomials whose inverses can be expressed in terms of radicals: J. F. RITT.

Concerning continuous curves in the plane: R. L. MOORE.

Concerning the relation of a continuous curve to its complement in space of three dimensions: R. L. MOORE.

An algebraic solution of Einstein's cosmological equations: EDWARD KASNER.

On biharmonic functions: T. H. GRONWALL.

General formulation of a combinatory method used by William Emerson and others: L. H. RICE.

A theorem on loci connected with cross-ratios: J. L. WALSH.

A generalization of the notion of covariants: L. B. ROBINSON.

Inductances of grounded circuits: G. A. CAMPBELL.

R. G. D. RICHARDSON,
Secretary