

BRITISH CHEMICAL AND PHYSIOLOGICAL ABSTRACTS

NOVEMBER, 1944



A I—GENERAL, PHYSICAL, AND INORGANIC CHEMISTRY

CONTENTS

	PAGE		PAGE
I, Sub-atomics	233	VI, Kinetic Theory. Thermodynamics	249
II, Molecular Structure	235	VII, Electrochemistry	250
III, Crystal Structure	238	VIII, Reactions	251
IV, Physical Properties of Substances (not included above)	242	IX, Preparation of Inorganic Substances	255
V, Solutions, Dispersions, and Mixtures	243	X, Lecture Experiments and Historical	—
		XI, Geochemistry	256

Published by the

BUREAU OF CHEMICAL AND PHYSIOLOGICAL ABSTRACTS

(Supported by the Chemical Society, the Society of Chemical Industry, the Physiological Society, the Biochemical Society, the Anatomical Society of Great Britain and Ireland, and the Society for Experimental Biology.)

Determination⁹

OF

CADMIUM

Gravimetric assay with
—NAPHTHOQUINOLINE
PHENYLTRIMETHYLAMMONIUM IODIDE
QUINALDINIC ACID



*The separation and determination
of CADMIUM and many other
metals forms the subject of*

"ORGANIC REAGENTS FOR METALS"

175 pp. 4th Edition, 1943 4/- post free

*The Book and the Reagents produced
and distributed by*

HOPKIN & WILLIAMS LTD.
16-17 ST. CROSS STREET, LONDON, E.C.1

VITREOSIL FILTERING & IGNITION CRUCIBLES



We can now supply VITREOSIL crucibles for filtration and subsequent ignition at temperatures up to 1000°C. Filtration without asbestos mats, ignition and weighing are all done in the same crucible. Laboratory workers will appreciate the value of these great advantages of the VITREOSIL filtering crucible.

THE THERMAL SYNDICATE LIMITED

Head Office: Wallsend, Northumberland
London Depot: 12-14, Old Pye St., Westminster, S.W.1

BUREAU OF CHEMICAL AND PHYSIOLOGICAL ABSTRACTS

Chairman: L. H. LAMPITT, D.Sc., F.R.I.C.

Vice-Chairman: B. A. McSWINEY, B.A., M.B., Sc.D., F.R.S.

Hon. Treasurer: F. P. DUNN, B.Sc., F.R.I.C.

Editor and Secretary: T. F. BURTON, B.Sc.

Indexer: MARGARET LE PLA, B.Sc.

JULIAN L. BAKER, F.R.I.C.

G. M. BENNETT, M.A., Sc.D., F.R.I.C.

H. W. CREMER, M.Sc., F.R.I.C.,
M.I.Chem.E.

H. J. T. ELLINGHAM, B.Sc., Ph.D., F.R.I.C.

E. B. HUGHES, D.Sc., F.R.I.C.

L. A. JORDAN, D.Sc., F.R.I.C.

G. A. R. KON, M.A., D.Sc., F.R.S.

H. McCOMBIE, D.S.O., M.C., Ph.D., D.Sc.
F.R.I.C.

SAMSON WRIGHT, M.D., F.R.C.P.
F. G. YOUNG, D.Sc., Ph.D.

Assistant Editors:

J. H. BIRKINSHAW, D.Sc., F.R.I.C.*

H. BURTON, M.Sc., D.Sc., F.R.I.C.

F. G. CROSSE, F.R.I.C.

A. A. ELDRIDGE, B.Sc., F.R.I.C.

E. B. HUGHES, D.Sc., F.R.I.C.

W. JEVONS, D.Sc., Ph.D.†

SAMSON WRIGHT, M.D., F.R.C.P.*

E. E. TURNER, M.A., D.Sc., F.R.I.C., F.R.S.

F. L. USHER, D.Sc.

H. WREN, M.A., D.Sc., Ph.D.

* Assisted by J. D. BOYD (Anatomy), A. HADDOW (Tumours), F. O. HOWITT (Biochemistry), A. G. POLLARD (Plant Physiology and Agriculture), K. TANSLEY (Sense Organs), L. G. G. WARNE (Plant Physiology), G. P. WELLS (Comparative Physiology), V. J. WOOLLEY (Pharmacology), and F. G. YOUNG (Ductless Glands).

† Assisted by A. J. E. WELCH (Physical Chemistry).

PUBLICATIONS OF THE BUREAU

ABSTRACTS SECTIONS

A I—GENERAL, PHYSICAL, AND INORGANIC CHEMISTRY.

A II—ORGANIC CHEMISTRY.

A III—PHYSIOLOGY, BIOCHEMISTRY, ANATOMY.

B I—CHEMICAL ENGINEERING AND INDUSTRIAL INORGANIC CHEMISTRY.

B II—INDUSTRIAL ORGANIC CHEMISTRY.

B III—AGRICULTURE, FOODS, SANITATION, ETC.

C—ANALYSIS AND APPARATUS.

COLLECTIVE INDEXES

DECENNIAL INDEX 1923—1932.

QUINQUENNIAL INDEX 1933—1937.

NOVEMBER, 1944.

I.—SUB-ATOMICS.

Stark effect in hyperfine structure of sodium D lines. H. Angenetter (*Naturwiss.*, 1943, 31, 112—113).—The quadratic Stark effect is calc. quantum-mechanically from the hyperfine structure. L. J. J.

Stark effect of the hyperfine structure of sodium. F. Gabler (*Naturwiss.*, 1943, 31, 42—43).—The method formerly used (A., 1942, 1, 254) for studying the inverse Stark effect, using an at. beam as absorbing medium, has been improved and used for the investigation of the Stark effect of the hyperfine structure of Na. The Stark effect of the D lines is a quadratic effect. The π and σ components of the D_1 line are displaced equally towards longer $\lambda\lambda$ by a field of 100 kv. per cm. In the case of D_2 , each hyperfine component splits into a π and two σ components. The weak σ_2 line and the π line are displaced by approx. the same amount to the red, but the strong σ_1 line is displaced by only about one third of this distance. A. J. M.

K-Absorption spectra of elements of atomic numbers 72 (Hf), 73 (Ta), 74 (W), 75 (Re), 76 (Os), and 77 (Ir). (Mlle.) I. Manescu (*Compt. rend.*, 1943, 216, 732—734).—Vals. of λ and ν/R for K -absorption edges are given for these elements. A. J. M.

Penetration of foils by electrons of high energy. K. T. Chao (*Sci. Rec. [Acad. Sinica]*, 1942, 1, 129—131).—Electrons with various incident energies up to 7 Me.v. penetrate foils of C (thickness = t = 0.5 cm.), Al (t = 0.0355 cm.), mica (t = 0.05 cm.), Pt (t = 0.0004 cm.), Pb (t = 0.0038, 0.006, and 0.05 cm.), and the transmitted intensities for the electron energies are measured experimentally and calc. theoretically. Results are compared. The experimental data for Pb, Pt, and mica [$H_2KAl_3(SiO_4)_3$] are in good agreement with the theory, but with C and Al the experimental vals. are < the theoretical. L. S. G.

Change of position of thorium in the periodic system. G. E. Villar (*Anal. Asoc. Quim. Argentina*, 1943, 31, 213—221).—Arguments are advanced for the existence of a series of "rare-earth" elements in the position occupied by Ac. The chemical and physical properties of Th agree with this. The at. mass of an element is shown to be < the average of the at. mass of its neighbours in the same group of the periodic system, and this relation is universally true only if Th, Pa, and U all occupy the same position as Ac. F. R. G.

Analysis of β -disintegration data. I. The Sargent curves and Fermi and Konopinski-Uhlenbeck theories of beta-radioactivity. C. S. Wang and W. Y. Chang. II. Probability of β -disintegration and the complexity of atomic nuclei. W. Y. Chang and C. S. Wang (*Sci. Rec. [Acad. Sinica]*, 1942, 1, 98—103, 103—108).—I. The Sargent curves are plotted for a no. of β -emitters. The radioactive elements group themselves more closely into Sargent curves when the positive and negative emitters are plotted separately. A comparison is made with the Fermi theory and the Konopinski-Uhlenbeck theory of β -decay, calculations being made of $|M|^2/\tau_0$ for each element, where M is the matrix element of the heavy particle and τ_0 is the universal decay time. The vals. of $|M|^2/\tau_0$ fall into groups of different orders of magnitude, viz., 10^{-24} , 10^{-26} , and 10^{-28} or 10^{-25} , 10^{-27} , and 10^{-29} according as to whether Fermi's or Konopinski and Uhlenbeck's form of interaction is taken. The classification of $|M|^2/\tau_0$ is satisfactory and there is good agreement between theory and experiment.

II. The vals. of τ_0 and $|M|^2$ for 4He are calc. the latter being compared with that of Gronblom. The difference in $|M|^2$ between positive and negative emitters is discussed and interpreted. The variation of $|M|^2$ with at. no., Z , is due to the greater rearrangement of the nuclear constituents after a β -transition as Z increases. The effect of isotope number and of a nuclear Coulomb field in the theory of β -disintegration is studied, and it is verified that the decay const. of positive emitters decreases while that of negative emitters increases with the isotope no. The selection rules for different β -transformations are also studied. L. S. G.

Sargent curves for artificially β -active nuclei. P. K. S. Chaudhury (*Indian J. Physics*, 1943, 17, 262—270).—Sargent curves of β -active nuclei have been drawn and used to deduce the approx. spin of nuclei of even mass no. The utility of these curves in studying nuclear isomerism is pointed out. W. R. A.

Lost radioactivity of caesium. W. Wahl (*Naturwiss.*, 1943, 31, 18—19; cf. Hahn *et al.*, A., 1943, I, 46).—The occurrence of a line corresponding to a mass no. of 132 in the mass-spectrogram of pollucite is confirmed, and the possible mols. or radicals which could give rise to this line are discussed. It appears to be due to ^{132}Ba , although this was not found by Hahn *et al.* A. J. M.

Lost radioactivity of caesium. O. Hahn, F. Strassmann, J. Mat-
tauch, and H. Ewald (*Naturwiss.*, 1943, 31, 19).—A reply to Wahl (see preceding abstract). A. J. M.

Natural and artificial activity of lutecium, a new case of isomerism. A. Flammersfeld and J. Mat-
tauch (*Naturwiss.*, 1943, 31, 66—67).—Irradiation of Lu with neutrons gives activities of half-life 3.4 ± 0.1 hr. and 6.6 ± 0.05 days. β -Ray absorption measurements give energy 1150 ke.v. and 4.40 ke.v., respectively. The long-life initial activity is 3 times that of the short-life with slow neutrons. The former is obtained only with thermal, the latter with both thermal and resonance, neutrons. Hence the two substances are not isomeric. Naturally active Lu gives β -rays of energy 400 ke.v., together with a harder radiation (γ -radiation). It is concluded that the 6.6-day substance is isomeric with ^{176}Lu , and the 3.4-hr. substance has mass no. 177. L. J. J.

New gaseous product of uranium fission. W. Seelmann-Eggebert and H. J. Born (*Naturwiss.*, 1943, 31, 59—62).—Two new Kr isotopes of half-life 75 min. and 4.6 hr., obtained respectively from 50-sec. Br and 3-min. Br, are described. 30-sec. I gives a 3.8-min. Xe. The max. energy of the 75-min. Kr is ~ 4 Me.v., that of the 4.6-hr. Kr is ~ 0.8 Me.v., and that of the 3.8-min. Xe is 4 Me.v. L. J. J.

Identification of uranium fission products with corresponding isotopes obtained by means of (na) and (np) processes. H. J. Born and W. Seelmann-Eggebert (*Naturwiss.*, 1943, 31, 86—89).—Irradiation of Rb and Sr salts with fast Li-D neutrons gives Kr isotopes by (na) and (np) processes. Sr gives one isotope with half-life 4.6 hr., Rb gives two with half-lives 4.6 hr. and 75 min. The identity of the Kr isotopes with those of the same half-lives from U is established by comparison of the absorption of emitted β -rays. The respective mass nos. 85 and 87 are ascribed to the two isotopes. The 30-min. Br from U is identical with a Br obtained from Rb by a (na) process. L. J. J.

Life of the mesotron. G. Cocconi and V. Tongiorgi (*Naturwiss.*, 1943, 31, 108—109).—Measurement of mesotron fine structure at 2200 m. above sea level at Passo Sella in the summer of 1942, at angles 0° , 25° , 40° , 50° , and 60° to the zenith, showed no variation in $\tau/\mu c^2$, where τ and μ are the life and rest mass of the mesotron. The val. 3.4×10^{-8} sec. per Me.v. was found for $\tau/\mu c^2$. L. J. J.

Life of the mesotron. J. Juilfs (*Naturwiss.*, 1943, 31, 109—110).—A reply to Cocconi (see above). The measurements quoted do not exclude the presence of mesotrons of short life. L. J. J.

Presence of mesotron showers in extended showers in air. G. Cocconi, A. Loverdo, and V. Tongiorgi (*Naturwiss.*, 1943, 31, 135—136).—In order to confirm the existence of extended showers of considerable penetrating power, and to investigate the connexion between them and the Auger electron showers, an apparatus using 8 groups of counters was employed. Almost all the penetrating showers are composed of electrons and mesons, and contain at least two mesons. A. J. M.

The meson-pair theory of nuclear interaction. O. Klein (*Archiv Mat. Ast. Fys.*, 1944, 30, A, 3, 13 pp.).—A modification is made of Marshak's "heavy electron" pair theory of nuclear forces in which the "heavy electrons" (obeying the ordinary relativistic Dirac equation) are replaced by mesons of integer spin and Bose statistics. The results are similar to those of Marshak, whose assumptions, however, do not contradict the known spin and statistical properties regarding the disintegration of mesons in cosmic rays. As in Marshak's theory, there is no indication of the origin of the β -electrons, which is naturally explained by Kemmer's "symmetrical" theory, nor of the non-Dirac magnetic moments of protons and neutrons, especially their opposite sign and approx. equality. To solve these difficulties it would probably be necessary to assume additional interactions in the pair theory. I. S. G.

Second maximum of the Rossi curve. M. Forró and Z. Ozorai (*Naturwiss.*, 1943, 31, 140).—An improved apparatus similar in design to that originally used by Schmeiser *et al.* (cf. A., 1938, I, 291) was used to detect the existence of the second max. of the Rossi curve. Between 5 and 24 cm. Pb no max. could be observed within the limit of error of 1–2%.

A. J. M.

The impulse-energy tensor of material particles. I. Mesons and electrons. II. Particles of spin 2 or 3/2. T. S. Chang (*Proc. Roy. Soc.*, 1944, A, 182, 302–311, 311–318).—I. The investigation gives a direct and general construction of a real, symmetrical tensor T_{ik} the divergence of which to i is -1 times the four-force f_k experienced by the matter. Interpreting T_{ik} as the impulse-energy tensor for the case of no electro-magnetic field the energy-momentum density obtained from T_{ik} is compared with that obtained by treating $(\hbar/i)(\delta/\delta x_k)$ as the energy-momentum operator. In the general case the Hamiltonian of the matter is compared with $\int T_{44} dV dy dz$. The compared quantities agree apart from unimportant modifications.

II. Calculations of a general impulse-energy tensor T_{ik} are extended to particles of spin 2 or 3/2, the wave equations of which were given by Fierz and Pauli. Results are generally similar, but the expression for T_{ik} is very complicated.

G. D. P.

II.—MOLECULAR STRUCTURE.

Band spectrum of nitrogen: new singlet systems. A. G. Gaydon (*Proc. Roy. Soc.*, 1944, A, 182, 286–301).—Five new systems due to N_2 are observed in a mildly condensed discharge through nitrogen. Rotational analyses of some of the bands are made and it is shown that all correspond to transitions to the upper level $a^1\Pi_u$ of the Lyman-Birge-Hopfield system. An additional progression of the system studied by Van der Ziel (the fifth positive system) is found, necessitating revision of the upper vibrational quantum nos. Some of Kaplan's systems are also examined and the rotational analysis of one shows that it corresponds to a transition to the lower level of the fifth positive system. This level probably lies a little below $a^1\Pi_u$ and is metastable; it may play a part in the formation of active N . Rotational and vibrational consts. for the singlet electronic states of N_2 are tabulated.

G. D. P.

Development of δ - and γ -bands of nitric oxide in active nitrogen and Lyman bands in helium-nitrogen mixture. B. M. Anand (*Indian J. Physics*, 1943, 17, 246–251).—The doublet structure of 0-0, 0-1, 0-2, and 0-3 bands of the δ system ($c^2\Sigma \rightarrow a^2\Pi$) of NO and of 1-0 and 2-0 bands of the γ system ($A^2\Sigma \rightarrow a^2\Pi$), as observed in active N, has been measured and is described. β bands of NO are not found in the afterglow of active N. Three new bands, 6-13, 0-8, and 4-9, of the Lyman-Birge-Hopfield system of N_2 are developed in a mixture of He and N_2 .

W. R. A.

Pressure widening of the rotation-vibration bands of the HCN molecule at 10,385 Å. G. Kortüm and H. Verleger (*Naturwiss.*, 1943, 31, 44).—The broadening of the fine structure of the rotation-vibration bands of HCN with increasing pressure, and the effect of addition of foreign gases, have been investigated, in order to discover the effect of intermol. forces on the sharpness of energy levels. In the range 75–550 mm. the pressure widening is greatest at the intensity max. of the band for both P - and R -branches, in agreement with Cornell (A., 1937, I, 343). The mean widening increases \propto pressure. Widening produced by the addition of foreign gases (N_2 , N_2O , H_2S , Me_2O , SO_2 , $EtCl$) depends largely on the dipole moment of the added gas, other factors being equal. The widening is, however, not \propto dipole moment. The effect may be due to van der Waals forces and/or resonance.

A. J. M.

Asymmetric rotor. II. Calculation of dipole intensities and line classification. P. C. Cross, R. M. Hainer, and G. W. King (*J. Chem. Physics*, 1944, 12, 210–243; cf. A., 1943, I, 113).—Mathematical. Provided that the asymmetry is roughly the same in the initial and final states, the relative intensities of all important rotational lines up to $J < 13$ for all bands of any mol. can be calc. with the aid of a table of line strengths for rigid asymmetric rotors. Irregularly spaced lines are classified into "sub-branches," defined by the changes of the K vals. of the initial level in the limiting prolate and oblate symmetric rotors, and "wings" which collect lines of "sub-branches" which have uniformly varying strengths and Boltzmann factor, and fairly uniform spacing.

W. R. A.

Absorption spectra of complex compounds of the noble metals. Chlorometallates of the platinum group. A. V. Babaeva (*Bull. Acad. Sci. U.R.S.S., Cl. Sci. Chim.*, 1943, 171–177).—Absorption spectra have been studied in the region 2000–6000 Å. for dil. (0.001–0.03M.) aq. solutions of $(NH_4)_2[RhCl_5] \cdot H_2O$; $(NH_4)_2[PtCl_4]$; $(NH_4)_2[PtCl_5] \cdot H_2O$; $(NH_4)_2[PtCl_6] \cdot 6H_2O$. These compounds each have three absorption bands in the range studied, the positions of which are governed by the at. no. of the "central atom" of the complex.

V. B.

Photochemical processes in aromatic compounds.—See A., 1944, I, 255.

Polymer spectra of cyanine dye. R. W. Mattoon (*J. Chem. Physics*, 1944, 12, 268–276).—Dil. aq. solutions of 1:1'-diethyl-2:2'-cyanine chloride (I) exhibit bands with max. at 4900 and 5230 Å., whilst in a 10⁻³M. solution an exceedingly narrow absorption and fluorescence band occurs at 5730 Å. (P band) at room temp. The P band shifts to ~ 5780 Å., becomes broader, and finally disappears as H_2O is removed by pumping or by heat. The behaviour is reversible, thus enabling the humidity of the atm. to be determined from the position of the band. The effect of temp. from -195° to 100° has been investigated. For films of (I) another, and weaker, absorption band occurs at 5430 Å. (P_M band) similar to the P band but polarised perpendicularly, not parallel, to the polymer chains. Thus the P band is due to single dye polymer chains and the P_M band to a system of coupled chains lying mutually parallel and forming threads. The threads were observed microscopically.

W. R. A.

Physico-chemical constants of cholesterol and its ozonide. H. Paillard, M. Berenstein, and E. Briner (*Arch. Sci. phys. nat.*, 1944, [v], 26, Suppl., 67–71).— d_4^{18} , n_D^{18} , γ^{18} , α , $[\alpha]_D$, and η for solutions of cholesterol (I) and of its ozonide (II) in CCl_4 and in $CHCl_3$ are recorded. The ultra-violet absorption of (II) is displaced towards longer λ and commences at 3400 Å. $CHCl_3$ solutions of (I) and (II) exhibit a weak greenish fluorescence; (I) has a single band at ~ 4700 –5300 Å. and (II) at 5000–6100 Å.

L. S. T.

Study of the structure and modes of vibration of metallic carbonates, hydrogen carbonates, and thiocarbonates by means of their infra-red absorption spectra. (Mme.) R. Duval, C. Duval, and J. Lecomte (*Bull. Soc. chim.*, 1943, [v], 10, 517–524).—The infra-red absorption spectra of 12 simple carbonates, 7 double carbonates, 5 H carbonates, and 5 thiocarbonates are obtained by the powder method. From the results, definite modes of vibration can be associated with all the observed frequencies, and a choice can be made between the various possible mol. models. Certain bands in the spectra of the thiocarbonates indicate the presence of acid thiocarbonates.

J. F. H.

Application of infra-red absorption spectra to the determination of the structure of ethylenic hydrocarbons (aliphatic series). M. Tuot and J. Lecomte (*Bull. Soc. chim.*, 1943, [v], 10, 524–542).—The infra-red absorption spectra of 22 ethylenic hydrocarbons, obtained by the dehydration of *sec.* and *tert.* alcohols, have been determined in the range 700–1400 cm^{-1} . The region 880–1000 cm^{-1} gives information on the position of the double linking. None of the dehydration products gives bands at 910 and 990 cm^{-1} , indicating that no $\alpha\beta$ ethylenic linkings are formed. A double linking not at the end of the chain gives strong bands at ~ 960 and 910 cm^{-1} , except where the double linking is attached to a *tert.* C, when a strong band appears at 880–890 cm^{-1} . Study of the region 720–780 cm^{-1} enables the length and form of the C chain to be deduced. The results are discussed theoretically.

J. F. H.

Empirical and theoretical considerations on the infra-red absorption spectra of saturated aliphatic secondary and tertiary alcohols. M. Tuot and J. Lecomte (*Bull. Soc. chim.*, 1943, [v], 10, 542–561).—The infra-red absorption spectra of 30 *sec.* and 20 *tert.* saturated aliphatic alcohols are examined in the range 6.5–15 μ . *sec.* Alcohols show a characteristic band at $\sim 9 \mu$, *tert.* alcohols at $\sim 8.75 \mu$. Chain-branching generally displaces the characteristic bands to lower λ and reduces the intensities of the absorption max. Consideration of mol. vibrations furnishes a theoretical explanation of the form of the spectra of the simple types; by analogy the treatment is extended to homologues.

J. F. H.

Infra-red spectrum of allene and interactions between molecular vibration and rotation. H. W. Thompson and G. P. Harris (*Trans. Faraday Soc.*, 1944, 40, 295–300).—The infra-red spectrum of allene vapour has been re-measured over the range 3–20 μ . The main conclusions of Linnett and Avery (A., 1939, I, 8) are substantiated, and the use of higher resolving power has revealed further details which are discussed.

F. L. U.

Optical methods of studying hydrocarbons. III. Combination scattering spectra of paraffins. P. A. Bashulin, M. F. Bokshtein, A. L. Liberman, M. J. Lukina, E. I. Margolis, O. P. Solovova, and B. A. Kazanski (*Bull. Acad. Sci. U.R.S.S., Cl. Sci. Chim.*, 1943, 198–205).—Spectral data are given for the following hydrocarbons: $\beta\beta$ - and $\beta\gamma$ -dimethylbutane; $\beta\gamma$ -, $\beta\delta$ -, and $\gamma\gamma$ -dimethylpentane; $\beta\beta\gamma$ -trimethylbutane; $\beta\beta$ -, $\beta\gamma$ -, and $\gamma\delta$ -dimethylhexane; $\beta\beta\gamma$ - and $\beta\gamma\delta$ -trimethylpentane; β - and γ -methyl- γ -ethylpentane; $\beta\beta\gamma\gamma$ -tetramethylbutane; $\beta\gamma\gamma$ -trimethylpentane. Methods of prep. and the principal physical consts. are also given. Certain of the data previously given (*ibid.*, 1941, 14) are modified by more accurate standardisation of the lines for cyclohexane.

V. B.

Raman spectra of some trihalogen derivatives of methane. (Mlle.) M. L. Delwaule (*Compt. rend.*, 1943, 216, 735–737).—The Raman spectra of CH_2FCl , CH_2ClBr , and CH_2Br_2 have been reinvestigated. For CH_2FCl , there are 10 lines (instead of 9) and for CH_2ClBr 11 lines are found, the most intense being a doublet in each case. For CH_2Br_2 , 9 lines are found. The λ and degree of polarisation of each line are given, and the results are discussed.

A. J. M.

Raman spectra of hexachloroethane and hexabromoethane. D. T. Hamilton and F. F. Cleveland (*J. Chem. Physics*, 1944, 12, 249—252).—Raman $\nu\nu$ of C_2Cl_6 and C_2Br_6 , and their relative intensities and depolarisation factors, are given. The fundamental $\nu\nu$ of C_2Cl_6 have been used to calculate force consts. using Stitt's equations for C_2H_6 . The equilibrium configuration corresponds with the point-group D_{3h} . $\nu\nu$ allowed in the infra-red have been calc. Selection rules for the fundamentals, binary combinations, and overtones of degenerate and non-degenerate $\nu\nu$ have been worked out for mols. having the symmetries D_{3h} , D_{3d} , and D_{3d} . W. R. A.

Reversible extinction of fluorescence of haematoporphyrin in solution. I. Ungar (*Anal. Asoc. Quim. Argentina*, 1942, 30, 217—219).—The fluorescence of 0.001% haematoporphyrin solution in a beam of an arc lamp filtered through 6% $CuSO_4$ is extinguished by 0.1% of $FeCl_3$. Addition of 1% of $Na_3P_2O_7$ causes reappearance of the fluorescence. It is concluded that the extinction is accompanied by a reduction of Fe^{+++} to Fe^{++} , which change is inhibited by $Na_3P_2O_7$. F. R. G.

Factors that alter the fluorescence of certain carcinogens. H. Weil-Malherbe (*Cancer Res.*, 1944, 4, 102—105).—The chemical classification of a solvent has no relation to the fluorescence intensity of hydrocarbons dissolved in it. With 3:4-benzpyrene (I) in $EtOH-H_2O$ mixtures the variation of fluorescence intensity with composition is entirely due to quenching by dissolved O_2 . The stability of the fluorescence of solutions of (I) depends on the solvent. In C_6H_{14} or C_6H_6 no change occurs during 20 min. irradiation. In $AcOH$ photo-oxidation occurs in presence of O_2 . In $EtOH$ and in $EtOH-H_2O$ mixtures, 0.1N-HCl, or 0.1N- $NaOH$ a slow non-oxidative fall in fluorescence occurs. The rapid destruction of fluorescence in $CHCl_3$ solution is non-oxidative. Inhibitors of fluorescence in solution are of three categories: (a) substances causing a reversible photochemical reaction; (b) substances causing irreversible changes of the fluorescent material; (c) substances that absorb the exciting $\lambda\lambda$. An unsaponifiable fraction of mouse tissues is less susceptible to the quenching effect of O_2 than are carcinogenic hydrocarbons. Fluorimetric determinations of hydrocarbons should be carried out in N_2 . F. L. W.

Hedvall wandering of disturbance centres. F. Möglichen and R. Rompe (*Naturwiss.*, 1943, 31, 69).—A quantum-mechanical basis for diffusion of excess energy in a solid structure is suggested. L. J. J.

Fluorescence and absorption spectral data for pterin-like pigments synthesised by the diphtheria bacillus and isolated by chromatographic analysis.—See A., 1944, III, 772.

Dielectric properties of dipolar substances. H. Fröhlich and R. Sack (*Proc. Roy. Soc.*, 1944, A, 182, 388—403).—Examination of the structural evidence shows that there is a large group of dipolar org. solids the dipoles of which have two equilibrium positions with opposite dipole direction. A theory is developed which gives larger dielectric consts. and smaller dielectric loss than Onsager's theory. It is shown that liquids with high η behave as solids whilst liquids of low η conform to Onsager's theory. G. D. P.

Refraction and dispersion of hydrogen sulphide, sulphur dioxide, and carbon oxydisulphide. H. Huxley and H. Lowery (*Proc. Roy. Soc.*, 1943, A, 182, 207—216).—The measurements were carried out by means of Jamin's interferometer; an improved technique makes it possible to apply a systematic correction for fringe drift by obtaining photographic records of a fringe system at definite intervals during the experiment. New vals. for the refraction and dispersion of SO_2 and H_2S are given. For COS the following consts. are determined for the first time: pressure coeff. = 0.1339×10^{-4} per mm.; ρ = 2.1046 (air = 1); temp. coeff. = 0.003830 per $^\circ C$. Dispersion, $(n - 1) \times 10^7$, at eight $Hg \lambda\lambda$, from 8817.0 at $\lambda 5792.26$ to 9061.9 at $\lambda 4047.70$. The Sellmeier formula deduced from these figures is: $(n - 1) = 9.372 \times 10^{27} / (10,903 \times 10^{27} - \nu^2)$. G. D. P.

Transmission of light by water drops 1 to 5 μ . in diameter. R. Ruedy (*Canad. J. Res.*, 1944, 22, A, 53—66).—The work done against surface tension in the formation of a small H_2O drop from supersaturated vapour is large compared with hT . This prevents the attainment in cloud-chamber experiments of the equilibrium indicated by Kelvin's v.p. equation. The colours observed when a source of white light is viewed through a cloud of drops of radii of a few μ . are explained in terms of the theoretical result that the intensity of transmitted monochromatic light varies periodically as the ratio radius/ λ increases. H. J. W.

Old and new views on some chemical problems. W. H. Mills (*J.C.S.*, 1944, 340—350).—An address. Recent advances in the knowledge of mol. structure, especially in relation to valency, are reviewed. C. R. H.

Calculation of certain higher-order Bethe approximations. W. J. C. Orr (*Trans. Faraday Soc.*, 1944, 40, 306—320).—Mathematical. The Bethe method is applied in calculating the no. of ways of arranging double mols. on planar arrays of adsorption sites. When consistently applied the method gives an unambiguous and apparently rapidly convergent result. F. L. U.

Effect of polar and paramagnetic molecules on absorption and refraction of radio-waves in the atmosphere. V. L. Ginzburg (*Bull. Acad. Sci. U.R.S.S., Sér. Phys.*, 1943, 7, 96—98).—The effect of paramagnetic mols. is small, and that of polar mols. negligible. J. J. B.

Radius of the H^+ ion, and constitution of the halogen acids. H. Triché (*Compt. rend.*, 1943, 216, 737—739).—It is possible to calculate approx. the radius of ions from the parachors of a family of compounds, and a certain no. of ionic radii (*ibid.*, 641). The method is applied to HCl , HBr , and HI . From the mean of the parachors of HCl and HBr , the radius of H^+ is 1.27 Å., and from HBr and HI it is 1.46 Å. The radius of H^+ is thus not small, and in the halogen acids the halogen ion must have a very small radius, but may be regarded as expanding to a vol. equal to the part of the H^+ which it encloses. The method is also applied to NH_3 , PH_3 , and AsH_3 , the radius of H^+ being 1.44—1.56 Å. A. J. M.

Molecular volume and structure. VII, VIII. T. W. Gibling (*J.C.S.*, 1944, 380—383, 383—385).—VII. The parachor vals. allotted (A., 1941, I, 324) for $(C) \cdot CO \cdot (C)$ and $(C) \cdot CHO$ should be increased by 0.1. "Standard vals." of compounds containing these groupings require additions of 0.1 or 0.2 unit. The correction for the δ -C in the O chain of aliphatic esters and ethers is —0.7. Modified vals. of previous data are given for *cyclo*-paraffins and -olefins and their derivatives.

VIII. Group vals. are estimated from published parachor data for alkyl sulphides, thiols, and disulphides. Interference corrections required in parachors of Hg *n*-alkyl mercaptides suggest a zig-zag arrangement of alkyl chains on opposite sides of the S-Hg-S nucleus in the liquid state. Alkyl sulphites have structures resembling those of the carbonates, and sulphates and phosphates also appear to belong to the same type. L. J. J.

Mol. wt. of cellulose. Average degree of polymerisation.—See A., 1944, II, 327.

Steric inhibition of resonance. I. Dichloronitrobenzenes. II. *m*-Xylidines and *N*-dimethyl-*m*-xylidines. G. Thomson (*J.C.S.*, 1944, 404—408, 408—410).—I. Mol. solution vols. and mol. refractivities of the 6 isomeric $C_6H_3Cl_2NO_2$ have been measured. The 2:6-compound has appreciably greater vals. for mol. solution vol., parachor, and energy of activation for reaction with $NaOMe$ and smaller mol. refractivities for NaD and Hg_{5441} lines. The effect is attributed to inhibition of resonance between the $\cdot NO_2$ and the C_6H_5 nucleus.

II. At. refractivity of N in 1:3:2- $C_6H_3Me_2 \cdot NMe_2$ (I) is approx. the val. in aliphatic tertiary amines, whilst in the 1:3:4-compound (II) it has the normal aromatic val. With *Me ortho* to the NMe_2 group an intermediate val. is found. The mol. solution vol. of (I) is > that of the 1:3:5-compound (III) but approx. that of (II). The parachor vals. are in the order (III) > (II) > (I). L. J. J.

Form and mobility of thread molecules in experiments with models. H. A. Stuart (*Naturwiss.*, 1943, 31, 123—127).—Models of thread mols. were shaken in an empty vessel, and in a vessel filled with glass beads to represent an indifferent solvent. Photographs of the statistical forms taken up by mols. of different lengths are given. The effect of solvation is also shown. The transition from dil. to conc. solution is accompanied by parallelism of mols. A. J. M.

III.—CRYSTAL STRUCTURE.

Use of the X-ray goniometer (differential X-ray goniometer). W. Hofmann (*Naturwiss.*, 1943, 31, 113—114).—An arbitrary axis of rotation of the crystal can be used if two photographs are taken, one a normal rotation photograph with stationary film, the other with half the film obscured and the rotation of the crystal coupled with longitudinal displacement of the film cylinder. L. J. J.

Calculation of density from X-ray data. W. G. Schlecht (*Amer. Min.*, 1944, 29, 108—110).—The val. of N to be selected for calculating ρ from X-ray measurements is discussed. L. S. T.

Improved algebraic method for the determination of crystal structure from X-ray data. S. H. Yu (*Sci. Rec. [Acad. Sinica]*, 1942, 1, 109—110).—Avrami's method consists in solving an algebraic equation of degree $n = m(m - 1)$, where m is the no. of x , y , or z components of the interat. distances to be determined. The present method is an improvement in that (i) it is necessary only to solve an equation (determinantal) of degree $n/2$ and (ii) the no. of terms needed in a given spectrum $H(h,k,l)$ is reduced from $2n$ to $n/2 + 1$. Hence intensity data of very high-order reflexions are not needed so that some experimental difficulties are avoided. L. S. G.

New method of analysis of X-ray data for the determination of crystal structure; its application to iron pyrites. S. H. Yu and C. P. Ho (*Sci. Rec. [Acad. Sinica]*, 1942, 1, 111—115).—A modification of the Patterson synthesis is developed and compared with the latter in an application to the analysis of the structure of Fe pyrites. The rates of convergence of the two methods are discussed and also the resolving power between peaks on the Patterson

diagram. It is claimed that the new method is much more powerful than the classical Patterson method.

L. S. G.

Application of the micro-absorption factor to problems of lattice distortion and the nature of anti-phase domains. A. Taylor (*Phil. Mag.*, 1944, [vii], 35, 404—414).—The results of Brindley and Spiers (A., 1936, 3) for the differences between the f -factors of chemically pptd. and filed metal powders are explained in terms of the micro-absorption factors of the powders, that of the ppt. being larger. An experimental procedure is suggested for testing the hypothesis that the broadening of the superlattice lines in the Debye-Scherrer spectrum of Cu_3Au is due to the existence of ordered domains or to lattice faults in the crystallites.

H. J. W.

Isotypism and isomorphism. F. Machatschki (*Naturwiss.*, 1943, 31, 43).—A reply to a criticism by Strunz (cf. A., 1943, I, 221) of the use of the phrase "isomorphism of elements." The new term "diadochism," proposed by Strunz, is unnecessary. The idea of "coupled diadochism," and the distinction between isotypism and isomorphism, are criticised.

A. J. M.

Isotypism and isomorphism. H. Strunz (*Naturwiss.*, 1943, 31, 93—94).—A reply to Machatschki (see preceding abstract).

L. J. J.

Matrix theory of correlations in a lattice. I, II. R. Eisenschitz (*Proc. Roy. Soc.*, 1944, A, 182, 244—259, 260—269).—I. The statistical mechanics of some cryst. systems may be reduced to statistical correlations between objects which are the unit cells of a fictitious lattice. The method leads to the definition of matrices such that the probability distribution for a chain of cells is found by forming the powers of a matrix. A similar approach to the statistics of a lattice involves infinite matrices. In certain conditions the infinite matrices may be replaced by the outer power of finite matrices. An equation is given for the thermodynamic energy as a function of temp.

II. The sp. heat-temp. curve for order-disorder equilibrium is derived from the nearest-neighbour model by means of the above theory. The calc. curve bears very little resemblance to the experimental.

G. D. P.

Asymptotic formulæ relating to the physical theory of crystals. W. Ledermann (*Proc. Roy. Soc.*, 1944, A, 182, 362—377).—The validity of certain approximations which had been used in the mathematical theory of crystals having been questioned, a rigorous examination of the problem was undertaken. The old procedure is fully justified provided that the no. of boundary particles is small compared with the total no. of particles in the crystal. Lattice sums may be replaced by infinite series and the distribution of frequencies closely follows Born's law for cyclic crystals. Upper limits are obtained for the errors caused by such approximations.

G. D. P.

Analysis of intracrystalline forces in simple layer lattices. I. Electrostatic energy and the Madelung constant. Z. G. Pisker (*Acta Physicochim. U.R.S.S.*, 1943, 18, 311—324).—Mathematical. The Madelung const. have been calc. for the CdI_2 , CdCl_2 , and CdBr_2 lattices according to Borzoth, and for the CdI_2 lattice according to Hassel. The electrostatic energies calc. from these const. are compared with the total lattice energies as determined by the Born-Haber cycle. The electrostatic energy and the % of electrostatic to total energy decrease in the order $\text{CdCl}_2 > \text{CdBr}_2 > \text{CdI}_2$.

C. R. H.

Structure of electro-deposited chromium. W. Hume-Rothery and M. R. J. Wyllie (*Proc. Roy. Soc.*, 1944, A, 182, 415).—A correction (cf. A., 1944, I, 53).

G. D. P.

Crystal structures of LaMg_2 and CeMg_2 . F. Laves (*Naturwiss.*, 1943, 31, 96).— LaMg_2 and CeMg_2 crystallise in the MgCu_2 type with lattice const. $a = 8.77 \pm 0.01$ and 8.71 ± 0.01 Å, respectively.

L. J. J.

Crystal structures of CaGa_2 , LaGa_2 , and CeGa_2 . F. Laves (*Naturwiss.*, 1943, 31, 145).— CaGa_2 has a 4.314, c 4.314 Å. LaGa_2 has a 4.320, c 4.396 Å. CeGa_2 has a 4.303, c 4.307 Å. Co-ordination nos. 12 and 6. Structural type is that of AlB_2 .

A. J. M.

High-temperature modification of sodium nitrite. B. Strijk and C. H. MacGillavry (*Rec. trav. chim.*, 1943, 62, 705—712).— NaNO_2 , orthorhombic and hemihedral at room temp., shows an anomaly in the temp. variation of the cell dimensions at 158° . Powder diagrams show the crystals to remain orthorhombic and body-centred but the intensities of reflexion are changed; trial analysis shows the crystal to have assumed a centrosymmetrical structure. The piezo-electric effect disappears completely at 166° . The Na—O distance is hardly changed by the modification but the distances in the NO_2 group are extended and the N bond angle becomes smaller. Comparison with data for N_2O_4 and MeNO_2 shows angles for the N—O bonds in accord with those of the low-temp. form and the N—O distances midway between those for the two forms.

J. O'M-B.

Crystal structure of sodium and ammonium iodate. C. H. MacGillavry and C. L. Panthaleon van Eck (*Rec. trav. chim.*, 1943, 62, 729—735).—Single crystals were obtained by evaporation from saturated solution at 100° . For NaIO_3 , described by Zachariasen

as an antiperovskite (A., 1929, 1131), the axial ratios agree with those of Eakle (A., 1897, ii, 21). The cell const., determined by Weissenberg diagrams, show a and b in agreement with the vals. of Zachariasen (*loc. cit.*), but c twice as great. The unit cell contains 4 mols. of NaIO_3 and has orthorhombic symmetry. Space-group D_{2h}^{16} — $Pbmn$. The position found for the Na agrees with that assigned by Zachariasen but that of I must be modified to agree with the new length of the c axis. Evidence is given that the I atom contributes to reflexions hkl with odd l , from which the x and y parameters of I on $4c$ are >0 . A possible configuration for O is derived from Goldschmidt's ionic radii; the trial analysis is confirmed by Fourier synthesis. The lattice has a co-ordination structure of Na and IO_3 ions in deformed CsCl packing, the IO_3 ions having pyramidal shape. For NH_4IO_3 , previously described as a perovskite (A., 1926, 228), the conclusions are essentially the same. The crystals used were tetragonal twins; since reflexions hkl and khl overlap almost completely it is difficult to determine the space-group, which is probably $Pbmn$.

J. O'M-B.

Space-groups of $\text{NiCl}_2 \cdot 6\text{NH}_3$, $\text{NiBr}_2 \cdot 6\text{NH}_3$, and $\text{NiI}_2 \cdot 6\text{NH}_3$. S. H. Yu (*Sci. Rec. [Acad. Sinica]*, 1942, 1, 151).—It was formerly thought that crystals of these salts must have the symmetry of one of the space-groups $Fm3$ (T_h^3), $F43$ (O_h^3), and $Fm3m$ (O_h^4). Reasons are adduced for concluding that the correct space-group is $F43m$.

L. S. G.

Structure of rhodizite. H. Strunz (*Naturwiss.*, 1943, 31, 68).—Rhodizite, $\text{KNaLi}_4\text{Al}_4\text{B}_6\text{O}_{27}$, has T_h^3 — P_{43m} symmetry, with a_0 7.30 Å and $Z = 1$. The co-ordination nos. of Li and Al are 6, for (K, Na) 12, and for (B, Be) 4, for O.

L. J. J.

Low-chalcocite and high-chalcocite.—See A., 1944, I, 259.

Chemistry of oriented growth of crystals of organic substances. J. Willems (*Naturwiss.*, 1943, 31, 146—147).—Oriented growth of org. substances takes place when mol. linkings connect the lattice of the crystallising compound with that of the substrate. In this connexion the following types of mol. compound are distinguished: (1) $\text{MSO}_4 \cdot n\text{H}_2\text{O} - (\text{CH}_2)_n\text{N}_4$, exemplified by the oriented growth of $(\text{CH}_2)_6\text{N}_4$ from C_6H_6 solution on (010) of gypsum; (2) quinone-metallic halide, exemplified by the oriented growth of 1:4-naphthoquinone, anthraquinone, and 1:4:6-trichloroanthraquinone from C_6H_6 solution on (100) of alkali halides. The growth of naphthazarin on (100) of an alkali halide also belongs to this class; (3) picric acid-aromatic hydrocarbon, exemplified by the growth of coronene from decalin solution on (010) of picric acid.

A. J. M.

Order-disorder transformations in the lattice of organic molecules.

II. **Crystal structure of tetramethyl orthothiocarbonate below 23.2° .** W. G. Perdok and P. Terpstra (*Rec. trav. chim.*, 1943, 62, 687—695).— $\text{C}(\text{SMe})_4$ has singular physical properties (*ibid.*, 1942, 61, 533). Rotational photographs resemble powder diagrams owing to the transition point at 23.2° , at which temp. the original tetragonal crystals become conglomerates of very small crystals. a 8.536 ± 0.002 , c 6.949 ± 0.002 Å. (temp. $= 18^\circ$), ρ 1.321; two mols. per unit cell. Space-group D_{2d}^4 ($P4_2/c$). The observed piezo-electric effect disappears as expected on heating above 23.2° . Bragg synthesis shows the c axis to be most closely occupied by atoms; this explains the tendency to crystallise in needles stretched along a tetragonal axis, which possesses smaller energy. The SMe groups are arranged tetrahedrally around the C atoms with C—S = 1.81 Å. and the Me groups in a pattern resembling a body-centred lattice, the interstices of which are alternately empty or filled with CS₂ groups.

J. O'M-B.

Form and mobility of cellulose molecule. P. H. Hermans, J. de Booy, and C. J. Maan (*Kolloid-Z.*, 1943, 102, 169—180).—Using commonly accepted vals. for at. distances, valency angles, and effective radii of atoms, the configuration of the straight cellulose chain is calc. The packing of parallel chains is considered. In order to make the length of the cellobiose radical agree with the identity period determined by X-ray methods, it must be assumed that the chain takes up a bent position, and the rings of successive glucose groups do not lie exactly parallel to each other. The model proposed does not differ greatly from that formerly deduced from X-ray data. The packing of several straight and parallel chains can be brought into agreement with X-ray data only when the chains have alternating polarities in successive layers in the direction of the c -axis. The chains in successive layers must also be displaced in the direction of the thread axis by ~ 3 —4 Å. The chain can change comparatively easily into a more or less crumpled or ball-like form.

A. J. M.

Small-angle interferences in myosin. O. Kratky, A. Sekora, and H. H. Weber (*Naturwiss.*, 1943, 31, 91).—Three weak equatorial reflexions corresponding with lattice plane separations of 33, 42, and 66 Å. are found in myosin threads, corresponding with the electron-microscope val. 50—60 Å. for the thread thickness. A further 100 Å. dimension may correspond with micellar widths.

L. J. J.

Small-angle interference of myosin.—See A., 1944, III, 764.

Magnesium oxide crystals in the electron microscope. E. Kinder (*Naturwiss.*, 1943, 31, 149).— MgO crystals obtained by burning

Mg have been examined with the electron microscope. Bright and dark stripes parallel to the cube edges are observed. In any one crystal the stripes are equidistant, ~ 16 – 20 m μ . apart, and all crystals on a given photograph have stripes the same distance apart. To obtain the stripes the electron beam must be at a definite inclination to the cube edges. A. J. M.

Electron microscope photographs of fine reaction films on crystals of metallic oxide smokes. M. von Ardenne and D. Beischer (*Kolloid-Z.*, 1943, 102, 127–131).—The film-like structure of the product obtained by burning Mg in air is a reaction film of basic MgCO_3 . The photograph of freshly deposited MgO shows two types of particle, one with an edge of ~ 100 – 550 Å, and the other consisting of larger crystallites with an edge of ~ 0.5 μ . The latter are formed by the heterogeneous reaction of the aerosol with H_2O and CO_2 . If the freshly deposited MgO is kept for several hr. in contact with air containing H_2O and CO_2 , the small particles become surrounded with a reaction layer of basic MgCO_3 . In this process the d falls from 3.58 to 2.32. Similar reaction layers on ZnO particles could not be ascribed to reaction between the smoke and CO_2 or NH_3 . They are probably due to impurities in the original Zn. A. J. M.

Photodichroism of coloured laminæ of potassium chloride. S. Nikitine (*Compt. rend.*, 1943, 216, 730–732).—Photodichroism is observed with thin coloured sheets of KCl, as with NaCl (A., 1942, I, 260). Unlike NaCl, reheated coloured crystals of KCl are unstable, and become spontaneously decolorised in the dark. The extinction curve of the coloured sheet before irradiation with polarised light, the curve of variation of photodichroism as a function of λ , and a similar curve after keeping the sheet for 3 hr. in darkness, are given. The last two curves differ markedly from the corresponding ones for NaCl. Two types of transformation can occur in coloured crystals: (i) the disappearance of F and F' centres (decolorisation) and (ii) the transformation of an F into an F' centre, or the reverse. The more important is (ii) with NaCl and (i) with KCl. A negative photodichroism curve is therefore obtained throughout the spectrum. A high proportion of F' centres exists with F centres in the coloured crystal after irradiation with X-rays. The F' centres are more important than F centres as regards photodichroism, and this causes displacement of the max. of the photodichroism curve to longer λ compared with the extinction curve. A. J. M.

Demonstration of positive or negative character of extremely small double refraction effects. F. Laves and T. Ernst (*Naturwiss.*, 1943, 31, 68–69).—The colour changes shown by a gypsum film between crossed Nicols on the introduction of a doubly-refracting crystal, and used to detect the positive or negative character of the birefringence, are much greater when the plane of vibration of the film is nearly parallel with that of the polariser ("sub-parallel" position) than in the usual arrangement when it is intermediate between those of polariser and analyser. The most favourable arrangement for use with very small degrees of birefringence is described. L. J. J.

Disperse structure of solid systems and its thermodynamic basis. XIII. D. Balarew (*Kolloid-Z.*, 1943, 103, 221–228).—Further evidence for the author's theory is derived from observations on the effect of appropriate heat-treatment on the rate of reaction between Ag and I vapour, the colour of Au–Ag alloys and of KCl–KBr mixed crystals, the swelling of cruciform BaSO_4 crystals, and the adsorption capacity of CaF_2 gels for certain dyes. Other phenomena bearing on the theory are also considered. R. H. F.

New phenomenon in the piezo-electric oscillations of a quartz crystal. S. Parthasarathy, A. Pande, and M. Pancholy (*J. Sci. Ind. Res. India*, 1944, 2, 295–296).—An X-cut quartz crystal of fundamental frequency ~ 580 kc. per sec. was excited by a 40-w. Hartley parallel-feed circuit, and the diffraction patterns obtained with a Hg 5461-Å source were photographed. Under suitable excitation conditions it is possible to make the crystal vibrate, not only at odd harmonics, but also at even and half-of-odd harmonics. The odd and half-of-odd harmonics could be excited to 3 or 4 orders, whereas even harmonics could be excited to ≥ 2 orders. J. G.

Internal stress created by plastic flow in mild steel, and stress-strain curves for the atomic lattice of higher carbon steels. S. L. Smith and W. A. Wood (*Proc. Roy. Soc.*, 1944, A, 182, 404–414; cf. A., 1941, I, 167; 1942, I, 261; B., 1943, I, 122).—The stresses remaining in a specimen after permanent deformation are measured by observation of the residual lattice strains. Mild steel after subjection to tension exhibits a longitudinal compression and lateral expansion in the ratio 2:1. The density thus remains unchanged. Comparison of X-ray and mechanical measurements shows that the elastic hysteresis loop of mild steel after overstrain can disappear and the linear elastic relation be recovered without change in the internal stress, which is therefore a more fundamental physical property. When the elastic range is extended by overstrain in tension there is no symmetrical increase in the elastic range in subsequent compression. Comparisons of the lattice stress-strain curves of 0.4% C steel (partly pearlitic) and of 0.8% C steel (pearlitic) with those of pure Fe and 0.1% C steel (annealed) show that

the max. residual internal strain developed by a lattice increases markedly with the fineness to which the crystallites can be broken down by plastic deformation. G. D. P.

Explanation of the observations of Stranski and Suhrmann on the melting of single-crystal tungsten wires. J. Leonhardt (*Naturwiss.*, 1943, 31, 139–140; cf. A., 1943, I, 147).—If a W single-crystal wire is corroded, either chemically or by evaporation on heating, the (011) surface forms corrosion furrows without slip surfaces. If a deformed single crystal is corroded, slip surfaces are shown on (211). The mechanism of the fusion of such wires is discussed on this basis. A. J. M.

Melting of single-crystal tungsten wires. I. N. Stranski and R. Suhrmann (*Naturwiss.*, 1943, 31, 140).—A reply to Leonhardt (see preceding abstract). A. J. M.

IV.—PHYSICAL PROPERTIES OF SUBSTANCES.

The intermediate state between normal conductivity and superconductivity. K. M. Koch (*Kolloid-Z.*, 1943, 105, 89–97).—A theory of transition from normal conductivity to superconductivity is given. At normal temp. a metal consists of two types of atom which differ in their electron shells (cf. dia- and para-magnetic atoms). Those corresponding to diamagnetic (I) are responsible for conductivity, and as the superconducting state is approached, both types coalesce into micro-regions having the properties of (I). At and before the transition point these form a "superstructure" similar to a macromol., and analogous to the order-disorder transition in Cu–Zn and Cu–Au systems. The behaviour of superconducting hollow bodies in a magnetic field, certain hysteresis phenomena in the transition from normal conductivity to superconductivity, and the Meissner–Ochsenfeld effect are explained by the theory. J. H. Ba.

Magnetic properties of nickel supersaturated with carbon. W. Gerlach and J. von Rennenkampff (*Naturwiss.*, 1943, 31, 96).—The temp.–magnetisation relation of Ni supersaturated with C is anomalous only between room temp. and 300° , and not at -200° to 0° . The coercivity decreases normally from -200° to $\sim 50^\circ$ and then remains const. up to $>300^\circ$. In the anomalous region of the temp.–saturation curve, saturation is not reached at 3000 oersted, suggesting the existence of numerous Curie points. The remanence increases below 0° . Lange's Ni–C alloy consists of a definite ferromagnetic substance with Curie temp. $\sim 50^\circ$ and a no. of other ferromagnetic alloys. L. J. J.

Physical properties of aliphatic compounds. A. W. Schmidt (*Ber.*, 1942, 75, [B], 1399–1424).—M.p., d , and n_D^{20} for a lengthy series of n -paraffins, Δ^2 -olefines, n -alkylcyclopentanes and -pentenes, n -alkylbenzenes and -cyclohexanes, and isoparaffins are discussed. Graphs are plotted and their usefulness in confirming the experimental results, particularly those obtained at low temp., is stressed. Only when the observation falls on the graph for the homologous series can the individual result be accepted without reserve since the physical consts. are very subject to the influence of relatively small amounts of impurity which evade detection by the usual tests. H. W.

Specific heat of metals crystallising in the cubic system. B. Dayal (*Proc. Indian Acad. Sci.*, 1944, 20, A, 24–50).—Sp. heat data for Al, Ag, Au, Cu, and Pb (face-centred), Li, K, Na, and W (body-centred) crystals have been evaluated by Raman dynamics of crystal lattice from known elastic consts. and a Debye function representing the other degrees of freedom. Calc. and experimental vals. are in fair agreement. The accuracy with which sp. heat data can be represented by a single Debye function is discussed. W. R. A.

Some properties of non-oxidisable invar. C. Volet and A. Bon-hour (*Compt. rend.*, 1943, 216, 734–735).—An alloy of 37% Fe, 54% Co, and 9% Cr has a lower coeff. of expansion than the usual Ni-steel invar. It is practically non-oxidisable, and is very stable. Its Young's modulus is $\sim 18,200$ kg. per sq. mm. When a bar of this material is made into wire the coeff. of expansion increases from 0.7×10^{-6} to 8.2×10^{-6} , whereas with Ni-steel invar there is a decrease. The effect of annealing on the hammered metal has been investigated. A. J. M.

Explanation of striking expansion phenomena with silica glass and special glasses. A. Dietzel (*Naturwiss.*, 1943, 31, 22–23).—The mean coeff. of expansion of SiO_2 glass above 400° decreases, and at higher temp. becomes negative. The max. val. is at 250° . If SiO_2 is fused with TiO_2 , a glass is obtained which has an even smaller coeff. than SiO_2 glass. If Al_2O_3 is fused with SiO_2 , the coeff. of the latter is almost unchanged. It is possible to explain this in two ways. If SiO_2 can be supposed to be made up of SiO_2 mols. which have polymerised into large aggregates, the introduction of Ti^{4+} or other strong cations, such as Al^{3+} , would link the SiO_2 mols. more firmly than the latter would bind themselves. Alternatively it may be supposed that fused SiO_2 has mixed ionic-at. linkings, being made up of a tetrahedral arrangement of Si^{4+} ions and O^{2-} ions and of SiO_2 dipoles. The strong Si^{4+} would cause such a glass

to have a low coeff. of expansion. If such a mixture were heated the equilibrium would move in favour of the ionic linking, and the Si—O distance would increase with rising temp. The increase of $[\text{Si}^{4+}]$ would, however, provide a stronger structure, and a lowering of the coeff. of expansion with increasing temp. (See also below.)

Thermodynamic properties of ethylene. R. York, jun., and E. F. White, jun. (*Trans. Amer. Inst. Chem. Eng.*, 1944, 40, 227—250).—A pressure-enthalpy-entropy diagram is constructed from known data for the range -140°F . to 500°F . and 1 to 300 atm.

Green's functions in the theory of heat conduction. A. N. Lowan (*Phil. Mag.*, 1944, [vii], 35, 495—498).—By superposition of solutions of the equation of heat conduction corresponding to sources and sinks, Green's functions are constructed for domains bounded by lines or planes which either are kept at 0° or are impervious to heat.

Effect of transverse high-frequency electric field on the viscosity of liquids. B. N. Singh and S. Ghose (*Indian J. Physics*, 1943, 17, 252—256).—An apparatus is described by means of which high-frequency fields of $\sim 10^6$ cycles per sec. can be applied transversely to liquids of fairly low conductivity flowing through narrow channels. The times of flow of xylene, $\text{C}_6\text{H}_{11}\text{OH}$, and EtOAc are unaffected by the field.

Initial deformations of flow [of metals]. J. de Lacombe (*Compt. rend.*, 1943, 216, 739—741).—The formula $\epsilon = \epsilon_0 + at^m + bt^n$, although it represents exactly the flow curves of metals over a long period, does not give the correct initial deformation when extrapolated and compared with the curve obtained when flow takes place more rapidly, ϵ_0 being $>$ the elastic deformation ϵ_e . The expression should be $\epsilon = \epsilon_e + \epsilon_p + at^m + bt^n$, ϵ_p being a function of time, rapidly reaching a limiting val. The effect of time, load, and temp. on ϵ_p has been investigated for a C-steel of medium hardness. The ϵ_p term corresponds to a very high initial speed of flow, and reaches its limit in ~ 30 min. Increase of load causes the limiting val. of ϵ_p to increase rapidly. The limiting val. increases with temp.

Internal friction of an α -brass crystal. C. Zener (*Amer. Inst. Min. Met. Eng.*, 1942, *Tech. Publ.* 1505, 5 pp.; *Metals Tech.*, 9, No. 6).—Internal friction measured in a single brass crystal at 620 and 1710 cycles per sec. at temp. between 330° and 550° rose rapidly to a max. at 420° and fell equally rapidly thereafter. This was considered to be due to inhomogeneities of unknown type giving rise to stress relaxation.

V.—SOLUTIONS, DISPERSIONS, AND MIXTURES.

Viscosity and vapour pressure of dilute solutions. I. Introduction. H. G. de Carvalho (*Anais Assoc. Quim. Brasil*, 1944, 3, 31—36).—A survey of the formulæ which have been proposed for η of dil. solutions.

Relative viscosity of some aqueous solutions of sulphamic acid and of some of its salts at 25° . A. F. Schmelzle and J. E. Westfall (*J. Physical Chem.*, 1944, 48, 165—168).—The relative η and d of aq. solutions of $\text{NH}_2\text{SO}_3\text{H}$ and of its NH_4 , Ba, Ca, and Mg salts have been determined at 25° . The Jones and Dole fluidity equation, $(\phi - 1)/\sqrt{C} = A + B\sqrt{C}$ where ϕ = fluidity, C = concn. in g.-equiv. per l., and A and B are consts., is applicable for $C > 1$, whilst the Root equation, $(d - d_0)/C = k_1 + k_2\sqrt{C}$ where d_0 is the d for H_2O , and k_1 and k_2 are consts., is applicable for the entire concn. range.

Diffusion constant and particle size of the saponin of the white soapwort (sapoalbin). E. O. K. Verstraete and I. Grassmann (*Kolloid-Z.*, 1943, 195, 114—118).—The diffusion const. (D) and particle radius (r) of sapoalbin in H_2O , 28.8% and 48% aq. EtOH were determined by the interference method of Rögner (cf. A., 1943, I, 224). r is of the same order ($\sim 8.3 \text{ \AA}$.) in each solution, this val. indicating almost mol. particles. The small influence of EtOH on r is in agreement with earlier measurements on flocculation etc. The vals. of D obtained show considerable variation.

Method of growing single crystals of sodium stearate and sodium palmitate. A. de Bretteville, jun., and F. V. Ryer (*J. Physical Chem.*, 1944, 48, 154—158).—Na stearate can be crystallised only at a crit. concn. $<$ the gel point in 95% EtOH . Na palmitate does not crystallise below the gel point; crystallisation is induced by addition of some NaCl.

Structure of silicate glasses. A. Dietzel (*Naturwiss.*, 1943, 31, 110—112).—Solubility data in H_2O and 0.1N-HCl, density at 20° , and expansion between 20° and the transition temp. and thence to 1400° have been determined for Li, Na, and K silicate glasses with 15—30 mol.-% R_2O . The solubility increases in the order $\text{Li} < \text{Na} < \text{K}$, in each case increasing very slowly with alkali content up to 20 mol.-% for K and 30 mol.-% for Na, thereafter increasing rapidly. Density vals. show that Li is completely absorbed in the voids of the SiO_2 structure, Na' up to 70%, and K' up to 27%,

for the $\text{R}_2\text{O} \cdot 3\text{SiO}_2$ glass. Expansion up to the transition region increases in the order $\text{Li} < \text{Na} < \text{K}$. Expansion between the transition region and 1400° increases with alkali content up to 20 mol.-% for K and 25 mol.-% for Na, thereafter remaining const.; with Li it continues to increase up to 32%. Possible arrangements of cations in the interstices of the SiO_2 lattice are discussed.

Constitution of the system indium-zinc. F. N. Rhines and A. H. Grobe (*Amer. Inst. Min. Met. Eng.*, 1944, *Tech. Publ.* 1682, 10 pp.; *Met. Tech.*, 11, No. 2).—Solidus and liquidus curves have been redetermined. There is a eutectic at 143.5° with 2.8% of Zn. The max. solubility of Zn in In is 1.2% and of In in Zn, 0.2%. The true compressive strength required to compress to a strain of 10% increases regularly with [Zn] but shows a slight unexplained max. at 3.48% of Zn.

Rolled zinc-titanium alloys. E. A. Anderson, E. J. Boyle, and P. W. Ramsey (*Amer. Inst. Min. Met. Eng.*, 1944, *Tech. Publ.* 1687, 9 pp.; *Met. Tech.*, 11, No. 2).—The Zn-Ti eutectic occurs with 0.12% of Ti (not 0.46% as hitherto reported) at 418.5° and the solid solubility of Ti in Zn is 0.007—0.015% at 300° . Addition of 0.05—0.23% of Ti to Zn causes grain refinement and increases the creep-resistance of hot-rolled strip. The 0.012% Ti alloy was found to soften when cold-worked and the creep-resistance was considerably impaired. The creep strength was, however, largely improved by annealing at 200 — 275° .

Dissociation of an alloy of copper, iron, and nickel. Further X-ray work. (Miss) V. Daniel and H. Lipson (*Proc. Roy. Soc.*, 1944, A, 182, 378—387).—The dissociation of the alloy Cu_2FeNi_3 was studied by means of the variation of intensity of the satellites which accompany the X-ray reflexions. It is shown that within the lattice there is a periodic variation of parameter due to variation of concn. The λ of the periodicity is $\sim 10^{-6}$ cm. The bearing of the observations on the kinetics of phase change is discussed.

Physico-chemical investigation of phases having a nickel arsenide structure in the systems iron-antimony-nickel and iron-antimony-cobalt. N. V. Ageev and E. S. Makarov (*Bull. Acad. Sci. U.R.S.S. Cl. Sci. Chim.*, 1943, 161—170).—Examination of the Fe-Sb-Ni and Fe-Sb-Co systems shows that in each there exists an uninterrupted series of solid solutions, of the Ni arsenide type, between the Ni-Sb and Fe-Sb and the Fe-Sb and Co-Sb binary systems respectively. A study of the micro-structure, electrical resistivity and its temp. coeff., and of the lattice consts. has enabled the ternary phases of the Ni arsenide type to be delimited.

Chemistry of alloys of transition metals. H. J. Wallbaum (*Naturwiss.*, 1943, 31, 91—92).—The formation of intermetallic compounds A_2B , where A is Ni, Cu, Zn, Ga, Al, Pd, Pt, or Au, and B is Ti, Zr, Nb, or Ta, is explained by the incompleteness of the $3d$ electron shell in Ni and neighbouring elements and the corresponding electronic conditions in the other transition elements forming such compounds.

Alloys of platinum and palladium.—See B., 1944, I, 340.

Accumulation of sulphur dioxide by sodium phosphate solutions. G. P. Lutschinski and R. M. Tavrovskaja (*J. Appl. Chem. Russ.*, 1940, 13, 421—427).—Solubility of SO_2 in Na_2HPO_4 solutions at 20° and at the b.p. is determined. At 20° it increases linearly with $[\text{Na}_2\text{HPO}_4]$; an 18% solution of Na_2HPO_4 dissolves 12% of SO_2 at 80 mm. Hg of SO_2 . Na_2HPO_4 solutions can be used for absorbing dil. SO_2 gas.

Critical solution temperatures of paraffins with nitrobenzene and $\beta\beta'$ -dichloroethyl ether. H. M. Woodburn, K. Smith, and H. Tetewsky (*Ind. Eng. Chem.*, 1944, 36, 588—590).—For n -paraffins in which the no. of C atoms gradually increases the difference between crit. solution temp. and NH_4Ph point gradually increases for PhNO_2 and gradually decreases for $(\text{Cl}[\text{CH}_2]_2)_2\text{O}$.

Gas absorption by a drop of liquid. K. Schabalin (*J. Appl. Chem. Russ.*, 1940, 13, 412—420).—When drops of H_2O fall in a tube the lower part of which is filled with NH_3 or CO_2 , and collect under a pool of oil at the bottom of the tube, the amount of NH_3 or CO_2 absorbed increases with the length (5—200 cm.) of the passage through NH_3 or CO_2 gas, but a large fraction of it is apparently due to adsorption during the impact of drops on the oil pool. The final concn. of NH_3 or CO_2 in the drop is the larger the smaller are the drops (0.2—0.4 cm.). The rate of absorption is affected by convection currents within the drop.

Measurements of activated adsorption by nickel films between 200° and 500° . A. van Itterbeck, P. Mariens, and O. van Paemel (*Ann. Physique*, 1943, [xi], 18, 135—144).—Activated adsorption of H_2 and D_2 , in contrast with low-temp. van der Waals adsorption, was investigated. Adsorption isobars obtained from measurements with a special apparatus are given, and anomalies in the neighbourhood of the Curie point are discussed in relation to available data and theories.

Process for determining absolute "occupation numbers" of molecules adsorbed from liquid mixtures on defined metal surfaces.

H. Harms (*Kolloid-Z.*, 1943, 103, 202—210).—Apparatus is described for determining the change in composition of a solution when one component is adsorbed on the surface of small falling drops of Hg. These are produced by forcing Hg through a jet under pressure, and their effective surface is calc. by counting and measuring microscopically a sample which is allowed to fall on a greased surface. The accurate concn. determinations necessary are carried out photometrically for coloured solutions. The quantity of liquid carried with the drops and the size of drops do not greatly affect the occupation nos. Abs. occupation nos. (no. of mols. adsorbed per sq. m.) for naphthol-yellow in H₂O decrease from 70.1×10^{16} at -45° to 45.3×10^{16} at 83° . The former figure corresponds closely to a complete unimol. layer. From the variation in adsorption with temp., the heat of adsorption is calc. to be 4200 g.-cal. per mol. at $24-50^\circ$.

R. H. F.

F.p. of adsorbed liquids. R. W. Batchelor and A. G. Foster (*Trans. Faraday Soc.*, 1944, 40, 300—305).—V.p. curves for liquid and solid dioxan, and for dioxan adsorbed on porous Fe₂O₃ gel (pore radius ~ 100 Å.), were determined between -10° and 20° , in which range the plots of $\log p$ against $1/T$ are linear. In the gel system the liquid and solid v.p. lines intersect at a temp. $5.6 \pm 0.4^\circ$ below the normal f.p. In a gel with a calc. pore radius 88 Å. the depression of f.p. is $7.3 \pm 0.4^\circ$. A theoretical expression for the depression, based on the Clapeyron and Kelvin equations, is given. H₂O adsorbed on SiO₂ gel of pore radius ~ 11 Å. remains liquid in cooling to -65° . The results described refer to adsorption on porous solids in which the occurrence of capillary condensation is presumed. F. L. U.

Cluster formation and phase transitions in the adsorbed state. H. M. Cassel (*J. Physical Chem.*, 1944, 48, 195—202).—Extensions of the Langmuir adsorption mechanism to the case of multilayers cannot account for the ultimate liquefaction of the adsorbate. A relation between the crit. temp. of two- and three-dimensional condensation has been derived which accounts, in a qual. way, for the fact that higher densities can be reached in monolayers without achieving condensation than is possible in vol. phases. Discussion of discontinuities in transitions from adsorbed gas to liquid vol. leads to the view that the hysteresis observed in adsorption and desorption of vapours on porous and powdered solids represents a supersaturation phenomenon.

C. R. H.

Heat of adsorption of long-chain compounds and their effect on boundary lubrication. J. J. Frewing (*Proc. Roy. Soc.*, 1944, A, 182, 270—285).—The behaviour of mild steel surfaces lubricated with solutions in white oil of long-chain halides, acids, α -substituted acids, esters, C₁₈H₃₇CN, C₁₈H₃₇CNS, and C₁₈H₃₇NO₂ was studied under high loads at low speeds. A transition from smooth sliding to "stick-slip" occurs at a temp. characteristic of the solution; the transition temp. increases with concn. It is assumed that the transition takes place when the surface concn. of the adsorbed film reaches a crit. val. which for a particular substance is independent of the temp., and a relation between the heat of adsorption U and the transition temp. is obtained and confirmed by experiment. The vals. of U show that these long-chain polar compounds are adsorbed by the interaction of their dipoles with atoms of the metal surface and not by chemical reaction. The results suggest that esters are similarly oriented at metal and aq. surfaces. G. D. P.

Contact angles and adsorption on solid surfaces. H. K. Livingston (*J. Physical Chem.*, 1944, 48, 120—124).—The known data for adsorption at solid-liquid-vapour interfaces are tabulated and show that the contact angle is generally zero, and that the solid surface is completely covered by mols. adsorbed from the vapour at saturation pressure. Doss and Rao's equation is thus verified except in cases of incomplete covering of surface and contact angle > 0 , for which no data exist. A derivation of the Doss-Rao equation for the special case of a solid surface completely covered by adsorbed mols. is given.

J. O'M-B.

Capacity of a mercury electrode in presence of multivalent cations. M. Vorsina and A. Frumkin (*Acta Physicochim. U.R.S.S.*, 1943, 18, 242—263).—The influence of Ba⁺⁺, La⁺⁺⁺, and Th⁺⁺⁺⁺ on the capacity (C) of the Hg electrode at various potentials and concns. has been examined, 0.01N and 0.001N-HCl being used as initial solutions. On addition of these cations C_{min} increases and, in the case of La⁺⁺⁺ and Th⁺⁺⁺⁺, is shifted towards less negative potentials. On the cathodic branch of the C -potential curve small additions of cations cause an abrupt rise in C leading to a max. after which C falls to a val. $>$ that in the original HCl. C_{max} in presence of La⁺⁺⁺ is approx. the same for both HCl concns., suggesting that it is La⁺⁺⁺ and not La(OH)₃ which is adsorbed. Calculations of the magnitude of the surface charge, the potential at the distance of one ionic radius from the interface, and the equiv. C of the electrode show that these cations bring about a reversal of the negative charge of the electrode surface. The data are discussed with reference to the Stern double layer theory.

C. R. H.

Measurement of boundary tension by the pendent-drop method. II. Hydrocarbons. G. W. Smith (*J. Physical Chem.*, 1944, 48, 168—172).—Using an improved apparatus giving greater magnification, the surface tension (γ) at 20.0° of 15 hydrocarbons has been

determined. γ increases with increasing mol. wt. of straight-chain compounds and decreases with increase in the degree of branching. For cyclic hydrocarbons γ decreases with increasing saturation and is generally $>$ for the corresponding straight-chain compounds.

C. R. H.

Separation of oil from the surface of water. G. Antonoff (*J. Physical Chem.*, 1944, 48, 173—174).—The possibility is discussed of collecting oil from the surface of H₂O by increasing the surface tension of the oil so that it tends to float as a lens. H₂O, on which was a layer of oil, was stirred with a stirrer with blades bent so as to give a slight inward pull. At low rotational speeds the oil collected around the axis in the form of a spherical planetary body, when it could easily be removed by means of a pipette.

C. R. H.

Variation of oil-water distribution ratio of divinyl ether with concentration. W. L. Ruigh and A. E. Erickson (*Anesthesiology*, 1941, 2, 546—551).—The solubility of divinyl ether in H₂O at 37° is 5.25 g. per l. The olive oil/H₂O distribution ratio (by wt.) of the ether at infinite dilution and 37° approaches 45.3. Above a concn. of 10 wt.-% ether in the oil phase the distribution ratio is a linear function of concn. and its val. at 100% is 190.5. A method is described for measuring the oil/H₂O distribution ratio of divinyl ether (b.p. 28.3°) at 37° .

G. P.

Effect of phenolic and nitrogenous substances on surface activity by complex formation. H. Bergstermann and O. Elbracht (*Biochem. Z.*, 1941, 310, 64—82).—Data for the surface tension (γ) of aq. solutions of various phenols and their derivatives and of N bases, and also for their mixtures, are graphically represented. The introduction of hydrophobic groups and the marked hydrophobic properties of the reaction products (cf. Labes et al., A., 1938, I, 518; 1939, II, 528) are reflected in their γ -depressing effect, which is \gg the additive effect of the single components and is apparent at concns. $<$ those necessary for any pptn. reaction.

F. O. H.

Harkins' "final spreading coefficient" and Antonoff's "rule." W. Fox (*J. Physical Chem.*, 1944, 48, 158—159).—The author's experiments (A., 1943, I, 13) show that Antonoff's "rule," though not general, is applicable to a no. of liquid-liquid-gas systems. From this and Harkins' expression of Antonoff's "rule" in terms of the "final spreading coeffs.," Antonoff's theory is concluded to be invalid.

J. O'M-B.

Foam formation in organic liquids. E. G. King (*J. Physical Chem.*, 1944, 48, 141—154).—Foam formation for 47 surface-active agents such as Emulphor O (I), Ninols, Aerosol Ay, and Nacconol NR in various org. solvents of commercial purity has been examined. Foaming capacity and stability were measured by time of expiration of the foam and where possible by its vol. Foaming seems in general $<$ in aq. solution though some org. foams are comparable in vol. and stability with aq. foams. The foaming capacity of (I) is greatest in hydroxylic solvents. Foaming properties usually increase with the surface tension γ of the solvent, but in some solvents of high γ such as PhNO₂, furfuraldehyde, and dioxan (I) shows no tendency to foam and does not depress their γ . The lowering of γ which often occurs with foam formation is not general. η and v.p. are not prime factors in foam initiation, but a high η tends to stabilise any foam that is formed. High η also inhibits aeration and decreases the rate at which equilibrium is set up at the interface. The surface activity and propensity for foam formation of colloidal electrolytes depend on structural connexions between solvent and solute, but these are complex. Thus (I) is efficacious in glycol but not in glycerol, whilst for Ninol 555 base the converse obtains.

J. O'M-B.

Minimum and equilibrium concentrations. A. M. Belousov and A. P. Terenteeva (*J. Appl. Chem. Russ.*, 1940, 13, 463—469).—The product $[Ba^{++}] \times [SO_4^{--}]$ at which turbidity produced by BaSO₄ becomes visible (Tyndall effect) is 100—1000 times the solubility product; when the turbidity is observed with the unaided eye, the ratio is 10^3-10^4 . It is higher when $[SO_4^{--}]$ is lower.

J. J. B.

Rate of sedimentation of non-flocculated suspensions of uniform spheres.—See B., 1944, I, 321.

Effect of electric field on Tyndall scattering. R. S. Subrahmanya, K. S. G. Doss, and B. S. Rao (*Proc. Indian Acad. Sci.*, 1944, 19, A, 405—413).—The effect of an electric field on sols of AgI, stearic acid (I), and benzopurpurin 6B (II) has been investigated. The equiv. spherical diameters in the AgI and (I) sols were 104.8 and 390.8 m μ . By combination of the schlieren and Langmuir methods the shapes of the particles were found to be: AgI not appreciably anisometric; (I) disc-shaped; (II) rod-shaped. The electric field (~ 100 v. d.c. or 220 v. a.c.) was applied by Pt or C sheet electrodes, the sol being illuminated so that the light was incident on the sol horizontally and the scattered light was viewed transversely in the horizontal and vertical directions. The field could be applied longitudinally parallel to the beam, or transversely in the vertical or horizontal directions. Both d.c. and a.c. gave identical results with (I) and (II). AgI showed no effect. For large disc- or rod-shaped particles oriented by a linear field there is enhanced scattering when the field is put on, if the plane of incidence and observation is perpendicular to the field, but diminished scattering for other orientations.

W. R. A.

Colloidal system carbon dispersed in xylene. V. R. Damerell and A. Urbanic (*J. Physical Chem.*, 1944, **48**, 125—133).—Lecithin, Cu oleate, Co naphthenate, and Na dioctyl sulphosuccinate increase the degree of dispersion of C in xylene in the order given, the effect being increased by drying. Cataphoresis of the organosols is unaffected by the degree of dryness; the particles are all negatively charged. Dispersion increases with adsorption for Cu oleate and Co naphthenate. Pptn. is brought about by addition of EtOH or H₂O, by heat, and by an electric field. Low temp. to -5° has no effect. H₂O hinders the adsorption of the surface-active material and hence decreases the stability. The source of the charge in such systems may be due to dissociation of the polar-non-polar additive in the presence of a trace of H₂O, or to slight dissociation in the pure xylene. J. O'M-B.

Effect of surface-active agents on dispersions of calcium carbonate in xylene. V. R. Damerell and R. Mattson (*J. Physical Chem.*, 1944, **48**, 134—141).—Zn, Ba, and Na dioctyl sulphosuccinates (I), lecithin (II), and Mg oleate cause dispersion of CaCO₃ in xylene. Drying causes decrease in the amount of coarse material, but the amount of colloidal material falls by 4%. Dispersion is independent of the concn. of (I) down to a low concn. The dispersing agent is positively adsorbed and for (I) forms a unimol. layer. The organosols are milky-white and opalescent, coagulated by H₂O, 95% Et₂O, and by heat. Cooling to 0° has no effect. The particles are positively charged except with (II), when they are both positive and negative. The origin of the charge in dry solution is difficult to explain. J. O'M-B.

Aqueous solutions of sodium mercurochrome and substances incompatible with them. P. Duquéniois (*Rev. Fac. Sci. Istanbul*, 1943, **8**, A, 153—157).—Aq. solutions of Na mercurochrome (Na₂ 2:7-dibromo-4-hydroxymercurifluorescein) (I) are stable sols which are coagulated by inorg. and org. acids and by salts of Li, NH₄, heavy metals, and alkaloids. The solutions sometimes become decolorised and lose their fluorescence. Natural colloids readily adsorb (I) from solution. C. R. H.

Laminar-dispersed substances. I. Colloidal nickel hydroxide. A. Berger (*Kolloid-Z.*, 1943, **103**, 185—202).—Ni(OH)₂ sols with laminar particles are easily prepared and are stable, and have been examined largely by the methods used for chain mols. X-Ray data give information on the size and shape of the primary particles. The axial ratio can be deduced from η measurements, provided that the necessary conditions apply. Using this axial ratio, measurements of streaming birefringence enable the vol. and hence the dimensions of the particles to be calc. Measurements of light scattering and examination with the ultra-microscope are also carried out. The prep. of Ni(OH)₂ sols by peptisation of pptd. Ni(OH)₂ with H₂O is described, and the course of peptisation followed by determining the concn. of the sol. Peptisation curves are S-shaped, indicating an induction period. X-Ray investigation reveals an aggregation effect, which is diminished by addition of glucose. The change in particle dimensions during peptisation is examined. The "mol. wt." of the primary particles is estimated to be 1.1×10^6 . Secondary particles are examined by the methods of the ultra-microscope and sedimentation velocity. R. H. F.

Solvent properties of detergent solutions.—See B., 1944, II, 287.

Electrical anisotropy of xerogels of hydrophilic colloids. I. S. E. Sheppard and P. T. Newsome (*J. Chem. Physics*, 1944, **12**, 244—248).—The degree of orientation in an alternating electric field of discs of colloid materials, e.g., proteins, plastics, in which a fibrous structure was produced by stretching to $<100\%$, has been measured. Induced electrical anisotropy is shown only by xerogels that are hydrophilic, and its relation to field strength, thickness, R.H., and H₂O content is discussed. Whilst most show dependence on R.H. and absorbed H₂O content, the effect with polyvinyl alcohol does not depend on the absorbed H₂O. W. R. A.

Form and size of dissolved particles from diffusely scattered X-rays at very small angles. O. Kratky and A. Sekora (*Naturwiss.*, 1943, **31**, 46—47).—When X-rays are passed into an assemblage of small particles, two types of scattering result, one at large angles, due to mol. arrangement, and the other at very small angles, due to the shape and form of the particles. A knowledge of the structure of the particle is unnecessary in dealing with the small-angle scattering. If a large no. of these particles are irregularly placed at distances large compared with the size of the particles, the total scattering effect can be obtained by adding the intensities due to single particles, as in the case of a gas. The introduction of a liquid as a medium does not affect the result. It is possible to use this method to investigate the form and size of colloidal particles. Chymotrypsin, a protein with an approx. spherical mol., and of mol. wt. 1 Svedberg unit, is taken as an example. The curve of intensity against scattering angle is obtained experimentally, and compared with that obtained by assuming Fraunhofer scattering at spherical particles of radius 23 Å. The theoretical and experimental curves agree closely. It is possible to obtain the approx. axis ratios of non-spherical particles. A. J. M.

Consistency of plastic suspensions of the Bingham type. H. de Bruijn, H. Dols, and C. Kuyper (*Rec. trav. chim.*, 1943, **62**, 696—704).—The velocity of deformation (D)—shearing stress (τ) and the fluidity (ϕ)— τ diagrams are given for C black in light mineral oil at 20° and 40° , and agree with the authors' theoretical predictions. The plasticity of such a system is almost entirely a function of the temp. coeff. of the ϕ of the intermicellar liquid. For measurements at high τ , turbulence vitiates the results; a corrective method, derived from the known temp. coeff. of the plasticity, is indicated. To describe the curved part of the D - τ diagram more exactly by consts., the concept of liquidation tendency, i.e., the slope of the straight section of the ϕ - τ relation, is introduced; it is best obtained from the D/τ - τ relation. J. O'M-B.

Mol. wt. of high-molecular substances by the method of longitudinal scattering of infra-red rays. W. W. Lepeschkin (*Kolloid-Z.*, 1943, **105**, 141—144).—The author's earlier apparatus for the measurement of the scattering of infra-red rays (Plotnikow effect) is improved to enable substances of lower mol. wt. to be studied. The method is used to determine the mol. wt. of the hæmocyannin of *Helix pomatia*, using ovalbumin as reference substance. The vals. obtained agree with those obtained by other methods. J. F. H.

High-molecular polymerisation of low-molecular substances by the method of longitudinal scattering of infra-red rays. W. W. Lepeschkin (*Kolloid-Z.*, 1943, **105**, 144—147; cf. preceding abstract).—The dependence of the Plotnikow effect on the mol. wt. of the scattering substance is used to study the polymerisation of aq. solutions of CH₂O, (I), ψ -isocyanine (II), resorcinol (III), quinol (IV), and a mixture of H₂O and C₆H₅N in the mol. ratio 3:1. All show strong polymerisation except (IV), which is more strongly polymerised in EtOH and Et₂O solutions. Dilution of (I) reverses the polymerisation. The polymerisation of (II) and (III) is reversed by warming. EtOH solutions of (II) are unimol. J. F. H.

Relations between tension, stretching birefringence, and deformation mechanism for rubber-like materials. J. J. Hermans (*Kolloid-Z.*, 1943, **103**, 210—221).—The curled-mol. theory of elasticity of rubber-like substances is discussed in relation to cross-linking between mol. chains, and a theory of deformation is developed on a purely physical basis. The distance between the ends of a mol. is determined by a diffusion equilibrium, which is displaced when an external force is applied. The increase in entropy, the extension, and the optical anisotropy on stretching are calc. for the case where no change of vol. occurs on stretching. Birefringence is derived by calculating the polarisabilities in two directions and expressing their difference in terms of n . This difference is \propto the applied tension. The relaxation time is the smaller the greater is the degree of netting of chains. The limits of validity of the theory are discussed. R. H. F.

Chemical constitution and colloid structure of fibre-forming synthetic polymers. I. Chemical constitution, intermolecular bonding, and colloid structure. W. Broser, K. Goldstein, and H. E. Krüger (*Kolloid-Z.*, 1943, **105**, 131—141).—Theoretical. These substances can be divided into two classes: (a) the polymeric hydrocarbons and their derivatives and (b) the "mesomeric chain polymers" in which the mesomeric groups (CO·NH₂, ester, urea groups, etc.) form part of the chain. The name "meta-zwitterion" is suggested for the prevailing state of the mesomeric groups, intermediate between the non-polar and zwitterion forms. In group (a) undirected dispersion forces are operative and a "cotton-plug" structure without any marked autonomous arrangement is formed. In group (b) dipole forces are operative and a micellar structure results. The bonding between these meta-zwitterions is intermediate between heteropolar principal valencies and normal dipole forces, for which the term "meta-ionic relation" is suggested. The common colloidal structure and hence similarity in physical properties of type (b) polymers are due to the presence of a common meta-ionic bonding and thus ultimately to similar chemical constitution. The meta-ionic bond should be considered the intermol. link between H and N in type (b) polymers rather than the H bond, if necessary with reference to a possible mesomerism: meta-ionic bond \longleftrightarrow H bond. J. F. H.

Combination of fibrous proteins with acids. G. A. Gilbert and E. K. Rideal (*Proc. Roy. Soc.*, 1944, **A**, 182, 335—346).—An approx. titration equation is developed for the reaction between fibrous proteins and acids, in which account is taken of the valency and intrinsic affinities of the acid anions, and of the limited no. of adsorption sites available for anions. The transition from sol. to fibrous proteins is traced in order to demonstrate that the main difference between the titration curves of the two types of protein arises from the difference of potential developed during the adsorption of protons. G. D. P.

Opacity changes during the coagulation of sols by electrolytes. M. Prasad, S. Guruswamy, and N. A. Padwal (*Proc. Indian Acad. Sci.*, 1944, **19**, A, 389—400).—Changes in opacity during the coagulation of Th(OH)₄, Sn(OH)₄, and Zr(OH)₄ sols have been investigated with the apparatus previously described (cf. A., 1943, I, 256). The results enable comparison of the coagulating power of electrolytes

to be made and show that Smoluchowski's equation is applicable only for rapid coagulation. Increased temp. and addition of MeOH or EtOH accelerate coagulation. W. R. A.

VI.—KINETIC THEORY. THERMODYNAMICS.

Thermodynamics of dissociation of acids. G. Briegleb (*Naturwiss.*, 1943, 31, 62—65).—Fundamental equations are given for the expression of acid strength in terms of intramol. polarisation and associated energy relations. L. J. J.

Effect of temperature on the electrolytic dissociation in strong electrolytes. I. Nitric acid. N. R. Rao (*Indian J. Physics*, 1943, 17, 295—299; cf. A., 1943, I, 153).—The degree of dissociation (α) of HNO_3 at various temp. has been calc. by comparing the intensity of the Raman ν at 1050 with that at 1300 cm^{-1} . With rise in temp. α decreases. W. R. A.

Influence of common ion on the dissociation of some strong electrolytes. I. Sulphuric acid and bisulphates. N. R. Rao (*Indian J. Physics*, 1943, 17, 283—286).—By Raman spectral methods the influence of added H^+ (from HCl and HClO_4) and SO_4^{2-} (from sulphates) ions on the dissociation of H_2SO_4 has been studied. Dissociation is decreased by H^+ ions. Dissociation of HSO_4^- is decreased by H^+ and enhanced by SO_4^{2-} ions. W. R. A.

Parachor of potassium dichromate and constitution of chromic acid.—See A., 1944, I, 214.

Relative free energies and dissociation constants of microscopic ions. T. L. Hill (*J. Physical Chem.*, 1944, 48, 101—111).—Microscopic dissociation constns. and relative standard free energies of ions may be calc. from experimental dissociation constns. for a no. of compounds. The average effects of charges in different positions in the mols. on their microscopic dissociation constns. are estimated. Thus approx. vals. of the microscopic constns. can be obtained for those substances for which there are no experimental data. The charge effects are generally represented by the equation $\text{p}K = 2.00 + d$, where d is the interchange distance, and in general $\Delta \text{p}K_a - \text{p}K_a^0 = c/d$, where $\text{p}K_a^0$ is the $\text{p}K$ val. in the absence of charge effects, and c is a const. For dicarboxylic acids the relative free energy of dissociation is the lower, the closer the second CO_2H is to the dissociating CO_2H . $\text{CH}_3(\text{CO}_2\text{H})_2$ and $\text{H}_2\text{C}_2\text{O}_4$ are anomalous owing to H bond formation between the dissociated and undissociated CO_2H . There is no evidence for H bonds in the amines examined. Analogies between the relative free energies and spectroscopic energy levels, and between the microscopic dissociation constns. and spectral lines, are indicated. J. O'M-B.

Dissociation constant and isoelectric point of sulphanilamide. A. J. Llacer (*Anal. Assoc. Quím. Argentina*, 1943, 31, 139—146).—Acidic and basic vals. of k for $p\text{-NH}_2\text{-C}_6\text{H}_4\text{-SO}_2\text{-NH}_2$ are respectively 3.55×10^{-11} and 7.01×10^{-12} at 25° , 5.37×10^{-11} and 1.20×10^{-11} at 30° , and 7.41×10^{-11} and 2.04×10^{-11} at 37° . There is an isoelectric zone between pH 4 and 9. F. R. G.

Application of the method of continuous variations to complex ion formation in cupric salts containing chloride ions. T. Moeller (*J. Physical Chem.*, 1944, 48, 111—119).—Alterations in the absorption spectra of cupric salts in solution on the addition of alkali halides indicate the formation of a complex ion containing Cl. Application of the above method (cf. Job, A., 1928, 589) shows that CuCl_4^{2-} (I) is formed but gives no information on the presence of other complexes. (I) is unstable except at high concns. of Cu^{2+} and Cl^- . Colour changes are explained by a shift in the equilibrium between $\text{Cu}(\text{H}_2\text{O})_6^{2+}$ and CuCl_4^{2-} , the latter being produced by an auto-complexing process. It is probably yellow, but the continued presence of $\text{Cu}(\text{H}_2\text{O})_6^{2+}$ prevents attainment of this colour by the solution. J. O'M-B.

Activities of components in austenite. J. Gerasimov (*Acta Physicochim. U.R.S.S.*, 1943, 18, 275—299).—A method of calculating the activities of the components of a binary solution from heterogeneous equilibrium constns. has been devised. For calculation purposes austenite (I) can be regarded either as a solid solution of C in $\gamma\text{-Fe}$ or as a solid solution of Fe_3C in $\gamma\text{-Fe}$, and component activities at 800—1100° have been calc. on both assumptions, although the second assumption is more convenient. The integral heats of dissolution of Fe_3C and the solubilities of α -ferrite and cementite (II) in (I) have been calc. Equations for the free energy of formation of (II) and of a less stable "regular" Fe_3C modification in Fe are given. C. R. H.

Gas-gas equilibrium and phase equilibria in binary systems. I. Kritschewski and D. Ziclis (*Acta Physicochim. U.R.S.S.*, 1943, 18, 264—274).—Equilibrium data for $\text{NH}_3\text{-N}_2$ and $\text{NH}_3\text{-CH}_4$ obtained over the range 90—148° and 45—100° respectively and at pressures $>10,000$ kg. per sq. cm. and for $\text{NH}_3\text{-N}_2\text{-H}_2$ (two different compositions) over the range 100—105° and at pressures >5500 kg. per sq. cm. prove the existence of limited mutual solubility of NH_3 and N_2 at temp. $>$ the crit. temp. of NH_3 . C. R. H.

System beryllium oxide-water. H. Terem (*Rev. Fac. Sci. Istanbul*, 1943, 8, A, 99—111).—Only one hydrate of BeO exists, viz., $\text{BeO}\cdot\text{H}_2\text{O}$, which is stable at temp. $<220^\circ$. Between 240° and 260° loss of H_2O is rapid and only traces of H_2O remain at 280° . BeO prepared by calcining at 300—400° is hygroscopic but if calcined at higher temp. its hygroscopicity is much lower. The uptake of H_2O is regarded as an adsorption process, the efficiency of which depends on the temp. of calcination. C. R. H.

Interpretation of distribution equilibria between molten metals and molten salts. E. Heymann, R. J. L. Martin, and M. F. R. Mulcahy (*J. Physical Chem.*, 1944, 48, 159—160).—A reply to criticism of the authors' paper (A., 1944, I, 63) by N. W. Taylor. J. O'M-B.

Complex formation in the system lead chloride-sodium chloride-water. B. V. Gromov (*J. Appl. Chem. Russ.*, 1940, 13, 337—344).—The solid phase in saturated solutions of PbCl_2 and NaCl in H_2O consists either of PbCl_2 , or of NaCl, or of both. There is no compound of PbCl_2 with NaCl, and the rise of solubility of PbCl_2 caused by NaCl must be due to interionic forces. J. J. B.

Equilibrium in the system lead sulphate-sodium chloride-water. B. V. Gromov (*J. Appl. Chem. Russ.*, 1940, 13, 345—356).—Solutions saturated with NaCl, PbCl_2 , and PbSO_4 at 25° , 50° , and 100° contain NaCl 23.4, 25.0, 26.0%, PbCl_2 2.34, 4.50, 12.7%, and Na_2SO_4 3.40, 2.05, 1.08%, respectively. Solutions saturated with NaCl, Na_2SO_4 , and PbSO_4 at the same temp. contain NaCl 22.3, 24.2, 26.3%, PbCl_2 0.60, 0.62, 1.43%, and Na_2SO_4 7.1, 5.37, 4.76%, respectively. Diagrams of state are given. J. J. B.

System magnesium selenate-selenic acid-water at 30° . H. Furukawa and G. B. King (*J. Physical Chem.*, 1944, 48, 174—178).—Solubility data for the system are recorded in tabular and triangular diagrammatic form. Four stable solid phases exist in equilibrium with H_2SeO_4 , viz., $\text{MgSeO}_4\cdot 6\text{H}_2\text{O}$, $\text{MgSeO}_4\cdot 4\text{H}_2\text{O}$, $\text{MgSeO}_4\cdot \text{H}_2\text{SeO}_4\cdot 6\text{H}_2\text{O}$, and, probably, MgSeO_4 at 0—35.50, 35.50—43.08, 43.08—56.79, and 56.79—77.69% of H_2SeO_4 respectively. C. R. H.

Polytherm of the ternary system $\text{NaNO}_3\text{-Na}_2\text{CrO}_4\text{-H}_2\text{O}$. M. I. Ravitsch (*Bull. Acad. Sci. U.R.S.S., Cl. Sci. Chim.*, 1943, 233—236).—Solution isotherms for the ternary system were determined at 0° , 25° , 50° , and 98.5° . Within this temp. range no evidence could be found for the formation of a double salt. Systems containing $\text{Na}_2\text{CrO}_4\cdot 10\text{H}_2\text{O}$ and $\text{Na}_2\text{CrO}_4\cdot 4\text{H}_2\text{O}$ were also investigated. The results are presented in tables and graphs. V. B.

System $\text{NaAlSiO}_4\text{-CaSiO}_3\text{-Na}_2\text{SiO}_3$. J. Spivak (*J. Geol.*, 1944, 52, 24—52).—Thermal equilibrium relationships in this system have been investigated by the quenching method. Thermal data for the system nepheline-wollastonite-Na metasilicate are tabulated, and the results are presented in the form of equilibrium diagrams. Their bearing on related systems of the $\text{Na}_2\text{O-CaO-Al}_2\text{O}_3\text{-SiO}_2$ tetrahedron, and their petrological significance, are discussed. L. S. T.

Heat of formation of oleum. F. D. Miles, H. Niblock, and D. Smith (*Trans. Faraday Soc.*, 1944, 40, 281—295).—Differential heats of addition of liquid SO_3 to oleum containing up to 70% of free SO_3 have been determined (1) directly and (2) by measuring the heat of vaporisation of SO_3 from oleum. Vals. given by method (1) are generally $<$ those given by method (2), probably owing to varying heat content of liquid SO_3 . Higher vals. are given by the direct method when the SO_3 has been redistilled once or twice with P_2O_5 . The heat of combination of liquid SO_3 with H_2O has been redetermined by adding SO_3 to aq. H_2SO_4 and using Brønsted's data for the change in heat content of the acid. The result is 20.00 kcal. per mol. at 30° . Integral heats of mixing liquid SO_3 with H_2O at 30° to form 1 g. of acid are given for the range 0.400—0.950 g. SO_3 . F. L. U.

Free energies of solutions of single and multiple molecules. W. J. C. Orr (*Trans. Faraday Soc.*, 1944, 40, 320—332).—Expressions for free energies, heats and entropies of mixing of single and multiple mols. are obtained on the basis of the statistical model of a strictly regular solution as defined by Fowler and Guggenheim. The limits of validity of the formulæ are discussed, and the theoretical calculations are compared with available thermodynamic data for the rubber- C_6H_6 system. F. L. U.

VII.—ELECTROCHEMISTRY.

Effect of temperature on the potential of glass electrode systems for pH measurement. N. Koyenuma (*Naturwiss.*, 1943, 31, 44—46).—A general expression for the temp. coeff. of a glass electrode is deduced. Differentiation of the equation $E_1 - E_2 = RT(\text{pH}_2 - \text{pH}_1)/F$, and substitution of the vals. $\text{pH}_2 = 4.62$ and $dE_2/dT = 0.085$ for a standard acetate buffer gives the temp. coeff. $dE_1/dT = 0.833 - 0.1985\text{pH}_2 - 59\text{dpH}_2/dT$. A similar equation can be obtained and extended on the basis of thermodynamics. The result in this case is $dE/dT = \text{const.} - 0.1985\text{pH} - 59\text{dpH}/dT$.

$1/F[dU/dT(\log T/T_0)]$. The evaluation of the const. and the last term of the above expression is carried out for $0.1N-HCl$.

A. J. M.

Reduction of nitroguanidine. XII. Oxidation potentials of the nitroguanidine-nitrosoguanidine and nitrosoguanidine-aminoguanidine systems. C. Hahn, E. Pribyl, E. Lieber, B. P. Caldwell, and G. B. L. Smith (*J. Amer. Chem. Soc.*, 1944, 66, 1223—1226; cf. A., 1938, II, 7).—Measurement of oxidation-reduction potentials shows that the system, nitroguanidine \rightleftharpoons nitrosoguanidine (I) has E_0 0.88 v. at pH 2—7 [reaction being $[C(NH_2)_2 \cdot NH \cdot NO_2]^+ + 2H^+ + 2e \rightarrow [C(NH_2)_2 \cdot NH \cdot NO]^+ + H_2O$], but 0.85 v. at pH 8—1 [reaction being $[NH \cdot C(NH_2) \cdot N \cdot NO_2]^- + 2H^+ + 2e \rightarrow [NH \cdot C(NH_2) \cdot N \cdot NO]^- (A) + H_2O$]; at pH 7—8 E_0 is indefinite. The system (I) \rightleftharpoons aminoguanidine has E_0 0.66 v. at pH 1—5 [reaction being $[C(NH_2)_2 \cdot NO]^+ + 4H^+ + 4e \rightarrow [C(NH_2)_2 \cdot NH \cdot NH_2]^+ (B) + H_2O$], indefinite at pH 6—8, 1.03 v. at pH 8—10 [reaction being $(A) + 6H^+ + 4e \rightarrow (B) + H_2O$], and 0.97 v. at pH 10—12 [reaction being $[NH \cdot C(NH) \cdot N \cdot NO]^- + 6H^+ + 4e \rightarrow NH_2 \cdot C(NH) \cdot NH \cdot NH_2 + H_2O$]. Vals. of $-\Delta F$ for the five named transformations are 40.6, 39.2, 61, 143, and 134, respectively, and of $\log K$ are 29.8, 28.8, 45, 70, and 65, respectively.

R. S. C.

Effect of the background electrolyte on polarographic waves of cadmium and lead. S. P. Schaikind (*J. Appl. Chem. Russ.*, 1940, 13, 455—462).—The height of the polarographic waves of Cd^{2+} in KCl , Na_2SO_4 , $ZnCl_2$, and $ZnSO_4$ solutions, and of Pb^{2+} in KCl and $ZnCl_2$ solutions, is $\propto [Cd^{2+}]$ or $[Pb^{2+}]$. The coeff. of proportionality is independent of the concn. of KCl but is the greater the higher is the dilution of Na_2SO_4 (0.1—0.9M.), $ZnCl_2$ (0.1—1.8M.), or $ZnSO_4$ (0.1—1.8M.).

J. J. B.

Behaviour of γ -keto- and aldehydo-acid derivatives at the dropping mercury electrode.—See A., 1944, II, 298, 307.

Reduction potentials of acridines, with reference to their antiseptic activity. B. Breyer, G. S. Buchanan, and H. Duewell (*J.C.S.*, 1944, 360—363).—The reduction potentials ($E_{1/2}$) of acridine, amino-acridines, and other derivatives have been obtained by means of the dropping Hg cathode. The reduction takes place in two steps of equal height, only one H atom being taken up with each step, meaning that the first reduction product is a free radical. The first reduction takes place at the N atom and the second at the C_{13} atom. There is a definite relation between $E_{1/2}$ and chemotherapeutic activity, in the sense that acridines with $E_{1/2}$ for the first-stage reduction more negative than -0.400 v. at pH 7.3 are biologically the most active.

C. R. A.

VIII.—REACTIONS.

Experimental determination of the decrease of pressure in the blue cone of flames. V. Vasilescu (*Ann. Physique*, 1943, [xi], 18, 190—208).—Measurements are reported with $H_2-O_2-N_2$ mixtures of known composition in order to verify Riemann's formula connecting the velocity of an impulse wave in a gaseous medium with the variation of pressure and density of the medium. Combustion in the stationary blue cone represents, on Jouguet's theory, impulse waves with decrease of pressure. This pressure decrease Δp was measured by two methods and results are compared with vals. calc. by Riemann's formula. Data show that Δp (calc.) is $> \Delta p$ (experimental), and this arises from the fact that the former corresponds with the interior zone of the cone, and the latter with the region around the base of the cone. It is assumed that there is a gain of pressure in the flame following its emergence from the cone, and the sum of this gain and Δp (experimental) should equal Δp (calc.). This gain is calc. and satisfactory agreement is found provided the blue cone is not very pointed. For more pointed cones Δp (calc.) $< \Delta p$ (experimental) corr. for pressure gain.

N. M. B.

Chemiluminescence of flame. V. Kondratiev (*Uspechi Chim.*, 1943, 12, 308—317).—The radiation of all flames in diluted gases and of some flames under atm. pressure is a chemiluminescence, i.e., its intensity is $>$ that of the thermal radiation, the dispersion of its intensity is not accounted for by probability, and it is quenched by foreign mols. The luminescence occurs either after recombination of free atoms or radicals or in an exchange reaction. The concn. of luminescent atoms or mols. sometimes is \propto rate of reaction; if the coeff. of proportionality is not affected by an external factor, this factor does not affect the mechanism of the reaction.

J. J. B.

Explosive reactions. II. Propagation of gaseous explosions. M. F. R. Mulcahy and A. Yoffe (*J. Proc. Austral. Chem. Inst.*, 1944, 11, 134—146).—A review of published work on flame propagation through gases.

L. J. J.

Kinetics of the reaction between chlorine and nitric oxide. E. M. Stoddart (*J.C.S.*, 1944, 388—393).—The fall in velocity coeff. for the reaction between Cl_2 and NO is due to ageing of the walls of the reaction vessel owing to adsorption of $NOCl$. Adsorbed $NOCl$ cannot be completely removed by evacuation and only with great difficulty by heat. The retarding effect of $NOCl$ is reduced by

drying the reactants, suggesting that this effect is due to adsorption of $NOCl$ on the H_2O content of the glass surface. When this effect is absent the reaction is termol.

C. R. H.

Explosions with degenerate branching. K. G. Fahlbusch and W. Jost (*Naturwiss.*, 1943, 31, 148).—In the oxidation of $COMeEt$ the induction times for the slow reaction and explosion pass steadily into each other. If τ is the induction time, the plot of $\log \tau$ against $1/T$ is two straight lines, one for the slow reaction, the other for the explosion. The slope of the two lines is almost the same.

A. J. M.

Spontaneous character, and indifference to the catalytic effect of oxygen, of the polymerisation of acetaldehyde at very low temperatures. M. Letort and X. Duval (*Compt. rend.*, 1943, 216, 608—610).—When $MeCHO$ is kept at the m.p. (-123.5°) for 2 hr. it polymerises. The polymerisation is unaffected by the purity of the $MeCHO$, and by the vessel in which the reaction occurs. It occurs with the substance from which traces of air have been removed and in absence of air. Probably it is not catalysed.

A. J. M.

Theory of chain copolymerisation reactions. R. Simha and H. Branson (*J. Chem. Physics*, 1944, 12, 253—267).—Mathematical. The kinetics of chain polymerisations is developed for reactions consisting of the three steps: (a) activation of a stable monomer, (b) growth of activated polymer radical by addition of monomer, (c) stabilisation of growing chains by (i) monomer addition, (ii) growing polymer. The general over-all reaction, determination of radical distribution, special rate equations, copolymer composition, and size distribution are discussed.

W. R. A.

Kinetics of the reaction between silver perchlorate and methyl iodide. M. F. Rodies and T. Iredale (*J. Physical Chem.*, 1944, 48, 224—230).—The reaction between $AgClO_4$ and MeI in various solvents and at various temp. has been investigated. Two forms of kinetics appear to be involved, pseudo-bimol. (second order) at low concns. and a 2.5 order at higher concns. With Et_2O as solvent a third-order rather than a 2.5-order reaction appears to be involved. The possibility of the reaction being heterogeneous because of the presence of pptd. AgI is discussed. The energies of activation are $\sim 11,000$ — $13,000$ g.-cal.

C. R. H.

Mechanism of some ionic reactions in aqueous solutions. J. Weiss (*J.C.S.*, 1944, 309—311).—In the reduction of $FeCl_3$ by Sn^{II} salts it is suggested that $SnCl_2$ forms the complex ion $SnCl_4^{2-}$ which takes part in the reaction according to $Fe^{3+} + SnCl_4^{2-} \rightleftharpoons Fe^{2+} + SnCl_4^{2-}$ and $Fe^{3+} + SnCl_4^{2-} \rightarrow Fe^{2+} + SnCl_4$, the equilibrium being $SnCl_2 + 2Cl^- \rightleftharpoons SnCl_4^{2-}$. This last equation shows that presence of HCl increases $[SnCl_4^{2-}]$ as well as increasing $[Fe^{3+}]$ by preventing hydrolysis of $FeCl_3$, and it is shown that under such conditions the reaction is bimol. The data for this reaction do not support Shaffer's hypothesis for oxidation-reduction processes, according to which reactions between mols. or ions, where one component is capable of a bivalent oxidation (or reduction) but the other only of a univalent reduction (or oxidation), do not take place or proceed only immeasurably slowly.

C. R. H.

Conductometric study of the velocity of the reaction $[CO(NH_2)_2 \cdot Cl]^{++} + OH^- \rightarrow [Co(NH_2)_2 \cdot OH]^{++} + Cl^-$. H. A. Puente and A. L. M. Lelong (*Anal. Asoc. Quim. Argentina*, 1943, 31, 5—22).—The reaction has $k = 78 \pm 1$ at 25° . Special precautions were adopted owing to the rapidity of the reaction.

F. R. G.

Rearrangement of alkyl halides. F. R. Mayo and A. A. Dolnick (*J. Amer. Chem. Soc.*, 1944, 66, 985—990).—The rate of equilibration of Pr^aBr with Pr^bBr at 250° (gives 67% of Pr^bBr) is somewhat erratic owing to traces of impurities. It is increased by O_2 (air), HBr , C_2H_6 , NEt_3Br , or NH_4Br (gives a quaternary salt), is decreased by $o-C_6H_4(OH)_2$ (very effective), Pr^aOH , or Pr^bO , but is unaffected by crushed Pyrex glass, H_2O , or illumination. $AlBr_3$ has a great accelerating effect but at 250° causes tar formation; at 70° it leads to 85% and at 26° to 91% of Pr^bBr . The rate is much faster in the liquid than in the vapour phase; this is not a dilution effect since the rate is rapid in dil. solution in $PhBr$. Reaction proceeds by loss and addition of HBr , two mechanisms (chain reaction and non-Markovnikov addition) proceeding simultaneously. Bu^aCl and Bu^bCl are unaffected at 250° but at 300° are equilibrated to give 78—92% of Bu^bCl (and tar); this reaction is unaffected by air or $o-C_6H_4(OH)_2$ but is accelerated by $NEt_3 \cdot Cl$ (CH_2Cl_2) and $CHMeCl_2$ or $(CH_2Br)_2$ and $CHMeBr_2$ are not equilibrated by $AlBr_3$ but some halogen exchange occurs with $(CH_2Cl)_2$ at 100° . $(CH_2Br)_2$ and $CHMeBr_2$ are equilibrated by $NEt_3 \cdot Br$ at 250° to give 76—82% of $(CH_2Br)_2$. Although non-Markovnikov addition of $HHal$ to olefines usually gives the thermodynamically more stable isomeride (cf. above), $CH_2 \cdot CHBr$ is exceptional.

R. S. C.

Useful life [rate of hydrolysis] of pyro-, meta-, and tetra-phosphates.—See B., 1944, I, 304.

Hydrolysis of maltohexaose.—See A., 1944, II, 326.

Rate of nitration of toluene with mixed acid.—See B., 1944, II, 269.

Reaction of water-gas conversion in quartz vessels. V. Kon-dratev and M. Ziskin (*Acta Physicochim. U.R.S.S.*, 1943, 18, 197—209).—The rate of reaction of $\text{CO}_2\text{--H}_2$ mixtures on passing through heated SiO_2 tubes is not governed by the reaction time but by the surface area of the reaction tube, a large area having an inhibiting effect. The amount of H_2 transformed into H_2O (γ) increases with temp. according to an exponential law, but equilibrium is far from being attained at 800° . A reaction scheme based on the assumption of catalytic activity on the part of O_2 is proposed, and it follows from calculations that $\gamma_{\text{max}} \propto e^{-(E_{\text{III}} - \frac{1}{2}E_{\text{I}})/RT}$, where E_{III} and E_{I} are the respective activation energies of stages $\text{H} + \text{CO}_2 \rightarrow \text{CO} + \text{OH}$ and $\text{O}_2 + \text{H}_2 \rightarrow 2\text{OH}$. C. R. H.

Interaction of oxygen and carbon filaments at high temperatures. R. F. Strickland-Constable (*Trans. Faraday Soc.*, 1944, 40, 333—343).—C filaments were electrically heated in O_2 at low pressures 0.02—0.5 mm.) over a temp. range of 900—2000° and the reaction was studied by pressure measurement and analysis. CO is the chief and primary product, only small amounts of CO_2 being formed. The reaction is of the first order. The rate increases from 900° to 1100°, is const. between 1600° and 2000°, and in the intermediate range is very sensitive to the immediate past history of the filament. No sorption of O as oxides in freshly outgassed filaments at 1000° was observed. The importance of avoiding activation of gas mols. by thermionic emission from the filament at high temp. is stressed and means of doing this are described. F. L. U.

Inflammability and explosibility of powders used in the plastics industry.—See B., 1944, II, 289.

Extraction of potassium carbonate from wyomingite. Kinetics of base-exchange reaction with sodium carbonate.—See B., 1944, I, 331.

Catalysis of the reaction between dichromate and aromatic amines by the oxalate ion. C. R. Viswanadham and G. G. Rao (*Current Sci.*, 1944, 13, 47—48).—Observations with 8 amines, in presence of dil. H_2SO_4 , show that 1 ml. of 0.2N- $\text{Na}_2\text{C}_2\text{O}_4$ causes the characteristic reaction colour to appear in 0—2 min. In absence of the ion the reactions may take 5—>30 min. N. M. B.

Induced oxidation of oxalic acid by dichromate with ferrous sulphate as inductor. C. R. Viswanadham and G. G. Rao (*Current Sci.*, 1943, 12, 327).—Oxalate (I) interferes with the titration of FeSO_4 with $\text{Na}_2\text{Cr}_2\text{O}_7$, giving results \gg that required for oxidation of Fe^{2+} . In absence of FeSO_4 , (I) is not attacked by $\text{Na}_2\text{Cr}_2\text{O}_7$, and it is concluded that interference of (I) is caused by the rapid reaction of FeSO_4 and $\text{Na}_2\text{Cr}_2\text{O}_7$, inducing reaction between (I) and $\text{Na}_2\text{Cr}_2\text{O}_7$. The induction factor increases with increasing concn. of (I), $[\text{FeSO}_4]$ and $[\text{H}^+]$ being const. FeSO_4 also induces reaction between $\text{Na}_2\text{Cr}_2\text{O}_7$ and tartaric, malic, and citric acid, but not succinic acid. A. T. P.

Interpretation of the Sandmeyer reaction. V. Comparative behaviour of cuprous, cupric, and ferric chlorides as catalysts. H. H. Hodgson and D. D. R. Sibbald (*J.C.S.*, 1944, 393—395).—The catalytic activity of Cu_2Cl_2 , CuCl_2 , FeCl_3 , and $\text{Cu}_2\text{Cl}_2 + \text{CuCl}_2$ for the decomp. of $p\text{-NO}_2\text{-C}_6\text{H}_4\text{-N}_2\text{Cl}$ in HCl has been investigated. With FeCl_3 an almost proportional decrease in yield of $p\text{-C}_6\text{H}_4\text{Cl-NO}_2$ occurs on dilution. Max. are observed with CuCl_2 at 26.9% and 4% of HCl and with Cu_2Cl_2 at 18.6% of HCl . The max. at 4% of HCl suggests the existence of a complex hydrated CuCl_2 anion, in which Cl is much more active than the bound H_2O . C. R. H.

Mechanism of co-polymerisation. T. Alfrey, jun., and G. Goldfinger (*J. Chem. Physics*, 1944, 12, 205—209).—By the aid of steady-state approximation the mechanism of catalytic co-polymerisation of two monomers A and B is discussed on the assumption of two initiation and two termination rates (one for each monomer). Four propagation rates, corresponding with the four possible types of "chain" addition, are considered and overall rates and no. average mol. wt. are calc. The composition of the polymer and the no. distribution curves of groups of sub-mols. are calc. as functions of the monomer composition and two rate const. ratios and are of general character and independent of the nature of the initiation and termination processes if the average degree of polymerisation is "high." W. R. A.

Co-polymerisation of systems of three and more components. T. Alfrey and G. Goldfinger (*J. Chem. Physics*, 1944, 12, 322; cf. preceding abstract).—The authors' method of calculating the course of co-polymerisation in two-component systems is extended to apply to systems of > two components. L. J. J.

Autoxidation of ascorbic acid in presence of vanadic acid, molybdic acid, and tungstic acid sols. S. C. Shome (*J. Indian Chem. Soc.*, 1944, 21, 19—23).—At all concns. V_2O_5 sol accelerates and WO_3 sol inhibits the autoxidation of ascorbic acid. MoO_3 sol accelerates autoxidation at low and inhibits it at high concns. C. R. H.

Oxidation processes. XVII. Autoxidation of ascorbic acid in presence of copper. A. Weissberger and J. LuValle (*J. Amer. Chem. Soc.*, 1944, 66, 700—705; cf. A., 1944, I, 42).—The rate of

autoxidation of ascorbic acid (I) in presence of Cu at pH 2.59—9.31 is $\propto [\text{O}_2]$ and independent of concn. of (I). At very low [Cu] it increases faster than the [Cu], but is $\propto [\text{Cu}]$ at higher [Cu]. The effect of pH shows that only the univalent ion of (I) is the substrate of Cu catalysis, but the effects may appear complex owing to interaction of some buffers with the Cu. The primary reaction is formation of 1 mol. each of dehydroascorbic acid and H_2O_2 from 1 mol. each of (I) and O_2 . The reaction mechanism is discussed. Ag has no effect. R. S. C.

Stepwise activation of oxygen in the organism.—See A., 1944, III, 611.

Mechanism of the oxidation of sulphur dioxide on active vanadium catalysts. I. Stability of single vanadium compounds in the conditions of the synthesis of sulphuric acid. G. K. Borckov and V. P. Pligunov (*J. Appl. Chem. Russ.*, 1940, 13, 329—336).— V_2O_5 (I), $\text{V}_2\text{O}_5 + 0.1 \text{ K}_2\text{SO}_4$ (II), $\text{V}_2\text{O}_5 + 0.1 \text{ K}_2\text{O}$ (III), $\text{V}_2\text{O}_5 + 0.5 \text{ K}_2\text{O}$ (IV), $\text{V}_2\text{O}_5 + 0.9 \text{ K}_2\text{O}$ (V), $\text{V}_2\text{O}_5 + 1.0 \text{ Na}_2\text{O}$ (VI), $\text{V}_2\text{O}_5 + 1.0 \text{ BaO}$ (VII), $\text{V}_2\text{O}_5 + 0.9 \text{ K}_2\text{O} + 1.9 \text{ SiO}_2$ (VIII), $\text{V}_2\text{O}_5 + 0.9 \text{ K}_2\text{O} + 7.7 \text{ SiO}_2$ (IX), and $\text{V}_2\text{O}_5 + 0.9 \text{ K}_2\text{O} + 38.4 \text{ SiO}_2$ (X) have been heated for 12—18 hr. at 480° in air + 5% of SO_2 + 5% of SO_3 . V_2O_5 was partly reduced to V_2O_4 (probably as VOSO_4), and the degree of reduction increased in the order (X) < (I) < (IX) < (V) < (VI) < (VIII) < (II), (III), (IV), (VII), the reduction being complete for (II) etc. BaO was converted into BaSO_4 , and Na_2O , K_2O , and K_2SO_4 gave pyrosulphates. The results disagree with Neumann's theory (B., 1935, 898). J. J. B.

Metal-catalysed reaction between acetylene and hydrogen. I. Nickel catalysts. J. Sheridan (*J.C.S.*, 1944, 373—380).—A nearly linear pressure-time curve is usually obtained for the first stages of the reaction between H_2 and C_2H_2 in presence of Ni catalyst. The fall in pressure becomes slower towards the end of the reaction. The activity of the catalysts increases markedly in the early stages of the reaction, then becoming steady over considerable periods. The yields of C_2H_4 , C_2H_6 , and higher hydrocarbons (empirically $\sim \text{C}_4\text{H}_8$) are the same on fresh and old catalysts, and so the increase in activity of the catalyst at the beginning of the reaction is not specifically in favour of a particular type of reaction in the system. The production of C_2H_4 is ~ 5 times that of C_2H_6 . The yield of " C_4H_8 " is 55—60% of the unrecovered C_2H_2 at all stages of the reaction. The data indicate that the kinetics of C_2H_4 and C_2H_6 formation and of " C_4H_8 " formation are the same, being first order with respect to H_2 and approx. zero order with respect to C_2H_2 . The data are discussed with reference to earlier work on chemisorption of C_2H_4 and C_2H_2 . C. R. H.

Use of palladium and platinum as catalysts.—See B., 1944, I, 315.

Possible use of palladium as catalyst in manufacture of acrichine.—See B., 1944, II, 245.

Action of carbonate catalysts in carburisation of steel.—See B., 1944, I, 313.

Influence of lead and manganese as driers in oil paints.—See B., 1944, II, 290.

Liberation of iodine from dilute iodide solutions by electrolysis on a monolithic porous carbon electrode. II. E. N. Vinogradova (*J. Appl. Chem. Russ.*, 1940, 13, 390—393).—A solution containing per l. 150 g. of NaCl , 0.05 g. of I⁻, and small amounts of other ions is filtered through an electrode made of active C, towards an Fe cathode. The voltage applied is 5 v. at the beginning, and 2 v. in the steady state of the electrolysis; if it is too high, IO_2 is formed, and at <1.5 v. I⁻ is not completely discharged. I_2 formed is adsorbed by the C. Through 10 sq. cm. of the electrode surface 500 c.c. per hr. can be passed without losing >1% of I. The method is recommended for recovery of I from oil well H_2O . J. J. B.

Formation of oxide layers on aluminium, especially on the anodes of electrolytic condensers. W. Hermann (*Kolloid-Z.*, 1943, 102, 113—127).—Modifications of Al_2O_3 are described and discussed. It is possible to find a common structural basis for the formation of the various types of oxide layer. The foundation of all Al_2O_3 layers is a film of $\gamma\text{-Al}_2\text{O}_3$, or a variety of it. Al^{+++} can migrate from the Al below, through the empty spaces in the spinel lattice of the $\gamma\text{-Al}_2\text{O}_3$. The film grows on the outer surface by reaction between Al^{+++} and O_2 or the anions of the electrolyte. In the case of the film formed in O_2 at room temp., there is a very thin layer embedded in one of greater thickness. By anodic treatment in suitable electrolytes, particularly aq. or alcoholic boric acid or borates, the layer may assume a thickness of 0.7 μ . The dielectric film grows only if the field strength is >10 mv. per cm. When a certain film thickness has been reached the field distribution curve in the Al_2O_3 slopes so steeply that electrons can penetrate the film with production of sparks. The sparking potential depends on the ionic concn. or conductivity of the electrolyte. In some electrolytes, e.g., H_2SO_4 , $\text{H}_2\text{C}_2\text{O}_4$, and H_2CrO_4 , a thick porous layer of Al_2O_3 is formed in addition to the thin dielectric film. A. J. M.

Behaviour of positive plates with lead-calcium alloy grids in lead accumulators.—See B., 1944, I, 315.

Lead plating.—See B., 1944, I, 314.

Use of palladium and platinum for electro-coatings.—See B., 1944, I, 315.

Photochemical processes in aromatic compounds. A. Terenin (*Acta Physicochim. U.R.S.S.*, 1943, 18, 210—241).—The main results obtained in earlier photochemical investigations are reviewed in order to arrive at a consistent picture of photochemical mechanisms. Many of the facts established for gaseous aromatic compounds have been explained on the assumption of a definite shape for the potential energy surfaces of the ground and excited states and of the existence of a definite angle between their principal sections. Evidence is given for the existence of a long-lived metastable electronic state in simpler derivatives of C_6H_6 in the gaseous and liquid states at low temp., which state may correspond with a triplet term of the aromatic ring. The connexion between the emission spectra of these derivatives at low temp. and their polymerisation processes is accounted for. Reaction mechanisms of O_2 with aromatic mols. are discussed from the viewpoint of conservation of the electronic spin. C. R. H.

IX.—PREPARATION OF INORGANIC SUBSTANCES.

Exchange reactions. R. Daudel (*Compt. rend.*, 1943, 216, 666—667).—Two main types of exchange reaction can be distinguished. In some cases an exchange of free, radioactive A^* for inactive A in the inactive compound AB takes place. There is a continual dissociation of AB into its elements. Thus, $AB \rightleftharpoons A + B$, $A^* + B \rightleftharpoons A^*B$, or, together $AB + A^* \rightleftharpoons A^*B + A$. The reaction is very rapid when the elements A and B are of opposite electrochemical character, and in aq. solution. The other type occurs through the formation of an intermediate mol. If AB and A^*C are the two reacting mols., $AB + A^*C \rightleftharpoons AA^*BC \rightleftharpoons A^*B + AC$. This type can be sub-divided into two, according as AA^*BC is, or is not, capable of isolation. Applications of this classification are mentioned. A. J. M.

Polymerisation with atomic hydrogen. J. P. W. Houtman, K. van den Berg, and P. M. Heertjes (*Rec. trav. chim.*, 1943, 62, 672—680).—Chemical affects of "atomic" H are uncertain unless the method of production ensures the absence of excited atoms, ions or electrons. The Langmuir thermal method is shown to produce ions; these are completely removed for $p > 0.4$ mm. by two metal plates between which is a p.d. of 10 v. The photochemical method, using a Hg sensitiser, gives only unexcited H atoms for $\lambda > 2300$. Using H from Langmuir's method hexadecene was polymerised and the polymerisation shown to be independent of the presence of ions by variation of the p.d. between the plates. Using H from the photochemical method WO_3 gave W and linseed oil was hydrogenated and polymerised. On a large scale, linseed oil was hydrogenated and polymerised and hexadecene reduced to hexadecane and a polymerised reduction product. All experiments were repeated using N_2 as the gas present to verify that the activity was due to H. J. O'M.B.

Action of non-metals on basic oxides. M. Lemarchands and L. Schwartz (*Compt. rend.*, 1942, 214, 982—983).—The action of S on Ag_2O has been investigated by examining the direct action of S vapour on the surface of Ag_2O for a long period (up to 96 days) and at different temp., and by shaking a solution of S in CCl_4 with Ag_2O for several weeks. An additive compound, Ag_2OS , is formed. It is steel-grey, has d 6.08, and is insol. in H_2O . It dissociates when heated (300—350°) into Ag_2S and Ag_2SO_3 . H_2 at 170° is without action. CO reduces it quantitatively to Ag_2S . It differs from Ag_2O and Ag_2S in its X-ray spectrum and its mol. vol. (Ag_2O 32.2, Ag_2S 34.1, Ag_2SO_3 43.4). A. J. M.

Preparation of copper phosphides by electrolysis of melts. M. Chène (*Compt. rend.*, 1942, 214, 977—979; 215, 81—83).—Electrolysis of fused Na metaphosphate containing varying amounts of dissolved Cu_2Cl_2 or CuO gives cryst. Cu phosphides, together with Cu at the cathode. Cu_3P and Cu_2P were isolated. Cu_3P , dark grey, has d^{20} 7.09. Cu_2P , dark brown, has d^{20} 5.51. Both are oxidised in warm air, are slowly attacked by HCl, and reduce warm conc. H_2SO_4 . When heated, Cu_2P readily evolves P, which ignites. A. J. M.

Fusion process in non-polar crystals. II. Explanation of mercury corrosion figures on copper crystal spheres. I. N. Stranski (*Naturwiss.*, 1943, 31, 144—145).—Spheres cut from Cu single crystals show typical corrosion figures when acted on by Hg and HNO_3 . The effect of Hg on the surface will be very similar to the fusion process. Rhombododecahedral areas of the Cu become covered with Hg and the thin "lanes" separating these areas retain their Cu colour. The phenomenon is explained on the basis of density of packing in the various surfaces of the Cu crystal. A. J. M.

Behaviour of aluminium in the etching of crystal figures. H. Mahl and I. N. Stranski (*Naturwiss.*, 1943, 31, 12—17).—The theory

of the etching of non-polar and ionic crystals is discussed. In the case of Al, in the absence of O_2 , e.g., in etching by means of dry HCl gas, octahedra in combination with cubes are obtained, as required by theory. In the presence of O_2 , the etching figures are those of the oxide layer on the surface, with an ionic lattice. In etching with HCl or electrolytically, the pure cube form is obtained, due to a two-dimensional oxide layer on the Al, of NaCl type. A. J. M.

Crystal structure [and preparation] of $ZnSb_2O_6$ and isomorphous compounds.—See A., 1944, I, 216.

Derivatives of monosilane. III. Fluoromonosilanes. H. J. Emeléus and A. G. Maddock (*J.C.S.*, 1944, 293—296).—Interaction of $SiHCl_3$, SiH_2Cl_2 , and SiH_3Cl with SbF_5 at room temp. in presence of $SbCl_5$ yields $SiHF_3$, silylene fluoride SiH_2F_2 , and silyl fluoride SiH_3F , respectively, the max. yields obtained being 91%, 80%, and 79% respectively. The v.p. for various temp. < b.p. are recorded and the following physical consts. have been determined: m.p. $SiHF_3$ —131.4°, SiH_2F_2 —122°; b.p. $SiHF_3$ —95.0°, SiH_2F_2 —77.8°, SiH_3F —98.6°; latent heat $SiHF_3$ 4802, SiH_2F_2 4751, SiH_3F 4500 g.-cal. per mol. Attempts to prepare SiH_2F_2 and SiH_3F by interaction of SiH_4I_2 and SiH_4I with AgF or HgF were unsuccessful. All these compounds undergo disproportionation at room temp. with formation of SiH_4 and SiF_4 , although with SiH_2F_2 decomp. is slow. The anomalous b.p. and Trouton's consts. indicate association in the liquid phase attributable to H-bonds. J. W. S.

Preparation of hypophosphoric acid and its sodium salt, $Na_2H_2P_2O_6 \cdot 6H_2O$. W. Jung (*Anal. Assoc. Quím. Argentina*, 1942, 30, 99—111).—A detailed description of the prep. and purification of $Na_2H_2P_2O_6$ by Blaser and Halpern's (A., 1934, 43) modification of Corne's method. The yield is improved. F. R. G.

Preparation of alkali tungstates in the dry way. E. Carrière, H. Guiter, and R. Giacomini (*Bull. Soc. chim.*, 1943, [v], 10, 587—588).—The action of WO_3 on alkali carbonates and sulphates at elevated temp. gives salts of the type $WO_3 \cdot pM_2O$, where p depends on the proportions used. Using excess of Li_2CO_3 , the compound $WO_3 \cdot 2Li_2O$ was obtained. In each case the min. temp. of reaction was determined, the carbonates being more readily attacked than the sulphates. J. F. H.

Composition and mechanism of formation of the hydrides of nickel. II. Reaction mechanism. A. A. Balandin, B. V. Jeroseev, K. A. Pecherskaja, and M. S. Stachanova (*Acta Physicochim. U.R.S.S.*, 1943, 18, 300—310).—Weichselder's view that the formation of NiH_2 from $NiCl_2$, $MgPhBr$, and H_2 is due to the interaction of H_2 with $NiPh_2$, formed as an intermediate compound, is incorrect. $NiCl_2$ is reduced to Ni by $MgPhBr$ in absence of H_2 . The formation of Ni hydrides by interaction of reduced Ni and H_2 proceeds in stages. These stages are autocatalytic, the dissolved H_2 reacting with solid Ni and with the hydrides and NiH , NiH_2 , and NiH_4 are formed. The Ni surface is poisoned by certain strongly adsorbed compounds, e.g., thiophen, which prevent the penetration of H_2 to the Ni surface and formation of hydride. The poisoning effect is even greater for catalytic hydrogenation of the C_6H_6 nucleus; on the other hand, the poisoning effect on the dissolution of H_2 in the hydrides is very small. Sols of Ni hydrides in Et_2O and other solvents were examined. Those in Et_2O are less stable than those in C_6H_6 , PhMe, and xylene. Colloidal solutions in Et_2O are formed only when $[MgPhBr]$ is $> 0.5M$, suggesting that adsorption of $MgPhBr$ on the hydride surface protects the colloid. H_2O and air rapidly coagulate the sols. C. R. H.

XI.—GEOCHEMISTRY.

Iodine-air investigations. H. Jesser and E. Thomae (*Z. anal. Chem.*, 1943, 125, 89—93).—Data showing the I content of the atm. over Stuttgart during the year 1941 are recorded and discussed. The vals. found are < those reported for previous years (A., 1939, I, 391). L. S. T.

Magnesium content of rain-water at Grignon. G. Bertrand (*Ann. Inst. Pasteur*, 1943, 69, 294—302).—In rain- H_2O collected during 1 year it is calc. that, of every 100 g. of Mn, only 0.0122 g. could not be accounted for as contamination from dust or other sources. F. S.

Magnesium and calcium in rain-water collected at Paris. G. Bertrand (*Compt. rend.*, 1943, 216, 701—704).—Even when care was taken to prevent dust from being collected with the rain- H_2O , it was found that in rain collected over 1 year, a deposit of ~ 0.8 g. of mineral matter was obtained on evaporation. This contained Mg and Ca salts. A. J. M.

Lakes and wells of Kustanai region. V. D. Poljakov and D. I. Kusnetsov (*J. Appl. Chem. Russ.*, 1940, 13, 404—411).—Some lakes near Kustanai (Western Siberia) contain deposits of $Na_2SO_4 \cdot 10H_2O$ and of other minerals. J. J. B.

Zinc-polluted River Ystwyth, north Cardiganshire, Wales. J. R. E. Jones (*Ann. Appl. Biol.*, 1940, 27, 368—378).—A survey of the

river which flows through areas of disused Zn mine workings is recorded. At normal level the H_2O contains 0.7—1.2 mg. of Zn and >0.05 mg. of Pb per l. The flora and fauna of the river are described. A. G. P.

Nature and significance of certain variations in composition of Los Angeles basin ground waters. R. R. Morse (*Econ. Geol.*, 1943, 38, 476—511).—Comparison of the numerous chemical analyses recorded shows the presence of several distinctive types, and indicates that different processes of varying importance operate to produce chemical variation. The occurrence and general relationships of the H_2O types are discussed. L. S. T.

Photometric study of the coloration of sulphuric acid by organic compounds of [sea-]water. V. G. Datzko (*J. Appl. Chem. Russ.*, 1940, 13, 384—389).—The H_2O of Caspian Sea darkens conc. H_2SO_4 ~10 times as much as does ocean H_2O near Greenland. The degree of coloration is a measure of the admixture of river- H_2O to the sea- H_2O (see C., 1944, Part 4). J. J. B.

Migration of substances in the earth's crust. C. W. Correns (*Naturwiss.*, 1943, 31, 35—42).—A review. The composition of the earth's crust is discussed. Processes causing migration of substances are distinguished as weathering, the formation of sediments from the weathering products, metamorphosis of rocks, and volcanic action. The part played by organisms in the formation of sediments is discussed. A. J. M.

Effect of a thin superficial deposit [of Fe] on the magnetisation of a steel ball. Application to magnetic properties of rocks. (Mme.) F. Bayard-Duclaux (*Compt. rend.*, 1943, 216, 727—728).—The effect of depositing Fe on a steel ball on its intensity of magnetisation (I) has been investigated. I reaches half its initial val. when a layer of Fe equal to 0.036 of its radius has been deposited. The deposited Fe acts as a magnetic screen. The magnetisation of volcanic rocks is stable for unaltered rocks, but is variable for altered ones. The above experiments show that if the magnetism of the rock is due to grains of magnetite or more complex Fe compound, alteration of the surface would create a new ferromagnetic layer, which would considerably affect the magnetic properties of the interior. A. J. M.

Application of radio-chemical analysis for the correlation of geological strata. V. I. Baranov, K. G. Kunasheva, and S. G. Zeitlin (*Bull. Acad. Sci. U.R.S.S., Cl. Sci. Chim.*, 1943, 178—190).—Cores from test oil borings in the Kazan area were examined. The cores were from the lower Permian and upper Carboniferous strata. The average concn. of Ra in the cores was $5.38 \times 10^{-1}\%$ and of Th $1.09 \times 10^{-4}\%$. Well-waters examined had [Ra] of the same order. V. B.

Diamonds in the north-eastern Bolivian Andes. V. Oppenheim (*Econ. Geol.*, 1943, 38, 658—661).—Diamonds have been found in the river gravels of Rio Tuichi. Origin is discussed. L. S. T.

Quartz crystal in New Zealand. J. Henderson (*New Zealand J. Sci. Tech.*, 1944, 25, B, 162—169).—Properties and uses of quartz crystal, and occurrences in New Zealand, are described. South Westland and Takaka appear to be the districts in which crystals suitable for piezo-electrical purposes may be found. L. S. T.

Melting and crystallisation of rock-forming minerals. J. F. Schairer (*Amer. Min.*, 1944, 29, 76—91).—A survey that shows the progress made in determining the chemical compositions, range of compositions, and the temp.—stability relationships of the various rock-forming olivines, pyroxenes, and melilites. Relevant equilibrium diagrams are reproduced. L. S. T.

Crystallography of calcite from Lake Superior copper mines. C. Palache (*Amer. Min.*, 1944, 29, 35—48).—Crystallographic forms are tabulated and illustrated. L. S. T.

Brucite in limestone near Wilkinson, Ontario. I. C. Brown (*Econ. Geol.*, 1943, 38, 408—419).—Brucite (I) is present as granules, blades, and needles disseminated in magnesian limestone at Wilkinson. It has formed at the expense of dolomite (II), the Ca of (II) going to form calcite. (I) from Wilkinson contains no remnants of periclase, and is regarded as the result of a process in which H_2O replaced CO_2 of (II). Chemical analyses are recorded. L. S. T.

Calcite-dolomite staining tests. W. S. T. Smith (*Econ. Geol.*, 1943, 38, 420—422).—Results described for distinguishing dolomite from calcite in the ore deposits of the Joplin region show that the hæmatoxylin and the $FeCl_3$ staining methods are untrustworthy for these deposits. L. S. T.

Deposit of barite and fluorspar, Thomson Hill, Wangapeka survey district, Nelson. E. O. Macpherson (*New Zealand J. Sci. Tech.*, 1944, 55, B, 178—180).—The deposit is described, and chemical analyses are given. L. S. T.

Distribution of helium and radioactivity in rocks. VI. The Ayer granite-migmatite at Chelmsford, Mass. N. B. Keevil, E. S. Larsen, and F. J. Wank (*Amer. J. Sci.*, 1944, 242, 345—353; cf. A., 1944,

I, 46).— >20 samples of rock and mineral concentrates from the Chelmsford granite-migmatite have been investigated. A wide range of radioactivities is shown by the 12 mineral concentrates; zircon (I), apatite, epidote, and biotite have >5 times the radioactivity of the parent rock. A 10,000-fold contrast in activity and a 150,000-fold contrast in He content were found between (I) and feldspar (II); the (I), containing 1.2 c.c. per g., appears to retain He, whilst the (II) and quartz have lost $>90\%$. Excess He over that produced since Carboniferous time was found in sphene. $>50\%$ of the radioactivity of the Chelmsford granite is due to accessory minerals. L. S. T.

Distribution and conditions of the primary migration of radioelements in nature. I. E. Starik (*Uspechi Chim.*, 1943, 12, 287—307).—Occurrence of radioactive elements in igneous and sedimentary rocks, rate of diffusion of gaseous and solid elements in the rocks, migration of these elements in the rock fissures, and related phenomena are discussed. J. J. B.

Thorium-uranium ratios in rocks and minerals. N. B. Keevil (*Amer. J. Sci.*, 1944, 242, 309—321).—100 recent determinations, including new data, of these ratios are tabulated, and plotted as frequency-distribution curves. The probable val. of Th/U for an igneous rock lies between 3.0 and 3.5. Independent confirmation of this range is given by Nier's determinations of abundances of Pb isotopes from samples of ore-Pb. For most purposes a val. of 3.2 can be assumed for the Th/U ratio. This leads to no significant error in α -counting theory and in determinations of the rate of production of radiogenic heat or of accumulation of He and Pb in rocks. The results do not support Holmes' theory of the genesis of Pb ores from a deep-seated source. L. S. T.

Dissolution of astrakhanite salt root in salt solutions. V. I. Nikolaev and N. A. Ilinich (*J. Appl. Chem. Russ.*, 1940, 13, 394—403).—Astrakhanite salt root is a deposition of minerals (astrakhanite, epsomite, and rock-salt) which has grown through the mud bed of many salt lakes near the delta of Volga. The dissolution of this mixture in some salt solutions without stirring shows rhythmic changes. At an undisturbed dissolution in a salt lake the upper layer of liquid contained mainly NaCl, the middle one mainly $MgSO_4$, and the lower one $MgSO_4$ and Na_2SO_4 . Astrakhanite forms no solid solutions either with epsomite or with rock-salt. J. J. B.

Structure of natrophilite, $NaMnPO_4$.—See A., 1944, I, 216.

Composition of some chromites of the Western Hemisphere. R. E. Stevens (*Amer. Min.*, 1944, 29, 1—34).—52 complete and 144 partial chemical analyses of purified chromites (I) from different deposits in the Western Hemisphere are recorded and discussed. The composition of (I) is represented by $(Mg,Fe)O \cdot (Cr,Al,Fe)_2O_3$. Fe_2O_3 is generally present, frequently as a minor, and commonly as a major, constituent. Terrestrial (I) are predominantly magnesio-(I) $MgO \cdot Cr_2O_3$ (II), hence ferro-(I), $FeO \cdot Cr_2O_3$ (III), is not the ideal formula for (I). The end members (II), (III), spinel (IV), hercynite, magnesio-ferrite, and magnetite (V) occupy the corners of a triangular composition prism. The principal zone of isomorphism for the (I) in this prism ranges from compositions approaching (II) and (IV) to (V), leading to the division of (I) into the following types, with the replaceable ions given in order of abundance: aluminian chromite $(Mg,Fe)O \cdot (Cr,Al,Fe)_2O_3$; ferrian chromite, $(Mg,Fe)O \cdot (Cr,Fe,Al)_2O_3$; chromian-spinel $(Mg,Fe)O \cdot (Al,Cr,Fe)_2O_3$; ferrian-spinel $(Mg,Fe)O \cdot (Al,Fe,Cr)_2O_3$; chromian-magnetite $(Fe,Mg)O \cdot (Fe,Cr,Al)_2O_3$; and aluminian-magnetite $(Fe,Mg)O \cdot (Fe,Al,Cr)_2O_3$. Data showing the variation of unit-cell edge with Cr content, and the no. of atoms of Cr, Al, Fe^{2+} , Fe^{3+} , and Mg per unit cell in order of increasing Fe^{3+} , are recorded. L. S. T.

Colloidal deposition of cinnabar. J. Pollock (*Amer. Inst. Min. Met. Eng.*, 1944 *Tech. Publ.* 1735, 10 pp.; *Min. Tech.*, 8, No. 4).—The stability of HgS sols (0.01—2.0 g. per l.) has been studied at room temp. The Schulze-Hardy rule is roughly obeyed ($Na^+ : Ca^{++} : Al^{+++} = 1 : 50 : 625$), and the stability of the sol increases with pH. The flocculation time in 0.035M-NaCl increases slowly with decreasing [HgS] down to vals. of ~ 0.06 g. per l., below which the flocculation time is infinite. SiO_2 sols have a strongly protective action, the flocculation time becoming infinite at $SiO_2 : HgS > 3 : 1$; at this val. the system behaves essentially as a SiO_2 sol. HgS is stable as a sol in natural H_2O known to be depositing cinnabar (I), and deposits containing finely-divided (I) (especially opalite) have probably derived it from colloidal solution. M. H. M. A.

Tungsten deposits of Southern Kiangsi, China. K. C. Hsu (*Econ. Geol.*, 1943, 38, 431—474).—Mode of occurrence of the deposits, the nature of the ore bodies, sequence of mineralisation, and some of the important districts are described. The Kiangsi deposits supply $\sim 70\%$ of the total output of Chinese W concentrates. Most of the deposits are hypothermal veins, but some are pegmatitic. The veins occur in granite and in sedimentary rocks not far from the granite intrusives. Greisenisation without development of topaz and tourmaline is the usual type of wallrock alteration in granite. Tourmalinisation is a common type of alteration in argillaceous

sediments near the veins. Wolframite is the chief ore mineral, whilst cassiterite, Bi minerals, molybdenite, and chalcocopyrite are of local economic importance. L. S. T.

Tungsten deposits of the Darwin Hills, Inyo Co., California. L. K. Wilson (*Econ. Geol.*, 1943, 38, 543—560).—The general geology of the district, and the mineralogy, origin, and extent of the scheelite ore-bodies, are described. L. S. T.

Manganese deposits of the Turtle mountains, N. Dakota. T. A. Hendricks and W. M. Laird (*Econ. Geol.*, 1943, 38, 591—602).—The chief Mn spring deposits of this locality have been investigated. Mineral Spring contains ~16,000 tons of Mn ore as rancite (I) in calcareous tufa with a Mn content of ~10%. The source of the Mn appears to be in Mn limonitic concretions. Chemical analyses are recorded. (I) is probably $(\text{Ca}, \text{Mn}^{II})\text{Mn}^{IV}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$. L. S. T.

Boron in braunite and manganese ores. B. Wasserstein (*Econ. Geol.*, 1943, 38, 389—398).—Spectrographic determinations of B_2O_3 in Mn ores are recorded and show that B (~0.5—1%) is a const. constituent of braunite (I), but not necessarily of other Mn minerals. The presence of B in (I) is considered to be due to isomorphous replacement of Si in the crystal lattice. L. S. T.

Pyrolusite. H. Strunz (*Naturwiss.*, 1943, 31, 89—91).—The optically and morphologically rhombic naturally occurring MnO_2 is tetragonal in agreement with its known rutile-like form, but occurs in submicroscopic crystallites pseudomorphous with other minerals, particularly manganite. The rhombic pseudomorphism is a "relict effect." L. J. J.

Colloform sulphide veins of Port au Port peninsula, Newfoundland. K. de P. Watson (*Econ. Geol.*, 1943, 38, 621—647).—Colloform deposits of Pb, Zn, and Fe sulphides are described, and their origin is discussed. L. S. T.

Low-chalcocite and high-chalcocite. M. J. Buerger and N. W. Buerger (*Amer. Min.*, 1944, 29, 55—65).—Bristol chalcocite (I) has been investigated by the Weissenberg and by the de Jong-Bouman methods. (I), orthorhombic, diffraction symbol $mmmAb-$, has a_0 11.90, b_0 27.28, c_0 13.41 Å. The Weissenberg investigation of high-(I) [Bristol (I) maintained above the inversion temp. of 105°], shows high-(I) to be hexagonal, with a diffraction symbol $6/mmmH6/-c-$, and a_0 3.89, c_0 6.68 Å. The low-(I) cell bears a supercell relation to the high-(I) cell; its a , b , and c axes are 3, 4, and 2 times, respectively, those of the high-(I) cell. Space-groups are $H6mcm$ ($D_{6h}4$) for high-(I), and $Ab2m$ ($C_{2v}15$) for low-(I). L. S. T.

Weinschenkite, yttrium phosphate dihydrate, from Virginia. C. Milton, K. J. Murata, and M. M. Knechtel (*Amer. Min.*, 1944, 29, 92—107).—Weinschenkite (I), previously known only from one Bavarian locality, occurs at Kelly Bank mine, Vesuvius, Virginia. (I) from Virginia has a 1.605, b 1.612, c 1.645, $\rho_{\text{calc.}}$ 3.270, $\rho_{\text{obs.}}$ 3.263. X-Ray data are recorded. Spectrograms of (I) from Virginia and from Bavaria are practically identical; the Yb lines are stronger in the Bavarian mineral. Lines due to Ti, As, Ag, Bi, Cd, Pb, Sb, Sn, Zn, Cu, Ba, Sr, B, Be, and Ge are absent. Major elements present are Y, Yb, Er, Dy, and Gd, minor elements are Nd, Sm, Eu, Ho, and La (trace); Th, Sc, Ce, Pr, Tb, and Lu were not found. (I) and artificially-prepared $\text{YPO}_4 \cdot 2\text{H}_2\text{O}$ show a moderately strong pink fluorescence (Hg-vapour lamp) when heated gently; on strong ignition, fluorescence ceases. $1\frac{1}{2}$ H_2O are lost at 180°, and $2\text{H}_2\text{O}$ at 900°. Origin of (I) is discussed. L. S. T.

Magnetic behaviour of a tektite. A. Sigamony (*Proc. Indian Acad. Sci.*, 1944, 20, A, 15—17).—A sample of tektite from the island of Billiton has ρ 2.448, χ 7.78×10^{-8} at 25°, and is magnetically isotropic. From χ the estimated FeO content is 5.8% in agreement with the known structure and composition of tektites. W. R. A.

Radium content of Ceylon thorianite. P. K. S. Chaudhury (*Indian J. Physics*, 1943, 17, 257—261).—A sample of Ceylon thorianite contained $\sim 5.94 \times 10^{-8}$ g. Ra per g. W. R. A.

Structure and colour reactions of montmorillonite earths. D. Krüger and F. Oberlies (*Naturwiss.*, 1943, 31, 92).—A variety of natural earths which show a feeble benzidine reaction in their natural state show a marked positive benzidine reaction after drying in vac. at room temp. or at 100° at atm. pressure. Hence factors other than lattice or chemical structure are operative in this reaction. The effect is ascribed to irreversible dehydration of SiO_2 or Al_2O_3 gel components. The nature of the exchangeable cations present also affects the reaction. L. J. J.

Determining factors in the coloration of granite soils in the south-eastern Piedmont. W. A. White (*Amer. J. Sci.*, 1944, 242, 361—363).—By its control of internal drainage, jointing also controls the alternation of oxidising and reducing conditions in the soil. Red soils develop on closely-jointed granites because of the good internal

drainage and the oxidising conditions that prevail. Yellow soils develop on sparsely-jointed granites where internal drainage is poor and reducing conditions mainly prevail. L. S. T.

Geology of the manganiferous iron ore deposits at Boston Hill, New Mexico. L. P. Entwistle (*Amer. Inst. Min. Met. Eng.*, 1944, 8, *Tech. Publ.*, 1712, 10 pp.).—The hypogene mineralisation of the intrusion carrying the Mn ores consists of three stages: the formation of (1) mesitite, a Mn Fe magnesite, (2) quartz and sulphides, and (3) barite-galena. The hypogene carbonate has been oxidised and enriched by meteoric waters containing excess of O_2 and CO_2 to form ore bodies of intimately mixed hematite and pyrolusite. L. S. T.

System Fe_2O_3 — Mn_2O_3 . Comments on the names bixbyite, sitaprite, and partridgeite. B. Mason (*Amer. Min.*, 1944, 29, 66—69).—The phase diagram for the system Fe_2O_3 — Mn_2O_3 is reproduced and discussed. It shows that max. replacement of Mn by Fe is ~30% at 600°, increasing rapidly with a rise in temp. to ~60% at 1000°. The mineral $(\text{Fe}, \text{Mn})_2\text{O}_3$ can be subdivided into two groups to include (i) minerals of pneumatolytic or fumarolic origin with 40—60% of Fe_2O_3 , and (ii) those occurring in metamorphosed Mn ores, with 0—30% of Fe_2O_3 . The name bixbyite covers the $(\text{Fe}, \text{Mn})_2\text{O}_3$ group satisfactorily, but if the group is to be subdivided, it should be into bixbyite, corresponding with sub-group (i), and sitaprite, corresponding with sub-group (ii). The name partridgeite is unnecessary (cf. A., 1944, I, 92). L. S. T.

Hydrothermal replacement in deep-seated iron ore deposits of the Lake Superior region. T. T. Quirke (*Econ. Geol.*, 1943, 38, 662—666).—A discussion (cf. A., 1943, I, 243). L. S. T.

Chemical and mineralogical composition of twenty typical "limonites." R. Blanchard (*Amer. Min.*, 1944, 29, 111—114).—Chemical analyses and calc. probable mineralogical compositions of 20 typical limonitic products of diverse origin and distribution are recorded and discussed. In spite of the typical limonitic appearance of all the hand specimens, wide variations in the composition, extent, and nature of the impurities present exist. The analyses also show that $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$ may and often does exist in porous gossans with too low a content of adsorbed and capillary H_2O to conform to the theoretical formula, $2\text{Fe}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$, formerly assigned to limonite. L. S. T.

Bravoite from a new locality. C. A. Rasor (*Econ. Geol.*, 1943, 38, 399—407).—Bravoite, $(\text{Ni}, \text{Fe})\text{S}_2$, has been identified as a constituent of the Ni-Co ores of south-eastern Missouri. L. S. T.

Cobalt content of some South Island (New Zealand) limestones. D. J. Stanton (*New Zealand J. Sci. Tech.*, 1944, 25, A, 221—224).—Limestones from the Nelson District contain 0.2—4.2 p.p.m., but generally <2.5 p.p.m., of Co; and those from Southland, Otago, Canterbury, and Marlborough, from 0.2 to 12.5 p.p.m., but generally <5 p.p.m. There appears to be no correlation between geological age and Co content, or between carbonate and Co contents, although high carbonate usually accompanied low Co content. Most South Island limestones are too low in Co to provide useful amounts of Co for top-dressing pastures for the control of Co-deficiency disease in stock. L. S. T.

Mechanism and environment of gold deposition in veins. W. H. White (*Econ. Geol.*, 1943, 38, 512—532).—A study of ores from 27 districts representing the main types of Au deposits in Canada and the United States reveals a no. of characteristic features, some of which are common to most of the deposits. The process of cataclasis, one of minute fracturing and almost contemporaneous recrystallisation of quartz (I) in Au veins, is probably an important factor permitting the residual solutions carrying the Au in the veins to permeate the (I) and distribute the Au. Vacuoles are common in vein (I), and play a part. Au was the last mineral to crystallise, its closest sulphide associate being galena, and occasionally, stibnite, realgar, and cinnabar. It was deposited under uniform conditions of low and waning stress at a temp. possibly <200°. L. S. T.

Alkali sulphide theory of gold deposition. F. G. Smith (*Econ. Geol.*, 1943, 38, 561—590).—It is postulated that natural solutions that deposit primary Au ores contain alkali sulphide, and that the Au is transported as alkali thioaurite. The synthesis of electrum by heating aq. Na_2S saturated with H_2S , Au_2S_3 , and Ag_2S in an atm. of H_2S to ~300°, and allowing cooling to take place in ~12 hr., is described. Calaverite has been synthesised by heating Na_2S_2 with Au and Te; it is formed in alkali sulphide systems only when the concn. of free S is low. L. S. T.

Silicates and dusts from the Witwatersrand gold mines. J. J. Frankel (*J. Chem. Met. Soc. S. Africa*, 1944, 44, 169—177).—Chemical and spectrographic analyses, and X-ray diffraction patterns, of the sericite, pyrophyllite, chlorite, actinolite, epidote, chloritoids, and clay minerals, and X-ray diffraction patterns of the dusts, are reproduced. L. S. T.

Structure of rhodizite.—See A., 1944, I, 240.



INDEX OF AUTHORS' NAMES, A I.

NOVEMBER, 1944.

- AGEEV, N. V., 241.
Alfrey, T., jun., 253.
Anand, B. M., 235.
Anderson, E. A., 241.
Angenetter, H., 233.
Antonoff, G., 246.
Ardenne, M. von, 241.

BABAËVA, A. V., 235.
Balandin, A. A., 236.
Balarew, D., 241.
Baranov, V. I., 257.
Bashulin, P. A., 236.
Batchelor, R. W., 245.
Bayard-Duclaux, F., 257.
Beischer, D., 241.
Belousov, A. M., 246.
Berenstein, M., 236.
Berger, A., 247.
Bergstermann, H., 246.
Bertrand, G., 266.
Blanchard, R., 260.
Bokshtein, M. F., 236.
Bonhoure, A., 242.
Borokov, G. K., 251.
Born, H. J., 234.
Boyle, E. J., 241.
Branson, H., 252.
Breyer, B., 251.
Briegleb, G., 249.
Briner, E., 236.
Broser, W., 248.
Brown, I. C., 257.
Buchanan, G. S., 251.
Buerger, M. J., 259.
Buerger, N. W., 259.

CALDWELL, B. P., 251.
Carrière, E., 256.
Cassel, H. M., 245.
Chang, T. S., 235.
Chang, W. Y., 233.
Chao, K. T., 233.
Chaudhury, P. K. S., 233, 259.
Chène, M., 235.
Cleveland, F. F., 237.
Coconi, G., 234.
Correns, C. W., 257.
Cross, P. C., 235.

DANERELL, V. R., 247.
Daniel, V., 244.
Datzko, V. G., 257.
Daudel, R., 255.
Dayal, B., 242.
de Booy, J., 240.
de Bretteville, jun., 243.
de Bruijn, H., 248.
de Carvalho, H. G., 243.
de Lacombe, J., 245.
Delvaule, M. L., 236.
Dietzel, A., 243, 245.
Dolnick, A. A., 252.
Doss, K. S. G., 246.
Duewell, H., 261.
Duquenois, P., 247.
Duval, C., 236.
Duval, R., 236.

DUVAL, X., 252.

EISENSCHITZ, R., 239.
Elbracht, O., 246.
Emelús, H. J., 250.
Entwistle, L. P., 260.
Erickson, A. E., 246.
Ernst, T., 241.
Ewald, H., 234.

FAHLBUSCH, K. G., 252.
Flammersfeld, A., 234.
Forró, M., 235.
Foster, A. G., 245.
Fox, W., 246.
Frankel, J. J., 260.
Frewing, J. J., 245.
Fröhlich, H., 237.
Frumkin, A., 246.
Furukawa, H., 250.

GABLER, F., 233.
Gaydon, A. G., 235.
Gerasimov, J., 249.
Ghose, S., 243.
Giacomini, R., 256.
Gibling, T. W., 238.
Gilbert, G. A., 248.
Giuzburg, V. L., 238.
Goldfinger, G., 253.
Goldstein, K., 248.
Grassmann, I., 243.
Grobe, A. H., 244.
Gromov, B. V., 250.
Güter, H., 256.
Guruswamy, S., 248.

HAHN, C., 251.
Hahn, O., 234.
Hainer, R. M., 235.
Hamilton, D. T., 237.
Harms, H., 244.
Harris, G. P., 236.
Heertjes, P. M., 255.
Henderson, J., 257.
Hendricks, T. A., 259.
Hermann, W., 254.
Hermans, J. J., 248.
Hermans, P. H., 240.
Heymann, E., 250.
Hill, T. L., 249.
Ho, C. P., 238.
Hodgson, H. H., 253.
Hofmann, W., 238.
Houtman, J. P. W., 255.
Hsu, K. C., 258.
Hume-Rothery, W., 239.
Huxley, H., 237.

ILLINICH, N. A., 258.
Iredale, T., 252.

JEROFEEV, B. V., 256.
Jesser, H., 256.
Jones, J. R. E., 256.
Jost, W., 252.
Juilis, J., 234.
Jung, W., 256.

KAZANSKI, B. A., 236.
Keevil, N. B., 257, 258.
Kinder, E., 240.
King, E. G., 246.
King, G. B., 250.
King, G. W., 235.
Klein, O., 234.
Knechtel, M. M., 259.
Koch, K. M., 242.
Kondratyev, V., 251, 253.
Kortüm, G., 235.
Koyenuma, N., 250.
Kratky, O., 240, 247.
Kritschewski, I., 249.
Krüger, D., 259.
Krüger, H. E., 248.
Kunashcheva, K. G., 257.
Kusnetzov, D. I., 236.
Kuyper, C., 248.

LAIRD, W. M., 259.
Larsen, E. S., 257.
Laves, F., 239, 241.
Lecomte, J., 236.
Ledermann, W., 239.
Lelong, A. L. M., 252.
Lemarchands, M., 255.
Leonhardt, J., 242.
Lepeschkin, W. W., 248.
Letort, M., 252.
Liberman, A. L., 236.
Lieber, E., 251.
Lipson, H., 244.
Livingston, H. K., 245.
Llacer, A. J., 249.
Loverdo, A., 234.
Lowan, A. N., 245.
Lowery, H., 237.
Lukina, M. J., 236.
Lutschinski, G. P., 244.
Lu Valle, J. E., 253.

MACGILLAVRY, C. H., 239.
Machatschki, F., 239.
Macpherson, E. O., 257.
Maan, C. J., 240.
Maddock, A. G., 256.
Mahl, H., 255.
Makarov, E. S., 244.
Manescu, I., 233.
Margolis, E. I., 236.
Mariens, P., 244.
Martin, R. J. L., 250.
Mason, B., 260.
Matteuch, J., 234.
Mattoon, R. W., 236.
Mattson, R., 247.
Miles, F. D., 250.
Mills, W. H., 237.
Milton, C., 259.
Möglich, F., 237.
Moeller, T., 249.
Morse, R. R., 257.
Mulchay, M. F. R., 259, 251.
Murata, K. J., 259.

NEWSOME, P. T., 247.
Niblock, H., 250.

Nikitine, S., 241.
Nikolaev, V. I., 258.

OBERLIES, F., 259.
Oppenheim, V., 257.
Orr, W. J. C., 237, 250.
Ozora, Z., 234.

PADWAL, N. A., 248.
Paillard, H., 236.
Palache, C., 257.
Pancholy, M., 241.
Pande, A., 241.
Parthasarathy, S., 241.
Pecherskaja, K. A., 256.
Perdok, W. G., 249.
Pinsker, Z. G., 239.
Pligunov, V. P., 254.
Poljakov, V. D., 256.
Pollock, J., 258.
Prasad, M., 248.
Pribyl, E., 251.
Puente, H. A., 252.

QUIRKE, T. T., 260.

RAMSEY, P. W., 244.
Rao, B. S., 246.
Rao, G. G., 253.
Rao, N. R., 249.
Rasor, C. A., 260.
Ravitsch, M. I., 250.
Redies, M. F., 262.
Rennenkampff, J. von, 242.
Rhines, F. N., 244.
Rideal, E. K., 248.
Rompe, R., 237.
Ruedy, R., 237.
Ruigh, W. L., 246.
Ryer, F. V., 243.

SACK, R., 237.
Seelmann-Eggebert, W., 234.
Sekora, A., 240, 247.
Schabalin, K., 244.
Schaikind, S. P., 251.
Schaier, J. F., 257.
Schlecht, W. G., 238.
Schmidt, A. W., 242.
Schwartz, L., 255.
Sheppard, S. E., 247.
Sheridan, J., 254.
Shome, S. C., 253.
Sibbald, D. D. R., 253.
Sigamony, A., 259.
Simha, R., 252.
Singh, B. N., 243.
Smith, D., 250.
Smith, F. G., 260.
Smith, G. B. L., 251.
Smith, G. W., 245.
Smith, K., 244.
Smith, S. L., 241.
Smith, W. S. T., 257.
Solovova, O. P., 236.
Spivak, J., 250.
Stachanova, M. S., 256.
Stanton, D. J., 260.

Starik, I. E., 258.
Stevens, R. E., 258.
Stranski, I. N., 242, 255.
Strassmann, F., 244.
Strickland-Constable, R. F., 253.
Strijk, B., 239.
Strunz, H., 239, 240, 259.
Stuart, H. A., 238.
Suhrmann, R., 242.

TAVROVSKAJA, R. M., 244.
Taylor, A., 239.
Terem, H., 250.
Terenin, A., 255.
Terenteeva, A. P., 246.
Terpstra, P., 240.
Tetewsky, H., 244.
Thomae, E., 260.
Thompson, H. W., 236.
Thomson, G., 238.
Tongiorgi, V., 234.
Triché, H., 238.
Tuot, M., 236.

UNGAR, I., 237.
Urbanic, A., 247.

VAN DEN BERG, K., 235.
Van Eck, C. L. P., 239.
Van Itterbeek, A., 244.
Van Paemel, O., 244.
Vasilescu, V., 251.
Verleger, H., 235.
Verstraete, E. O. K., 243.
Villar, G. E., 233.
Vinogradova, E. N., 254.
Visvanadham, C. R., 253.
Volet, C., 242.
Vorsina, M., 245.

WAILL, W., 234.
Wallbaum, H. J., 244.
Wang, C. S., 235.
Wank, F. J., 257.
Wasserstein, B., 259.
Watson, K. de P., 259.
Weber, H. H., 240.
Weil-Malherbe, H., 237.
Weiss, J., 252.
Weissberger, A., 255.
White, E. F., jun., 243.
White, W. A., 259.
White, W. H., 260.
Willems, J., 240.
Wilson, L. K., 259.
Wood, W. A., 241.
Woodburn, H. M., 244.

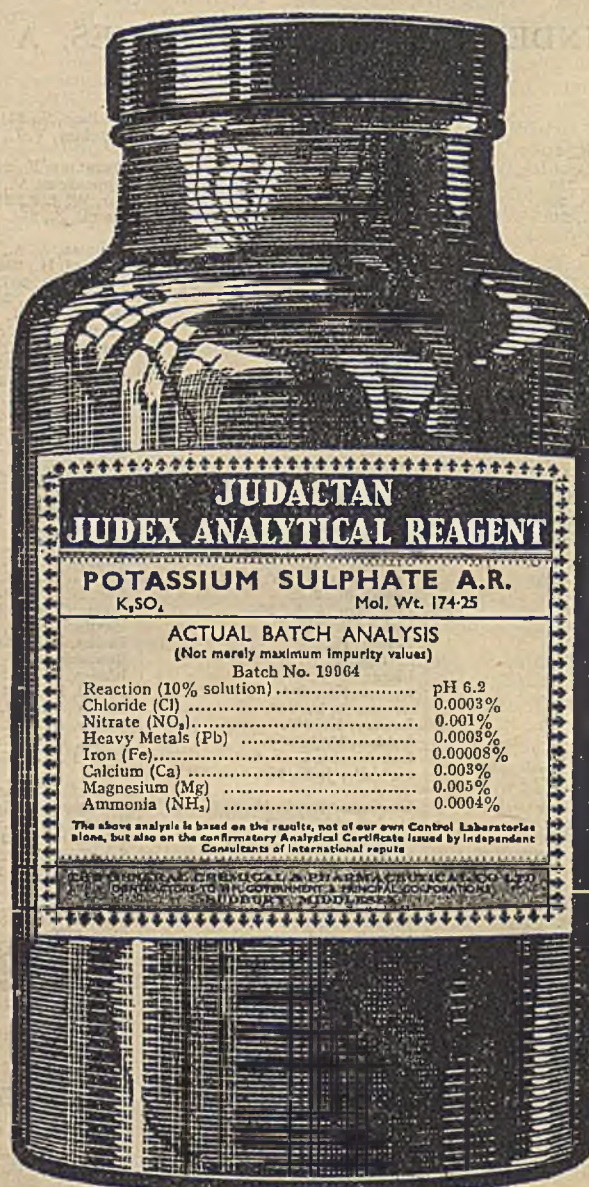
YOFFE, A., 251.
York, R., jun., 243.
Yu, S. H., 237, 240.

ZITLIN, S. G., 257.
Zener, C., 243.
Zich, D., 240.
Ziskin, M., 253.

JUDACTAN

ANALYTICAL REAGENTS WITH ACTUAL BATCH ANALYSIS

ACTUAL
BATCH
ANALYSIS



Each Batch
subjected
to
INDEPENDENT
ANALYSIS
before
label is printed

You are invited to compare the above
actual batch analysis with the purities

guaranteed by the specifications of any
competing maker in this country or abroad

THE GENERAL CHEMICAL & PHARMACEUTICAL CO. LTD.

Chemical Manufacturers, Judex Works, Sudbury, Middlesex