

BRITISH CHEMICAL AND PHYSIOLOGICAL ABSTRACTS

MARCH, 1944



A I—GENERAL, PHYSICAL, AND INORGANIC CHEMISTRY

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MARCH, 1944.

I.—SUB-ATOMIC.

Continuous spectrum of hydrogen-like atoms (parabolical co-ordinates). W. R. Morgans (*Phil. Mag.*, 1944, [vii], 34, 842—850).—Theoretical expressions for the intensities for transitions between the continuous states and the Lyman and Balmer states are obtained from the solution of the wave equation in parabolical co-ordinates. H. J. W.

Continuous absorption of light in potassium vapour. R. W. Ditchburn, J. Tunstead, and J. G. Yates (*Proc. Roy. Soc.*, 1943, A, 181, 386—399).—A new type of absorption tube for the study of metal vapours is described. The continuous absorption of K and K₂ vapour in the range 3000—1600 Å. is studied, and the at. and mol. absorptions are separated. At short λ the at. absorption coeff. increases rapidly and varies linearly with ν . The at. results are in conflict with theory; it is suggested that exchange effects may account for the discrepancy. G. D. P.

Curves of growth for the A dwarfs, γ Geminorum and Sirius. L. H. Aller (*Astrophys. J.*, 1942, 96, 321—343).—The curves are constructed from measurements of equiv. widths of absorption lines of Fe I, Fe II, Ca I, Cr I, Cr II, Ti II, Sc II, and V II, a table of which is given. Excitation temp. ($\sim 6000^\circ$) and ionisation temp. (8700°) are derived. The electron pressure, 1.2×10^2 dynes (theoretical, 7×10^2), is calc. on the assumption that the broadening of the H lines is due entirely to continuous absorption by at. H in the stars. The amount of Fe above the photosphere of Sirius is 0.05 of that above the photosphere of the sun. H/Fe (by wt.) is ~ 1000 in the A dwarfs. E. R. R.

Survey of the spectra and radial velocities of the less regular M-type variable stars. A. H. Joy (*Astrophys. J.*, 1942, 96, 344—370).—The distribution, spectroscopic abs. magnitudes, spectral types, radial velocities, and displacements of emission lines are determined for 118 stars; spectroscopic observations on 105 of these are new. E. R. R.

Mean absolute magnitudes and space motions of the irregular variable stars. R. E. Wilson (*Astrophys. J.*, 1942, 96, 371—381). E. R. R.

Wave-lengths of new coronal lines. W. Petrie and D. H. Menzel (*Astrophys. J.*, 1942, 96, 395—398).— λ measured from three jumping-film, one ultra-violet moving-film, and five moving-film spectra of high dispersion, all photographed during the 1936 eclipse, are tabulated. New lines at 3980.9, 4003.5, 4056.3, 4170.8, 4272.9; 5899.1, 5912.4, 5937.1, 6294.9, 6336.9, 6513.0, 6524.1; 3216.5, 3296.1, 3577.2, 3586.6, 3630.7, 4429.8, 4674.4, 4705.7, 4783.9, and 5094.0 Å. were discovered. The last ten of these may arise from photographic effects of undetermined origin. E. R. R.

Composite spectrum of ζ Tauri. J. A. Hynek and O. Struve (*Astrophys. J.*, 1942, 96, 425—437). E. R. R.

Negative hydrogen ion and its absorption coefficient. R. E. Williamson (*Astrophys. J.*, 1942, 96, 438—450).—A six-parameter wave-function, derived on the basis of the Ritz principle, predicts an electron affinity of 0.0265 at. unit (current val. 0.0253) and an at. absorption coeff. of 3.0×10^{-17} sq. cm. at 5000 Å. (cf. 2.6×10^{-17} sq. cm. at 4000 Å.). The new vals. for the absorption coeff. are substantially $>$ the old throughout the red and infra-red. E. R. R.

Spectrographic observations of Nova Herculis (1934) and Nova Serpentis (1909) with identifications of [Fe V] and [Fe III] in Nova Pictoris (1925). P. Swings and O. Struve (*Astrophys. J.*, 1942, 96, 468—474).—Velocities of expansion of Nova DQ Herculis (1934) vary from 338 km. per sec. for [O II] to 256 km. per sec. for [O III], suggesting stratification. Lines show curved outer components, with a faint central line in the case of H γ . Since 1940 relative intensities of emission lines have changed considerably and the continuum of the central star has decreased in brightness. [Fe V] and [Fe VI] are well developed in the spectrum of Nova Serpentis, in which the electron density in the nebulosity is still high. E. R. R.

Interpretation of the spectrum of HD 190073. O. Struve and P. Swings (*Astrophys. J.*, 1942, 96, 475—480).—Beals' interpretation is discussed in the light of more recent measurements of the contours of the H and Ca I lines. E. R. R.

Spectrum of 67 Ophiuchi. P. Lacroute and W. H. Dirks (*Astrophys. J.*, 1942, 96, 481).—The spectrum, which is faint, was studied from 4100 to 4520 Å. During 28—29 July and 6—7 Aug., 1942, the star was of the P Cygni type. C II and O II lines were not observed either in emission or in absorption (see following abstract). E. R. R.

Spectrum of 67 Ophiuchi. O. Struve (*Astrophys. J.*, 1942, 96, 482).—Spectra taken in 1929—30, May, 1939, and 22 Sept., 1942, show no P Cygni structure (see preceding abstract). E. R. R.

Nuclear emission in spiral nebulae. C. K. Seyfert (*Astrophys. J.*, 1943, 97, 28—40).—Spectrograms of six extra-galactic nebulae with high-excitation nuclear emission lines superposed on a normal G-type spectrum are recorded. True relative intensities are deduced and individual differences discussed. Max. width of the Balmer emission lines increases with abs. magnitude of the nucleus and with the ratio of light in the nucleus to total light in the nebula. The wide emission lines are absent in the brightest diffuse nebulae in other extra-galactic objects. E. R. R.

Spectrographic study of meteorites. W. W. A. Johnson and D. P. Norman (*Astrophys. J.*, 1943, 97, 46—50).—18 meteorites were examined spectrographically for 69 elements. 40 were found, including As, Be, Cd, Ce, Hg, In, Ir, Pd, Pt, Te, Tm, and Zr, which are absent from King's list. No obvious grouping on the basis of at. constituents is possible. E. R. R.

Spectrum of τ Scorpii. P. W. Merrill and W. S. Adams (*Astrophys. J.*, 1943, 97, 98—104).—Total widths and displacements of lines of H, He, O, Ne, C, N, Mg, Al, Si, S, and Ca are measured with dispersion 2.9 Å. per mm. Total widths are H, 23 Å.; He, 1—8 Å.; others, 0.5 Å. Profiles and displacements of He lines strongly indicate the Stark effect. E. R. R.

Structure of interstellar H and K lines in 50 stars. W. S. Adams (*Astrophys. J.*, 1943, 97, 105—111).—Intensities of interstellar H and K lines of Ca II in 50 stars are measured. Radial velocity measurements may distinguish between different interstellar clouds, which appear to be of discrete nature, free from considerable turbulence, and of great extent. Intensities and displacements of additional narrow interstellar lines of Ca I, Fe I, CN, CH, and CH⁺ are measured. E. R. R.

Spectrum of the nebulosity near Kepler's Nova of 1604 [Nova Ophiuchi 1604]. R. Minkowski (*Astrophys. J.*, 1943, 97, 128—129).—The spectrum consists of emission lines of [O III] λ 5007, [O I] λ 6300, [N II] λ 6584, 6548, H α , and [S II] λ 6731 Å. The nebulosity may be a remnant of Kepler's Nova, which was a supernova. E. R. R.

Spectrum of Nova Cygni 1942. R. C. Sanford (*Astrophys. J.*, 1943, 97, 130—134).—Changes in the light and spectrum of this nova from Sept. 15 to Dec. 17, 1942, are recorded and compared with those of Nova Herculis 1934. E. R. R.

Emission-line intensities in some bright northern Wolf-Rayet stars. L. H. Aller (*Astrophys. J.*, 1943, 97, 135—165).—Excitation temp. of the atm. envelopes of certain bright Wolf-Rayet stars, estimated from emission line intensities, are very high and depend on the ionisation potential of the ion employed. The emission lines do not arise from the primary mechanism. The chemical composition of the atm. is deduced: in C stars, He/O=50, He/C=15; in N stars, He/N=20, He/C=300. These compositions indicate supernova rather than nova. Electron densities in the radiating layers of Wolf-Rayet stars are 10^{11} to 10^{12} electrons per c.c. E. R. R.

Spectrographic observations of peculiar stars. V. P. Swings and O. Struve (*Astrophys. J.*, 1943, 97, 194—225).—The spectrum of Z. Andromedæ in three successive years is tabulated. Strong lines of [Fe VII] were evident in July and Nov., 1942. New data on the emission lines of Fe I, Fe II, [Fe II], [Fe III], and [Fe V] in peculiar stars are given. Four stars with absorption shells are described in detail, especially shell lines of H and He I. Spectra of 83 Be stars are described: MWC 23 has a strong shell spectrum of H; MWC 342 shows strong emission lines of H, Fe II, and [Fe II], and shows structure in the H lines. The fluorescence and recombination mechanisms are related to the general characteristics of shell spectra. The "N flaring stages" of nova are discussed and related spectroscopic phenomena interpreted. E. R. R.

BD +14° 3887, a peculiar *Be* star showing emission lines of Na I, [Fe III], and He I, with a note on the spectrum of *CD -27° 11944*. J. W. Swenson (*Astrophys. J.*, 1943, 97, 226—233).—*BD +14° 3887* shows lines of H, Fe II, [Fe II], Cr II, Mg I, and Mg II, with an unusual combination of Na I, [Fe III], and He I. The mechanism of excitation of the emission lines is discussed. New lines, especially permitted Fe III multiplets $a^4P-4p^4P_0$ and $a^4D-4p^4P_0$, which are sensitive to dilution effects, are reported in *CD -27° 11944*.

E. R. R.

Spectrum of *HD 192954*. A. A. Broyles (*Astrophys. J.*, 1943, 97, 234—251).—Contours of H lines show very narrow and deep central cores with broad shallow wings to each side, indicating that part of the absorption occurs in a dense layer corresponding with a main sequence star, and part in a layer of low pressure. The weakening of Mg II and Si II lines indicates dilution in an outer layer. The star is probably of type B9n. λ of lines from λ 3321 to λ 5479 Å. are tabulated.

E. R. R.

Spectrum of ν Sagittarii in the visual region. J. S. Greenstein (*Astrophys. J.*, 1943, 97, 252—254).—The spectrum is marked by the strength of N and Ne lines. High Ne/O and abnormal N/O abundance ratios are estimated.

E. R. R.

Spectrophotometric observations of the light of the night sky. C. T. Elvey and (Miss) A. H. Farnsworth (*Astrophys. J.*, 1942, 96, 451—467).—Variations of intensities of lines at 5577, 6300, 6560, and 5893 Å. with zenith distance indicate a height of 500 km. for the auroral layer. Nocturnal variations of intensities were determined, and explanations suggested in the case of the Na line and the red O line (6300 Å.). The distribution of Na is exponential between 70 and 115 km.

E. R. R.

Observations of the light of the night sky with a photoelectric photometer. C. T. Elvey (*Astrophys. J.*, 1943, 97, 65—71).—Nocturnal variations include one with a min. near midnight and one in which intensity decreases throughout. Irregular variations which differ in different directions in the sky are reported. No positive results are obtained for the height of the atm., and motions of the irregular patches of light, and no relation is found between fluctuations in light and variations in the ionosphere as indicated by signal strengths of reflected radio beams.

E. R. R.

Time-lag of impulse breakdown at high pressures. J. D. Cobine and E. C. Easton (*J. Appl. Physics*, 1943, 14, 321—331).—Spark breakdown time lags are determined in N_2 at varying pressures (7—1000 lb. per sq. in.) and overvoltages 14—128% of the static breakdown voltage, for surges between Cu, Al, and Ni electrodes. Crit. pressure and overvoltage conditions, at which the lag changes abruptly from $\sim 10^{-2}$ to $\sim 10^{-5}$ — 10^{-6} sec., are found.

L. J. J.

Element 93 and its position in the periodic system. K. Starke (*Z. anorg. Chem.*, 1943, 251, 251—259).—Theoretical. Evidence for the view that element 93 has an outer electron configuration $5f6d^4 7s^2$, and represents the first of a series of "uranides" analogous to the rare earths, is discussed.

F. J. G.

Analytical chemistry of the rare earths. Average at. wt. of the rare earths in a mixture. G. L. Barthauer, R. G. Russell, and D. W. Pearce (*Ind. Eng. Chem. [Anal.]*, 1943, 15, 548—549).—The oxalate to oxide, oxalate to $KMnO_4$ method (cf. C., 1944, Part I) gives high vals. for the at. wts. of La, Nd, and Sm if the $KMnO_4$ is standardised against $Na_2C_2O_4$. The $KMnO_4$ must be standardised against a pure sample of the oxalate of the rare earth that is the most abundant constituent of any mixture under investigation.

L. S. T.

Separation of isotopes and thermal diffusion. J. Kendall (*Proc. Roy. Inst.*, 1942, 32, 296—309).—A lecture.

Applications of photographic methods to problems in nuclear physics. I (a) Determination of the energy of homogeneous groups of α -particles and protons. (b) Determination of the energy of fast neutrons. C. F. Powell (*Proc. Roy. Soc.*, 1943, A, 181, 344—359).—The relative advantages of the photographic method over the expansion chamber are discussed, and it is claimed that the advantages can be fully realised in practice.

(a) The range distribution is determined from the tracks of α -particles from Th and U. Protons are obtained by bombardment of B and Li targets with 500-kv. deuterons, and their photographically-determined range distribution is compared with results obtained with the counter method. The photographic method gives satisfactory agreement.

(b) Neutrons are obtained from Be and B by deuteron bombardment, and their energy is determined by observation of the tracks of "knocked-on" protons in the photographic emulsion. Satisfactory agreement with expansion-chamber results of other investigators is obtained. Neutrons from the transmutation of D and F are also examined.

G. D. P.

Measurement of the activity of radiosulphur in barium sulphate. R. H. Hendricks, L. C. Bryner, M. D. Thomas, and J. O. Ivie (*J. Physical Chem.*, 1943, 47, 469—473).—If pptd. $BaSO_4$ containing radioactive S is dispersed in EtOH and allowed to settle and the EtOH gently evaporated, a uniform deposit is obtained. Deposi-

tion of definite masses of ppt. on a polished brass disc and bringing the disc to a fixed position with respect to a thin counter window enables the activity of such ppts. to be measured quantitatively, very little activity being unavailable to the counter.

C. R. H.

Penetrating non-ionising cosmic rays. L. Jánossy and G. D. Rochester (*Proc. Roy. Soc.*, 1943, A, 181, 399—403).—Experiments already briefly reported (cf. A., 1942, I, 129) prove the existence of a penetrating non-ionising radiation at sea-level having a mean range of 10 cm. in Pb. It is probably the same as the radiation discovered by Rossi and Regener (A., 1941, I, 145) at 4300 m. above sea-level. The radiation may consist of neutrons.

G. D. P.

Origin of cosmic rays and duration of existence of atoms. V. G. Fesenkov and N. N. Pariiski (*Compt. rend. Acad. Sci. U.R.S.S.*, 1943, 39, 191—194).—From the intensity of cosmic rays it is calc. that the half-life of an "average atom" is $\sim 1.6 \times 10^{17}$ years.

J. J. B.

II.—MOLECULAR STRUCTURE.

Tentative identification of the Herzberg bands of O_2 in the ultra-violet spectrum of the night sky. P. Swings (*Astrophys. J.*, 1943, 97, 72—74).—The strong night-sky bands between λ 3110 and 4174 Å., including the strongest ultra-violet feature at λ 3556 Å., are identified with bands of Herzberg's system $^3\Sigma_g^- \rightarrow ^3\Sigma_g^-$, in agreement with

E. R. R.

Profiles in the alpha band of atmospheric oxygen. H. A. A. Panofsky (*Astrophys. J.*, 1943, 97, 180—185).—Seven lines were photographed with the Berkeley solar spectrograph and interferometer and their profiles measured. Consistency, and agreement of the results with theory, indicate no serious errors in the interferometric method. The total absorption coeff. of the α band, computed by two methods, was 8.7×10^4 and 9.4×10^4 per sec. per cm. of normal atm. The mean mol. diameter for collision between O_2 mols. and air mols. was estimated to be 5.15×10^{-8} cm.

E. R. R.

Resolution of the telluric bands ω_1 and ω_2 . A. Adel (*Astrophys. J.*, 1943, 97, 190—193).—The CO_2 bands ω_1 and ω_2 in the solar spectrum (20,061, 20,568 Å.) are resolved into their rotational structures, and observational data for the two branches of each band are tabulated.

E. R. R.

Absorption spectra of *o*-dichlorobenzene. K. Siddiqi (*Current Sci.*, 1943, 12, 253).—With a H_2 discharge tube as ultra-violet source, 12 absorption bands in the region 2799—2596 Å. were obtained under optimum conditions (14 mm. pressure and 24°). Data for λ and ν are tabulated.

N. M. B.

Complete analysis of absorption spectra. VI. Physico-chemical properties of the chromophoric naphthalene nucleus. E. Hertel (*Z. Elektrochem.*, 1941, 47, 813—819; cf. A., 1943, I, 296).—The absorption spectra of the following compounds have been determined over the range 15,000—40,000 cm^{-1} : α - and β - $C_{10}H_7NH_2$, 1- and 2- $C_{10}H_7NO_2$, β - $C_{10}H_7OH$, 1:2, 1:4, 1:5, and 1:8- $C_{10}H_6(NH_2)_2$, *o*- and *p*- $NO_2C_6H_4NH_2$, 1:2, 6:2, 8:2, 1:4, 2:1, and 5:1- $NO_2C_{10}H_6NH_2$, and 1:5- and 1:8- $C_{10}H_6(NO_2)_2$. The dipole moments of some of these compounds, together with some others, have been determined or re-determined. The relationship between absorption spectra and dipole moments is discussed. If two groups are substituted in the same nucleus of $C_{10}H_8$, the effect on absorption spectrum and dipole moment is very similar to that produced in C_6H_6 . If two similar substituents are introduced into different nuclei, the absorption spectrum is additive but distorted. With two dissimilar substituents in different nuclei, there is a small displacement of the absorption range if the varichrome activity of the substituents is small. If it is greater, the long- λ absorption range is displaced far into the visible. The effect on colour of introducing NO_2 in different positions of *p*-dimethylaminobenzene-1-azonaphthalene has been investigated by means of absorption spectra.

[A. J. M.]

Absorption spectrum of luciferin and oxidised luciferin.—See A., 1944, III, 138.

Preparation and absorption spectra of five pure carotene pigments.—See A., 1944, II, 74.

Special characteristics and configurations of stereoisomeric carotenoids including polyycopene and pro- γ -carotene.—See A., 1944, II, 40.

Colour matching.—See B., 1944, II, 41.

Chemistry of sulphur. I. Raman spectrum and constitution of hydrogen disulphide. F. Feher and (Frl.) M. Baudier (*Z. Elektrochem.*, 1941, 47, 844—848).—The Raman spectrum of carefully purified H_2S_2 corresponds completely with that of H_2O_2 , and the constitution of the two mols. is therefore similar. An assignment of frequencies to S-S and H-S linkings is made.

A. J. M.

Ultra-violet luminescence of crystals of alkali halides activated by heavy metals. A. M. Polonski (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 543—545).—The position, form, and intensity of the ultra-

violet luminescence bands of alkali halides containing Cu, Ni, and Ag ions are investigated, rock-salt and artificial KCl, NaBr, and RbCl crystals being used. The introduction of Cu⁺⁺ or Ni⁺⁺ into the lattice of NaCl and KCl does not affect the position and form of the fluorescence bands of crystals coloured by X-rays. The introduction of Ag⁺ on the other hand, gives a very intense ultra-violet luminescence, the bands of which agree with the radiation from the unactivated crystals. NaCl and KCl, activated by Ag⁺, also show an intense ultra-violet phosphorescence. NaBr and RbCl, which, in the pure state, show no ultra-violet luminescence, give a very intense one on introduction of Ag⁺. A. J. M.

Electrical moment of metallo-organic compounds. II. Silicon triethyl and triphenyl hydroxide; silicon triethyl chloride and oxide. L. Malatesta and R. Pizzotti (*Gazzetta*, 1943, **73**, 143—148).—The electrical moments of SiEt₃Cl, SiEt₃OH, (SiEt₃)₂O, and SiPh₃OH are slightly < the moments of the corresponding C compounds. This is attributed chiefly to the capacity of the Si atom to take up > eight electrons in the outer shell. J. F. M.

Nature of molten salts.—See A., 1944, I, 63.

Dielectric properties of Buna synthetic rubbers.—See B., 1944, II, 55.

Influence of thin dielectric films on the magneto-optical Kerr effect in ferromagnetic mirrors. M. M. Noskov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **81**, 111—112).—Films of nitrocellulose, bakelite, or paraffin oil on Ni, permalloy, or Fe increase the magnetic rotation effect to a max. of ~100%, followed by a decrease with increasing film thickness. The field-dependence of the increased effect follows the change of the normal effect in a magnetic field, reaching saturation at the same val. of the field. Explanations are discussed. N. M. B.

Physical properties of *l*(+)- and *d*(-)-alanine.—See A., 1944, II, 35.

Rotatory dispersion of α -amino-acids.—See A., 1944, II, 70.

Constitution of glass. B. Schweig (*Glass*, 1943, **20**, 173—174, 200—202, 227—229, 236, 257—259, 285—287, 313—314, 318; 1944, **21**, 7—11).—A review of at. structure leading to the appraisal of glass-forming and glass-stabilising anions and cations in terms of their ionic potentials (*i.e.*, valency/ionic radius) and their ρ -vals. (*i.e.*, ionic radius/at. radius). On the basis of the σ -val. (*i.e.*, valency of cation \times (radius of anion)^{1/2}/valency of anion \times (radius of cation)^{1/2}), the various oxides fall uniformly into groups of glass formers, stabilisers, and modifiers, without the overlapping of the group σ -vals. The theories of the structure of the glassy state are briefly described. J. A. S.

Effect of resonance on the force constants and lengths of chemical bonds. E. Warhurst (*Trans. Faraday Soc.*, 1944, **40**, 26—39).—An equation is derived showing the effect of resonance on bond length, and is applied to resonance between covalent single and double bonds, and to that between covalent and ionic bonds. A second equation shows how the bond force const. is affected by resonance, and is used to explain the decrease in vibration frequency observed when certain gases are liquefied or dissolved in non-ionising solvents. For HCl, HBr, HI, and H₂ the calc. magnitudes of this effect agree with experimental data. F. L. U.

Molecular wave functions for lithium. C. A. Coulson and W. E. Duncanson (*Proc. Roy. Soc.*, 1943, **A**, **181**, 378—386).—The method of mol. orbitals is applied to the discussion of the ground state of Li₂. The final energy val. has an error of ~1.3%. The changes in screening consts. in passing from at. to mol. states are discussed and empirical rules deduced. G. D. P.

Application of Polya's theorem to optical, geometrical, and structural isomerism. W. J. Taylor (*J. Chem. Physics*, 1943, **11**, 532).—The applications described by Hill (A., 1943, I, 220) can be extended. The result of the calculations of the nos. of three types of isomerides of cyclopropane is given as an example. L. J. J.

Physical properties and chemical constitution. VIII. Alkyl chlorides, bromides, and iodides. A. I. Vogel (*J.C.S.*, 1943, 636—647; cf. A., 1943, I, 117).—*n* has been determined for a wide range of alkyl chlorides, bromides, and iodides, for the C, D, F, and G' lines, at 20.0°. γ and ρ have also been determined, over a range of temp.; [R] and parachors have been calc., and the CH₃ differences evaluated from the results for *n*-halides. The CH₃ difference in parachors is 40.10 from the data for chlorides, 40.02 for bromides, and 39.98 for iodides, differing somewhat from the accepted val. (39.0). A. J. M.

Surface tension of white phosphorus.—See A., 1944, I, 12.

Surface energy and heat of vaporisation.—See A., 1944, I, 12.

III.—CRYSTAL STRUCTURE.

Structure of electrodeposited chromium. W. Hume-Rothery and M. R. J. Wyllie (*Proc. Roy. Soc.*, 1943, **A**, **181**, 331—344).—The appearance and crystal orientation of electrodeposited Cr are c 2 (A, 1.)

studied with c.d. of 50—3000 amp. per sq. ft. in the temp. range 12—85°. In the brightest deposits a (111) plane is parallel to the surface. The residual stress in the deposit is least when the brightness and preferred orientation are greatest; the hardness is also max. for these deposits. G. D. P.

Reflexion of X-rays from the "anti-phase nuclei" of AuCu₃. A. J. C. Wilson (*Proc. Roy. Soc.*, 1943, **A**, **181**, 360—368).—The superlattice lines in the X-ray spectra of AuCu₃ are not always sharp; the breadth depends on the indices of the line. The effect is due to the way in which the superlattice is organised in different parts of the crystal. Calculations are made of the line broadening to be expected on five assumptions regarding the way in which the nuclei "change step." Closest agreement with observations is given by a manner of "changing step" in which Au atoms avoid one another. G. D. P.

X-Ray study of the dissociation of an alloy of copper, iron, and nickel. (Miss) V. Daniel and H. Lipson (*Proc. Roy. Soc.*, 1943, **A**, **181**, 368—378).—Unusual diffraction effects are observed when the alloy Cu₂FeNi₃ is in process of dissociating into two face-centred cubic structures. Each line in the spectrum is accompanied by side bands. Although complete agreement with theory is not obtained it appears that the cubic lattice is deformed by segregation of the atoms in the early stages of the dissociation. The segregation occurs with a periodicity of ~50 unit cells, so that a modulation of the structure is produced. The changes which the alloy undergoes will probably elucidate the mechanism of dissociation in alloys in general. G. D. P.

Crystal chemistry of alloys. U. Dehlinger and G. E. R. Schulze (*Z. Metallk.*, 1941, **33**, 157—160).—In metallic compounds in which the valencies are not fully saturated each metallic bond between two atoms corresponds with a definite energy of formation, and hence an increase in the co-ordination no. of the lattice implies a greater heat of formation and therefore greater thermal stability. This principle explains the composition, structure, and stability of CuMg₂ and MgZn₂-type phases, the structure of AlB₂, CuAl₂, and similar compounds, and the preference of heteropolar metallic compounds for the composition AB and a body-centred cubic structure; the electrical conductivity of the AB type of metal compounds shows that an equally strong metallic bond is superimposed on the heteropolar bond. A. R. P.

X-Ray diffraction studies on precipitated cuprous and cupric sulphides. H. B. Weiser, W. O. Milligan, and J. M. Marshall, jun. (*J. Physical Chem.*, 1943, **47**, 496—501).—Cu₂S prepared by pptn. with H₂S from solutions of Cu₂Cl₂, and CuS similarly prepared from solutions of CuCl₂, give chalcocite and covellite X-ray diffraction patterns, respectively. Copptd. sulphides give both patterns, with no indication of the presence of digenite. Ageing the ppts. under H₂O at room temp. has little effect, except to form traces of CuSO₄·5H₂O if air has not been excluded. Ageing at 90° increases the primary particle size. C. R. H.

Crystalline structure of zinc cyanide. H. S. Shdanov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **31**, 352—354).—The lattice is cubic, *a* 5.80 Å.; 2 mols. per unit cell; space-group *T*_h².

Crystal structure of silver oxalate. R. L. Griffith (*J. Chem. Physics*, 1943, **11**, 499—505).—X-Ray diffraction data show that Ag₂C₂O₄ crystals are monoclinic, with the space-group *P*₂/C—*C*_{2h}. The unit cell has *a* 3.46 ± 0.02, *b* 6.16 ± 0.02, *c* 9.47 ± 0.04 Å., β 76 ± 1°, with 2 mols. of Ag₂C₂O₄. All atoms are in sets of fourfold general positions. The structure can be considered as an assemblage of chain mols., (Ag₂C₂O₄)_n, parallel to the *b* axis, held together by Ag—O linkings. The α , γ , and z parameters found for the atoms are, respectively: Ag 0.145, 0.495, 0.156; C —0.070, 0.115, —0.012; O¹ 0.163, 0.216, —0.110; O² —0.163, 0.187, 0.100. L. J. J.

Crystal structure of braunite.—See A., 1944, I, 72.

Morphology of the finest lead oxide sublimates. III, IV. R. Meldau and M. Teichmüller (*Z. Elektrochem.*, 1941, **47**, 630—634, 634—636).—III. Very fine PbO sublimates dissolve in H₂O at room temp. and deposit hexagonal crystals of Pb(OH)₂. Electron-micrographs of salmon-coloured PbO show the frequent occurrence of crystals closely resembling those of Pb₃O₄.

IV. Very fine PbO₂ sublimates are unaffected by H₂O. They have a large sp. surface with only traces of cryst. structure. Very fine Pb sublimates slowly oxidise in air at room temp. to PbO in the form of pseudomorphs of the original Pb crystals. Sublimates having the approx. composition Pb₂O show crystal angles resembling those of Pb and PbO; there is no evidence for the existence of Pb₂O. F. J. G.

Relations between silicates, phosphates, and sulphates. R. Klement (*Z. Elektrochem.*, 1941, **47**, 843—844).—The isotypy and isomerism occurring among silicates, phosphates, and sulphates is discussed with special reference to the compounds Na₂Ca₂(SO₄)₂F₂, K₂Ca₂SiP₂O₁₂, Ca₂Si₂P₂O₂₀, and Na₂Ca₂S₂O₂₀. From analogy with the isotypy of titanite, CaTi(SiO₄/O), and tilasite, MgCa[AsO₄/F],

it is assumed that isotopy also exists between disthene, $\text{AlAl}[\text{SiO}_4/\text{O}]$ (triclinic), and amblygonite, $\text{LiAl}[\text{PO}_4/\text{F}]$ (triclinic). The powder diagrams of the last two show some similarities. A. J. M.

Crystal structure of ethylene. C. W. Bunn (*Trans. Faraday Soc.*, 1944, 40, 23—25).—Reconsideration of published data leads to the following details for the structure of solid C_2H_4 : unit cell orthorhombic, a 4.87, b 6.46, c 4.14 Å. Space-group $Pnmm$ (D_{2h}^{12}). Coordinates of C atoms: (1) $xy0$; (2) $\bar{xy}0$; (3) $\frac{1}{2}-x, \frac{1}{2}+y, \frac{1}{2}$; (4) $\frac{1}{2}+x, \frac{1}{2}-y, \frac{1}{2}$, where $x=0.11a$ and $y=0.06b$. The interat. distances agree with those found in related substances. F. L. U.

Diffraction of X-rays by sodium laurate and sodium palmitate at higher temperatures. O. E. A. Bolduan, J. W. McBain, and S. Ross (*J. Physical Chem.*, 1943, 47, 528—535).—Fibre photographs of the supercurd, subwaxy, and waxy cryst. phases of Na laurate (I) and palmitate (II) obtained over the range 25—155° show that the three phases are respectively stable at the following approx. temp.: (I) 85°, 112°, 153°; (II) 85°, 120°, 155°. The existence of the transition curd \rightleftharpoons supercurd at $\sim 70^\circ$ for (I) is indicated.

C. R. H.
Structure and thermal properties of crystals. V. Thermal expansion of phthalocyanines and porphins. A. R. Ubbelohde and (Miss) I. Woodward (*Proc. Roy. Soc.*, 1943, A, 181, 415—427).—H. Pt. and Cu phthalocyanines are investigated by X-ray methods at 90—600° K. The thermal mol. movements in the crystals are calc. Apparatus, including a new design of furnace for use with X-ray cameras and single crystals, is described. G. D. P.

Diamond. (Sir) R. Robertson (*Chem. and Ind.*, 1944, 18—24).—Jubilee memorial lecture.

Change of colour and optical properties of beryls on heating.—See A., 1944, I, 71.

Development of stresses in the bonding of single crystals and polycrystalline metals. U. Dehlinger, A. Kochendörfer, H. Held, and E. Lörcher (*Z. Metallk.*, 1941, 33, 233—235).—The load-bending curve for Zn single crystals shows a well-marked point of inflexion; this behaviour may be explained by assuming that flow begins in the outer layers immediately the normal elastic limit is reached, but proceeds unchecked only after application of a greater bending moment. Al single crystals behave similarly, but the point of inflexion is less marked and the bending moment required to cause plastic deformation is \ll for Zn. Polycryst. Al, Cu, and steel behave similarly when the yield point is exceeded. A. R. P.

Orientation of grains of recrystallisation in zinc crystals. V. A. Solotov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1943, 39, 186—190).—When plates from a single crystal of Zn are bent so as to induce twinning, and then annealed at 350°, the preferred orientation of the new crystal grains agrees with that of the twinning axis. Single Zn crystals bent and heated at 350° show a strong recrystallisation, but it is much reduced if the bent crystals are first kept at 150° and then annealed at 350°. J. J. B.

Vitreous state. Semiquantitative considerations. M. L. Huggins (*J. Physical Chem.*, 1943, 47, 502—511).—Theoretical. Equilibrium between cryst. and non-cryst. conditions in a solid or liquid and the rate of attaining equilibrium are considered as functions of net energy changes for small internal structural rearrangements, of the activation energies of such rearrangements, and of temp. Annealing, devitrification, and stability of vitreous substances are considered from this viewpoint. Slow cooling through all crit. regions of structural change is essential for max. stability. Rapid cooling results in the "freezing-in" of some relatively unstable at. distributions which will cause strains and inhomogeneities, and which may not resolve into a stable structure for a very long time. C. R. H.

Theory of elastic properties of rubber.—See B., 1944, II, 54.

IV.—PHYSICAL PROPERTIES OF SUBSTANCES.

Mol. wt. and composition of high polymers.—See B., 1944, II, 55.

Magnetic properties of crystalline horse-radish peroxidase and its derivatives.—See A., 1944, III, 138.

Absorption of ultrasonic waves in viscous liquids. P. A. Bashulin (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 81, 113—116).—For not too viscous liquids, discrepancies between experimental absorption- ν vals. and those calc. by Stokes' formula taking account only of the normal η coeff. can be explained with the help of the second η' coeff. regarding viscosity as a relaxation phenomenon. Absorption measurements for ultrasonic waves in glycerol containing 50% of H_2O and in castor oil show in the former case fair agreement, and in the latter case wide divergence from calc. vals. Explanations in terms of relaxation theory are discussed. N. M. B.

Specific heat of carbon dioxide. C. S. Venkateswaran (*Current Sci.*, 1943, 12, 252—253).—The intense sharp Raman line at 58 cm^{-1} for solid CO_2 is attributed to coherent rotational oscillations of mols. in the crystal lattice. This is supported by application of the

Raman theory of sp. heat; the vals. for C_p calc. for the range 15—100° K. from frequencies corr. for low temp. are in close agreement with observed vals., showing that the Raman theory is applicable to mol. compounds. N. M. B.

Thermal behaviour of micro- and macro-molecular substances and its modification. K. Ueberreiter (*Kolloid-Z.*, 1943, 102, 272—291).—The properties of a substance in any state of aggregation are determined by the freedom of motion of its mols. In liquids the thermal energy of mols. is sufficient to overcome the potential barriers surrounding them. In cryst. solids the potential barriers are all of similar magnitude; in amorphous bodies they differ, hence the melting process is not sharp, and a place-exchange occurs below the m.p., resulting in increased orientation. The f.p. of amorphous bodies is determined experimentally as the point of intersection of sp. vol.-temp. curves for solid and liquid. In a macromol. liquid the chain members are more strongly influenced by their neighbours in the same chain than by those in other chains. The relative magnitudes of inter- and intra-mol. forces determine whether chains move as a whole, or whether chain units move relatively to one another. The relation of chain length to f.p. shows that large mols. must be subdivided into small kinetic units having varying degrees of thermal agitation. The state in which the kinetic energy is distributed among chain members but not whole mols. is described as a liquid with fixed structure (I). Its range of existence is greater the greater is the chain length. Macromol. substances are classified according to their thermal properties into (i) rubber-like polymers, with weak intramol. forces and wide temp. range of (I), (ii) thermoplastics, with smaller and higher temp. range of (I), and (iii) non-softening polymers, with small or no range of (I). Intramol. movement is limited by electrostatic forces, and modification of physical properties necessitates modification of electric moments, especially of side-groups or chains. E.g., chlorination of polyvinyl chloride or replacement of Cl by ester groups lowers the f.p. by compensation or reduction of dipole moments. Internal mobility may be increased or decreased by netting of chains, according to its effect on the dipoles. External plasticisers reduce intramol. forces and so increase the mobility of chain members. R. H. F.

Viscosities and rheochors of nitric acid, nitro-paraffins and their isomeric nitrites. J. N. Friend and W. D. Hargreaves (*Phil. Mag.*, 1944, [vii], 34, 810—816).—Measurements of ρ and η for HNO_3 and the first six nitro-paraffins and their isomeric nitrites (except $\text{MeO}\cdot\text{NO}$) lead to vals. of the rheochors (R). Using previously determined vals. for C, O, and H, R can be calc. for NO_2 and $\text{O}\cdot\text{NO}$. The effect of the co-ordinate bond is to decrease R from a mean val. 39.3 to 38.9. For HNO_3 the measured R is in agreement with the val. calc. on the assumption that the NO_2 group is not dissociated. H. J. W.

Structure mechanics of viscous elastic systems. VI. Viscosity and chemical constitution of micromolecular systems. H. Umstätter (*Kolloid-Z.*, 1943, 102, 232—245).—By substitution of the time parameter in the Maxwell elasticity law by the corresponding quantity in Newton's law of cooling, an equation connecting viscosity and temp. at const. vol. is obtained. The integration limits are the upper and lower crit. temp., the latter corresponding with that temp. at which the liquid no longer flows but breaks, and the transition from solid to liquid occurs without heat intake. From the surface tension (γ) and the shearing elasticity (E), calc. from the deduced equations, the linear dimensions of micromols. can be calc. from $r=2\gamma/E$ to 0.75 Å. or better. The relaxation time (τ) can be calc. from γ and the abs. mol. wt. (m) from $\tau^2=m/2\gamma$. Compounds with approx. equal r -vals. dissolve each other well. Mol. cohesions can be compounded additively at corresponding temp., as is shown at half the crit. temp. From measurements of mol. refraction, the "mean" formulæ (in terms of no. of double bonds and rings) of a series of technical hydrocarbon mixtures are determined. J. F. H.

V.—SOLUTIONS, DISPERSIONS, AND MIXTURES.

Viscosity of normal paraffin solutions. Viscosity and structural relations of linear polymers. A. R. Kemp and H. Peters (*Ind. Eng. Chem.*, 1943, 35, 1108—1112).—The viscosities (η) of solutions of n -paraffins from $\text{C}_{10}\text{H}_{22}$ to $\text{C}_{28}\text{H}_{58}$ in C_6H_6 , CCl_4 , $n\text{-C}_8\text{H}_{18}$, CHCl_3 , and cyclohexane have been measured at 20°. Only in C_6H_6 is the sp. $\eta \propto$ the length of the C chain, as demanded by the Staudinger relation. Consideration of the contribution to the η of chain atoms has led to the development of a new η const. $K_{ca} = \log \eta W / \Phi N$ (W = proportional wt. of chain atoms in repeating unit to base mol. wt., Φ = vol. concn., N = no. of C atoms in the chain). Vals. for K_{ca} lie between 0.030 and 0.038 (mean 0.032) and use of the mean val. permits calculation of chain length in polymers. The η of solutions of stearic and palmitic acids in $n\text{-C}_8\text{H}_{18}$ indicates that they exist as double mols. whereas their esters occur as single mols. J. W. S.

Changes in an osmotic system during freezing. G. Galos (*Bio-dynamica*, 1941, 3, 209—216).—When a Cellophane bag containing

sucrose solution was immersed in the same sucrose solution and the outer solution frozen, H_2O passed from the inner to the outer solution during the freezing. L. G. G. W.

Dielectric constant of mixed systems. R. Vieweg and T. Gast (*Z. tech. Physik*, 1943, 24, 56—62).—Parameters in the formulae for ϵ of two-phase mixed systems are evaluated by measurements in systems in which one phase is invariable in distribution and properties while the ϵ of the other is varied. This effect is produced by compression of air in the interstices of a porous mass. The ϵ of a material in powder form can be determined in this way. L. J. J.

Structural mechanics of viscous-elastic continua. VIII. Kinetics of aggregation of molecular disperse systems. H. Umstätter (*Kolloid-Z.*, 1943, 103, 150—159).—The variation of results obtained from mol. wt. determinations of substances of high mol. wt. in solution is due to the presence of groups capable of free rotation, which can behave as if they were dissociated from the mol. On the other hand, strongly unbalanced mols. can aggregate on account of the compensation of their intramolecular energy differences, thus behaving kinetically as if they were associated. The viscous properties of solutions are more often due to aggregates than to the mols. themselves. A. J. M.

Fluidity of electrolytes. II. E. C. Bingham and R. T. Foley (*J. Physical Chem.*, 1943, 47, 511—527).—Available data on the η of mixtures of electrolytes have been examined. Better agreement between observed and calc. vals. is obtained if it is assumed that fluidities and not η are additive. Fluidity data for mixtures of $N-KCl$ and $-NaCl$ at 25°, $N-NaNO_3$ and $-KNO_3$ at 10°, 20°, and 30°, and 0.05N-LiF and $-KI$ at 25° are tabulated. A new determination of the ionic fluidity elevation of Pb shows that the positive val. calc. from Grüneisen's data (cf. *ibid.*, 1941, 45, 885) is incorrect, the correct val. being —28.2. C. R. H.

Anion rotation in crystal lattices of A_2BX_3 compounds. M. A. Bredig (*J. Physical Chem.*, 1943, 47, 587—590).—The existence of a thermal effect without a change in crystal symmetry, which has been observed in solid solutions of Na_2SO_4 and K_2SO_4 , is ascribed to a second-order transition from oscillation to rotation of the SO_4^{2-} anions at high temp. C. R. H.

Standard nomenclature of magnesium alloy microstructures. A. Fisher (*Magnesium Rev.*, 1943, 3, 31—38).—In the system of nomenclature adopted, the names given to the different types of structure are those used to describe similar structures in steel. Typical photomicrographs are given. C. E. H.

Orientation of precipitated beta phase in relation to that of parent alpha grain in Elektron AZ 91. E. Lardner and J. Nelson (*Magnesium Rev.*, 1943, 3, 39—41).—From X-ray and microscopical evidence, it is concluded that the thin plates of β , pptd. from the super-saturated solid solution of Al in Mg on ageing above 200°, lie flat on the basal planes (0001) of the α grains. C. E. H.

Constitution of the lead-antimony and lead-antimony-silver systems. B. Blumenthal (*Amer. Inst. Min. Met. Eng.*, 1943, *Tech. Publ.*, 1634, 11 pp.; *Met. Tech.*, 1943, 10, No. 6).—The solidification of Pb-Sb alloys was studied by thermal analysis, cooling rapidly at 12—18° per min., and stirring vigorously. Supercooling was observed with hypereutectic alloys and could not be entirely prevented even by vigorous stirring at slow rates of cooling. The eutectic is placed at 252° with 11.1% of Sb. Supercooling was also observed in Pb-Sb-Ag alloys. This system has a ternary eutectic with 11.4% of Sb and 1.4% of Ag at 244.7° \pm 0.5°. Invariant equilibria are assumed to exist at 272° and 297°. J. C. C.

Nickel-molybdenum system. F. H. Ellinger (*Trans. Amer. Soc. Met.*, 1942, 30, 607—638).—The constitutional diagram was determined from metallographic and X-ray data, using alloys made by sintering or melting briquetted mixtures of H_2 -reduced powders in H_2 . A eutectic occurs between Ni-rich α solid solution and the δ phase ($NiMo$) at 1320° with 46.5% of Mo; δ (62.5% of Mo) is formed from Mo-rich ϵ solid solution by a peritectic reaction at 1370°. At 1370°, ϵ dissolves 0.9% of Ni. At 1320°, α dissolves 37% of Mo, the solubility falling to 30% at 890° (when a peritectoid reaction occurs with the formation of γ , Ni_3Mo), to 23% at 840° (when another peritectoid reaction produces β , Ni_2Mo), and to 20.5% at 600°. Alloys with 21 to 35% of Mo, quenched from 1300°, age-harden on heating at 600—800°. J. C. C.

Magnetic investigations in the ternary system, aluminium-chromium-copper. A. Knappwost and H. Nowotny (*Z. Metallk.*, 1941, 33, 153—157).—Alloys of the ternary system with >30% Al were examined by X-ray, magnetic and micrographic methods. Al dissolves 3.1% of Cr at 600°. With more Cr the compound Al_2Cr separates, but with 30—50 at.-% of Cr a body-centred cubic phase with superlattice is formed; this phase has a 3.035—3.000 Å. In the ternary system no ternary compounds are formed but the γ Cr-rich solid solution dissolves a max. of 10 at.-% of Cu and the γ Cu-rich solid solution only a small amount of Cr. The ternary diagram contains two broad ternary fields: $Al_2Cu + Al_2Cr + \gamma$, and

$Al_2Cu + \gamma + \gamma'$, a broad binary field of $\gamma + \gamma'$, and two narrow binary fields: $Al_2Cu + Al_2Cr$ and $Al_2Cu + \gamma$. Al_2Cu is non-magnetic, the γ' phase is strongly diamagnetic, and the other phases are paramagnetic. A. R. P.

New temperature-sensitive magnetic alloy. F. W. Ackermann (*Z. tech. Physik*, 1943, 24, 45—46).—Magnetic properties of materials can be made dependent on temp. by utilising the effect of internal mechanical stresses, e.g., a material for which μ increases with temperature can be made from a Ni-invar bimetallic strip in which deformation with change of temp. is prevented. This has μ increasing approx. linearly from 7 at —100° to 31 at 100° at 3 oersteds. L. J. J.

X-Ray study of the hysteresis effect observed in the palladium-hydrogen system. E. A. Owen and E. St. J. Williams (*Proc. Physical Soc.*, 1944, 56, 52—63; cf. A., 1937, I, 560).—Investigations in the range 60—130° of the hysteresis effect observed when the pressure is varied show definite relations between the temp. and certain critical values of the pressure connected with the appearance and disappearance of the two phases present in the system. The α -phase lines in the structure spectra were initially sharp, but, on reappearance of the phase with decreasing gas pressure, were diffuse; the β -phase lines were always diffuse. N. M. B.

Correlating adsorption data. D. F. Othmer and F. G. Sawyer (*Ind. Eng. Chem.*, 1943, 35, 1269—1276).—Plots of equilibrium v.p. of adsorbed substances against concn. (Freundlich isotherms) are not straight lines, even on a logarithmic plotting. They may be replaced by plotting equilibrium pressure against normal v.p. of the same or a similar substance in accordance with the Dühring system, but using a logarithmic plot. In general the new relationship is expressed by a straight line or by two intersecting lines indicating a change of state at the intersection. By suitable choice of a reference substance, plots may be continued beyond the critical point of the adsorbed material. From the slope of the lines (isosteres) a measure of the instantaneous heat of adsorption may be obtained, and shown to agree with experimental vals. F. Rb.

Adsorption of vitamin-C. A. Kuhn and H. Gerhard (*Kolloid-Z.*, 1943, 103, 130—135).—Untreated C adsorbs ascorbic acid (I) with simultaneous oxidation. The adsorption does not follow Boedecker's adsorption formula, $x = K(C-x)^n$, where C = initial concn., x = mass adsorbed, K and n are consts. Pre-treatment of the C with reducing agents (Na_2S , $Na_2S_2O_4$, etc.) reduces the extent of oxidation considerably. The presence of Fe in the C is less important. Boedecker's formula holds for (I) and dehydroascorbic acid when the C has been treated as above. Floridin, bentonite, and frankonite adsorb very little (I) from HPO_3 solution, and there is some oxidation. Fuller's earth adsorbs somewhat, without oxidation. A. J. M.

Surface tension of n -heptane and n -butane containing dissolved nitrogen. G. J. Reno and D. L. Katz (*Ind. Eng. Chem.*, 1943, 35, 1091—1093).—The surface tensions of $n-C_7H_{16}$ and $n-C_4H_{10}$ saturated with N_2 at 200, 500, and 1000 lb. per sq. in. pressure have been measured at 25°. Measurements with C_7H_{16} solutions were also made at 55° and 85°. From the results it is inferred that the parachor [P] of N_2 in $n-C_4H_{10}$ is 60, in accord with the val. for liquid N_2 , but that when dissolved in C_7H_{16} [P] = 41. J. W. S.

Surface tension of sodium soap dispersions in mineral oils. W. Gallay and I. E. Puddington (*Canad. J. Res.*, 1943, 21, B, 225—229).—Addition of Na oleate (I) and Na stearate (II) to mineral oils does not affect the surface tension (γ) until a certain temp. is reached [greater for (I) than for (II) in the same polar oil], when they cause a sharp decrease. The decrease for a polar is > that for a non-polar oil, and addition of glycerol (III) as well as the soap causes a greater decrease but it occurs at the same temp. The γ -temp. relation is linear in all cases and the additions do not affect the temp. coeff. In the polar oil, additions of excess of fatty acids and alkali as well as (II) act similarly to (III) but the alkali raises the temp. at which γ decreases. The effects are related to the physical state of the soap in the dispersions (cf. A., 1944, I, 32). J. H. Ba.

Wetting power in sodium soap-mineral oil systems. W. Gallay, I. E. Puddington, and J. S. Tapp (*Canad. J. Res.*, 1943, 21, B, 230—235).—The contact angle of mineral oils on Na stearate (I) and oleate (II) is independent of the viscosity index of the oil but is the less the smaller is its viscosity. In general the angle at (I) is < at (II). Oils of low viscosity index show a lower interfacial tension against H_2O and greater emulsion stability. The presence of glycerol (III) on the surfaces increases the spreading of the oil, and in (III)-soap gels the oil will displace the (III) to a certain extent. Such a displacement occurs in industrial soap-base lubricating greases, (III) existing as droplets in the oil. J. H. Ba.

Pseudo-optics in capillary phenomena. R. E. Liesegang (*Kolloid-Z.*, 1943, 103, 95—96).—When dye solutions are allowed to rise in paper through capillary action patterns are formed by the pptd. dye. If barriers, in the form of cuts in the paper, are put in the path of the capillary rise, patterns resembling optical patterns are obtained. Coloured photographs are given. A. J. M.

Movement phenomena in the precipitation of dissolved substances of high mol. wt. F. H. Müller (*Kolloid-Z.*, 1943, 103, 144—145).—If a drop of fairly dil. solution of polystyrene in $C_6H_{11}OAc$ is dropped on to H_2O , it immediately spreads out, forming a thin film, but after a short time circular movements take place, and the film suddenly contracts considerably with crinkling. For conc. solutions the crinkling takes place more slowly. Phenomena of a similar kind with other substances are described. They are unaffected by impurities on the surface, or in the bulk of the H_2O . The effect is modified when the solution is poured on to a glass surface. An explanation involving orientation of the polystyrene chains is given. A. J. M.

Structure of collodion membrane and its electrical behaviour. VII. **Water uptake and swelling of collodion membranes in water and solutions of strong inorganic electrolytes.** C. W. Carr and K. Sollner (*J. Gen. Physiol.*, 1943, 27, 77—89; cf. A., 1943, I, 180).—Dried collodion (I) membranes swell reversibly when placed in H_2O to an extent varying from 5 to 11% according to the brand of (I). The uptake of H_2O and swelling of oxidised (I) are the same as those of the original unoxidised (I), and hence the CO_2H that are introduced in the oxidation have no detectable effect on swelling. There is a very small negative temp. coeff. of swelling, and swelling at 50° is $\sim 13\%$ < at 3° . The uptake of H_2O as determined by increase in wt. is > can be accounted for by the increase in vol., and swelling accounts for only 60—70% of the H_2O taken up by the membrane. When " H_2O -wetted dried" (I) membranes are transferred from H_2O to solutions of strong electrolytes there is no detectable change in vol., and under similar conditions there is no significant change in vol. with "porous" membranes. When dried (I) membranes swell in H_2O some of the H_2O becomes "bound" and both intra- and inter-micellar swelling seem to occur, and hence neither the increase in wt. or in vol. nor their difference is a measure of the true pore space of the membrane. It is concluded that the abs. H_2O content is not so important as the proportion of H_2O in the H_2O -wet membranes that is available in useful ways for the different solutes. J. N. A.

Capillary activity and colloidal gas. R. Auerbach (*Kolloid-Z.*, 1943, 103, 136—137).—The effect of capillary-active substances on changes of state of gas dispersions has been investigated. Such substances (e.g., $iso-C_6H_{11}OH$) favour the formation of colloidal gases, and prevent their coagulation or dissolution. A. J. M.

Results of aerosol research in science and technology 1932—1942. I, II. K. A. G. Meyer (*Kolloid-Z.*, 1943, 102, 293—298; 103, 65—71).—A short review covering the more academic aspects of the work. The subjects discussed include terminology, prep., stabilisation, measurement of particle size, coagulation by ultrasonic waves, filtration, and adsorption. J. F. H.

Ionic exchange in colloid sulphur. I. E. O. K. Verstraete (*Kolloid-Z.*, 1943, 102, 251—267).—A preliminary investigation of the prep. and conditions of stability of S sols. Both Raffio and Selmi sols were used. The two sols are similar. A method is described for the determination of the polythionic acids present (both as free acid and as salts), which enables the process of ageing to be investigated. The degree of dispersion of the S sols was also determined. The coagulation vals. (C.V.) of $LiCl$, HCl , $NaCl$, $MgCl_2$, $CaCl_2$, $SrCl_2$, $BaCl_2$, $Al(NO_3)_3$, $Th(NO_3)_4$, and hexol nitrate for the Selmi sol were determined (order of decreasing C.V.). For anions the order of decreasing C.V. is $S_2O_3^{2-}$, SO_4^{2-} , ClO_3^- , Cl^- , NO_3^- , CO_3^{2-} . Dilution of the sol leads to greater C.V., which is not in agreement with previous authors. H_2S decreases the stability of the sols. It shows a characteristic influence on the C.V.; in general the univalent metals are unaffected, for 2- and 4-valent metals the C.V. decreased, for Al and K increased. H^+ ions lower the charge on the S, whilst OH^- ions cause a slight initial rise in the electrokinetic potential up to neutralisation. Na^+ depresses the ζ -potential and the sol is discharged long before it is pptd. The appearance of the coagel and the reversibility or irreversibility of the coagulation caused by various cations were investigated. J. F. H.

Study of dispersed systems by progressive desiccation. J. V. Rubio and M. Amat (*Anal. fis. quim.*, 1943, 39, 332—350).—Two varieties of $Cr(OH)_3$ peptised by ClO_4^- are partly separated by ultrafiltration into two parts which behave differently on progressive desiccation. F. R. G.

Recognition of various types of bentonite. H. Erbring and H. Lehmann (*Kolloid-Z.*, 1943, 103, 126—129).—The η of suspensions of 3 bentonites (from U.S.A., Italy, and Germany) in cyclohexanol has been determined by a rotation viscometer. The η -concn. curves of the U.S.A. and German specimens lie very close together, but the η of the Italian bentonite is > that of the other suspensions at the same concn. The method may be used for identification. A. J. M.

Effect of concentration and pH on the viscous and electrochemical properties of hydrogen bentonites. J. N. Mukherjee, N. C. Sen Gupta, and M. K. Indra (*J. Physical Chem.*, 1943, 47, 553—577).—The sp. conductivity of dil. suspensions of H bentonites increases linearly with concn. (C) except at high C when it increases much

more rapidly. The equiv. conductivity, after being approx. const., rapidly diminishes and passes through a min. At this C the cataphoretic velocity, which increases with C, passes through a max. The equiv. conductivity calc. from pH is > that observed. The extinction coeff. diminishes with C and then rises to a max. η increases with C \gg would be expected from a linear relation on account of the particles being non-spherical and non-rigid and the effective vol. of the particles varying with C. The apparent sp. gr. increases with C to a const. val. which agrees with the sp. gr. of dried bentonite. The data suggest that increase in C causes aggregation and that the aggregates form a structure possessing yield val. C. R. H.

Electrochemical properties of clay minerals and the differentiation of hydrogen clays and bentonites by electrochemical methods. I. **Kaolinite and kaolinitic clays.** J. N. Mukherjee, R. P. Mitra, and D. K. Mitra. II. **Montmorillonite clays and bentonites.** R. P. Mitra, S. N. Bagchi, and S. P. Ray (*J. Physical Chem.*, 1943, 47, 543—549, 549—553).—I. Titration curves and other electrochemical features of kaolinite and kaolinitic clays from Dacca lateritic soils have been investigated and are discussed. At both inflexion points the base-exchange capacities of kaolinite are in the order $Ca(OH)_2 > NaOH > Ba(OH)_2$, but for a given pH the order is $Ca(OH)_2 > Ba(OH)_2 > NaOH$. The data for the clays show that kaolinite is the dominant mineral constituent of the Dacca lateritic soil.

II. Similar examination of montmorillonite from Padegaon (Bombay) and of two bentonites from Hati-Ki-Dhani (Jodhpur) and Bhadres has been undertaken. The second clay behaves as a strong or moderately strong dibasic acid towards NaOH, the other clays being weakly monobasic; towards $Ca(OH)_2$ and $Ba(OH)_2$, however, the first clay behaves as a strong monobasic acid. C. R. H.

Theory of thixotropy. W. von Engelhardt (*Kolloid-Z.*, 1943, 102, 217—232).—Theoretical. The series of liquids of increasing thixotropic activity, obtained by Winkler (A., 1939, I, 77) using kaolin, is the same as that obtained by the author (*Nachr. Akad. Wiss. Göttingen, Math.-phys. Kl.*, 1942) in an investigation of the abrasive hardness of quartz in various liquids, the quartz being hardest in liquids where the thixotropy is greatest. The degree of thixotropy (T) is defined as the ratio vol. of liquid : vol. of solid in a suspension that gels in 1 min. Between the solid particles of a rigid gel are assumed attractive and repulsive forces, the latter decreasing the more rapidly with distance. The distance (d) between the particles is related to the quantity of liquid held in the gel and hence to T. The repulsive forces are attributed to the electrical charge on the solid particles, which causes a polarisation of the liquid. The stronger is the polarisation, the less is d and therefore the less is T. Non-polar liquids are polarised least and therefore T is greatest in them. The dependence of T on the solid phase is determined in the first instance by the shape of the solid particles. A gel of plates will contain more liquid than one of spheres if the d vals. are the same. It is shown that the d vals. for a gel containing plates and for one containing spheres, with radius equal to that of the plates, are of the same order; the only assumptions made are that the attractive forces are of a van der Waals nature and that the repulsive forces are due to surface charges. J. F. H.

Viscosity of suspensions. (Effect of strong electrolytes on the viscosity of starch and bentonite suspensions.) A. von Buzagh (*Kolloid-Z.*, 1943, 103, 119—126).—The η of starch (I) and bentonite (II) suspensions have been determined at various concns. up to 20 g. per 100 c.c. and are compared with those of quartz (III) suspensions. For suspensions with charged particles the η -concn. curve is convex to the concn. axis, but for (I) and (III) suspensions with isoelectric particles, η varies linearly with concn. With (II) suspensions the curve is convex to the concn. axis, as for charged particles. (I) and (III) suspensions show no structural η in either the charged or isoelectric state, though this is found for (II) suspensions. The relation between η , cohesion, and cataphoretic migration velocity has been investigated for the three suspensions in the presence of a no. of strong electrolytes. In the case of hydrophobic suspensions (quartz and starch), electrolytes affect η and cohesion in a similar manner. There is a max. of both quantities at the isoelectric point. The cation only is effective with quartz suspensions, but both ions are effective with starch. For (II) there is no connexion between η and cataphoretic velocity. Ostwald's activity coeff. law holds for (I) and (III), but not for (II). A. J. M.

Theory of elastic properties of rubber.—See B., 1944, II, 54.

Statistical mechanics of cross-linked polymer networks. I. Rubber-like elasticity. II. Swelling. P. J. Flory and J. Rehner, jun. (*J. Chem. Physics*, 1943, 11, 512—520, 521—526).—I. Expressions are derived for the structural entropy and entropy change on deformation of a network of polymer chains with random cross-linkages. The cross-linkages are treated as if situated at the common apices of a series of regular tetrahedra.

II. Statistical mechanical treatment of swelling in solvents on the basis of the authors' model shows that max. swelling depends on the degree of cross-linking, and its temperature coeff. can be

used to calculate the heat of interaction with the solvent. Swelling capacity should be diminished by the application of external stress, and the modulus of elasticity should decrease inversely with the cube root of the swelling vol. L. J. J.

Statistical thermodynamics of rubber. III. F. T. Wall (*J. Chem. Physics*, 1943, 11, 527—530; cf. A., 1942, I, 204).—Expressions for the distribution of mol. lengths in strained rubber, and equations of state for rubber-like materials, are derived. L. J. J.

Statistical treatment of imperfectly flexible chains. H. M. James and E. Guth (*J. Chem. Physics*, 1943, 11, 531).—Mathematical methods applicable to a quant. treatment of the authors' mol. model of rubber (B., 1944, II, 54) are indicated. L. J. J.

Influence of adsorbed gases on hydrogen-ion concentration of frozen and thawed solutions of synthetic high polymers. L. Holzapfel and F. F. Nord (*Biodynamica*, 1940, 3, 1—9).—Solutions of polyacrylic acid (I), polyvinyl alcohol (II), and polymethacrylamide (III), frozen after CO_2 , N_2 , O_2 , or H_2 had been bubbled through them and then thawed, showed an altered pH. O_2 decreased the pH of (I) solutions after freezing at all concns. of the acid, and $>0.001\%$ of H_2 and N_2 decreased it at low but increased it at high concns. N_2 increases at low and decreases at high concns. the pH of (II), but gives the reverse effect with (III). At all concns. CO_2 decreases the pH of solutions of these substances. Solutions treated with CO_2 , frozen, thawed, and then treated with N_2 showed no effect of the CO_2 on the pH. It is suggested that foods frozen in a CO_2 atm. should be thawed in a N_2 atm. L. G. G. W.

Statistical theory of chain configuration and physical properties of high polymers. P. J. Flory and J. Rehner, jun. (*Ann. New York Acad. Sci.*, 1943, 44, 419—429).—The distribution of distances between chain ends in polymers with flexible mols. is unaffected by a symmetrical hindrance potential with regard to rotation about bonds. Steric effects in long mols. are not symmetrical, and hindrance to rotation then increases the distance, but the form of the distribution function is unchanged. Methods of calculating elastic moduli of materials with network structures from the change of entropy are discussed, and a statistical treatment is given avoiding simple assumptions of change in chain length distribution on deformation. Swelling by solvents is a combination of osmotic dilution opposed to elastic reaction. Equations are derived for the concn. of cross-linkings from the equilibrium degree of swelling. R. H. F.

Elasticity and flow in high polymers. R. Simha (*Ann. New York Acad. Sci.*, 1943, 44, 297—312).—The elastic properties of a crystal and a liquid are contrasted with those of rubber-like materials. The latter are distinguished from other high polymers both by the val. of elastic deformation and by the rate of attainment of equilibrium. An equation describing the total deformation as composed of ordinary elastic extension, a reversible deformation established gradually, and a viscous flow is examined in detail. The equations reproduce approx. experimental data on creep curve and effect of temp. on deformation for various times of loading and frequencies. The behaviour is not characterised by a single time const. but by a range of relaxation times. The process of relaxation is discussed, and the case of two mechanisms with different relaxation times is examined. The effect of temp. on elasticity is principally on the time effects. Analogies are drawn between mechanical deformation and thermal expansion. The relations do not apply if crystallisation occurs on deformation. R. H. F.

Rigidities of solutions of polymers. J. D. Ferry (*Ann. New York Acad. Sci.*, 1943, 44, 313—327).—Rigidity is complicated by relaxation of stress at const. strain, viscous flow in series with elastic deformation, delayed elastic recovery, and variation of rigidity with frequency of applied stress. These can be partly accounted for by the Maxwell concept of viscous deformation in series with elastic deformation. Methods of and difficulties in determining rigidities are described, and results are discussed for solutions of polybutene in heptane, polystyrene in xylene, and plasticised polyvinyl chloride and polymethyl methacrylate. Two mechanisms for support of shear are the orientation entropy of long-chain mols. and the bending of C—C bonds in immobilised mols. At high concns. intermol. attractions must be considered. A mechanical model, the elements of which can be identified with mol. processes, is described to represent the behaviour of the polystyrene-xylene system. R. H. F.

Absorption of light by, and particle size in, humus colloids. F. Piekenbrock (*Kolloid-Z.*, 1943, 103, 146—150).—Na humate solutions from various sources, extracted with $\text{Na}_2\text{C}_2\text{O}_4$ or NaOH, were brought to different pH vals. by addition of NaOH or $\text{H}_2\text{C}_2\text{O}_4$, and their extinction coeffs. were determined before and after centrifuging at 3000 and at 15,000 r.p.m. A considerable part of the deepening of colour produced by addition of alkali was removed by centrifuging at the higher speed, but not at the lower. The colour deepening is due to a large extent to the commencement of coagulation, which, however, does not proceed further owing to the stabilising effect of Na^+ and OH^- . A. J. M.

Structure-viscosity of mucin and a new apparatus for its measurement. P. Zamboni (*Kolloid-Z.*, 1943, 102, 246—251; cf. C., 1944, Part 1).—A viscometer is described which enables the time of outflow to be measured at various pressures and is especially suitable for the investigation of "fibrocolloids." Structure viscosity is especially marked in solutions of mucin, but is not observed in presence of salts in sufficient concn. The salt concns. necessary are of the same order as those required for the activation of mucin-dissolving enzymes. J. F. H.

Production of chain-like aggregates during coagulation. K. Hoffmann (*Kolloid-Z.*, 1943, 103, 161—163).—The coming together of colloidal particles to form chain-like aggregates is ascribed to the different field distribution at the ends and side surfaces of the components of the chains. A. J. M.

VI.—KINETIC THEORY. THERMODYNAMICS.

Equilibrium problems [in chemical kinetics] with more than one solution. P. Oesper (*J. Chem. Educ.*, 1943, 20, 511).—Two examples are discussed. L. S. T.

Hydrolysis of chlorine. G. B. Kolhatkar and U. A. Sant (*J. Univ. Bombay*, 1943, 12, A, Part 3, 57—59).—Conductivity measurements show that the equilibrium $\text{Cl}_2 + \text{H}_2\text{O} \rightleftharpoons \text{HCl} + \text{HOCl}$ is very rapidly attained from either direction, thus confirming the findings of Schilov *et al.* (A., 1936, 1345). H. W.

Potential barriers in ethyl alcohol and the equilibrium in the reaction $\text{C}_2\text{H}_5 + \text{H}_2\text{O} \rightleftharpoons \text{C}_2\text{H}_5\text{OH}$. J. G. Aston, G. J. Szasz, and S. Isserow (*J. Chem. Physics*, 1943, 11, 532—534).—EtOH can exist in "straight" and "bent" forms with a difference of 1560 g.-cal. per mol. for E_0 . Using the val. -52,090 g.-cal. per mol. for ΔE_0 in the reaction $\text{C}_2\text{H}_5(g) + \text{H}_2\text{O}(g) \rightleftharpoons \text{C}_2\text{H}_5\text{OH}(g)$, free energy changes and equilibrium consts. at 298.2—600° K. are calc. as $\Delta F^\circ = -1565$, +15, +1570, +7488, at 298.2°, 351°, 403°, 600° K., respectively, in improved agreement with experimental vals. L. J. J.

Effect of temperature change on ionisation constants of weak electrolytes. H. O. Jenkins (*Trans. Faraday Soc.*, 1944, 40, 19—22).—A new equation, $\log K = A/T + B(\log T)/T + C(\log^2 T)/T + D$, is proposed, which fits experimental vals. for aq. HCO_2H , AcOH , EtCO_2H , and PrCO_2H as well as do those of Harned and Robinson (A., 1940, I, 412) and Everett and Wynne-Jones (*ibid.*, 73); it also involves relationships for ΔH and ΔC_p that are more in accordance with expectation than those given by existing formulae. F. L. U.

Thermodynamic properties of solutions of high polymers: empirical constant in the activity equation. M. L. Huggins (*Ann. New York Acad. Sci.*, 1943, 44, 431—443).—The thermodynamic activity of each component in a solution of flexible long-chain mols. in a small-mol. solvent is expressed as a function of the partial molal vols. by a formula involving an empirical const. μ_1 characteristic of the pair of components. μ_1 is related to the heat of mixing and to the lack of perfect randomness of mixing (aggregation or solvation); it is only slightly dependent on the flexibility of chains. A linear relation between μ_1 and the reciprocal of the abs. temp. is deduced, and confirmed by data on polystyrene-alkyl laurate gels. In many cases μ_1 is independent of concn. Vals. of μ_1 for a large no. of systems are tabulated. R. H. F.

Principles of Carnot and Clausius. W. Wilson (*Phil. Mag.*, 1944, [vii], 34, 828—833).—A discussion of the different ways of stating the second law of thermodynamics. Comments are made on a recent paper by Ehrenberg (A., 1943, I, 229). H. J. W.

Phase diagrams and the mass law. T. R. Briggs (*J. Chem. Educ.*, 1943, 20, 484—487, 510; A., 1924, ii, 836).—Mass law equations for calculating P - T - X phase diagrams for binary systems consisting of vapour and a congruently dissociating solid such as NH_4Cl or $\text{NH}_2\text{CO}_2\text{NH}_4$ are given. Diagrams for $\text{NH}_2\text{CO}_2\text{NH}_4$ in the system CO_2 - NH_3 at 10—50° and 0—400 mm. pressure are calc. L. S. T.

Statistics of binary systems (A) G. H. Wannier. (B) K. Fuchs (*Proc. Roy. Soc.*, 1943, A, 181, 409—411, 411—415).—(A) A criticism of the results obtained by Fuchs (A., 1942, I, 205).

(B) A reply.

G. D. P.

System hydrocyanic acid-diethyl ether.—See A., 1944, II, 71.

Vapour pressure data and phase diagrams for some concentrated soap-water systems above room temperature. J. W. McBain and W. W. Lee (*Oil and Soap*, 1943, 20, 17—25).—A series of isotherms have been constructed from v.p. data procured by the use of the McBain sorption balance for a typical commercial toilet soap and for pure Na laurate, myristate, palmitate, stearate, and oleate, and from this information the phase diagrams relating to the corresponding binary soap- H_2O systems have been revised and extended. The region of soap-boiler's neat soap in the soap- H_2O diagrams is shown to be a single homogeneous phase in all cases, its left-hand boundary agreeing with the T_c curve determined by other methods. The formation of the hemihydrates from curd is demonstrated in

the case of Na stearate, palmitate, and myristate: higher hydrates, e.g., Na palmitate, $9\text{H}_2\text{O}$, may exist at high R.H., as in the presence of isotropic solution. A photograph of "waxy soap" crystals growing from the "subwaxy" form as hydration progresses is given.

E. L.

Polytherm of the ternary system sodium bromide-potassium bromide-water from the temperature of complete freezing to 50° . N. A. Vlasov and A. G. Bergman (*Compt. rend. Acad. Sci. U.R.S.S.*, 1943, 39, 148—151).—Ice, α -KBr, and $\text{NaBr}\cdot 5\text{H}_2\text{O}$ crystallise together at -32° and NaBr 36.5, KBr 4, H_2O 59.5 wt.-%. NaBr, $5\text{H}_2\text{O}$, NaBr, $2\text{H}_2\text{O}$, and α -KBr crystallise at -26° and NaBr 38, KBr 3.6, H_2O 58.4 wt.-%. NaBr, $2\text{H}_2\text{O}$, NaBr, and β -KBr crystallise at 46° and NaBr 47, KBr 7.8, H_2O 55.2 wt.-%. NaBr, $2\text{H}_2\text{O}$, α -KBr, and β -KBr crystallise at 7° and NaBr 41.4, KBr 5.4, H_2O 53.2 wt.-%.

J. J. B.

Distribution equilibria between molten metals and molten salts, with reference to the stability of intermetallic compounds in the molten state. E. Heymann, R. J. L. Martin, and M. F. R. Mulcahy (*J. Physical Chem.*, 1943, 47, 473—484).—The distribution equilibria of Na between NaBr and Cd or Pb at 780° , and of Cd between CdCl_2 or CdBr_2 and Bi or Sb at 690° , have been investigated. The observed deviations from Raoult's law show that compounds between Na and Cd are decomposed at 780° and that intermetallic compounds between Na and Pb are stable in the liquid state at 780° . The curves for Cd- CdCl_2 (CdBr_2)-Bi are similar but both show anomalies in their max., suggesting that the curves do not truly represent the activity of Cd in the mixture. Sb is insol. in molten CdCl_2 in absence of Cd, but very sol. in presence of Cd, suggesting the formation of an intermetallic compound (CdSb ?) which is stable at 690° and very sol. in molten CdCl_2 .

C. R. H.

Equilibria of silver and lead, silver and bismuth, and bismuth and lead with their fluorides at 900° . H. H. G. Jellinek (*Trans. Faraday Soc.*, 1944, 40, 1—5).—The equilibrium of Bi and Pb with their molten fluorides was determined at 900° in graphite vessels. Bi is by far the nobler in this reaction. The metal and salt phases are approx. ideal, and the calc. heat of formation of BiF_3 agrees with the accepted val. Similar determinations with Ag could not be carried out in open vessels owing to vaporisation of AgF , but equilibrium consts. for its reactions with PbF_2 and BiF_3 are estimated from the corresponding heats of reaction.

F. L. U.

The carbon-oxygen equilibrium in liquid iron. S. Marshall and J. Chipman (*Trans. Amer. Soc. Metals*, 1942, 30, 695—746).—The equilibria between C and O in liquid Fe at 1540 — 1700° and CO and CO_2 in the surrounding gas at pressures >20 atm. were studied by the use of a closed high-frequency furnace. When equilibrium was reached, gas samples were withdrawn from the furnace for analysis and the steel was "killed" by the addition of Al and quickly cooled. The steel samples were analysed for [C] and [O], the latter being determined from the $[\text{Al}_2\text{O}_3]$. In the reactions, the equilibrium factors depend on [C]. The product of %C and %O in the metal is a function of temp., pressure, and [C]; at 1 atm. of CO + CO_2 at 1540° the val. varies from 0.0018 with 0.02% of C to 0.0034 with 1.0% of C. This effect is explained if $\sim 0.0028\%$ of CO is sol. as such in steel at 1540° under a pressure of 1 atm.

J. C. C.

Silicon-oxygen equilibria in liquid iron. C. A. Zapffe and C. E. Sims (*Amer. Inst. Min. Met. Eng.*, 1942, *Tech. Publ.* 1498, 30 pp.; *Metals Tech.*, 9, No. 6).—The equilibria were studied by heating mixtures of Fe and Si in H_2 containing known amounts of H_2O , followed by quenching and chemical analysis. The equilibria could not be expressed in terms of $[\text{FeO}]$ and $[\text{Si}]$. Assuming the presence of SiO , the const. $K = [\text{FeO}][\text{Si}]$ agrees closely with theoretical vals. Free energy changes, heats of reaction, and entropy changes are calc. Total O in steel consists of FeO and suboxides of alloying elements and deoxidisers; if large amounts of the latter are present, determination of O by vac. fusion may give incorrect results.

R. KE.

VII.—ELECTROCHEMISTRY.

Nature of molten salts and their mixtures. M. F. R. Mulcahy and E. Heymann (*J. Physical Chem.*, 1943, 47, 485—496).—Available data for the equiv. conductivity of molten alkali and alkaline-earth chlorides are applied to a discussion of the main factors governing the conductivity of molten salts. The conductivity of mixed molten salts and the non-additivity of conductivity where complex ion formation occurs are also discussed. N. W. Taylor criticises the theoretical treatment in this and in an earlier paper (Heymann *et al.*, *supra*).

C. R. H.

Transport numbers of nitric acid in water at 25° from e.m.f. measurements. H. I. Stonehill (*J.C.S.*, 1943, 647—651).—Since accurate activity coeff. data for HNO_3 are available (Hertmann *et al.*, A., 1933, 675), transport nos. for HNO_3 can be obtained from the e.m.f. of cells with transport. The e.m.f. of a cell of the type $\text{Pt}|\text{quinhydrone (saturated)}|\text{HNO}_3 (m', \text{fixed})||\text{HNO}_3 (m, \text{variable})|\text{quinhydrone (saturated)}|\text{Pt}$ was determined, taking into account

the known salt error (Stonehill, A., 1943, I, 130). Combining the results at different concns. (0.001—0.2M.) with activity coeff. data, the cation transport nos. (t_+) are calc. The results agree satisfactorily with the theoretical limiting val., and limiting slope of the t_+ -(concn.)¹ curve, and with the Jones-Dole equation (A., 1929, 767) and the Longworth equation (A., 1932, 914; 1935, 1078), but not with the Owen equation (A., 1936, 292). Up to 0.2M. the mobilities of H^+ in HNO_3 and HCl of the same concn. are equal. The mobilities of NO_3^- in KNO_3 (up to 0.2M.) and in AgNO_3 (up to 0.1M.) are < those in HNO_3 . KNO_3 and AgNO_3 are, therefore, incompletely dissociated at these concns.

A. J. M.

Electrostatic potentials in electrochemically important systems of rigid charge layers. E. Lange and M. Wiedemann (*Z. Elektrochem.*, 1941, 47, 568—580).—The external and surface electrostatic potentials of certain systems of charge layers (spherical, circular disc, spherical condenser, plate condenser) are surveyed as functions of charge, dipole moment, and density. Potentials in systems of alternate layers of positive and negative charges, in systems of similarly charged layers, and for an adsorption layer with dipole structure on a metal base, are calc. The calculations are applied to ionic hydration, pyro- and piezo-electric crystals, and to metals in electrolyte solutions.

J. H. BA.

Over-potential of hydrogen in relation to the composition of the electrode material. U. Croatto and M. Da Via (*Gazzetta*, 1943, 73, 117—133).—The over-potential (η) of H_2 was measured at 20° with varying c.d. in 6N-KOH with cathodes of binary alloys of Pb-Cd and Pb-Sb. In the eutectic ranges of the alloys the c.d. necessary to produce a given η varies linearly with the % composition of the electrode surface. In the regions of mixed crystals there is a rapid rise of η for Pb-Sb with increase of the lesser component, with a max. at the point where two phases are formed. The reverse is true for Pb-Cd. While two phases are present η rises gradually with increase of Cd or Sb. This can be explained by assuming that addition of Pb or Cd to each other increases the surface activity of the crystals by decreasing their stability, the reverse being assumed for the Pb-Sb alloy.

J. F. M.

Overpotential and corrosion. U. Croatto (*Gazzetta*, 1943, 73, 133—143).—With Pb and its alloys with various metals (0.08 and 0.16%) as the cathode in 15N- H_2SO_4 at 120° the overpotential of H_2 at varying c.d., and the c.d. necessary to produce a given overpotential with various alloys, were measured. The results indicate that the corrosion of alloys of Pb with Ag, Ni, and Cu is electrochemical as well as chemical, but with Zn, Sn, Sb, Cd, and Bi is purely chemical.

J. F. M.

Electrophoretic properties of globin from various sources.—See A., 1944, III, 138.

VIII.—REACTIONS.

Models of physico-chemical processes. G. K. Diakonov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1943, 39, 143—147).—Several dimensionless parameters are derived which determine the progress of physico-chemical reactions as Reynolds no. determines the kind of liquid flow. One of these parameters shows whether the reaction proceeds by a series of near-equilibrium stages, or takes place far from the equilibrium; another is the ratio between the time required for the completion of a reaction and the time available.

J. J. B.

Theory of the autogenesis of chain reactions. N. S. Akulov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1943, 39, 204—208).—It is assumed that the average length of the reaction chain does not change in the course of the reaction and is $=1/(k\delta-1)$, δ being the probability of an active centre reacting with other mols., and k the no. of new centres created in this reaction. From these assumptions the main equations of chain processes, especially of explosion and flame reactions, are derived.

J. J. B.

Theory of combustion, ignition, and explosion. N. S. Akulov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1943, 39, 239—243).—From the equations obtained earlier (see preceding abstract) expressions are derived for the latent period of ignition and for the pressure-temp. dependence of the ignition limits including the "peninsula of ignition." The rate of reaction has a finite val. within the ignition limits and is 0 at the limits.

J. J. B.

Inflammability of methylene chloride-oxygen-nitrogen mixtures. G. W. Jones, R. E. Kennedy, and F. E. Scott (*U.S. Bur. Mines Rept. Invest.* 3727, 1943, 7 pp.).— CH_2Cl_2 - O_2 mixtures containing 15.5—66.4% of CH_2Cl_2 are inflammable. CH_2Cl_2 does not give inflammable mixtures with air at room temp. and pressure, but if the air is enriched to contain $<18.9\%$ of O_2 , inflammable mixtures are produced within certain limiting concns. of CH_2Cl_2 . CH_2Cl_2 vapour ignites in air at 642° and in O_2 at 606° .

J. W. S.

Unreleased energy in hydrocarbon flame gases. W. T. David and J. Mann (*Phil. Mag.*, 1944, [vii], 34, 816—822).—Dry and moist hydrocarbon gases mixed with air in various proportions were burnt in an open burner and the flame temp. measured by the resistance of fine quartz-coated Pt-Rh wires. The unreleased

energy (latent energy + abnormal dissociation) in the flame gases is calc. from the temp., sp. heat, and heat of combustion; as a function of the gas concn. in the mixture it first falls and then rises. The fall is due to a decrease in the latent energy, and the rise to abnormal dissociation. The effect of H_2O in dil. mixtures is to increase the flame temp. and decrease the unreleased energy; at higher gas concn. the moisture effects decrease to zero. H. J. W.

Mechanism of addition polymerisation. C. C. Price (*Ann. New York Acad. Sci.*, 1943, 44, 361—370).—Reactions which generate free radicals initiate many addition polymerisations, as indicated by the presence of fragments of them as end-groups in the resulting polymer. Analytical data are given for polystyrene and polymethyl methacrylate prepared in presence of acyl peroxides and diazohydroxides. The kinetics of the polymerisation of *d*-sec-Bu α -chloroacrylate catalysed by Bz_2O_2 are examined over the temp. range 26—88°, and a mechanism is allotted to it. Inhibitors may be free radicals which react with the active free radical interrupting the chain growth, or substances, e.g., aromatic NO_2 compounds, which increase the stability of radicals and so retard the polymerisation. Stabilisation of growing chains by chain transfer occurs in some cases. A mechanism involving an active cationoid intermediate, induced, e.g., by strong acids, BF_3 , $AlCl_3$, or $SnCl_4$, is operative in some polymerisations. This leads to different kinetics, which are examined for styrene polymerisation catalysed by $SnCl_4$.

R. H. F.

Kinetics and elementary steps of poly-reactions. J. Abere, G. Goldfinger, H. Mark, and H. Naidus (*Ann. New York Acad. Sci.*, 1943, 44, 267—296).—The course of poly-reactions may be followed by measuring the amount of monomer removed and the average degree of polymerisation and mol. size distribution of the polymer formed as a function of time and reaction conditions, and by chemical analysis of the polymer, and determination of the no. of active centres starting chains. Poly-reactions consisting of a single elementary step are of two types: (1) reaction occurs between monomers or polymers of any chain length (e.g., poly-esterifications), (2) only monomer addition takes place [e.g., addition of $(CH_3)_2O$ to glycols, amines, or acids]. Equations for rate of formation of polymer are derived for both cases. For poly-reactions consisting of initiation, propagation, and termination the possible mechanisms of each of these processes are examined. By equating the rate of formation and disappearance of active centres formulae are deduced for the rate of reaction and no. average degree of polymerisation of the polymer using all possible combinations of the mechanisms. In several cases experimental figures are compared with those calc. on probable assumptions, and appropriate mechanisms allotted. Formulae are deduced for the distribution curve of the polymer, and compared with experiment. Chain transfer and branching introduce additional complications. The activation, propagation, and termination processes are considered in detail.

R. H. F.

Kinetics of the oxidation of isopropyl alcohol by chromic acid. F. H. Westheimer and A. Novick (*J. Chem. Physics*, 1943, 11, 500—512).—The oxidation reaction is of the first order with respect to $[HCrO_4^-]$ and $[PrOH]$ and of the second order with respect to $[H^+]$. A compound of Cr^{IV} or Cr^V is concerned in the mechanism.

L. J. J.

Recent advances in the theory of reaction kinetics in solution. R. P. Bell (*J. C.S.*, 1943, 629—635).—Tilden lecture. A review of the theoretical explanation of velocities of bimol. reactions in solution is given. The collision theory and the transition state theory are discussed. The effect of interaction between solvent and solute is considered.

A. J. M.

Hydrolysis of acetyl and bromoacetyl bromides. J. Rodriguez Velasco and J. M. R. de La Borbolla (*Anal. fts. quim.*, 1943, 39, 31—36).—The velocity of hydrolysis of $AcBr$ and $CH_2BrCOBr$ is comparable with that of $AcCl$ and $CH_2ClCOCl$ (A., 1942, I, 369), although the coeffs. are higher. AcI and $CH_2I\cdot COI$ have analogous but higher coeffs. which are less precise owing to secondary reactions.

F. R. G.

Rate theory and some physical and chemical properties of high polymers. H. M. Hulbert, R. A. Harman, A. V. Tobolsky, and H. Eyring (*Ann. New York Acad. Sci.*, 1943, 44, 371—418).—The ionic and radical mechanisms of polymerisation are considered in relation to the electronic structure of the double bond. Initiation reactions are classified into (1) those with frequency factors of $\sim 10^{11}$ and activation energy ~ 40 kg.-cal. per mol., e.g., polymerisation of alkyl-substituted olefins catalysed by acids, $AlCl_3$, BF_3 , etc., (2) those with lower frequency factors and activation energies, e.g., styrene and acrylate polymerisations. The criteria of the ionic mechanism are change in rate on changing electronegativity of substituents, catalysis by acids or bases, and intramol. rearrangement during polymerisation. The kinetics of growth of chains by the ionic mechanism are worked out on the basis of polarisation of the double bond in its activated state. The kinetic data on polymerisation of vinyl compounds, especially styrene, are reviewed. Chain transfer, which terminates polymer mols. without interrupting the reaction chain, has a velocity ~ 0.001 of that of propagation. Formulae are derived for mol. wt. distribution and no.

average mol. wt., taking as a basis 8 general reactions of initiation, propagation, and termination, and considering the steady state with respect to no. of active mols. The distribution function agrees with data on styrene polymerised as pure liquid, after recalculation of mol. wts. A theory of physical properties of polymers in the rubber-like state of aggregation is developed, based on the no. of bonds per unit vol., strength of bonds, and internal viscosity of the local liquid-like structure. An equation of state derived from the relation between tension and entropy leads to a formula for the modulus of elasticity of rubber-like materials. Relaxation of stress, creep, and extrusion behaviour are accounted for by slipping of bonds, allowing chains to coil into random configuration. The motion of the mobile chain segments has a damping effect on mechanical properties. A formula is given for the most probable vol. of a randomly shaped chain, and a relation between η and mol. wt. is derived from it.

R. H. F.

Mechanism of inhibition of styrene polymerisation. G. Goldfinger, I. Skeist, and H. Mark (*J. Physical Chem.*, 1943, 47, 678—587).—Styrene polymerisation at 70°, 100°, and 130° is inhibited by benzoquinone (I), the length of the inhibition period being \propto initial concn. of (I). (I) is used up more rapidly at higher temp., indicating a considerable activation energy (27,000 g.-cal. per mol.) for the formation of the active centres which consume the inhibitor. After the induction period the overall rate of polymerisation and the no.-average degree of polymerisation of the polymer formed are inversely \propto initial concn. of (I).

C. R. H.

Spatial arrangement of atoms in contact catalysis and dehydrogenation of hydrocarbons with open chains. A. A. Balandin (*Acta Physicochim. U.R.S.S.*, 1943, 18, 69—90).—The multiplet theory of catalysis, in which the shape and size of mols. and of the lattice of the catalyst are regarded as of primary importance, is discussed with particular reference to the dehydrogenation of hydrocarbons. Models indicating the orientation of $n-C_4H_{10}$ (I), Δ^a -butene (II), and PhEt mols. when undergoing catalytic dehydrogenation are drawn, and the reactions are studied, using the flow method. With (I), the dehydrogenation at a Cr_2O_3 catalyst amounts to 52% of (I) passed, or to 85% of that decomposed at 570°, and a spatial velocity of 700—1000 l. per hr. At lower temp. the yield on the basis of (I) passed decreases, whilst that based on (I) decomposed increases. The yield-time of contact (*t*) curves, drawn for various temp., show a max., indicating an optimum *t*. The composition of the contact gas at 570° and *t* = 1.5 sec. is H_2 , 37.5%, CH_4 , 2.4%, C_2H_6 , 3.7%, C_2H_4 , 0.3%, C_3H_8 , 0.1%, C_4H_8 , 29%, C_4H_{10} , 26.8%. The dehydrogenation and formation of C compete with one another on Cr_2O_3 catalysts, and the Cr_2O_3 becomes deactivated owing to C films, but is readily regenerated. With (II), activity decreases above a certain temp., probably owing to decomp. of products. The yield of butadiene at 600° is 34% based on (II) passed and 75% based on (II) decomposed. The most important side-reaction is $C_4H_8 + 4CO_2 = 8CO + 4H_2$, but the CO does not poison the catalyst. The activity varies with time in a peculiar manner. The dehydrogenation of (II) has also been investigated at low pressures, in which case the optimum *t* is greater. The effect of dilution with CO_2 and N_2 was also studied. Two methods for the production of styrene (III) from PhEt are given. There is again an optimum *t*. The effect of addition of (III), PhMe, and C_6H_6 , respectively, to PhEt undergoing dehydrogenation indicates the following sequence of mean lives of mols. on the active surface: (III) > PhEt > PhMe > C_6H_6 . The curves of yield of (III) against *t* are similar to those obtained in the pyrolysis of PhEt.

A. J. M.

Isotherm of heterogeneous catalytic reactions carried out under flow method conditions and a new method for determining the relative adsorption coefficients. A. L. Liberman (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 448—452).—An equation connecting reaction velocity with adsorption on reaction centres, which is based on Langmuir's equation and also takes into account the change in vol. occurring during a reaction, has been derived. This equation, $m/M = 2k/\beta m - 2/\beta$ (*M* and *m* are respectively the no. of mols. of reactant entering the reaction tube and the no. of such mols. reacting per unit time, $\beta = a_2/a_1 + a_3/a_1$, where a_1 , a_2 , and a_3 are the adsorption coeffs. of reactant and reaction products, and *k* is a reaction rate coeff.), has been satisfactorily applied to data for the dehydrogenation of *sec*-BuOH, for which reaction $\beta = 7.4$.

C. R. H.

[Oxidation of ammonia.] N. S. Bayliss (*J. Chem. Educ.*, 1943, 20, 510).—A heated helix of Pt wire is used as catalyst.

L. S. T.

Cracking of cyclohexane: thermal and catalytic decomposition at high pressures.—See B., 1944, II, 1.

Catalytic desulphurisation of gasolines by cobalt molybdate.—See B., 1944, I, 46.

Organic catalysts for the elimination of carbon monoxide from formamide. II. Catalysts with phenol hydroxyl at active group.—See A., 1944, II, 70.

Electrolysis with undulating current. II. Production of ozone by electrolysis. E. Briner and A. Yalda (*Helv. Chim. Acta*, 1943, 26,

1162—1166; cf. A., 1943, I, 232).—When an increasing intensity of a.c. is superposed on d.c. the yield of O_3 increases to a max. and then falls to zero. F. J. G.

Production of hydrogen and oxygen by electrolysis of water.—See B., 1944, I, 53.

Iron plating.—See B., 1944, I, 69, 70.

Electrodeposition of cobalt-tungsten alloys from an acid plating bath.—See B., 1944, I, 72.

Continuous plating of fine steel wire with nickel.—See B., 1944, I, 70.

Electrofinning.—See B., 1944, I, 71.

Darkening of cadmium halides and of antimony oxide by ultra-violet light. G. Cohn and J. A. Hedvall (*J. Physical Chem.*, 1943, 47, 603—607).—The photosensitivity of crystals of CdI_2 , $CdBr_2$, and Sb_2O_3 towards ultra-violet light depends on crystallographic factors, occurring either at strongly absorbing crystal faces or in presence of an unstable modification. Darkening of the crystals only occurred in presence of H_2O , and a photosensitised reaction mechanism involving H_2O and leading to the formation of Cd or Sb is proposed. C. R. H.

Kinetics of photographic development by hydroxylamine. T. H. James (*J. Physical Chem.*, 1943, 47, 597—602).—In the development of AgBr film with NH_2OH at 20° the relation between Ag formed and optical density (D) can be expressed by $\log Ag = 1.42 \log D + \text{const.}$, this being approx. the same relation as found for development by quinol. The rate of development increases regularly with pH over the pH range 10—12.7 and with $[NH_2OH]$ and decreases with increase in $[Br^-]$. Small amounts of Na_2SO_3 affect the rate of development only slightly, but large amounts decrease the rate and in extreme cases shift the character of development to the so-called "physical" type. Fog formation is primarily due to an uncatalysed reaction. The data support the view that development is a catalysed heterogeneous process which takes place preferentially at the interface between Ag and Ag halide. C. R. H.

IX.—PREPARATION OF INORGANIC SUBSTANCES.

Isotope separation and the mechanism of combustion in ascending hydrogen-deuterium flames. K. Clusius, W. Kölsch, and L. Waldmann (*Z. Elektrochem.*, 1941, 47, 820).—In ascending H_2 - D_2 - O_2 flames, a slight separation of isotopes occurs on account of partial combustion. H_2 is enriched in the H_2O , and D_2 in the unburnt gas. A. J. M.

Regeneration of acid cuprous chloride solution. G. E. Mapstone (*J. Proc. Austral. Chem. Inst.*, 1943, 10, 267—268).—Regeneration of spent Cu_2Cl_2 solution (oxidised during the process of CO gas analysis) is effected by placing the solution, with HCl, in a bottle containing Cu wire extending from top to bottom. Reduction is complete in 2—3 days. R. H. H.

Hydration of the aluminates of calcium. V. Hydrothermal decomposition products of tricalcium aluminate at 350°. H. Johnson and T. Thorvaldson (*Canad. J. Res.*, 1943, 21, B, 236—246).— $Ca_3Al_2O_6$ or the corresponding mixture of CaO and Al_2O_3 yields a cryst. product (I) $4CaO \cdot 3Al_2O_3 \cdot 3H_2O$ (n 1.627, d^{20}_D 2.71) and $Ca(OH)_2$ when treated with steam at 350°. (I) dehydrates between 650° and 750° in dry air to give $12CaO \cdot 7Al_2O_3$ and Al_2O_3 . X-Ray powder patterns of (I) and its dehydration products are given. J. H. Ba.

Complexes of zinc and glycine. I. Greenwald (*J. Physical Chem.*, 1943, 47, 607—622).—pH and titration data for mixtures of glycine and ZnCl₂ indicate the existence in solution of ZnX^{++} , $ZnXOH^+$, $ZnX_2(OH)_2$, $ZnX_3(OH)_2$, and $ZnX_4(OH)_2$ where $X = O_2C \cdot CH_2 \cdot NH_3$. Vals. for the consts. for the formation of the first four complexes have been calc. The following compounds have been cryst.: $Zn(HO_2C \cdot CH_2 \cdot NH_3)_2 \cdot Cl_2 \cdot H_2O$; $ZnXCl_2 \cdot H_2O$; $ZnX_3(OH)(ONa) \cdot H_2O$; $ZnX_4(ONa)_2 \cdot H_2O$. No satisfactory evidence for the existence in solution of the complex cation of the first compound, i.e., $Zn(HO_2C \cdot CH_2 \cdot NH_3)_2^{++}$, has been obtained. C. R. H.

Co-precipitation of cadmium and mercuric sulphides. E. S. Rittner and J. H. Schulman (*J. Physical Chem.*, 1943, 47, 537—543).—Cubic CdS changes to the hexagonal form if kept in contact with a conc. solution of $(NH_4)_2S$ for two days at room temp., or with 0.3N- HNO_3 at 100° for a week. Heating CdS at 500° for a week or at 700—900° for a few min. and then rapidly cooling brings about the same change. The vac. sublimation of HgS (red cinnabar) on to a cooled glass surface yields a new form of cinnabar which is black. CdS-HgS solid solutions, which are formed at room temp. by direct reaction of stable or unstable CdS and HgS in contact with conc. $(NH_4)_2S$, exist in cubic or hexagonal CdS form but not in hexagonal HgS form. The presence of CdS inhibits and may prevent the transformation of metacinnabar into cinnabar when Cd and Hg are co-pptd. in presence of $(NH_4)_2S$. When co-pptd. in presence of 0.3N- HNO_3 solid solutions of the metacinnabar type

are formed from nitrate and chloride solutions, cubic structures also being formed in chloride solutions. C. R. H.

Over-compression of mercury fulminate. K. K. Andreev (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 456—458).—Published work on the influence of high pressures on the detonation of Hg fulminate is discussed with reference to the mechanism of detonation. C. R. H.

Peroxytitanates. J. Beltrán (*Anal. fis. quim.*, 1943, 39, 373—381).— $Na_4TiO_6 \cdot 2.4H_2O$ contains 4 atoms of active O of which only 2 are peroxide O, whence the formula $Na_4TiO_6 \cdot 2H_2O_2$ is suggested. F. R. G.

Co-ordination number of bivalent lead. R. C. Haworth and F. G. Mann (*J.C.S.*, 1943, 661).—The compound $6CS(NH_2)_2 \cdot Pb(NO_3)_2$, m.p. 160° (decomp.), undergoes considerable dissociation in boiling dil. aq. solution, but crystallises unchanged on cooling. If the 6 mols. of $CS(NH_2)_2$ are co-ordinated normally to Pb, giving the salt $[CS(NH_2)_2]_6Pb(NO_3)_2$, the Pb has the electronic state of U. The compound may, however, be a mol. additive compound. A. J. H.

Plastic sulphur. M. Epstein (*J. Chem. Educ.*, 1943, 20, 360).—A hot test-tube containing boiling S is plunged into cold H_2O . When cold, the shattered tube can be stretched. L. S. T.

Decomposition of sulphur monoxide and the polysulphur oxides. P. W. Schenk (*Z. Elektrochem.*, 1941, 47, 855).—Both SO, condensed by liquid air, and its decomp. products contain SO groups, since both react with Cl_2 giving $SOCl_2$. If condensed SO is mixed with cooled CCl_4 or certain other solvents intensely yellow solutions are produced, and after removing the solvent, a yellow plastic substance remains which has the same reactions as SO obtained by warming the condensate. The mol. wt. of SO dissolved in CCl_4 is ~800. The condensed SO and its decomp. product are regarded as high-mol. poly-S oxides of variable composition. A. J. M.

Conductometric elucidation of complex chromium cations. III. Masking action of monobasic organic acids. S. G. Shuttleworth (*Leather Ind. Res. Bull. [S.A.]*, 1943, 2, Circ. 24, 357—365).—From conductometric titration curves of acetate, acetato-sulphate, formato-sulphate, and levulinato-chromium complexes it is shown that the Na salts of monobasic org. acids displace the SO_4 groups in a sulphato-Cr complex, forming a new complex containing no electrovalent groups. It reacts with dil. alkali to form a 66.67% basic Cr complex which is fully elated, the stability of which varies inversely as the strength of the acidic group therein. A structural explanation is offered. D. W.

Peroxyuranates. J. Beltrán (*Anal. fis. quim.*, 1943, 39, 368—372).— $Na_4UO_6 \cdot 8H_2O$ does not lose its 3 atoms of active O on drying at 100°. 2 atoms are instantaneously hydrolysed in H_2O or alkaline solution. It is concluded that H_4UO_6 is a true peroxyacid. F. R. G.

Safe handling and storage of anhydrous hydrofluoric acid.—See B., 1944, I, 52.

Behaviour of ferric oxide towards added foreign oxides at temperatures about 1300°. N. G. Schmahl (*Z. Elektrochem.*, 1941, 47, 835—843).—By direct isothermal determinations of O_2 pressure, the effects of BeO , Al_2O_3 , Cr_2O_3 , Mn_2O_3 , SiO_2 , and TiO_2 on the equilibrium $6Fe_2O_3 \rightleftharpoons 4Fe_3O_4 + O_2$ have been investigated, the temp. being usually 1323° (in a few cases 1060°). Isothermal concn.-pressure diagrams are constructed. BeO , Al_2O_3 , and SiO_2 exert very little effect. Cr_2O_3 and TiO_2 form very stable solid solutions with the Fe oxides, and therefore exert a marked effect on the equilibrium. TiO_2 forms Fe^{III} titanates with the Fe_2O_3 . In the case of Mn_2O_3 , the Fe_2O_3 acts as the foreign oxide, reducing the Mn_2O_3 to MnO , and forming a spinel, $MnO \cdot Fe_2O_3$. A. J. M.

Constitution of sodium nitroprusside. F. E. Raurich S. (*Anal. fis. quim.*, 1943, 39, 55—132).—Comparison of the properties of $Fe(NO)(CN)_5$ with those of metallic cyanides indicates that the metal is Fe^{II} . F. R. G.

Application of artificial radioelements to the elucidation of problems of chemical complexes. A. A. Grinberg and P. M. Filinov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1947, 31, 453—455).—Using radioactive Pt and Ir it has been shown that there is no exchange of central ion between $[PtCl_6]^{--}$ and $[Pt(NH_3)_4Cl_2]^{++}$, $[IrCl_6]^{--}$ and $[IrC_2H_5N_3]Cl_4$, and $[IrCl_6]^{--}$ and $[Ir(C_2H_5N_3)_2Cl_2]^{++}$. The considerable difference in the activities of Pt and Ir after bombardment with neutrons suggests a simple method of determining traces of Ir in Pt. C. R. H.

X.—LECTURE EXPERIMENTS AND HISTORICAL.

Calorimetric studies of various types. D. B. Pattison, J. G. Miller, and W. W. Lucasse (*J. Chem. Educ.*, 1943, 20, 319—326).—The following reactions, suitable for calorimetric measurements, are described: the decomp. of H_2O_2 , the reaction of CaC_2 with aq. HCl, of aq. $Hg(NO_3)_2$ with aq. NaCl, of aq. $CuSO_4$ with aq. NH_3 , of aq. $KBrO_3$ with aq. HBr, of aq. $MgSO_4$ and aq. $Al_2(SO_4)_3$ with

aq. NaOH, of Ac_2O with aq. NaOH, and of NH_4OH and COMe , the dissolution of anhyd. and hydrated NaOAc, and the heat of dilution of EtOH by H_2O . L. S. T.

Chemical knowledge in the Old Testament. S. Isserow and H. Zahnd (*J. Chem. Educ.*, 1943, 20, 327—335). L. S. T.

Rise and development of chemistry in the Argentine Republic. V. Arreguine (*J. Chem. Educ.*, 1943, 20, 474—478). L. S. T.

Chapter of the history of chemistry in Vienna. Adolf Lieben, 1836—1914; Zdenko Hans Skraup, 1850—1910. M. Kohn (*J. Chem. Educ.*, 1943, 20, 471—473). L. S. T.

James Curtis Booth, chemist, 1810—1888. E. F. Smith (*J. Chem. Educ.*, 1943, 20, 315—319, 357). L. S. T.

Selected references to biographical sketches of 100 well-known chemists. G. L. Fraser (*J. Chem. Educ.*, 1943, 20, 506—507). L. S. T.

XIII.—GEOCHEMISTRY.

Hydrochemical features of the rivers Dubna, Jachroma, Ikscha, and Volguscha in 1932—1933. B. A. Skopintzev and S. M. Dratshev (*Hydrochem. Mat.*, 1941, 12, 155—157).—The above rivers are tributaries of Upper Volga. J. J. B.

Hydrochemical behaviour of the river Volga and some rivers of the Volga basin in winter under ice. B. A. Skopintzev (*Hydrochem. Mat.*, 1941, 12, 159—168).—The $[\text{O}_2]$ of the river H_2O decreases during the winter to a min. in March or April since in the winter months the rivers are fed with deep ground H_2O containing but little air. J. J. B.

Hydrochemical sketch of the river Piasina. V. S. Ivlev (*Hydrochem. Mat.*, 1941, 12, 169—181).—The river is in the Siberian tundra. J. J. B.

Hydrochemical features of the river Volga between Kalinin and the river Dubna in 1931—1934. S. M. Dratshev and B. A. Skopintzev (*Hydrochem. Mat.*, 1941, 12, 151—154). J. J. B.

Volumetric zinc uranyl determination of sodium by the method of Dobbins and Byrd. N. Veselovski (*Hydrochem. Mat.*, 1941, 12, 25—33).— $[\text{Na}]$ of 11 samples of ground H_2O of Lower Don district is given (cf. C., 1944, Part I). J. J. B.

Determination of sulphates in water and in aqueous extracts from soil and medicinal mud by titration of the excess of barium chloride with potassium chromate in presence of rosolic acid. M. Konarev (*Hydrochem. Mat.*, 1941, 12, 79—86).— $[\text{SO}_4]$ of 18 water samples from the Lower Don district are given (cf. C., 1944, Part I). J. J. B.

Determination of sulphates in water and aqueous extracts from soil and medicinal mud by titration in presence of sodium rhodizinate. M. Konarev (*Hydrochem. Mat.*, 1941, 12, 87—102).— $[\text{SO}_4]$ of 29 samples of water from the Lower Don district are given (cf. C., 1944, Part I). J. J. B.

Volumetric benzidine method of determining sulphates in water and in aqueous extracts from soil and medicinal mud. M. Konarev (*Hydrochem. Mat.*, 1941, 12, 103—117).— $[\text{SO}_4]$ of 17 H_2O specimens from the Lower Don district are determined (cf. C., 1944, Part I). J. J. B.

Radioactivity of the waters and rocks of Matzesta. M. S. Merkulova (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 347—349).—Analyses are given. A. J. M.

Determination of the age of the waters of Matzesta. M. S. Merkulova (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 469—460).—The calculation of the age of the waters of Matzesta from the He/A ratio according to the method of Savtschenko gives 2.02×10^8 years. C. R. H.

Geochemistry of subterranean waters of Tartar Republic. N. V. Tageeva (*Compt. rend. Acad. Sci. U.R.S.S.*, 1943, 39, 244—247).—Petroleum usually is associated with waters containing much Ca, Cl, B, Sr, Ra, Br, and I, and a subnormal amount of SO_4 . Waters from the carboniferous strata of Tartar Republic belong to this group. J. J. B.

Characteristics of ice from the Kungur cave. G. A. Maximovitsch and G. G. Kobjak (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 478—481).—The physical and chemical properties of ice taken from various parts of the Kungur cave in the Urals are tabulated. C. R. H.

Radiogenic heat in rocks. N. B. Keevil (*J. Geol.*, 1943, 51, 287—300).—Several hundred new radioactivity determinations are combined with earlier data, and presented as frequency-distribution curves for granitic, other acidic, intermediate, basaltic, ultra-basaltic, and sedimentary rocks, and soils and clays. The data lead to probable rates of heat production lower than those estimated previously. This may be due partly to non-representative sampling. Analyses for Ra alone are not satisfactory. When a Th : U ratio of 3.5, the average abundance ratio in rocks, is assumed, the rate of heat production is $H = 2.15a + 0.05K$ g.-cal. per g. per 10^6 years,

where a is the no. of α -rays emitted per g. per hr. and K the wt.-% of K. K/a can be assumed to be 2.06, so that $H = 2.25a$. The data show that the errors in using this simple method are negligible. L. S. T.

Statistical investigation of rounded Ural diamonds. I. I. Schrafanovski (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 791—793).—The const. of diamonds from a no. of Ural districts are given. A. J. M.

Solution etching of detrital staurolite. G. Bond (*Geol. Mag.*, 1943, 80, 155—156).—Etching of staurolite grains by a solution from overlying basalt is described. L. S. T.

Fluorite and other minerals in Lower Permian rocks of S. Durham. A. Fowler (*Geol. Mag.*, 1943, 80, 41—51).—Occurrences of fluorite (I) and barytes (II) as cavity fillings in the magnesian limestone of S. Durham are described. (II) is present in relatively small amount, and is seldom associated with (I). Origin and order of deposition of these and associated minerals are described. L. S. T.

Mineralisation of Permian rocks of S. Durham. T. S. Westoll (*Geol. Mag.*, 1943, 80, 119—120; cf. preceding abstract).—Primary deposition of the ores may have been due to the presence of decaying macerated org. tissues, possibly with the help of S-bacteria. L. S. T.

Regeneration in rocks. J. S. Visnevski (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 797—798).—The occurrence of desericitisation of plagioclase is described as an example of regeneration of rocks. A. J. M.

Age of Lovozero tundras. E. K. Gerling, L. V. Komlev, K. N. Sokolova, and V. G. Barkan (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 135—136).—Determinations by the He method using loparite and a loparite concentrate give an age of $231-266 \times 10^6$ years, and indicate that the Lovozero massif was formed in the same epoch as the Chibiny massif, and was complete not later than the Lower Carboniferous. L. S. T.

Stratification and a law of sedimentation of clastic deposits. V. P. Baturin (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 137—140).—Theoretical. L. S. T.

Cambrian carbonate deposits of the Ussin-Tomsk watershed of the Kuznetsk Alatau. A. L. Dodin (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 143—144).—Palaeontological evidence establishes the age of the marmorised limestones as Middle Cambrian. The Mn mineralisations associated with the carbonate deposits of the Ivanov and Isras mines are described. L. S. T.

Age of Africanda pyroxenite intrusion of the Kola Peninsula. E. K. Gerling, L. V. Komlev, V. G. Barkan, and M. E. Ermolaeva (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 769—770).—The age calc. by the He method for knopite from the pyroxenite intrusion is $358 (? 385) \times 10^6$ years. That of knopite from a nepheline vein was calc. to be 249×10^6 years, but this is regarded as an underestimate. A. J. M.

Amphibole of variable composition from the region of the Cheliabinsk granite massif. M. E. Jakovleva (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 794—796).—Analyses and optical properties of amphiboles of different colours are given. Increase of $[\text{Fe}_2\text{O}_3 + \text{FeO}]$ results in increase of n and decrease of optic angles. The angle of extinction is unaltered and the birefringence slightly reduced. The vals. of the optical const. have been used to determine the $[\text{Fe}_2\text{O}_3 + \text{FeO}]$ of other specimens of amphibole. A. J. M.

Products of fusing hornblende with fluoride additions. D. P. Grigoriev and O. N. Lebedeva (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 787—790).—A 9 : 1 mixture of hornblende and NH_4F was fused. The melt contained mica of the phlogopite type, amphibole (I), magnetite (II), and an unknown mineral, identified by analysis as Ca silicofluoride (III). The order of separation is (II), mica, (I), and (III). The order of separation of (I) and mica is discussed. The intergrowth of the two crystals indicates the existence of epitaxy, which may be due to the structural similarity of the two minerals. A. J. M.

Celestite in the Permian deposits of the Bashkir Autonomous Socialist Soviet Republic. V. P. Florenski (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 784—786).—The characteristics of celestite from this region are outlined, and its origin is discussed. A. J. M.

Calcite in the decomposed tectonic zones of the Chibiny tundras. B. N. Melentiev, P. K. Semenov, and P. N. Tschirvinski (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 782—783).—Analysis of calcite veins from this district is given. The mineral is found in association with aggregates of optically negative chabasite. A. J. M.

Effect of oxidation on magnetic properties of magnetite. O. N. Althauzen (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 566—568).—The effect of heating in air on the magnetic properties of artificial and natural magnetite has been investigated. There is no simple connexion between Fe_2O_3 content and χ_{max} . A. J. M.

Natural residual magnetism of rocks. T. Roze (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 668—670).—The effect of cooling

from above the Curie point on rocks in a magnetic field has been investigated. Data obtained support the hypothesis that the natural residual magnetisation of rocks is due to their cooling in the terrestrial field. W. R. A.

Irreversible variation of the magnetic properties of magnetites. O. N. Althausen (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 661—664).—The irreversible changes in coercive force and max. susceptibility of magnetites from Wyssokaja, Magnitnaja, Tejskoye, and the Kola Peninsula on heat-treatment have been investigated. The influence on the terrestrial field of variation in temp. of the rocks of magnetite-bearing localities is discussed. W. R. A.

Mineralogy of the Urutukan deposit (Upper Kolyma, Far East Region). G. P. Barsanov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 689—690).—Specimens from the Urutukan deposit are pieces of a quartz-sulphide vein have been examined and a genetic scheme is tentatively advanced. W. R. A.

Diagram showing the dependence of coloration of magnesian-ferriug micas on the content of iron oxides. D. P. Grigoriev and A. V. Kotulski (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 691—693). W. R. A.

Talc-magnesite and quartz-magnesite rock, Cobb-Takaka district. H. W. Wellman (*New Zealand J. Sci. Tech.*, 1942, 24, B, 103—127).—Deposits of magnesite (I) rock in the upper basin of Takaka River are described and estimated quantities given. Chemical analyses recorded show the presence of 40—80% of (I) with almost complete absence of CaO. Analyses showing the progressive alteration of serpentine to (I) rock are also recorded and discussed. A ternary diagram showing the range in mineral composition of talc-magnesites is given. Economic possibilities and uses of the deposits are discussed. L. S. T.

Cuspidine and villiaumite in welding slag. V. V. Lapin (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 694—696).—Artificial cuspidine has been prepared pyrogenetically in a welding slag. Small quantities of CaF_2 , perovskite, villiaumite, and chromospinel are simultaneously formed. W. R. A.

Problem of the occurrence of beach-limestone at [Brown's Island] Auckland, New Zealand. J. A. Bartrum (*New Zealand J. Sci. Tech.*, 1942, 23, B, 92—96).—The beach-limestone is not comparable with that of tropical regions, but is the product of special local conditions. Restricted ground- H_2O circulation may have dissolved CaCO_3 from shell material to saturation point, after which pptn. was initiated by causes unknown. L. S. T.

Rosasite from Kyzyl-Espse deposit. N. G. Sumin (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 779—781).—The consts. (optic angle, dispersion, n , and hardness) of rosasite from this region are given. The chief component oxides are CuO , ZnO , CO_2 , and H_2O , but the quantity of mineral available was insufficient for complete analysis. A. J. M.

Change of colour and optical properties of beryls on heating. B. A. Gavrusevitch and F. J. Sarapulov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 775—778).—Coloration, transparency, and vitreous lustre of beryls decrease suddenly as temp. is increased above 600°. n and birefringence also decrease somewhat. A. J. M.

New luminescence method for establishing the bituminous nature of rocks. V. N. Florovskaja (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 359—360).—The ultra-violet luminescence of a no. of minerals containing bitumen has been investigated, and the method is suggested for the detection of bitumen in rocks. A. J. M.

Micaceous kimberlites in the north of Central Siberia. G. Moor (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 363—365).—Analysis of rock from the Upper Taimyra river shows that it closely resembles the micaceous kimberlites of S. Africa. In the northern parts of Central Siberia rocks of both the micaceous kimberlite and the basalt kimberlite types are found. It is possible that diamonds may occur in Central Siberia. A. J. M.

Silver-bearing tetrahedrite from Nagolnaya Tarasovka in the Donetz Basin. E. K. Lazarenko (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 475—477).—The composition of the Ag-bearing tetrahedrite at Zhuravka (Nagolnaya Tarasovka) can be approx. expressed by $(\text{Sb}, \text{As})_2\text{S}_3 \cdot 3-8(\text{Cu}_2, \text{Ag}_2, \text{Fe}, \text{Zn}, \text{Hg})\text{S}$. It has d^{17-2} 4.889. C. R. H.

Vallerite from vein deposits of sulphide copper-nickel ores of the Monche-Tundra. I. N. Tschirkov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 472—474).—Vallerite occurs infrequently in ores of the Monche-Tundra generally associated with cubanite, both minerals having been formed, apparently, at the same time. C. R. H.

Ishkulite. New mineral of the spinel group. G. P. Barsanov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 468—471).—Ishkulite, found in the northern part of the Ilmen reserve, is a hard, highly magnetic ore of d 5.0791, the physical properties being similar to

those of magnetite. Its formula is $\text{FeO}(\text{Fe}, \text{Cr})_2\text{O}_3$ with a portion of FeO isomorphously replaced by MgO. C. R. H.

Luminescence method for detecting uranium minerals and ores. U. G. Melkov and Z. M. Sverdllov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 361—362).—To obtain luminescent compounds from U-black, nasturan, and other ordinarily non-luminescent U ores, the minerals are sprayed with H_2SO_4 , HNO_3 , HCl , AcOH , or H_3PO_4 . They then show luminescence when irradiated with short- λ ultra-violet. The method can be used for detecting U minerals. A. J. M.

Pre-anorthosite granite of the Grenville sub-province Quebec. C. Faessler (*Natural. Canad.*, 1943, 70, 97—138).—Recent opinions on the existence of a granite older than the Morin anorthosite are reviewed. L. S. T.

Crystal structure of braunite, $3\text{Mn}_2\text{O}_3 \cdot \text{MnSiO}_3$. A. Byström and B. Mason (*Arkiv Kemi, Min., Geol.*, 1943, 16, B, No. 15, 8 pp.).—Braunite from various sources has a body-centred lattice with a 9.41, c 18.7 Å. The determination of the space-group is discussed. D_{10}^{20} - λ 2 gives an approx. correct distribution of O. A. J. M.

Orthopyroxene from Dodkanya, Mysore. P. R. J. Naidu (*Current Sci.*, 1943, 12, 253—255).—The mineral occurs in grains up to 1 cm. in length in a norite of the gneissic complex. Full data for the cryst. and optical properties and for the chemical composition are reported. The analysis points to the bushveldt rather than the charnockite type. N. M. B.

Copper deposits of Australia. A. B. Edwards (*Proc. Austral. Inst. Min. Met.*, 1943, No. 130, 105—171).—The Cu deposits of numerous localities and mines are described. Chemical analyses of two feldspar porphyrys from Moonta, and of ekmanite from Great Cobar mine, are recorded. L. S. T.

Natural mineral amalgams. D. R. Hudson (*Metallurgia*, 1943, 29, 53—60).—Native Ag amalgams occur as mercurial Ag, a grey-white ductile mineral of variable composition containing $>55\%$ Hg in solid solution in the Ag lattice, or as argentol or lundbergite, the brittle intermetallic compound Ag_3Hg_4 , crystals of which are usually coated with free Hg. The occurrence, properties, and crystal habits of these minerals are critically reviewed. Brief reference is made to native amalgams of Pb, Pd, and Au. J. C. C.

Identification of clay minerals in some Iowa and New England soil profiles. J. L. Haddock (*Iowa State Coll. J. Sci.*, 1943, 18, 42—44).—Clay minerals in 5 Iowa and 5 New England soils were determined by integrating data from thermal analysis, base-exchange capacity, and non-exchangeable K determination. F. R. G.

X-Ray analysis of Spanish clays. A. Hoyos (*Anal. fis. quim.*, 1943, 39, 351—367).—In 68 clays examined from a no. of localities, moscovite, quartz feldspar, and CaCO_3 were identified. F. R. G.

Anomalous heat adsorption of kaolinite. F. H. Norton and W. G. Lawrence (*J. Amer. Ceram. Soc.*, 1943, 26, 388—389).—The 2- μ . monodisperse fraction of Florida kaolin required 50% more heat to drive off the H_2O of crystallisation than did pure kaolinite. In absence of other plausible explanations of this anomaly, the existence of two forms of kaolinite is postulated. J. A. S.

Filtration stratification of highly disperse weathering and humification products in the profile of medium developed brown clay. H. Pallmann, E. Frei, and H. Hamdi (*Kolloid-Z.*, 1943, 103, 111—119).—Processes involved in soil formation, and production of the various types of stratification, are considered. Filtration stratification is the most important, and the layers comprise SiO_2 - Fe_2O_3 complexes of very variable composition. The Fe and Al silicates appear to act as stabilisers. A more or less thick protective skin of SiO_2 is formed around the clay nuclei, and is dissolved or dispersed by solutions of oxalates. A. J. M.

Forms of inorganic phosphorus in the lower horizons of some Iowa soils as indicated by plant availability and chemical methods. M. Stelly (*Iowa State Coll. J. Sci.*, 1943, 18, 89—91).—Fertility of sub-soils is considered to depend on their content of acid-sol. P. F. R. G.

X-Ray study of soils in São Paulo state. J. E. de Paiva Netto (*Rev. Brasil. Quim.*, 1943, 16, 99—113).—79 samples have been examined for the constituents of the clay minerals, and the location of these is recorded. F. R. G.

Colloid chemistry of soil types of Asia Minor. R. Lorenz (*Kolloid-Z.*, 1943, 103, 171—180).—Climatic and vegetation zones in Asia Minor are reviewed as regards their effect on the soil. The various types of soil in different parts of the country are described, and the part played by the unfavourable distribution of H_2O is discussed. A. J. M.

Bird's-eye coal from Greymouth, New Zealand. M. Gage and J. A. Bartrum (*J. Geol.*, 1943, 51, 320—329).—Examples of eye-structure in early Tertiary bituminous coal are described. Photographs are reproduced, and origin is discussed. L. S. T.



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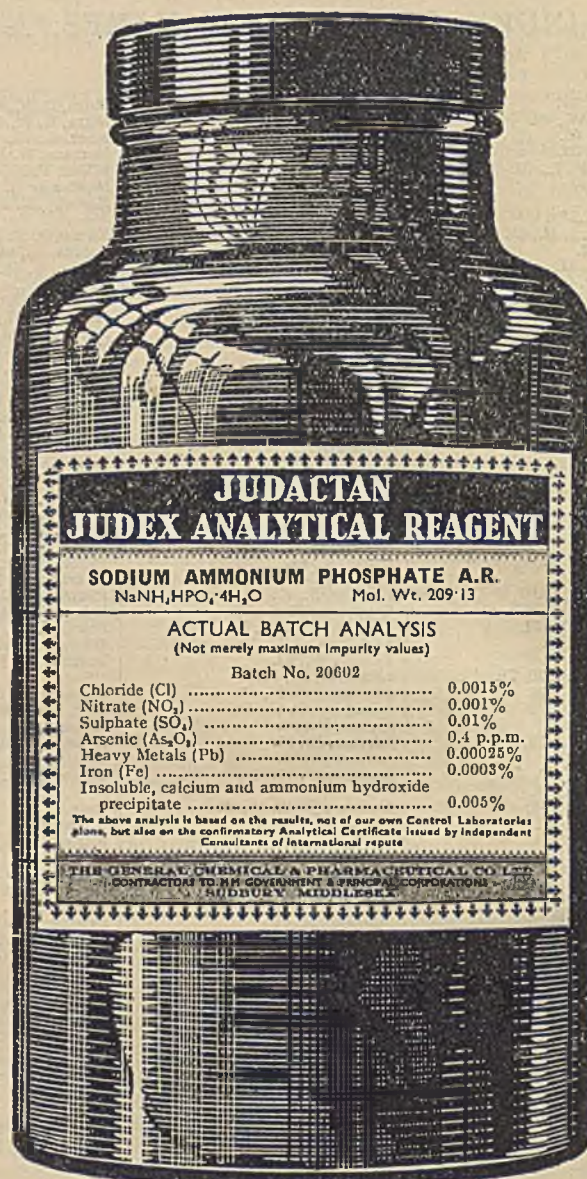
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