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A., I.—GENERAL, PHYSICAL, AND INORGANIC CHEMISTRY

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BRITISH CHEMICAL AND PHYSIOLOGICAL ABSTRACTS

A., I.-General, Physical, and Inorganic Chemistry

JANUARY, 1943.

I.--SUB-ATOMICS.

Fine structure of hydrogen. A. Sommerfeld (Z. Physik, 1941, 118, 295-311).—The observed displacement of the 2S terms towards higher energies than those given by Schrödinger's equations is accounted for by development of Dirac eigenfunctions for continuous variation of potential with nuclear separation. L. J. J.

Forbidden transitions in the Zeeman effect with the alkali metals. F. Gabler and J. Tomiser (*Naturwiss.*, 1942, **30**, 281).—Forbidden components in the Zeeman spectra of Na, K, Rb, and Cs, together with their degrees of polarisation, are given. A. J. M.

Position of the $3p^1D$ term in O III. B. Edlén (*Naturwiss.*, 1942, **30**, 279).—The position of the $3p^1D$ term of O III was formerly deduced from two lines, of which, however, the identification appears to have been mistaken. When the correct combinations are used, the deviation of this term from that expected from the C I and N II spectra disappears. The val. of *R* obtained agrees with that for C I and N II. A. J. M.

Simplified formulation of the limiting laws of quantum states of atoms and its application to the determination of atom terms. P. Gombås (Z. Physik, 1941, 118, 164–180).—A statistical formulation of the permitted states of valency electrons is developed, and applied to give an approximation formula for the determination of terms and eigenfunctions of the valency electrons of atoms and ions.

A. J. M. **Calculation of multiple terms of the Na and K atoms, and the** ground terms of the Al⁺ and Al⁺⁺ ions. B. Kozma and A. Kónya (Z. Physik, 1941, 118, 153—163).—The approximation method of Gombás (cf. preceding abstract) has been used to calculate the 35, 45, 3P, 4P, and 3D terms of the Na atom, the 4S, 4P, 3D, 4F, and 5G terms of the K atom, and the ground terms of Al⁺ and Al⁺⁺ with the corresponding eigenfunctions. The results agree well with the empirical vals. A. J. M.

Characteristic pressure-widening of mercury lines. R. Rompe and P. Schulz (Z. Physik, 1941, 118, 269-276).—The widths of the resonance terms $2^{1}P_{1}$ in the 10140 A. line in the high-pressure discharge in Hg are compared with the theoretical vals. The characteristic pressure-widening of lines depends on the no. of similar atoms and the *f*-no. of the transition of the widened term to the ground state. Determinations were made at pressures of 4.5—80 atm. The temp. of the arc was also found. A. J. M.

Th III spectrum. T. L. de Bruin, P. F. A. Klinkenberg, and P. Schuurmans (Z. Physik, 1941, 118, 58-87).—Zeeman effects in Th III are investigated. About 200 lines between 2000 and 9000 A. are arranged in two term systems. Theoretically predicted term groups are identified. Calc. g vals. are compared with Landé vals., and the g-" sum law" is generally followed within the limits of experimental error. The data are compared with those on CeIII and LaII spectra. W. R. A.

Low-tension sparks and spectrographic detection of difficultly excitable non-metals.—See B., 1942, I, 484.

Quantitative spectroscopy.—See A., 1942, I, 409.

Quantitative spectrographic analysis by the arc method.—See A., 1942, I, 411.

Photometric study of the profiles of the Fraunhofer lines in the solar spectrum. I. Mg b group. Y. P. Rao and C. K. Ananthasubrahmanyam (Indian J. Physics, 1942, 16, 177-186).—Data obtained by photographic photometry and by the direct-reading photo-electric spectrophotometer are given and discussed. N. M. B.

Comparison of emission lines of Novae Herculis 1935 and Lacertae 1936. P. Rossier (Arch. Sci. phys. nat., 1942, [v], 24, Suppl., 38– 40).—The relative line intensities for the two novae are of the same order. L. J. J.

Ionisation in stellar atmospheres composed of *n* kinds of atoms. Y. Fujita (*Japan. J. Astron.*, 1936, **13**, 141-160).—Theoretical. CH. ABS. (e)

Theory of the initial avalanche in the breakdown of a discharge counter in helium. S. C. Brown (*Physical Rev.*, 1942, [ii], **62**, 244-254).—On the basis of Townsend's criterion, a general treatment of breakdown between coaxial cylinders to the limiting case of parallel plates is developed. The functional form of the photon effect leads to the assumption that two types of photons are operative, which can be identified with the resonance radiation of He I and He II. Theoretically derived graphical methods for predicting breakdown voltages are given. N. M. B.

Relation between isothermal and adiabatic Ettingshausen-Nernst coefficients. M. Kohler (Z. Physik, 1941, 118, 312-316).—The discrepancy found by Frank (*ibid.*, 1931, 63, 596) between isothermal and adiabatic Ettingshausen-Nernst consts. vanishes when the metal plate and its connecting leads are thermoelectrically equiv., and when the thermo-effects between magnetised and unmagnetised metal are sufficiently small. L. J. J.

Spectral sensitivity distribution of selenium barrier-layer cells. F. Eckart and A. Schmidt (Z. Physik, 1941, 118, 199-209).—The effect of metallic impurities (Cd) on the photo-electric properties of Se barrier-layer cells has been investigated. The addition of small quantities of Cd causes a smoothing out of the long- λ falling-off of sensitivity of the cell, but the addition of larger quantities causes the appearance of a second max. at 0.7 m μ . The phenomena can be explained by the existence of small areas of CdSe, crystallising in the wurtzite type, is also photo-sensitive.

A. J. M. Long-wave selective photo-effect in super-semi-conductors. G. Maurer (Z. Physik, 1941, 118, 104—121).—A new theory of longwave selective photo-effect in super-semi-conductors is advanced and an emission formula derived. An "inner" and an "outer" photo-effect combine. W. R. A.

Precision determination of h/e by means of the short-wave-length limit of the continuous X-ray spectrum at 20 kv. W. K. H. Panofsky, A. E. S. Green, and J. W. M. Du Mond (*Physical Rev.*, 1942, [ii], 62, 214-228).—To obtain further evidence on the discrepancy between vals. from direct and indirect methods, practical improvements giving increased accuracy are described, and sources of error in measurements and interpretation are discussed. The new val. $h/e = (1.3786 \pm 0.0002) \times 10^{-17}$ erg sec./e.s.u. is in fair, but not complete, agreement with measurements of other at. consts.

N. M. B. **Ionisation of argon and neon by electron impact.** D. P. Stevenson and J. A. Hipple (*Physical Rev.*, 1942, [ii], **62**, 237-240).—The ionisation efficiency curves for A⁺, A⁺⁺, Ne⁺, and Ne⁺⁺, and tabulated data for the relative probabilities of forming the singly and doubly charged ions, are given and discussed. N. M. B.

Cathodic sputtering in the glow discharge. I. Primary vaporisation of copper. A. Günther-Schulze (Z. Physik, 1941, 118, 145– 152).—Cathodic sputtering is considered as both an evaporation and a diffusion process. It is necessary to determine the no. of atoms vaporised per coulomb (N_p) , and its dependence on cathode drop, cathode material, surface characteristics of the cathode, and the type of gas used, and the no. of atoms diffusing per coulomb (N_d) . A method of determining N_p is described for Cu in He, Ne, A, and H₂, and for a cathode drop of 480 v. A. J. M.

Physical characteristics of supervoltage Roentgen rays.—See A., 1942, III, 933.

Comparison of certain aspects of 200- and 400-kv. radiation.—See A., 1942, III, 933.

Secondary electron emission of semi-conductors or insulators. G. Maurer (Z. Physik, 1941, 118, 122-144). W. R. A.

Structure of the nucleus. N. Tsunajima (Sanshusha Press, Tokyo, Separate, 1936, 20 pp.).—Theoretical. The average separation of an electron and positron in the lowest quantum state is $\sim 3 \times 10^{-13}$ cm. The radius of the neutron is $\sim 0.2 \times 10^{-13}$ cm.

CH. ABS. (e) Statistics of isotope distribution in condensed particles. L. Holleck (Z. Physik, 1941, 118, 340-342; cf. ibid., 1940, 116, 624).—A probability function is derived for the occurrence of isotopic compositions lying between specified limits. L. J. J.

Magnetic field measurement in β -ray spectroscopy.—See A., 1942, I, 411.

Permanent magnet β -ray spectrograph.—See A., 1942, I, 411.

Fission of the deuteron by fast neutrons. E. Bagge (*Physikal. Z.*, 1942, 43, 226-236).—Recoil particles produced in H_2 and D_2 by neutrons from Ra + Be are studied in a cloud-chamber. The energy distribution of the primary neutrons at 0.8—3 Me.v. is deduced. With D_2 the range distribution curve for the recoil particles has a peak at ~2.6 cm. air-equiv., attributed to fission of deuterons; the sharpness of the peak is ascribed to a resonance effect. The effective cross-section for fission by neutrons in the Ra + Be spectrum at <3.5 Me.v. is ~3 × 10⁻²⁵ sq. cm. The expected angular and energy distribution of the recoil particles is compared with the observed distribution. A. J. E. W.

Effective cross-sections for reactions between neutrons and deuterons. K. H. Höcker (*Physikal. Z.*, 1942, **43**, 236–257).—A derivation of the eigenfunction for the system ${}^{2}_{1}H + {}^{1}_{0}n$ and a solution of the Schrödinger equation applicable to this system are given. Allowance is made for exchange effects, but polarisation of the deuteron is necessarily neglected. Calc. cross-sections are: for scattering, $2 \cdot 5 \times 10^{-24}$ sq. cm. for thermal energies, and $1 \cdot 6 \times 10^{-24}$ for energies of ~2.8 Me.v.; for neutron capture, $1 \cdot 7 \times 10^{-28}$ sq. cm.; for fission of the deuteron, 2×10^{-24} sq. cm. (10-Me.v. neutrons). Fission can occur only with neutrons of energy $\ll 3.45$ Me.v.

Physical differences between types of penetrating radiation. A. H. Compton (Amer. J. Roentgenol, 1940, 44, 270–275).—Neutron rays have about the same penetrating power as high-voltage X-rays but the ions they produce occur in highly conc. groups; they also act much more strongly on H-containing substances than on any other whilst for hard X-rays H is least effected. H. L.

 γ -Radiation of light elements by proton irradiation. N. Hole, J. Holtsmark, and R. Tangen (Z. Physik, 1941, 118, 48–57).—Excitation functions for γ -radiation produced when Li, B, C, Na, Mg, Si, and Cl are bombarded with protons have been measured and compared with existing data. The widths at half max. intensity have been determined from resonance data. W. R. A.

Nuclear excitations resulting from radioactive decay. E. H. Plesset (*Physical Rev.*, 1942, [ii], 62, 181–186).—Radiations emitted by several radioactive nuclei were investigated with a permanent β -ray magnet spectrograph. Four transitions result from the decay of ^{\$7}Co. No internally converted radiation is emitted by ^{\$5}Zn in the region 20–300 ke.v. A complicated and only partly resolved spectrum is emitted by the products of deuteron bombardment of Au. N. M. B.

Short range a-particles from fluorine bombarded with protons. R. A. Becker, W. A. Fowler, and C. C. Lauritsen (*Physical Rev.*, 1942, [ii], **62**, 186—196; cf. Streib, A., 1941, I, 187).—Data and measurements for the ranges of the a-particles from the five resonances in the bombardment of F with protons are tabulated. The Q vals. of the particles obtained at 334, 867, 927, and 1363 ke.v. are identical, viz., $1\cdot81\pm0.04$ Me.v. The Q val. of the low-energy a-particle obtained at the 1220-ke.v. resonance is $1\cdot93\pm0.07$ Me.v. Hence the energy separation for the two corresponding states of 16 O is $0\cdot12\pm0.08$ Me.v. At least one of the two resonances near 900 ke.v. must yield short-range a-particles with non-spherically symmetric angular distribution. N. M. B.

β-Ray spectra of arsenic, rubidium, and krypton.[•] G. L. Weil (*Physical Rev.*, 1942, [ii], **62**, 229–237).—Cloud-chamber measurements on the β-rays emitted by the radioactive nuclei ⁷⁶As (27 hr.), ^{88, 290}Kr (3 hr.), and the decay product ^{88, 200}Rb (18 min.) of the latter give results : half-life 26.8 hr., -, 17.5 min., respectively; and upper energy limits of the disintegration electrons, 2-71, 2-5, 5-1 Me.v., respectively. Fermi and Konopinski-Uhlenbeck plots and analyses are reported and discussed. N. M. B.

Electron components of cosmic radiation and the instability of mesotrons. G. Cocconi and V. Tongiorgi (Z. Physik, 1941, 118, 88—103).—Two series of measurements, at altitudes 120 and 2200 m. above sea level, have been carried out to determine the change and relation between electron and mesotron components of cosmic radiation with respect to zenith angle. Decomp. components and residual primary components in the lowest layers of air have approx. equal intensities, thus postulating modification of accepted views on the decomp. of mesotrons. The life of a mesotron is $\sim 3-4 \times 10^{-6}$ sec. W. R. A.

Compton effect for mesons. R. Iskraut (Z. Physik, 1941, 118, 181–198).—Theoretical. The Compton effect is calc. for mesons when the incident radiation is not of too short λ , and the treatment is non-relativistic. The method is based on that of Gordon and Sommerfeld (A., 1927, 84). The spin of the meson exerts no effect on the scattered radiation to the degree of approximation of the calculation. A. J. M.

Determination of soft cosmic-ray components through various materials for the estimation of the proportion of disintegration electrons. B. Siegert (Z. Physik, 1941, 118, 217-231).—The no. of disintegration electrons and their secondaries produced per meson is determined experimentally by finding the difference between the soft components in air and after passing through a light solid or liquid. Pb absorption curves are obtained by the use of three counters for the vertical intensity in air, and after passage of the rays through H_2O , C, and Fe. The ratio of soft to hard radiation in air is 0.32; after passage through H_2O and C it is 0.20, and after passage through Fe 0.16. The mean disintegration time of the meson is 3.5×10^{-6} sec. A. J. M.

Proton-proton interaction and the Yukawa particle. K. C. Kar (Indian J. Physics, 1942, **16**, 187–195).—Proton-proton scattering, previously examined with a short-range interaction potential of the type $Ae^{-\alpha r}$ (cf. A., 1942, I, 32), is treated with a Yukawa-type potential $V(r) = (A/r)e^{-\alpha r}$. The rigorous formula deduced agrees well with experiment (cf. Heydenburg, A., 1940, I, 51). The fitting vals. of A and α give vals. of the short-range charge and mass of the neutretto agreeing exactly with those for the mesotron as determined from the binding energy of the deuteron. N. M. B.

Electric quadrupole moments of light and heavy nuclei. S. B. Welles (*Physical Rev.*, 1942, [ii], **62**, 197-203).—Mathematical. On the assumption that the asymmetrical nuclear charge distribution is due to a single proton, a general expression for the electric quadrupole moment as a function of nuclear spin is obtained. It is deduced that the quadrupole moment is negative and its val. increases negatively as nuclear spin increases. The calculation for light nuclei shows that the addition of a proton to a nucleus with Q originally zero produces a negative quadrupole moment. N. M. B.

Cloud-chamber study of collision electrons in equilibrium with mesons. L. Seren (*Physical Rev.*, 1942, [ii], **62**, 204–214).—Pb blocks of different thicknesses above a cloud chamber containing a W plate allowed a distinction between mesons and electron showers. Of 601 meson tracks observed, with no magnetic field, 497 traversed the W plate; hence the % of fast collision electrons in equilibrium with mesons in W and Pb is 10.5 and 8, respectively, in agreement with theory. 143 collision electrons with energy range 13—175 kev. were produced by meson tracks in the gas and indicate a $1/E^2$ differential spectrum. N. M. B.

Pair-theory of nuclear forces. G. Wentzel (Z. Physik, 1941, 118, 277–294). The dependence of static nuclear forces on separation is calc. approx. on the basis of a scalar pair-theory without recourse to perturbation methods. The field is quantised according to Bose-Einstein statistics after substitution of zero particle-spin vals. for $\frac{1}{2}$ vals. The method gives a relation in agreement with that given by perturbation theory, but abs. vals. given for nuclear forces are too high. L. J. J.

Influence of an "uneven" anisotropy on the path of light rays. P. Frank (*Physical Rev.*, 1942, [ii], 62, 241-243).—Mathematical. N. M. B.

N. M. B. **Rotating disc.** C. W. Berenda (*Physical Rev.*, 1942, [ii], **62**, 280—290).—Relativistic geometrical considerations lead to a suggested new test of general relativity by the cyclotron; an artificially radioactive element of low at. wt., revolved as ions in the cyclotron, should be more radioactive, on being brought to rest, than an equiv. sample remaining at rest. N. M. B.

II.—MOLECULAR STRUCTURE.

Completion of the analysis of CH bands. L. Gerō (Z. Physik, 1941, -118, 27-36).—By the investigation of predissociation phenomena in CH bands excited in different ways the analysis of known bands has been extended to higher rotational quantum nos. and the rotational analysis of the (2, 2) band of the $A^2\Delta \rightarrow X^2\Pi$ system 4300 A. has been made. W. R. A.

Predissociation phenomena in the CH and CD bands. L. Gerö and R. Schmid (Z. Physik, 1941, **118**, 210–216).—CH and CD bands excited under various conditions and with different pressures in the source of light exhibit a no. of predissociation phenomena. Limit curves are given, and the positions of the atom term combinations are indicated. The CD mol. is more stable than CH. A. J. M.

Dissociation of isotopic molecules. L. Gerō and R. Schmid (Z. Physik, 1941, **118**, 250-256).—Isotopic mols. do not have the same potential curves. For deuterides the curves are usually somewhat higher than those of hydrides, showing greater stability, in agreement with other results. A. I. M.

Structure of the electronic bands of the OD molecule. V. A-Doubling. M. G. Sastry (Indian J. Physics, 1942, 16, 169–175; cf. A., 1942, I, 223).—The A-doubling in the ⁴II states is examined on Mulliken's theory. The doublet difference $\delta_{\nu_{2de}}(K) - \delta_{\nu_{1de}}(K)$ varies nearly linearly with K. The doubling in OD is < in OH (cf. Johnston, A., 1934, 237); the ratio is \sim 0.31. N. M. B.

 ${}^{2}\Pi_{u}$ — ${}^{2}\Pi_{o}$ bands of CO₂⁺. II. S. Mrozowski (*Physical Rev.*, 1942, [ii], 62, 270—279; cf. A., 1942, I, 131).—Full data and rotational analyses for 24 new sub-bands are reported and consts. are evaluated. Former vals. of consts. are corr. and A-doubling for all levels is calc. N. M. B.

Influence of water vapour on flame-gas temperatures.-See A., 1942, I, 400.

Radiation from flames.-See A., 1942, I, 400

Condition of freshly burnt gases.—See A., 1942, I, 400.

Double minimum problem applied to potassium hydrogen fluoride. 609).—The doublet character of the infra-red absorption band at 3775-0 and 3664.4 cm.⁻¹ of solid KHF is discussed. From a plot of 3775-0 and 3664.4 cm.⁻¹ of solid KHF is discussed. From a plot of $\Delta h\nu_a/h\nu_a$ against the parameter q, the val. of q corresponding with the observed doublet separation $(\Delta h\nu_a/h\nu_a = 0.03)$ is 2.7; the distance (l = 0.26 A.) from the centre of the ion to the potential min. can then be calc. from $l = 5.805q/(\mu\nu_a)^{0.5}$, where $\mu = 0.982$ and ν_a is the average fundamental frequency (3719.7 cm.⁻¹). This val. of l agrees with the dimensions of the FHF' ion as obtained by other methods and supports the view that the doublet is due to the "tunnel effect." The height of the potential barrier (33,400 g.-cal. per mol.) compares favourably with the val. 32,150 g.-cal. per mol. for the potential hill intervening between two Morse curves for HF where the F—F distance equals that in KHF, viz., 2.25 A. C. R. H. C. R. H.

Vibrational spectra of hydrocarbon molecules. V. Computation of the frequencies of the bond vibrations of olefine chains. B. I. Stepanov (J. Phys. Chem. Russ., 1941, 15, 78-90; cf. Eliasche-vitsch, A., 1942, I, 193).-Infra-red frequencies are calc. for straight and branched olefines. Only changes in the neighbourhood of a double bond affect the frequency due to double bond (\sim 1650 cm.⁻¹). Published experimental data confirm the theory. J. J. B.

Fundamental quantities and symbols in light absorption. A. Thiel (Z. Elektrochem., 1942, 48, 267-270).-The dimensions of fundamental quantities are discussed. C. R. H.

[Photo-sensitivity of] acyclic acids.—See A., 1942, I, 404.

Spectrum of *n*-primary alcohols between 14,000 and 9000 cm.⁻¹ J. Kreuzer (Z. Physik, 1941, 118, 325–339).—The absorption of *n*-primary alcohols in the near infra-red to $\lambda \cdot 1 \cdot 1 \mu$. is compared with that of substances which give OH spectra (H₂O) and CH spectra (*n*-C₆H₁₄ and cyclohexane) only. The effect of coupling on CH fraction areas the order spectra (*n*-C₆H₁₄ and cyclohexane) only. CH frequencies is small, and separation of absorption frequencies is determined principally by constitutional differences between CH₂ and Me groups. The integral absorption in the CH region α the no. of CH linkages from C_1 to C_8 . L. J. J.

Absorption spectra and photochemistry, with special reference to water solutions. C. S. Forbes (Cold Spring Harbor Symp. Quant. Biol., 1935, 3, 1–9).—Quinfine is stable to H_2CrO_4 at λ 4360 A, but decomposes at λ 4050. Photolysis of cinchonine occurs at λ 3660, but not at λ 4050. The quantum yield is a max. for quinine at λ 2800, for cinchonine at λ 2540 and for N₂O₄ at λ 3360.

Сн. CH. ABS. (e) Chemical properties of X-ray-activated molecules with special reference to the water molecule. H. Fricke (Cold Spring Harbor Symp. Quant. Biol., 1935, 3, 55-63).--X-Rays do not decompose H₂O. Reactions are caused by the activated H₂O mol., which is produced at the rate of 0.55μ -mols. per 1000 c.c. per 1000 r. (1 r. produces an ionisation of 1 e.s.u. in 1 c.c. of air at 0°/760 mm.). The activated mol. reacts with H₂O, forming H₂O₂ and H₂. Dosage of 1000 r. produces 2.8×10^{-6} g. ion pairs in 1000 g. of H₂O. The production of H₂O₂ from H₂O, the reduction of crO₄", and the decomp. of H₂O₂, HCO₂H, and of H₂C₂O₄ by X-rays and by light vary with the pH and the conc. H₂O has a strong absorption band for light beginning at ~1760 A. CH. ABS. (e) ABS. band for light beginning at ~ 1760 A. Сн. Авз. (е)

Configuration of organic co-ordination compounds of nickel, with special reference to nickel bisformylcamphor-ethylenediamine. H. S. French, M. Z. Magee, and E. Sheffield (J. Amer. Chem. Soc., 1942, 64, 1924—1928).—Ni complexes from salicylaldehyde, o-COMeC₆H₄·OH, and formylcamphor (I) are paramagnetic (μ 3·2, 3·1, and 3·4, respectively). Those from salicylaldimine, o-hydroxy-acetophenoneimine, disalicylidenepropylene- $\alpha\beta$ -diamine, o-aminobenzaldimine, and di-o-aminobenzylidenephenylenediamine are diamagnetic. That from the condensation product of (I) and (CH₂·NH₂)₂ is diamagnetic when solid, but rather feebly paramagnetic (μ 1·9) in MeOH, owing, probably, to the source co-planar Configuration of organic co-ordination compounds of nickel, with magnetic (μ 1.9) in MeOH, owing, probably, to the square co-planar arrangement of the solid becoming strained and asymmetric in solution under the influence of the asymmetry of the (I) component. Absorption spectra are recorded and discussed; para- and diamagnetic compounds may perhaps be thus distinguished.

R. S. C

Electromagnetic mechanism of the β -phosphorescence of fluorescein in acid solution. S. I. Weissman and D. Lipkin (J. Amer. Chem. Soc. 1942, 64, 1916. 1918). A wide-angle interference study of the β -phosphorescence of fluorescein in H₃PO₄ at 95° K. shows that the process involves an electric dipole transition.

W. R. A. Raman spectra of a solid peroxide, benzoyl peroxide, and a solid anhydride, benzoic anhydride. B. Susz and M. Berenstein (Arch. Sci. phys. nat., 1942, [v], 24, Suppl., 182-186).—Data given for the cryst. solids are compared with those obtained by other workers

for the substances in solution. The resemblance is close, but new weak lines are present in the spectra of the solid peroxide. The spectra of the solids show $\nu\nu$ characteristic of monosubstituted C₆H₆ derivatives, and of C.O. Bz₂O has a second ν , less intense, at 1714 cm.⁻¹, due to C.O. The absence of this line in the spectrum of Bz₂O₂ indicates the great independence of the two C.O, which no longer show resonance, and the greater symmetry of the mol. L. S. T.

Raman effect and hydrogen bonds. V. Mixtures of acetic acid with ethers. G. V. L. N. Murty and T. R. Seshadri (Proc. Indian Acad. Sci., 1942, 16, A, 50-53).—Results for AcOH-dioxan and AcOH-acetal mixtures support the mechanism proposed in previous W. R. A. papers (A., 1942, I, 315).

Raman effect and constitution. 2: 6-Dimethyl-4-pyrone.-See A., 1942, II, 373.

Ionisation and dissociation of electron impact : ethane, n- and iso-butane.-See A., 1942, I, 404.

Relation of dielectric properties to structure of crystalline polymers. I. Polyesters. W. A. Yager and W. O. Baker. II. Linear polyamides. W. O. Baker and W. A. Yager (J. Amer. Chem. Soc., 1942, 64, 2164—2171, 2171—2177).—I. The dielectric const. (ϵ^{\prime}) and loss (ϵ^{\prime}) were determined for the frequency interval kc.—75 Mc. for polyethylene ω -hydroxypolydecoate, polydecamethylene sebacate and oxalate, and polyethylene sebacate, azelate, adipate, and succinate. Observed polarisation and dispersion are related to the orientation and concn. of polar groups in the chains and to their relative positions in adjacent chains. For all polyesters examined relative positions in adjacent chains. For all polycists examined ϵ' is > the refraction val. Oscillation of dipole groups contributes orientation polarisation; these dipoles interact chiefly between chains, thus causing broad dispersion. The polyesters exhibit high-frequency absorption with max. at low temp., indicating small oscillating units in the chains. Packing of the chains is strongly influenced by the dipoles, and formation of dipole layers makes the interaction largely independent of polar group concn. Dielectric results indicate thermal motion in the polymerides, which may explain mechanical properties such as thermal retraction associated with chain kinking in long chain mols.

II. Similar data over the same frequency range and a temp. interval of 120° were determined for polyhexamethylene sebacamide and adipamide. Dipole orientation accompanied by anomalous dispersion is exhibited even at room temp. Vals. of ϵ' and ϵ'' increase as the conc. of the polar group increases, but interaction between groups in adjacent mols. causes substantial modification. Interaction was reduced by different means and this was accompanied by enhanced polarisation. The dielectric properties show steep temp. coeffs. Polyamides have high d.c. conductivity at high temp., caused probably by mobile, charged atoms, *e.g.*, H, resulting from isomerism in the amido-linking. W. R. A.

Ellipsoid method of determining dielectric constants.-See A., 1943. I. 26.

Dielectric investigation of polypeptides. II. Dispersion of simple amino-acid polypeptides.—See A., 1942, I, 393.

Electric moments of inorganic halides in dioxan. II. Chlorides of boron, aluminium, iron, silicon, germanium, and tin. T. J. Lane, P. A. McCusker, and B. C. Curran (J. Amer. Chem. Soc., 1942, 64, 2076—2078).—Vals. are: BCl₃ 4.86 ± 0.07 ; AlCl₃ 2.02 ± 0.05 ; FeCl₃ 1.27 ± 0.05 ; SiCl₄ 0.0; GeCl₄ 0.67 ± 0.08 ; SnCl₄ 3.82 ± 0.15 D. Co-ordination between dioxan and BCl₃ is almost complete but FeCl₃ shows very slight interaction. In group IV halides co-ordin-ation increases with increasing size of the central atom. W. R. A.

W. R. A.

Dipole moments in the vapour state and resonance effects in sub-stituted benzenes. E. C. Hurdis and C. P. Smyth (J. Amer. Chem. Soc., 1942, 64, 2212-2216).—From measurements of dielectric Soci, 1816, 1917, with those reported. PhI has a val. > the anticipated val. $o-C_6H_4Cl_2$ gives a val. > that reported in literature for the vapour but agrees with the val. calc. from the solution val. after correcting for solvent. Vals. for the xylenes give 0.36 D. for the group moment produced by attaching Me to $C_{\rm s}H_{\rm s}$. Vals. for the *p*-disubstituted benzenes are > the differences (due to resonance) between the W. R. A. corresponding monosubstituted compounds.

Reduction of reflexion at the surface of optical glasses. Smakula (*Physikal. Z.*, 1942, **43**, 217–222).—Reflexion of light at an air-glass interface can be reduced by $\sim 50\%$ by a thick layer of material of suitable *n* on the surface. With monochromatic light reflexion can be eliminated by a suitable layer of thickness comparable with h. The theory of the methods is proved by the subwith λ . The theory of the method is given, and methods of preparing the layers are proposed. The possible use of composite layers or layers of variable n is also discussed. A. J. E. W. A. J. E. W.

Ultra-violet dispersion of air. H. Lowery (*Phil. Mag.*, 1942, [vii], **33**. 622-630).—The dispersion of dry air, CO₂ not removed, was measured between 6563 and 1822 A. by a combination of prism and diffraction grating. Results agree with previous work and lead to the Cauchy formula $(n - 1) \times 10^7 = 2882 \cdot 2 + (13 \cdot 53/\lambda^2 \times 10^{-8}) +$ $(0.3064/\lambda^{4} \times 10^{-16}).$ O. D. S.

Effect of temperature on streaming double refraction of benzene. E. Winkler (Z. Physik, 1941, 118, 232-249).—The streaming double refraction in C_6H_6 was produced in a cylindrical apparatus with a fixed inner and a rotating outer cylinder. With this apparatus the streaming is laminar up to a considerable speed of rotation. The effect of temp. on the streaming double refraction was determined at various speeds of rotation, for temp. from m.p. to b.p. There is a considerable increase in the Maxwell const. of C_6H_8 between 5° and 15°. This is due to a certain degree of ordering of mols. in the neighbourhood of the m.p. The results are compared with the effect of temp. on magnetic double refraction of normal and cryst. liquids. A. J. M.

Thermodynamical notes. W. Wilson (*Phil. Mag.*, 1942, [vii], 33, 831-841).—The work of Carnot, Clapeyron, and Clausius is discussed. Thermodynamic reversibility is discussed, and a treatment of thermoelectric phenomena is given which avoids the use of con-ditions to ensure reversibility. Planck's statement of the second law of thermodynamics is considered. A. J. M.

Statistical mechanics. J. E. Mayer (J. Chem. Physics, 1942, 10, 629-643). Mathematical. General equations dealing with distribution functions and fugacity are derived. C. R. H.

Systematic method of obtaining the relations between thermodynamic derivatives. A. Tobolsky (*J. Chem. Physics*, 1942, 10, 644-645).—A simple method, suitable for tuition purposes, of obtaining the relations between the various thermodynamic coeffs. is presented. It is readily adaptable to any desired set of independent variables. C. R. H.

Carbon-carbon bond strengths in ethane, propane, and *n*-butane. E. R. Van Artsdalen (*J. Chem. Physics*, 1942, **10**, 653).—After correcting energy relations to 0° K. the following bond strengths are calc.: Me-Me $85 \cdot 6 \pm 2 \cdot 3$; Et-Me $83 \cdot 8 \pm 3 \cdot 3$; Et-Et $82 \cdot 4 \pm 4 \cdot 5$ kg.-cal., a CH2 increment lowering the bond strength 1.5 kg.-cal.

C. R. H. Associating effect of the hydrogen atom. XI. Hydrogen bonds involving the sulphur atom. The S-H-N bond.—See A., 1943, II,

Small liquid drops. II. E. Rumpf and N. Neugebauer (Z. Physik, 1941, 118, 317-324; cf. A., 1939, I, 140).—Measurements of min. radii for droplets of salt solutions in air streams show a dependence on the R.H. of the air. L. J. J.

III.—CRYSTAL STRUCTURE.

Thermal radiation in crystals and X-ray diffraction. J. Weigle (Arch. Sci. phys. nat., 1942, [v], 24, 56-58).—The author's treatment for a simple cubic lattice, by the use of the reciprocal lattice, is generalised for all lattice types. L. J. J.

Connexion between the kinematic and dynamical theories of X-ray diffraction. H. Ekstein (*Physical Rev.*, 1942, [ii], **62**, 255–261).— Mathematical. The Laue kinematic theory for very small crystals and the Darwin-Ewald theory for large crystals are deduced from limiting cases of a general integral equation. N. M. B.

Diffraction of X-rays by liquid oxygen. P. C. Sharrah and W. S. Gingrich (J. Chem. Physics, 1942, 10, 692).—Erratum (see A., 1941, I, 354).

62, 261–270; cf. A., 1940, I, 404).—The X-ray diffraction pattern of A is obtained at 26 different conditions of pressure (0.8–51.1 atm.) and temp. $(84.35-168^{\circ} \text{ K.})$ with a density variation 1.401-0.038 g. per c.c. Sharp max. at high density are less marked or non-existent at low density. Results are plotted and discussed. Six liquid patterns and one vapour pattern are analysed for at. distribution. N. M. B.

Electron reflexions in MgO crystals with the electron microscope. R. D. Heidenreich (*Physical Rev.*, 1942, [ii], **62**, 291-292; cf. Hillier, A., 1942, I, 319).—An electron micrograph obtained with a small objective aperture shows alternate light and dark bands. The bands occur in cubes oriented with the plane of two opposing edges normal to the paper and are due to multiple electron reflexions from the crystallographic planes. Spacings and intensity max. are discussed. N. M. B.

Crystal structure of phosphorus pentachloride. D. Clark and H. M. Powell, and (independently) A. F. Wells (*J.C.S.*, 1942, 642–645).—X-Ray oscillation photographs of PCl₅ crystals from PhNO₂ solution, protected by a coating of vaselin and medicinal paraffin, were obtained, and the structure was worked out independently, The results were in agreement, and showed that PCl, has a tetragonal unit cell containing tetrahedral PCl_4^+ and octahedral PCl_6^- groups. The PCl_4^+ and PCl_6^- are arranged in a structure of the CsCl type, but distorted, since these ions are not spherical. Each complex has 8 neighbours of opposite charge. The P—Cl distance in $PCl_4^$ is a little < the distance calc. from the sum of the normal tetrahedral covalent radii derived from Me compounds.

A. J. M. te. S. B X-Ray investigation of the structure of lead chromate. S. B. Brody (J. Chem. Physics, 1942, 10, 650-652).—Simple rotation and Weissenberg equi-inclination X-ray photographs taken about the c and b axes of PbCrO₄ (crocoite) verify the lattice and space-group previously settablished. The x is a previously settablished previously established. The x, y, z parameters in fractions of cell translations are Pb: 0.220, 0.150, 0.400 and Cr: 0.215, 0.150, 0.896 respectively. Accurate O parameters could not be obtained. The structure appears to be fairly close-packed and the co-ordination no. of O atoms about Pb is probably 8 or more. The mechanism of photo-conductivity and photo-blackening in PbCrO₄ is more probably due to migration through holes due to lattice defects than to migration through a perfect lattice. C. R. H. to migration through a perfect lattice.

Comparative Rœntgen-ray diffraction study of natural apatites and apatite-like constituents of bone and teeth substance.—See A., 1942, III, 900.

X-Ray diffraction studies of iodinated amino-acids and proteins. M. Spiegel-Adolf, R. H. Hamilton, jun., and G. C. Henny (*Biochem. J.*, 1942, **36**, 825-828).—X-Ray diffraction studies of a no. of iodinated NH2-acids and proteins have been made in order to discover whether the process of iodination produces any change of mol. configuration which could cause physiological activity. The substances examined were tyrosine, 3: 5-di-iodo-tyrosine (I) and -thyronine, thyroxine (II), thyroglobulins (III) of human origin, iodocasein (\mathbf{IV}) , and plastein from (\mathbf{IV}) . Iodination causes some kind to of structural rearrangement in the case of NH_2 -acids. X-Ray diffrac-tion patterns of (**III**) of varying (**II**) content and of (**IV**) are identical with those of the I-free substances. In artificial mixtures, 2% (**II**) seems to be the lower limit for detection by X-ray diffraction methods; the method is not sensitive enough to detect minute amounts of (II) present in normal and pathological (III). Artificial mixtures of (I) and case n corresponding with the I content of iodinated case in show the pattern due to (I) superimposed on that of casein. Plastein made from (IV) has a pattern distinct from that of (**IV**). A. J. M.

Electron diffraction by silver amalgams. Z. G. Pinsker and L. I. Tatarinova (J. Phys. Chem. Russ., 1941, 15, 96-100).-Evaporated Ag films kept in Hg vapour show transmission patterns of a cubic lattice (17.94 A.) and, at a higher [Hg], two tetragonal face-centred lattices ($a \ 6.93$ and 9.05, $c \ 5.82$ and 5.62 A.). J. B.

Electron-microscope study of surface structure. R. D. Heiden-reich and V. G. Peck (*Physical Rev.*, 1942, [ii], 62, 292–293).—A brief description of a new technique of reproducing the surface structure of opaque bodies for examination by transmission. An impression of the surface is formed in a thermoplastic (polystyrene) and a thin film replica is made from the moulding by evaporating on to it a film of SiO_2 . N. M. B.

Disperse structure of solid systems and its thermodynamic basis. VIII. Fusion and crystallisation from the viewpoint of the theory of the coalescing conglomerates in real crystal systems. D. Balarev (Kolloid-Z., 1942, 99, 157-159).-It is suggested that a crystal system always contains surface particles not conforming with the crystal structure and that at higher temp, this results in appreciable softening. This increases continuously during fusion, which occurs suddenly through the difference in the equilibrium dimensions of the free and softened elementary crystals. Fusion and crystallisation can be regarded as peptisation and coagulation processes.

J. W. S.

A

IV.—PHYSICAL PROPERTIES OF PURE SUBSTANCES.

Determination of the mol. wt. of cellulose by an end-group method. E. Husemann and O. H. Weber (*Naturwiss.*, 1942, **30**, 280-281).----Mol. wts. of celluloses obtained by physical and chemical methods are compared. A polymeric-homologous series of celluloses was prepared from purified cotton-wool by progressive hydrolysis. All these contained aldehydic end-groups. They were converted into carboxylic acids without decomp. The $-CO_2H$ groups were determined by the reversible methylene-blue method, and the no. determined by the reversible methylene-blue method, and the no. of glucose residues to one $-CO_2H$ was calc. This gives the length of chain in the mol. The degree of polymerisation of the same sub-stances was determined by finding the η of solutions in Schweitzer's reagent. The substances were also nitrated without decomp. and the mol. wt. was determined osmotically in COMe₂. Results of the horized and subscied methods agree satisfactorily of the chemical and physical methods agree satisfactorily.

Electrical conductivity, increase of resistance in a magnetic field, Hall effect, and superconductivity of rhenium. G. Aschermann and E. Justi (*Physikal. Z.*, 1942, 43, 207-212).—The temp.-dependence of resistance (*R*) at 0.85—373° K. is studied for a rod and a plate

prepared by sintering Re powder successively at 1000° and 2400°. The results may be approx. represented by the Grüneisen function $(\Theta_D = 283^\circ)$, deduced from the Lindemann m.p. formula). The temp. coeff. of R at $0-100^\circ$ is 0.46% per 1°. The at. resistivity at Θ_D is 12.5 Ω .cm. Transverse magnetic fields $(H \ge 34.3 \text{ kG})$ increase R; at 20.4° κ . and H > 10 kG. the ΔR -H curve is approx. linear, ΔR reaching 26.6%. The R-H relationship is represented in a reduced Kohler diagram, in which comparison is made with other elements. The Hall effect in Re is anomalous $(A_{\rm H} = +3.15 \times 10^{-3})$. Re becomes superconductive at ~0.95° κ . A. J. E. W.

Optical properties of 2-sulphanilamidopyrimidine (sulphadiazine). A. S. Wilkerson (J. Amer. Chem. Soc., 1942, 64, 2230).—Crystals of sulphadiazine, m.p. 254°, are monoclinic, colourless, transparent to translucent; lustre vitreous. Cleavage pinacoidal at right angles, perfect. Solubility 0.0123 g. per 100 c.c. H_2O at 37°. Optically biaxial positive; a 1.680, β 1.695, γ 1.788, all \pm 0.002. W. R. A.

Physical constants of methyl isopropenyl ketone. J. H. Brant (J. Amer. Chem. Soc., 1942, 64, 2224—2225).—Vals. of n_{D}^{20} , p_{20}^{20} , R. and b.p. at various pressures of the ketone are given. Ageing produces polymerisation. W. R. A.

Specific heat equations for carbon dioxide, carbon monoxide, steam, hydrogen, and oxygen, and the free energy equation for the watergas reaction. M. de K. Thompson (*Trans. Electrochem. Soc.*, 1942, 82, *Preprint* 8, 95–100).—The least square solutions for the sp. heat equations of CO₂, CO, H₂O, H₂, and O₂ are worked out for $C_p = a + bT + cT^2$, $C_p = a + bT + cT^{-2}$, and $C_p = a + bT + cT^{-3}$. The form which best reproduces the observed vals. for these gases is determined. For the range 300—3500° K., the T^2 equation is best for CO and H₂O, the T^{-2} for H₂, and the T^{-4} for CO₂ and O₄. The equation for ΔG_0 of the water-gas reaction is computed, and the vals. of log K derived are compared with those observed experimentally (*Trans. Amer. Soc. Metals*, 1941, preprint). C. E. H.

Melting processes. A. Eucken (*Chemie*, 1942, 55, 163-172). —The relations between at. and mol. structure and the changes which occur when solids melt are discussed. A theory of melting based on a consideration of entropy changes is offered.

C. R. H. Density of graphite and determination of the mean coefficient of compressibility between 1 and 20,000 kg. per cm.² J. Basset (*Compt.* rend., 1941, 213, 829-831).—The density of natural and artificial graphite measured after three compressions at 20,000 kg. per cm.² and twice degassing in vac. at 2100° has a max. val., in a natural specimen, 2·180. The mean coeff. of compressibility of this specimen at 18°, expressed as $\mu = (V - V')/V(P' - P)$ for 5000 kg. per cm.² pressure intervals, is: P 1-5000, $\mu = 4\cdot41 \times 10^{-6}$; P 5000-10,000, μ 3·27 × 10⁻⁶; P 10,000-15,000, $\mu = 2\cdot50 \times 10^{-6}$; P15,000-20,000, $\mu = 1\cdot90 \times 10^{-6}$. O. D. S.

Vapour-pressure chart for volatile hydrocarbons. R. V. Smith (U.S. Bur. Mines, 1942, Inf. Circ. 7215, 10 pp.).—Data for v.p. of hydrocarbons up to $n-C_{12}H_{26}$ have been collected and plotted, log v.p. being plotted against temp. A. J. M.

Correlating vapour pressure and latent heat data. Use of critical constants. D. F. Othmer (*Ind. Eng. Chem.*, 1942, 34, 1072-1078). -At const. reduced temp. the reduced v.p. (P_r) and reduced latent heat $(L_r = \text{latent heat}/T_e)$ of any substance is such that $\log P_r/L_r = k$, a const. independent of the substance considered. Nonograms to facilitate calculations from this relation are presented. J. W. S.

Effect of temperature on the surface tension and density of halogensubstituted acetic acids. J. J. Jasper and L. Rosenstein (J. Amer. Chem. Soc., 1942, 64, 2078—2079).—For the ranges 55—170° and 85—130° the vals. of ρ and of γ for CH₂Br·CO₂H and CH₂I·CO₂H are given by: $\rho = 1.93302-0.0016482\theta$ and 2.41128—0.0017837 θ ; $\gamma = 46.20552-0.10901\theta$ and $48.35779-0.11483\theta$. W. R. A.

Equation of state of gases. III. S. S. Vassiliev (J. Phys. Chem. Russ., 1941, 15, 239-245; cf. A., 1941, I, 459).—The consts. aand b of van der Waals' equation are linear functions of temp., increasing with increasing T above $T_{crit.}$ and with decreasing Tbelow $T_{crit.}$ J. J. B.

Equation of state for gases at high pressures involving only critical constants. S. H. Maron and D. Turnbull (J. Amer. Chem. Soc., 1942, 64, 2195—2198).—An extension to other gases of the equation of state for N_2 (A., 1942, I, 139). The equation, based on the principle of corresponding states, requires only the crit. temp. and pressure of a gas and for pressures up to 1000 atm. and reduced temp. >1.55. It also applies for reduced temp. 1·30—1·55 and pressures of ~100 atm., and is superior to other common equations of state. A generalised equation for the compressibility coeffs. of gases is deduced. W. R. A.

Partition function of a gas of hard elastic spheres. O. K. Rice (J. Chem. Physics, 1942, **10**, 653-654).—Tonks' equation of state (cf. A., 1938, I, 71) of a one-dimensional gas is discussed and a new interpolation formula to bridge the gap between two of Tonks' equations is suggested as giving a better interpolation than Tonks' original interpolation formula. C. R. H.

Partition function of a simple liquid. O. K. Rice (J. Chem. Physics, 1942, **10**, 654).—If atoms are removed from a face-centred cubic solid, which is regarded as resembling a close-packed gas of hard spheres, the resulting model can be regarded as representing a liquid, the holes previously occupied by atoms contributing to the free vol. Considering only thermal energy, the equations dealing with the partition function of a gas (cf. preceding abstract) have been extended to the case of such a liquid. The author claims that such a model gives a better indication of the behaviour of liquid A. C. R. H.

Thermal conductivity and thermoelectric, galvanomagnetic, and thermomagnetic effects of isotropic metals in transverse magnetic fields. M. Kohler (Z. Physik, 1941, 118, 37-47).--Mathematical. W. R. A.

Thermal conductivity of fluorochloro-derivatives of methane in liquid state. R. Plank (Z. ges. Kalte-Ind., 1942, 49, 47; Chem. Zentr., 1942, II, 1210).—The following expression is derived for the thermal conductivity (k) (kg.-cal./in./°c./hr.) at 20° of compounds $CH_zF_zCl_z$, viz., k = 0.157-0.03y - 0.017z, or 0.089 + 1.017x. R. B. C.

Thermal conductivity of liquid metals. M. R. Rao (*Indian J. Physics*, 1942, **16**, 155—159).—The abrupt decrease in the thermal conductivity of metals near the m.p. is explained by assuming that the mol. vibration frequency changes near the m.p. The ratio of conductivities in the solid and liquid phases near the m.p. The ratio of $e^{2\lambda_m/3k_yT_m}$, where k_0 is the Boltzmann const. and λ_m/T_m is the entropy of melting. This accords with observation. The slight decrease in conductivity in the liquid phase is ascribed to the disordered state of the liquid. N. M. B.

Thermal conductivity of liquids. M. R. Rao (Indian J. Physics, 1942, 16, 161–167).—A detailed account of results previously reported (cf. A., 1941, I, 330). The revised val. of the const. in the formula is $2\cdot096 \times 10^5$. Calc. vals. of K for 13 liquids agree fairly well with observed vals. K is intimately connected with the free vol. of the liquid at the m.p. N. M. B.

Random reorganisation of mol. wt. distribution in linear condensation polymers. P. J. Flory (J. Amer. Chem. Soc., 1942, 64, 2205— 2212).—Individual mols. exist only temporarily when heated to a suitable temp. owing to ester interchange between an ester group of one polymer mol. and the terminal functional group of another. Such processes have no effect on the no. average degree of polymerisation but they may modify the distribution of species. These considerations lead to the concept of an entropy of heterogeneity and the same equilibrium size distribution as that obtained directly by random poly-condensation. The changed distribution of species in a mixture of polyesters was observed by η measurements and agrees with theoretical predictions. Conversion of a cyclic ester (lactone) into a linear polyester should yield a much narrower distribution of species than is obtained by polycondensation, but if ester interchange occurs between the polymer mols. subsequent to their initial formation, the distribution will be broadened. W. R. A.

Viscosity and cryoscopic data on polystyrene; Staudinger's viscosity rule.—See A., 1942, I, 397.

Frictional phenomena. VI.—See A., 1942, I, 412.

V.—SOLUTIONS AND MIXTURES (INCLUDING COLLOIDS).

Theory of the viscosity of liquid mixtures. A. G. Stromberg (J. Phys. Chem. Russ., 1941, 15, 205-219).—Andrade's theory (cf. A., 1934, 356) is extended to mixtures of liquids. The new theory accounts for all the known types of the viscosity-composition curves and, qualitatively, also for the variation of their shape with temp. J. J. B.

Viscosity-concentration relationships in concentrated solution. V. R. Houwink and K. H. Klaassens. VI. Significance of the viscometric "extension factor." H. L. Bredee and J. de Booys (Kolloid-Z., 1942, 99, 160—171, 171—189; cf. A., 1940, I, 290).—V. The validity of the formula $\log \eta_r = KC_{\pi}^{a}$ where η_r is the relative viscosity, C_{τ} the dry vol. concn. of the dispersed substance, a a "stretching factor," and K a const., is discussed with reference to a no. of systems, and compared with that of the formula of Bredee and de Booys (A., 1937, I, 303). Below a limiting concn., a = 1 in the above equation. In certain circumstances (but not always, as assumed previously), a is a measure of the length of the dispersed colloidal particles; the smaller is a, the greater is the particle length. The variations in the vals. of a are considered to be due to differences in the density of packing of the dispersed particles.

VI. A review of the literature, with particular reference to the inter-connexion between the two viscometric factors contained in the von Bredée-de Booys equation (A., 1937, I, 303), and their variation with concn. N. G.

Electrolytic study of linear diffusion of silver salts. H. A. Laitinen (Trans. Electrochem. Soc., 1942, 82, Preprint 9, 101-108; cf. A., 1940.

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I, 106) .- The theory of diffusion is applied to the case of a single metal salt being electrolysed to the metal, with diffusion occurring in a linear column, and assuming virtually complete concn. polarisation of the cathode. The theoretical current-time relationship is applied to the diffusion of $AgNO_3$, Ag_2SO_4 , and AgOAc, and compared with experimental data. The diffusion of pure Ag salt solutions is compared with that of Ag ions in the presence of excess of an in-different ionised salt. The effect of the latter is analogous to the suppression of the migration current in polarographic current-voltage curves. C. E. H. voltage curves.

Effect of impurities on crystallisation. V. K. Sementschenko and L. P. Schischobalova (*Min. Suir.*, 1936, 11, No. 6, 27-31).—The surface tension (γ) of NaNO₃, with and without the addition of salts, was studied at 315—560° by a modification of the Jaeger method. The changes produced by $\geq 30\%$ of KCl, NaCl, NaI, and NaF were within the experimental error (0.5—2.0%). Surface-active sub-stances (KOAc and EtCO₂K) considerably diminish γ . The halides have little effect on crystallisation, but KOAc and EtCO₂K produce a greater degree of dispersion of the cryst. greater degree of dispersion of the cryst. aggregates than that in pure NaNO₃. Сн. Авз. (е)

Vapour pressure nomographs for aqueous sodium hydroxide have been constructed to permit calculation of the v.p. of NaOH solutions over the concn. ranges 1-17 m. and 0.1-7 m., respectively. . W. S

Specific heat of concentrated aqueous lithium, sodium, and potas-sium chlorides. A. J. Bogorodski and G. P. Dezideriev (*Trans. Kirov Inst. Chem. Tech. Kazan*, 1935, No. 4-5, 29-40).—Data are recorded for LiCl 11.4-36.68, NaCl 7.42-26, and KCl 6.95-24.8% at 16-34°. Сн. Авз. (е)

Raman effect of aqueous solutions of potassium hydrogen fluoride and hydrofluoric acid. L. A. Woodward and H. J. V. Tyrrell (*Trans. Faraday Soc.*, 1942, 38, 513—517).—Apparatus of polished Ag suit-able for use with solutions containing HF is described. No Raman effect is obtained with 25 K KHE able for use with solutions containing HT is described effect is obtained with 3.5_{M} -KHF₂, a result which supports Pauling's effect is obtained with 3.5_{M} -KHF₂, a result which supports Pauling's effect is obtained with 3.5_{M} -KHF₂. HF a heavy continuous spectrum, which appeared to be due to fluorescence, was obtained, and no Raman lines could be observed. F. L. U

Viscosity of the system SiO₂-**PbO.** A. S. Konovalov and K. S. Evstropeev (*J. Phys. Chem. Russ.*, 1941, **15**, 109-115).—The η of 9 glasses with between 67 and 90 wt.-% of PbO between 580° and 1460° can be expressed by the relation log $\eta = -A + a/T^3$, *T* being the abs. temp. and *A* and *a* consts. *A* decreases and *a* increases with the % of SiO₂; it is doubtful whether they show kinks at the compositions PbSiO₃ and Pb₂SiO₄. The equation is valid also for sheet glass (Fourcault) for sheet glass (Fourcault). I. J. B.

Viscosity of the system Na₂SiO₃-SiO₂ in molten state. M. M. Skorniakov, A. J. Kuznetzov, and K. S. Evstropeev (*J. Phys. Chem. Russ.*, 1941, **15**, 116-124).—The η of 13 glasses containing 22-50 mol.-% of Na₂O is expressed between 760° and 1420° by log $\eta = -A + a/T^2$ (cf. preceding abstract). A increases with [Na₂O], a increases with [SiO₂], and both show a kink at the composition Na₂O 2500. tion $Na_2Si_2O_6$. No singular point marks the composition $Na_2O_3SiO_2$. J. J. B.

J. J. B. J. J. B. J. J. B. J. J. B. Viscosity of glasses of the system Na₂Si₂O₆-PbSiO₃ in the region of the softening temperature. B. A. Pospelov and K. S. Evstropeev (J. Phys. Chem. Russ., 1941, 15, 125-133).- η is calc. from the rate of extension of a hanging glass fibre. In the steady state η is identical for annealed and unannealed glass. The expression log $\eta = -A + a/T^2$ (cf. preceding abstracts) is valid between $\eta = 10$ and $\eta = 10^{15}$ poises, but the vals. of A and a are different for the regions of η 10-10⁷ and 10⁷-10¹⁵ or, for other glasses, 10-10⁴ and 10⁴-10¹⁶ poises. At high temp. η increases with [Na₂O], and at low temp. shows a min. at the composition Na₂Pb₂Si₄O₁₁. J. B.

State of diffusion of hydrogen in pure iron.-See B., 1942, I, 525.

Decomposition of β in aluminium-zinc alloys and effects of small additions of other elements on rate of decomposition. E. Gebhardt (Z. Metallk., 1941, 33, 328-332) .- Dilatometric, thermal, resistance, and hardness measurements on a 21% Al–Zn alloy during the breakdown of β and X-ray examination of the structure indicate that this phase decomposes at 272° directly into β' and η . Additions of Sn, Cu, In, Li, and Mg retard this decomp., the effect increasing in the order given. Decomp. of β in quenched ternary alloys containing any of these elements proceeds as a quasibinary reaction without the establishment of an equilibrium as long as any β remains. A. R. P

Systems zinc-cerium and zinc-lanthanum. J. Schramm (Z. Metallk., 1941, 33, 358-360).—Alloys with up to 40% of Ce or La were examined by thermal and micrographic methods. Solid Zn dissolves only traces of either metal and the eutectics are very close to the Zn end of the system. $CeZn_{11}$ and $LaZn_{11}$ are formed by peritectic reactions at 785° and 852° respectively, and CeZn, and LaZn, melt congruently at 972° and 962° respectively. Alloys

with 22-40% Ce undergo, during cooling from liquid, three-phase reactions of undetermined nature at 942°, 870°, 840°, 817°, and 790° accompanied by evolution of heat; similar reactions occur in the La system at 930°, 852° , and 750° . X-Ray examination revealed two new phases in alloys of both systems containing 60-70% of Zn. A. R. P.

Partial systems of zinc with titanium and zirconium. E. Gebhardt *(Z. Metallk.*, 1941, 33, 355–357).—Alloys of Zn with up to 5% of Ti and up to 3% of Zr were investigated by thermal analysis and micrography. The eutectic points are at 418°, 0.45% Ti, and 416°, 0.1% Zr. Peritectic reactions occur in the Ti system at 460° and 490° and in the Zr system at 545° and 970°. Zn dissolves 0.02% of Zr and only a trace of Ti at 400°. A. R. P.

Alloys of thorium with copper, aluminium, and sodium. G. Grube and L. Botzenhardt (Z. Elektrochem., 1942, 48, 418-425).—The systems Cu-Th and Al-Th ($\geq 50\%$ Th) and Na-Th ($\geq 80\%$ Th) have been studied by thermal analysis. The compounds Cu₂Th and Na₄Th and an Al-Th compound, possibly Al₇Th, all with in-congruent m.p., have been shown to exist. Near the m.p. solid Cu and Al dissolve 4.5 and 2.3% of Th, respectively. The age-hardening of the alloys of low Th content has been studied at various temp J. W. S.

Solidus temperatures in the systems iron-tungsten and iron-molybdenum. W. P. Sykes (*Trans. Amer. Soc. Met.*, 1936, 24, 541-550).—Data are recorded. Micro-structures of drastically quenched specimens indicate that in both systems the a phase is formed in the peritectic reaction : liquid $+ \varepsilon \rightleftharpoons a$.

CH. ABS. (e) **Partial system nickel-NiAl.** J. Schramm (Z. Metallk., 1941, 33, 347—355).—Alloys with up to 25% Al were examined by thermal, micrographic, X-ray, and magnetic methods; only three phases, a, a', and β , exist in this range. The peritectic reaction a + liquid $\approx a'$ occurs at 1362°, the horizontal extending from 10.5 to 12.5% Al, and the eutectic reaction liquid $\approx a' + \beta$ at 1360°, the horizontal extending from 12.5 to 16% Al. At room temp. Ni dissolves 4.6% Al, the β phase contains a max. of 25% Al, and the a' phase covers the range 12.6—14.4% Al and is non-magnetic. Pptn.-hardening occurs on reheating quenched a-alloys with 5—10% Al and β -alloys with 15—25% Al. A. R. P. Сн. Авз. (е)

Structure and volume changes of zinc-copper-aluminium alloys. I. Phase fields of the concentration plane at 300°. II. Relation between CuAl and the ternary crystal phase. W. Köster and K. Moeller. III. Equilibria in the system copper-aluminium-zinc. W. Köster. IV. Causes of the volume changes and a method of obtaining volume stability. E. Gebhardt (Z. Metallk., 1941, 33, 278-283, 284-288, 289-296, 297-305).—I. Equilibria in the 550% interpret the relation of the system copper-aluminium and set of the system copper-aluminium and set. 350° isothermal plane were established by X-ray and micrographic 350° isothermal plane were established by X-ray and micrographic methods. The system contains a ternary compound phase (T) with Cu 56—58 and Zn 10—30%; it forms large polygonal crystals after annealing at 600° and has a body-centred cubic lattice of the W type when the Al is $\geq 20\%$ and a CsCl type lattice with super-structure when the Al is $\geq 20\%$ (T' phase). T is probably Cu₁₀Al₈Zn₄ and T' Cu₁₇Al₁₇Zn₆; both compounds have ~ 2 : 1 valency electron-atom ratio, form the primary crystallites over a wide concn. range, and can exist in equilibrium with $\alpha = A$ and α CucAl phases and and $T' \operatorname{Cu}_1, \operatorname{Al}_1, \operatorname{Zn}_6$; both compounds have ~ 2 : 1 valency electron-atom ratio, form the primary crystallites over a wide concn. range, and can exist in equilibrium with γ , η , θ , and a Cu-Al phases and with β , γ , and ε Cu-Zn phases. The γ phases of the Cu-Al and Cu-Zn systems merge into a ternary γ containing a max. of 3% Zn and passing into γ_2 towards the Al side. The $(\gamma + \eta)$ and the η fields of the Cu-Al system extend to 12% Zn in the ternary system, the θ (CuAl₂) phase takes $\geq 2\%$ of Zn and the ε (Cu-Zn) phase $\sim 2\%$ of Al into solid solution, and the $(\gamma + \eta + T)$ and $(\theta + \eta + T')$ fields are relatively small triangles. The two large three-phase fields $(a_{Al} + \theta + T)$ and $(a_{Al} + T' + \varepsilon)$ are triangles covering the ranges Cu 1.5-56, Al 66-34, Zn 33.5-2%, and Cu 1.5-18, Al 31.5-2, Zn 12.5-80% respectively. There are also an elongated $(T + \gamma + \varepsilon)$ field in the range Cu 56-27, Al 13-3, Zn 31-70%, and a small $(a_{Cu} + \beta + \gamma)$ field near the Cu corner. Two-phase fields are $\gamma + \eta$, $\gamma + T$, $T' + \eta$, $\theta + \eta$, $\theta + T'$, $a_{Al} + \theta$, $a_{Al} + T'$. $a_{Al} + \varepsilon$, $T + \varepsilon$, $\gamma + \varepsilon$, $\beta + \gamma$, $a_{Cu} + \beta$, $a_{Cu} + \gamma$. II. Equilibria between γ , η , θ , and T phases in Al-Zn-Cu alloys with 55-80% Cu have been determined up to 900°; η and T form a continuous series of solid solutions at high temp. which separate below 630° (Zn 7.5, Al 21.5%) to 540° (Zn 6, Al 30%) into two phases $(T + \gamma \text{ or } T' + \theta)$. In equilibrium with γ the Zn content of η and T increases and the Cu content decreases with fall in temp. below 500°, whilst in equilibrium with θ the Zn content of T increases, that of γ decreases clightly and the d he antent of the here.

below 500°, whilst in equilibrium with θ the Zn content of T' increases, that of η decreases slightly, and the Al content of both η and Tthat of η decreases signify, and the fit content of both η and τ remains const. The η phase exists in three forms, the change from η_2 through η_1 to η with rise in temp. being accompanied by increases in the symmetry of the lattice. The superstructure lines of the T' lattice become more distinct with rise in temp, and with increase in Zn content. Zn thus appears to render the high-temp. modifications of the Cu-Al phases more stable at lower temp.

III. A complete space model and various sectional diagrams have been constructed to show the equilibria in the Cu-Al-Zn system at temp. up to the m.p. of the alloys. Addition of Zn lowers the eutectic temp. of the Cu-Al system since the a_{Al} phase can dissolve

up to 60% of Zn and the 0 phase 2% of Zn at the m.p. The eutectic equilibrium in the Cu-Al system merges with the peritectic equilibrium at 396° in the Cu-Al system to give the peritectic reaction: liquid (Cu 15, Al 25°) + 0 (Cu 52, Al 46°) = a (Cu 2, Al 33°) + 7' (Cu 55·5, Al 31·5°) at 420°; at lower temp. In separates from the a phase, only 5° being retained at 100°. Some alloys can thus be two-phase at high and low temp, and three-phase at intermediate temp. Another four-phase reaction occurs at 396°, viz. ; liquid (Cu 10-5, Al 15·5°) + T (Cu 55·5, Al 30·5°) = a (Cu 1.8, Al 26·2°) + ϵ (Cu 17·2, Al 0·3°) = T (Cu 56, Al 32°) + ϵ (Cu 1.7, Al 0·3°) + T (Cu 53, Al 30·3°) = ϵ (Cu 1.4, Al 24°) + ϵ (Cu 17·2, Al 0·3°) = ϵ (Cu 22, Al 15°) + T (Cu 57·5, Al 32°) + ϵ (Cu 1.7, Al 0·3°) + δ (Cu 53, Al 13°) = ϵ (Cu 24, Al 24°) + ϵ (Cu 57·5, Al 17·5°) + δ (Cu 53, Al 13°) = ϵ (Cu 48, Al 26°) + τ (Cu 48, Al 3°) + τ (Cu 48, Al 9°) + τ (Cu 48°). The vol. changes which occur during storage of Zn-base alloys containing Cu and Al are due to four causes, viz. (a) decomp. of β equilibrium in the Cu-Al system merges with the peritectic equilibrium

containing Cu and Al are due to four causes, viz., (a) decomp. of B into an Al-rich and a Zn-rich phase with a contraction of 1.1% in vol. (b) the reaction $\beta + z \rightleftharpoons \eta + T$ which normally occurs at vol., (b) the reaction $8 + \varepsilon = \eta + 1$ which normally occurs at 275° but, if suppressed, occurs over a period of months at room temp accompanied by a vol. expansion of 4%. (c) pptn. of excess of solute from the four phases mentioned in (b) with a vol. change of solute from the four phases mentioned in (c) and the vol. 0-1%, and (d) structural changes due to deformation. All the vol. changes are prevented by annealing at 240-260° for 40 hr. to complete reactions (a) and (b) and then either cooling very slowly or re-annealing at $100-150^{\circ}$ for several hr. This treatment improves the bardness and impact val. of the alloys. A. R. P.

Iron-nickel-aluminium phase diagrams .- See B., 1942, I, 527.

Polymorphism and miscibility in the isomorphous group dibenzyl, rotymorphism and misciplity in the isomorphics group differences (stilbene, tolane, and azobenzene. A. Kofler and M. Brandstatter (Z. physikal. Chem., 1942. A. 190, 341-360).—The systems (CHPh.), -(NPh.), and -(CPh.), show complete miscibility of Rooze-boom's type I whilst the system (NPh.),-(CPh.), is of type III. (CH,Ph), is completely miscible with the other compounds only when they are in their unstable β forms, so the phase diagram shows discontinuities with regions of incomplete miscibility.

W.S.

Adsorption potentials at gas-solid interfaces. A. A. Frost (Trans. Electrochem. Soc., 1942, 82, Preprint 10, 109-113, —An improved apparatus (cf. A., 1941, I, 108) for the study of potentials due to gas adsorption at solid surfaces consists essentially of two parallel brass plate electrodes connected in series with a potentiometer and an electrometer. One electrode is uncoated, and the other coated in turn with dicetyl, paraffin, stearic acid, colloidal graphite, nitrocellulose, collodion, and vinylite. Air saturated with the vapour under investigation is drawn into the cell and the potential between respect to both the vapour and the adsorbing surface. Possible C. E. H. the two electrodes observed. The potentials are highly sp. with applications are suggested.

Accommodation coefficient of mercury on platinum and the heat of vaporisation of mercury. L. B. Thomas and F. G. Olmer (J. Amer. Chem. Soc., 1942, 64, 2190-2195).—The accommodation coeff. of Hg on Pt, measured at low pressures of Hg, approaches I as the temp. difference between the filament and the wall approaches 0 but decreases by ~ 0.08 for each 100° of the temp. difference. From these data the heat of vaporisation of Hg has been calc. as W. R. A. 14,920 g.-cal.

Rate of molecular sorption on active charcoal. A. Shuchovitzki, Zabeshinski, and A. Venitschkina (J. Phys. Chem. Russ., 1941, 15, 174-183) .- Theoretical considerations based on the analogy between diffusion and heat transfer and experimental data (higher rate of adsorption of Et₄O diluted with H₂ than when diluted with air) show that external diffusion to charcoal grains is more important than internal diffusion within their pores. J. J. B.

Applicability of the radioactive indicator method to determining the surface of solid materials. L. L. Imre (Kolloid-Z., 1942, 99, 147-157).—Relationships expressing the adsorption at solid-liquid phase boundaries are derived from statistical mechanical considerations. It is shown that Paneth's equation for exchange adsorption has only a limited validity. The theory is supported by data for the exchange adsorption of Th-B on PbSO, from aq. or EtOH solution. I. W. S.

Equilibrium and surface phenomena in the systems phenol-formic acid-water and phenol-acetic acid-water. II. K. M. Golubkova, N. N. Petm, and K. V. Toptschieva J. Phys. Chem. Russ., 1941, 15, 193-204: cf. A., 1936, 25).—PhOH and H.O become completely miscible in presence of about 4 mol.-% of AcOH or 10 mol.-% of HCO₂H. The H₂O and acid content of the co-existing layers and their electric conductivity are determined. The surface tension their electric conductivity are determined. The surface tension of these layers is almost independent of concn. and the interfacial tension between the layers increases when the difference in composition of the lavers decreases. J. J. B.

Contact angles at liquid-liquid-air interfaces. W. Fox (J. Chem. Physics, 1942, 10, 623-628).—An air bubble in a hollow glass tube (3 mm. internal diameter) is brought down to the interface of two liquids and the angles of contact where the interfaces meet are measured from photographs of the bubble so formed. The various angles of contact for the systems air- H_1O-NH_2Ph , $-PhNO_3$, $-CCl_4$. angles of contact for the systems alf- $H_{2}O-NH_{2}Ph$, $-Ph_{N}O_{3}$, $-CcL_{4}$, -CHCl₂, $-C_{6}H_{6}$, and $-Et_{3}O$ have been determined. Calculations of the work of adhesion (W) between any two liquids in presence of a gas phase have been made. To explain spreading in a sp. gas phase it is only necessary to compare W for the gas to the liquid on which the spreading is to take place with W for the two liquids in presence of the same gas. If the free energy change is negative, spreading will eccent in that direction which will give a partice free aperture change. occur in that direction which will give a negative free energy change. Č. R. H.

Electric determination of film-volume and film-density. H. Lowy (*Phil. Mag.*, 1942, [vii]. **33**, 772—774).—Equations concerning the covering of rock particles by films of H_3O are given. The dielectric const. of the soil in the Western Desert of Egypt after a rainy day is given for different days, and the film-vol, is calc. The fact that film thickness is independent of the size of the solid particle covered is confirmed. A. J. M.

High mol. wt. aliphatic amines and their salts. VIII. Soluble and insoluble films of amine acetates. A. Surface tension of aqueous solutions of dodecylamine acetate. E. J. Hoffman, G. E. Boyd, and A. W. Ralston (*J. Amer. Chem. Soc.*, 1942, 64, 2067–2070).—The variation of γ with conc. for solutions of dodecylamine acetate has been investigated at various temp. and a time effect was observed only at 25° in one solution below the crit. concn. for micelle formation. Unilayers of octadecylamine acetate are too sol. to permit their investigation by the film balance, but films of docosylamine acetate spread on aq. AcOH have been studied. Rise in temp. causes these films to become more expanded and the calc. heat of spreading at an area of 35 sq. A. per mol. is 140 ergs per sq. cm. W. R. A. per sq. cm.

Steric factor in the permanganate oxidation of triolein monolayers. R Mittelmann and R. C. Palmer (Trans. Faraday Soc., 1942, 38 506-513).-The rate of increase of area at const. pressure of monolayers of triolein spread on 0.0025 × KMnO₄ (pH 1) (cf. Hughes and Rideal, A., 1933, 679) follows a first order law between 1 and 14 dynes per cm., is \propto [KMnO₄], and increases with decreasing pH of the substrate. On the assumption that the observed expansion is a measure of the rate at which double linkings make contact with the surface of the liquid, a simple model is described, on the basis of which an expression for the force-area curve of triolein is derived. This expression, which contains no arbitrary consts., is in reasonable agreement with the measurements. F. L. U. is in reasonable agreement with the measurements.

Radial spreading of organic liquids on water surfaces. W. von Guttenberg (Z. Physik, 1941, 118, 22-26).—Small drops of oleic, linoleic, and linolenic acids on H_3O spread to give circular films. The films were photographed, after dusting with lycopodium powder, by a technique which is described. All acids behave similarly. The velocity of spreading is related to the radius of the film.

W. R. A

Structure of collodion membrane and its electrical behaviour. IV Relative merits of homogeneous phase theory and micellar-structural theory as applied to the dried collodion membrane. K. Sollner and C. W. Carr (J. Gen. Physiol., 1942, 26, 17-25; cf. A., 1942, I, 171). --Dried collodion membranes prepared from an electrochemically inactive collodion prep. have characteristic low (\sim 30 mv.) concn. potentials. After activation by oxidation to give max. or nearly max concn. potentials (\sim 50 mv.), the membranes are dried, dissolved in EtOH-Et_aO, and a new set of membranes is pre-pared from this solution. These have low concn. potentials, and since the properties of a homogeneous phase should be uninfluenced by rearrangement of its constituent particles, the results do not support the homogeneous phase (solubility) theory, but agree with the micellar-structural theory. J. N. A.

Methods for determining particle size distribution .- See B., 1942, I, 490.

Macromolecular compounds. CCXCVI. Viscosity measurements on esters with unbranched and branched chains. CCXCVII. Deter-mination of the chain-length of polyamides. H. Standinger and H. Jörder (J. pr. Chem., 1942, [ii], 160, 166–175, 176–194).—CCXCVI. The relationship $Z_{\eta} = Kn$, where Z_{η} is the viscosity no. (limiting val. of the ratio sp. viscosity/concn. as the concn. $\rightarrow 0$), n is the no. of C atoms in the chain mol, and K is a const. which varies only with the solvent so long as the mols, are equally solvated, holds equally well for straight-chain mols, and parallel- or branched-chain of K for various solvents are: $C_{4}H_{6}$ 0-93, CCl_{4} 1-07, $COMe_{2}$ 1-0, and m-cresol 0.54×10^{-4} . With m-cresol, however, short-chain mols. give rather low vals. of K

give rather low vals. of A. CCXCVII. In $C_{4}H_{6}$, CCl_{4} , $CHCl_{3}$, and AcOH, amides show anomalously high vals. of Z_{η} , attributable to the existence of a high dipole moment. These can be expressed $Z_{\eta} = Kn + ny | a$, where ais the no. of C atoms per CO·NH₃ group, but y is not const., de-creasing with increasing vals. of n and of a, becoming 0 for $CHCl_{3}$ solutions when $n | a \leq 4$. Hence the chain-length of amide poly-

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merides can be determined from η measurements on CHCl₃ solutions, for which $K = 1.14 \times 10^{-4}$. J. W. S.

Macromolecular compounds. CCXCIX. Fibrillar structure of natural and artificial cellulose fibres. M. Staudinger (J. pr. Chem., 1942, [ii], 160, 203-216).—Fresh ramie and cotton fibres and fibres 1942; [11], 100, 203–210).—Fresh ramle and cotton nores and nores of which the cellulose has been degraded to various extents by treat-ment with 1% H₂O₂ in 2% NaOH show similar appearances under the microscope and have similar X-ray spectra. After hammering or pressing, however, the degraded forms show more shattering, an extreme case being that of fibres from mummy wrappings. Flax fibres show similar behaviour but synthetic fibres differ in that secondary structures are set up on degradation. J. W. S.

Structures of substituted natural celluloses.—See B., 1942, II, 427.

"Water-soluble" cellulose. T. Lieser (Kolloid-Z., 1942, 98, 142—148).—Cellulose (I), being a polyhydroxyvinyl compound, should be readily sol. in H_2O . The fact that it is a high polymer should not affect its solubility. It also contains hydrophilic (OH) should not affect its solubility. It also contains hydrophilic (OH) groups. The structure of the (I) mol. in relationship to its solubility, and the solubility of cellulose-A in alkalis, are discussed. A dil. aq. solution of (I) (1:1000) was prepared by dialysing a dil. aq. solution of cellulose ditetraethylammonium trixanthate into H_2O until all xanthate groups were hydrolysed. The solution is considered to contain isolated macromols. of (I). Such solutions are very unstable the rate of poth depending on concept terms and blocked to boltam isolated matchings, of (\mathbf{I}) . Such solutions are very unstable, the rate of ppth. depending on conc., temp., and degree of polymerisation. The more highly polymerised is the (\mathbf{I}) the more rapidly does it ppt. The properties of (\mathbf{I}) , such as its insolubility, rigidity, and elasticity, are dependent equally on the supermol. or micellar structure, and on the macro-mol. structure.

Preparation and properties of protein sols. II. Sols with /-hist-ine, d-arginine, d-nroline, and / hydrony, H. idine, d-arginine, l-proline, and l-hydroxyproline. C. Wunderley (Helv. Chim. Acta, 1942, 25, 1053-1063).—The prep. of four protein systems is described whereby euglobin is used as protein component and the NH_{2} -acid component is *l*-histidine, *d*-arginine, *l*-proline, or *l*-hydroxyproline. The colloidal dissolution processes of the systems are characterised by their solution dispersivity, intensity, and solution capacity of the peptiser. The inner surface of the protein aggregates is measured by their dissolving power and degree of Rayleight depolarisation. In the region under investigation the Rayleigh light is exactly α the protein concn. whilst the degree of depolarisation is independent thereof. H. W.

VI.—KINETIC THEORY. THERMODYNAMICS.

Solvent effects in association equilibria. A. Wassermann (J.C.S., 1942, 621-623).—Solvent effects in the thermal equilibrium const. of $2(\text{NPh}_2\cdot\text{NBz}) \rightleftharpoons (\text{NPh}_2\cdot\text{NBz})_2$, which was shown by Goldschmidt and Bader (A., 1929, 1173) to be $Be^{-\Delta H/RT}$, are represented by a linear relation between log B and ΔH . F. R. G.

Ion-solvent interaction and individual properties of electrolytes. K. Fajans and O. Johnson (*Trans. Electrochem. Soc.*, 1942, 82, *Preprint* 16, 161-175).—Present knowledge of the structure of solutions of strong electrolytes, especially as given by refractometric data, is summarised and discussed. The resultant of forces between neighbouring ions and between ions and solvent which predominates at high concns. and the interaction of free ions and solvent which predominates at low concns. are shown to be the two principal factors involved. C. R. H.

Extension of the acidity scale. L. Michaelis and S. Granick (J. Amer. Chem. Soc., 1942, 64, 1861–1865).—In a bivalent reversible system there are three levels of oxidation-reduction, viz., reduced system there are three levels of oxidation-reduction, viz., reduced (R), semi-oxidised (S), and completely oxidised forms (T). If the normal potentials for the $R \to S$, $S \to T$, and $R \to T$ systems are E_1 , E_2 , and E_m , then $E_m = (E_1 + E_2)/2$. All vals. of E depend on pH, and $E_2 - E_1$; the "spread," also depends on pH. Using hydroxythiazine, aminothiazine, and thionine, the pH scale for aq. H_2SO_4 up to 11M. has been extended by considering the relation between pH and the spread of E_m for the dyes. The vals. deduced agree closely with those given by Hammett. W. R. A.

Study of electrolytic dissociation in iodic acid by Raman effect. N. R. Rao (Indian J. Physics, 1942, 16, 71-76).—In conc. solutions the dimeride (HIO₃)₂ exists but on dilution breaks down. Lines are identified with mol. species of HIO₃ and with IO₃' ion. In 0.1 solutions the IO₃' line from HIO₃ is less intense than that from KIO₃, hence HIO₃ is not completely dissociated at that dilution. W. R. A

Relative strengths of formic, acetic, and propionic acids in alcohols and dioxan-water mixture. M. Kilpatrick and R. D. Eanes (J. Amer. Chem. Soc., 1942, 64, 2065–2067).—The log acid strength of Amer. Chem. Soc., 1942, 64, 2000–2007):—The log acid strongen of HCO_2H relative to AcOH and of $EtCO_2H$ relative to AcOH in dioxan- H_2O is not $\propto 1/\epsilon$, where ϵ is the dielectric const. of the medium. In H_2O , MeOH, EtOH, and $(CH_2 \circ OH)_2$ the relationship is linear. W. R. A.

Isoelectric points of threonine and some related compounds. C. S. Vestling and D. T. Warner (*J. Biol. Chem.*, 1942, **144**, 687–690).—

From the results of electrometric titrations with 0.1N-HCl and -NaOH at 25° and total ionic strength 0.1, the apparent dissociation cousts. and isoelectric points of *l*-threonine, *dl-O*-methylthreonine, *dl-O*-methylallothreonine, and *dl*-NH₂·CHEt·CO₂H have been calc. These vals. are compared with data for related compounds. W.

Thermodynamic properties of solutions of amino-acids and related substances. VII. Ionisation of some hydroxylamino-acids and proline in aqueous solution at 1-50°. P. K. Smith, A. T. Gorham, and E. R. B. Smith (*J. Biol. Chem.*, 1942, 144, 737-745).—From e.m.f. measurements on cells without liquid junctions the thermo-dynamic ionisation consts. of *dl*-serine, *dl*-threonine, *dl*-allothreonine, *l*-hydroxyproline, and *l*-proline have been determined at $1-50^\circ$. The vals. of the thermodynamic functions for the ionisation are J. W. S. derived.

State of order in liquid electrolyte solutions. H. Falkenhagen (*Physikal. Z.*, 1942, 43, 170-190).—A review and discussion of modern theory of interionic forces, and of experimental data for the principal properties of electrolyte solutions. A. J. E. W.

Phase behaviour of the acetylene-ethylene system. S. W. Churchill, W. G. Collamore, and D. L. Katz (*Oil and Gas J.*, 1942, 41, No. 13, 33-34, 36-37).—This system exhibits azeotropic behaviour so that predictions of its properties from those of the pure constituents may be very unreliable. J. W.

Phase equilibria in hydrocarbon systems. Volumetric and phase behaviour of the methane *n*-pentane system. B. H. Sage, H. H. Reamer, R. H. Olds, and W. N. Lacey (*Ind. Eng. Chem.*, 1942, 34, 1108—1116).—The sp. vols. of 6 CH_4 -n- C_5H_{12} mixtures have been determined at 100—460° F. and at pressures \Rightarrow 5000 lb. per sq. in. The bubble-point and dew-point pressures and the sp. vols. of the components of the coverting pressures this terms. components of the coexisting phases over this temp. range are re-corded. Enthalpy and fugacity data are deduced. J. W. S.

Composition of the liquid phase and of the weight-equivalent vapour phase of the systems butadiene- ψ -butylene, -ethyl alcohol, -acetaldehyde, and -ethyl ether. I. N. Buschmakin and K. I. Kutschinskaja (Sintet. Kautschuk, 1936, No. 5, 3-6).—Tables and graphs are given. Сн. Авз. (е)

Equilibrium between the liquid and vapour of the binary system butyl alcohol-water. I. N. Buschmakin, A. P. Begetova, and K. I. Kutschinskaja (*Sintet. Kautschuk*, 1936, No. 4, 8–11).—Data are recorded for the systems $BuOH-H_2O$ and $sec.-BuOH-H_2O$.

Systems with boron trifluoride. H. S. Booth and D. R. Martin (J. Amer. Chem. Soc., 1942, 64, 2198-2205).—F.p. data for systems of BF₃ with MeCl, HCl, NO, and SO₂ show that only SO₂ forms a compound, SO₂, BF₃, with BF₃. The reported existence of BF₃, 3HCl is refuted. W. R. A. is refuted.

Binary systems composed of titanium tetrachloride and nitrocompounds.—See A., 1943, II, 4.

X-Ray methods for ternary systems. A. G. H. Andersen and E. R. Jette (*Trans. Amer. Soc. Met.*, 1936, 24, 519-540).—The methods of interpolation and extrapolation of lattice const. measurements differ from these used in binary systems. Illustrations are given from the Fe-Cr-Si diagram. CH. ABS. (e)

Fusion surface of the ternary system of organic compounds. II. C. Shinomiya and T. Asahina (J. Chem. Soc. Japan, 1936, 57, 732— 742; cf. A., 1936, 429).—Eutectic points of binary systems of $C_6H_2Me(NO_2)_3$ (I) and $C_6H_3(NO_2)_3$ (II) are at 59° and 59.5% (I); (II) and $OMe \cdot C_6H_2(NO_2)_3$ (III) are at 45° and 37.5% (II); (III) and (I) are at 42° and 60.0% (III). The eutectic point of a ternary system of (I), (II), and (III) is at 30°, 26.8% (I), 27.6% (II), and 45.6% (III). CH. ABS. (e) 45.6% (III). Сн. Авз. (е)

Zirconium salts. (Mlle.) M. Falinski (Ann. Chim., 1941, [xi], 17. 237-325).-By analysis of the saturated solutions and wet solids 237—325).—By analysis of the saturated solutions and wet solids it has been shown that the following compounds exist in the system $ZrO_2-SO_3-H_2O$: $Zr(SO_4)_2$, $Zr(SO_4)_2$, $4H_2O$, $2ZrO_2,3SO_3,5H_2O$, $Zr(SO_4)_2,H_2SO_4$, $Zr(SO_4)_2,H_2SO_4,H_2O$, $Zr(SO_4)_2,H_2SO_4,2H_2O$, $7ZrO_2,3SO_3,30H_2O$, and $2ZrO_2,SO_3,7H_2O$. In the system $ZrO_2-HNO_3-H_2O$ the compounds $Zr(NO_3)_4,6H_2O$, $Zr(NO_3)_4,5H_4O$, and $Zr(NO_3)_4,2HNO_3,4H_2O$ have been shown to exist. The optical rotation of mannitol is increased by the presence of Zr salts, and evidence of the formation of unstable complexes in the solution has been obtained. been obtained. J. W. S.

Heat of formation of calcium aluminates. W. A. Roth (Z. Elektro-chem., 1942, 48, 267).—Revised vals. for the heats of formation of 3CaO,Al₂O₃ and 5CaO,Al₂O₃ are +2.0 and +3.6 kg.-cal. respectively.

Heat of formation of manganese carbonate and entropy of man-ganese ion. A. F. Kapustinski (J. Phys. Chem. Russ., 1941, 15, 220-227).—The heat of dissolution of $MnCO_3$ in N-HCl to give N-MnCl₂ and CO₂ gas is at 25° -3680 $\pm 3.5\%$ g.-cal. This gives for the heat of formation of $MnCO_3$ -207,800 $\pm 1\%$ and for the entropy of $Mn^{\circ\circ}$ in H O. -19:1+0.6. C. R. H. of Mn" in H₂O -19.1 ± 0.6 . J. J. B.

Influence of very fine grinding on the heats of wetting and of dis-Indence of very line grinding on the nears of wetting and of dis-solution of sugar and cellulose. J. Gundermann (Kolloid-Z., 1942, 99, 142—147; cf. Z. physikal. Chem., 1941, B, 49, 64).—The heat of dissolution (q) of unground sucrose (I) is negative but becomes positive with increasing time of grinding of its suspension in CCl_4 in a swing mill. Grinding in a swing mill is described, up to a limit-ing concn., by the equation $C = C_0 e^{-kt}$, where C_0 is the initial concn. of the unground material and C its concn. after a time t. On the basis of the changes observed in q, the following effects were deduced : (a) grinding is 3 times as rapid with steel as with porcelain balls. (b) a ball mill grinds much better when charged with many small balls than with a few large balls, (c) the Bloch-Rosetti mill is inferior to a ball mill, and the latter is inferior to a swing mill. The sharp X-ray diffraction pattern of unground (I) is completely destroyed by sufficient grinding. When (I) is dry-ground, the destroyed by sufficient grinding. When (I) is dry-ground, the changes described above are less definite since it agglomerates into a ball or clump and grinding is impeded. The dry-grinding of different kinds of coke gives graphs similar to those given by (I) when the heat of wetting q' is plotted against the time of grinding. The limiting vals, of q' for ground coke approach those for commercial active carbons (II), presumably because the surface area of the ground coke has approached that of (II). When celluloses (III) are ground in CCl₄ suspension until their X-ray diffraction patterns have disappeared, the ground material dried and then suspended in H₂O, a rise in temp. is observed. When the wetted material is re-dried and then remoistened, a smaller rise in temp. is obtained, the differand then remoistened, a smaller rise in temp. is obtained, the difference being due to the energy used up in the recrystallisation of the ground (III). The same results are obtained for both wood- and ramie-(III). It is concluded that q and q' can be used to characterise the progress of grinding. N. G.

Calculation of free energy, entropy, specific heat, and equilibria from spectroscopic data and the validity of the third law. H. Zeise (Z. Elektrochem., 1942, 48, 425-447).—Thermodynamic data deduced from spectroscopic measurements are summarised and compared with experimental vals., with particular reference to their confirmation of the third law of thermodynamics. J. W. S.

VII.—ELECTROCHEMISTRY.

Electrical conductivity of the potassium fluoride-aluminium fluoride and potassium aluminium fluoride-alumina systems. K. Bataschev and A. Shurin (*Metallurg*, 1935, 10, No. 12, 67–73).—The electrical conductivity of the KF-AlF₅ system at 930—1050° decreases con-siderably with increasing [AlF₃]. That of the K₃AlF₆-Al₂O₃ system (960—1050°) decreases rapidly with increasing [Al₂O₃]. The solubility of Al₂O₃ in K₃AlF₆ is slightly > in Na₃AlF₆. K₃AlF₆-Al₂O₃ mixtures fuse at a lower temp. than the corresponding Na₃AlF₆-Al₂O₃ mixtures. CH. ABS. (e)

Present state of the problem of standardising the pH scale and the potential values of reference electrodes. F. Müller and H. Reuther (Z. Elektrochem., 1942, 48, 288-297).—The development of the concept of the activity pH scale, and the various attempts to obtain accurate reference electrode vals. that are free from theoretical objections based on differing views of the activity concept, are reviewed. C. R. H.

Activity of the cadmium ion in solutions of cadmium acetate. (Mlle.) M. Quintin (*Compt. rend.*, 1941, **213**, 831–833; cf. *ibid.*, **212**, 855).—The e.m.f. of the cell Cd-Hg (2 phases)|Cd(OAc)₂ (c)|KCl saturated₁KCl 0·1N.|Hg₂Cl₂-Hg was measured at 25° with c from 0·001 to 0·396M. The normal potential Cd|Cd⁻⁻ is -0.4009 v. O. D. S

Contact potentials. V. Metal-electrolyte Volta effect. VI. Single potential differences. VII. Chemical and thermal effects. J. A. Chalmers (*Phil. Mag.*, 1942, [vii], 33, 594—598, 599—608, 608—613; cf. A., 1942, I, 331).—Theoretical. V. The metal-electrolyte Volta effect is probably made up of the p.d. at the metal-electrolyte boundary + that at the electrolyte-air boundary the latter bairs 0.26 y.

boundary, the latter being 0.26 v. VI. Published work on single p.d. is discussed. VII. Consideration of enthalpy differences gives a clear distinction

between the chemical and thermal origins of contact p.d. Concn. effects are thermal rather than chemical. O. D. S.

Decomposition potentials of the systems $AsBr_3$ -ether and $SbCl_3$ -ether at various current densities. I. O. K. Kudra and G. S. Kleibs (*J. Phys. Chem. Russ.*, 1941, 15, 228-233).—When c.d. increases gradually the cathodic potential changes suddenly at the moment when black powdery deposit of As or Sb takes the place of a bright deposit; this potential is termed "second decomp. potential." It decreases when $[AsBr_3]$ or $[SbCl_3]$ increases; the "first decomp. potential" is independent of concn. Black deposits are due to dis barge accomplex cations. J. J. B.

Decomposition potentials of the system AlBr₃-NaCl-EtBr at various urrent densities II. O. K. Kudra and G. S. Kleibs (*J. Phys. Lent. Rass.* 1941, 15, 234-238).—AlBr₃-EtBr mixtures show two decomp. potentials; at the lower one bright Al, and at the higher

black Al, is deposited. The lower potential is independent of $[AlBr_3]$, and the upper one increases with [EtBr]. In a solution of NaCl (0.5 mol.) and AlBr₃ (0.5 mol.) in EtBr there is a third decomp. potential at which Na is deposited. J. J. B.

Elimination of liquid junction potentials. IV. Conditions of extrapolation. B. B. Owen and S. R. Brinkley, jun. (J. Amer. Chem. Soc., 1942, 64, 2071—2075).—A given pair of junction solutions may lead to quite different limiting cell potentials according to the nature of the electrodes employed and the way in which the limit is approached. Typical cells are described in which the limiting L^{∞} of the liquid innertion is zero are non-lectric different between the or colourbub. potential, E_1° , of the liquid junction is zero, or neglected, or calculable. Vals. of E_j° calc. from the Henderson equation agree satisfactorily with observed vals. Extrapolations must be performed at const. UNIX W. R. A. ionic strength.

Elimination of errors due to electrode polarisation in measurements of the dielectric constants of electrolytes. T. M. Shaw (J. Chem. Physics, 1942, 10, 609-617).—The dielectric const. of aq. Chem. Physics, 1942, 10, 609-617).—The dielectric const. of aq. solutions of glycine in presence of electrolytes has been determined over the frequency (ν) range 10-5000 kc. per sec. and the conductivity range 0·29-1.74 × 10⁻⁴ ohm⁻¹ cm.⁻¹ Errors due to electrode polarisation can be eliminated by the methods of Fricke and Curtis (cf. A., 1937, I, 458) or of Oncley (cf. A., 1938, I, 357). If the latter method is modified by assuming that cell capacity (C) varies linearly with $\nu^{-1\cdot7}$ instead of with $\nu^{-1\cdot5}$, it becomes applicable to lower ν and to higher electrolyte concns. The former method is more useful than the latter as modified since it is applicable to a greater range of ν and conductivities and can be used to eliminate polarisation effects in measurements made at a single ν . The latter method effects in measurements made at a single v. The latter method requires measurements for at least two ν , but more precise results C. R. H. are obtainable with it.

Hydrogen overvoltage at high current densities. VI. Mechanism of hydrogen overvoltage. A. Hickling and F. W. Salt (*Irans. Faraday Soc.*, 1942, 38, 474—490; cf. A., 1941, I, 418).—Theories of H overvoltage assuming discharge of H ions, and those assuming recombination of H atoms, as the rate determining factor, are recombination of H atoms, as the rate-determining factor, are considered in relation to a wide range of experimental data, and the conclusion reached is that the latter assumption is alone consistent with most of the known facts. A theory of overvoltage is developed, in which the chief assumptions are that the discharge of H ions is rapid, that the resulting H atoms give rise to a pressure of at. H which determines the electrode potential in accordance with the Nernst equation, and that the removal of adsorbed H atoms may occur by evaporation, by catalysed combination to H_2 , and by electrochemical reduction. F. L. U.

Overvoltage. XIII. Decay of cathode potential in still and stirred solutions saturated with hydrogen or with nitrogen. A. L. Ferguson and M. B. Towns (*Trans. Electrochem. Soc.*, 1942, 82, *Preprint* 25, 285–299).—The rate of decay (*R*) of polarised potentials at a platinised Pt cathode is independent of the duration of the preceding cathodic polarisation, and increases with the c.d. used to polarise the cathode. After 10 sec. R is the same in still solutions saturated with H₂ as in those saturated with N₂; the initial rate in N₂ is > in H₂. Stirring the solution increases R. The stable cathode potential for any c.d. increases in the order : still (H₂) < still (N₂) < stirred (H₂) < stirred (N₂). The data support the theory that cathode polarisation potentials are determined by the activity of at. H and of H' at the electrode-solution interface. C. R. H.

Dropping mercury electrode in acetic acid. II. Electrocapillary curves and the theory of maxima. G. B. Bachman and M. J. Astle (*J. Amer. Chem. Soc.*, 1942, **64**, 2177—2181; cf. A., 1942, I, 300).— The electrocapillary curve for Hg in AcOH solutions of NH₄OAc cheves a fact bread too with two more which come closer on addition shows a flat, broad top with two max. which come closer on addition of H_2O to AcOH and merge to one max. at 50 mol.-% H_2O . The effect of added salts depends on the reduction potential of the cation. Two types have been identified: class I, in which the half-wave reduction potential is more negative than the first max. (A) for AcOH solutions of NH₄OAc, includes Zn^{**}, Pb^{**}, Cd^{**}, Co^{**}, Sb^{***}, Ni^{**}, Cr^{***}, and Bi^{***}; class II, with half-wave reduction potentials more positive than A, includes Pb^{***}, Fe^{***}, Cu^{**}, and Hg^{***}. Class I cations can be determined polarographically in AcOH after degassing, but class II cations cannot. The max. are explained on the basis of a streaming of the electrolyte around the Hg drop. Certain ions shift the position of A to more negative potentials and cause certain reducible substances to change from class I to class II. Addition of substances of high mol. wt. and of capillary-active substances W. R. A. tends to decrease the heights of max.

Polarographic investigation of rhenium compounds. II. Cation of Re' at the dropping electrode and the potential of the Re Oxid--Re' **accouple.** J. J. Lingane (J. Amer. Chem. Soc., 1942, **64**, 2182–2190; cf. A., 1942, I, 303).—A Zn reductor is described in which reduction can be performed at a controlled temp. and in the absence of O_2 . Re' is produced when ice-cold and air-free solutions of ReO_4 ' ions in dil. $\operatorname{H}_2\operatorname{SO}_4$ and HClO_4 are reduced by Zn and this has been con-firmed by oxidimetric titration with $\operatorname{Ce}(\operatorname{SO}_4)_2$. Polarograms of solutions of Re' in $1-2\operatorname{N}-\operatorname{H}_2\operatorname{SO}_4$ and $\operatorname{IN}-\operatorname{HClO}_4$ show three anodic waves pertaining to the same oxidation states in both media. The diffusing currents in both media α [Re']. The three waves, of which the middle one is resolved into two components, represent oxidation of Re' to (i) Re", (ii) Re" and ReV, (iii) ReVI (*i.e.*, ReO₄') and amperometric titration with Ce(SO₄)₂ confirms this. Partly oxidised solutions, with an average oxidation state of ReI, are obtained by warming dil. H₂SO₄ solutions of Re' to ~50° for 1 hr. in the absence of O₂ but polarograms indicate that this is not due to presence of ReI but to a mixture of Re' and oxidation states higher than ReI. W. R. A.

Reactions between metals and electrolyte solutions. W. R. A. Reactions between metals and electrolyte solutions. V. Existence of the difference effect in metal replacement processes. R. Piontelli and G. Poli (Z. physikal. Chem., 1942, A. 190, 317–330).—When a sample of Cd and an auxiliary electrode of a more inert metal (Cu or Pt) are immersed in aq. CuSO₄ a current flows in the external circuit between the electrodes and Cu is deposited on the auxiliary electrode. Stirring the solution accelerates the deposition of Cu on the Cd and decreases the current between the electrodes. This effect is attributed to an increase in the local currents at the Cd electrode, and is in accord with the theory of multi-electrode systems. J. W. S.

Adsorption of reduced methylene-blue at the dropping mercury electrode. R. Brdička (Z. Elektrochem., 1942, 48, 278–288).—The current-potential curves show that reduction takes place in two stages if pH is >4.92 and if the methylene-blue (I) concn. is $\leq 6.1 \times 10^{-6}$ M. The presence of the additional initial stage is ascribed to the adsorption of a reduction product, the adsorbed mols. limiting the magnitude of this stage. Equations for the current-potential curves have been derived with the aid of the Langmuir adsorption isotherm, and from them have been calc. the max. no. of mols. of reduced (I) adsorbed at 25° ($\sim 10^{14}$ mols. per cm.²) and the mol. energy of adsorption (11-2 kg.-cal. per mol.). Kinetic adsorption equations which have been derived lead to a val. of 0.0046 sec. for the average duration of adsorption of a mol. of reduced (I) on the Hg surface. C. R. H.

VIII.—REACTIONS.

Temperature-dependence of reaction rates from the standpoint of the Brönsted-Christiansen-Scatchard equation. E. S. Amis and G. Jaffé (J. Chem. Physics, 1942, 10, 646-650).—The k_{∞}^* term in the Brönsted-Christiansen-Scatchard general kinetic equation is divided into two parts, one representing the rate coeff. extrapolated to a standard reference state of temp., dielectric const. (D), and conc., the other giving temp.-dependence and embodying a non-electrostatic potential which is independent of D and has a positive val. for those distances at which the formation of an intermediate compound between the two reacting mols. occurs. If the two reactants have charges of the same sign, the ratio of rate-dependence on temp. (a_T) to rate-dependence on $D(a_D)$ is > T/D; if they are of opposite sign $a_T/a_D < T/D$. Existing kinematic data are satisfactorily applied to the equations.

Conditions of self-ignition of gas mixtures. XVII. Effect of composition of mixture on induction period of the cold flame of acetaldehyde. N. P. Keier and M. B. Neumann (J. Phys. Chem. Russ., 1941, 15, 156—163).—At 231—265° the induction period τ , when $[O_2]$ is kept const., is $\tau = B/[MeCHO]^2$, and when [MeCHO] is const., $\tau = C + D/[O_2]^2$; B. C, and D are functions of temp. When [MeCHO] varies, C and D are inversely \propto [MeCHO]². These rules are valid for $[O_2]$ between 8 and 90 mm. Hg, and for (MeCHO] between 50 and 420 mm. They are accounted for by a chain mechanism involving the branching of the chains by triple collisions of AcO₂H with MeCHO and O₂. J. J. B.

Heat of dissociation of cyanogen. N. C. Robertson and R. N. Pease (J. Chem. Physics, 1942, 10, 490).—H₂ reacts with C_2N_2 at 575—675° by the chain mechanism : (1) $C_2N_2 \rightarrow 2CN$, (2) CN + $H_2 \rightarrow HCN + H$, (3) $H + C_2N_2 \rightarrow HCN + CN$, (4) $H + HCN \rightarrow$ $H_2 + CN$, (5) $2CN \rightarrow C_2N_2$. The rate of reaction agrees with a val. 120—130 kg.-cal. per mol. for the heat of dissociation (D) of C_2N_2 . The overall activation energy is ~72 kg.-cal. L. J. J.

Mechanism of the thermal polymerisation of styrene. Effect on the polymerisation of methylated *p*-benzoquinone and chloranil. J. W. Breitenbach and H. L. Breitenbach (Z. *physikal. Chem.*, 1942, A. 190, 361—374).—Benzoquinone, its Me derivatives, and chloranil all decrease the rate of polymerisation of styrene at $60-150^{\circ}$ and also decrease the mean chain length of the polymeride. It is suggested that the quinone reacts with the polystyrene chains in some manner which hinders their growth and the fact that it is partly reduced to the quinol supports the view that this is associated with dehydrogenation. J. W. S.

Mechanism of additions to double bonds. XIV. Nature of the activated complex in bimolecular diene syntheses. A. Wassermann (J.C.S., 1942, 612-617).—As the association of $(CH_2:CH)_2$ is not affected by O_2 or peroxides (Vaughan, A., 1932, 1209) and contrary to Kistiakowsky and Ransom (A., 1939, I, 614) entropy calculation from existing data is inconclusive, the intervention of free radicals is unproved. The slowest stage in the dimerisation

is considered to involve activated complexes of the same stereochemical type as the stable product mols. F. R. G.

"Tervalent" carbon. XVII. Kinetics and energetics of radical dissociations.—See A., 1943, II, 6.

Reaction rates in ionic solutions. P. Debye (*Trans. Electrochem.* Soc., 1942, 82, Preprint 13, 133—139).—Smoluchowski's method of evaluating the fundamental frequency factor for the rate of a reaction such as the coagulation of a colloidal suspension, by employing a purely diffusional treatment, is extended to include the electrostatic effects arising from the presence of net charges. The introduction of the concept of a diffuse ionic cloud leads to the derivation of the Brönsted-Debye primary salt effect formula. The so-called "solvent" term of the Christiansen-Scatchard equation, arising from the self-potential of the ions, is also derived, but appears as the linear approximation of an exponential expression. C. E. H.

Kinetics of the reaction between copper and iodine in aqueous (potassium iodide) solution. I. L. L. Bircumshaw and M. H. Everdell (*J.C.S.*, 1942, 598-605).—For solutions at 20—35° containing 0.0025—0.02N-I in KI (initially 4 mol.), the rate of reaction with Cu is unimol. with respect to I, and is unaffected by Cu₂O formed at 100° or in the solution, or by the mode of prep. of the metal. The crit. increment is 6500 g.-cal. per g.-atom. 0.02N-I in KI (300 g. per 1.) similarly gives a solution of Cu₂O. The reaction is presumed to proceed by passage of I through the Cu₂O film.

F. R. G. Hydration of unsaturated compounds. XI. Acraldehyde and acrylic acid. D. Pressman and H. J. Lucas (J. Amer. Chem. Soc., 1942, 64, 1953-1957; cf. A., 1942, I, 366).—The rates of the reactions, acraldehyde \rightleftharpoons hydracraldehyde and acrylic \rightleftharpoons hydracrylic acid, in aq. HClO₄ are of first order relative to the [H₃O⁺] (0.493-2N,) and concn. of org. compound. The rate coeffs. are lower when H₃O⁺ replaces Na⁺, probably owing to formation of a less reactive oxonium complex by the org. compound; the concomitant, decrease in equilibrium consts. is probably due to the hydrated compound being a weaker base than is the unsaturated compound. CH₂:CH:CHO hydrates at 100° to the same extent in H₂O as in 0.5N:HClO₄. AH of hydration are -5.8 and -6.6 kg.cal. for the aldehyde and acid, respectively. R. S. C.

Electrostatic influence of substituents on reaction rates. III. Solvent effect. F. H. Westheimer, W. A. Jones, and R. A. Lad (J. Chem. Physics, 1942, 10, 478-485; cf. A., 1940, I, 415).—The first and second saponification consts. of $CH_2(CO_2Et)_2$ and $(CH_2 \cdot CH_2 \cdot CO_2Et)_2$, measured in H_2O and in 80% EtOH at several vals. of ionic strength and extrapolated to infinite dilution, show that the electrostatic effect is greater in the solvent of lower ϵ .

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Rate of dissolution of particles of quartz and certain silicates. P. H. Kitto and H. S. Patterson (J. Ind. Hyg., 1942, 24, 59-74).— The rate of dissolution at 36.9° was determined for quartz and other SiO₂-containing minerals when suspended as particles comparable in size with the dust in the air of the Witwatersrand mines. The dissolved SiO₂ was determined colorimetrically by the formation of yellow NH₄ silicomolybdate. The rate increased with rise in pH and with increasing fineness of the dust. The initial high rate was due mainly to the "Beilby layer" and "edge" effects; the final slow rate probably represents the true rate of dissolution of the undisturbed surfaces. E. M. K.

Structure and reactivity of cellulose. M. Ulmann (Kolloid-Z., 1942, 98, 160—164).—The action of liquid HCl on cellulose (I) is discussed. It is a reaction that does not involve swelling or alteration of cryst. state. The extent to which grinding, recrystallisation of the ground product by treatment with H₂O, dissolution to form viscose, spinning, and mercerisation affect the course of the reaction between liquid HCl and (I) has been investigated. The deformation of the (I) lattice by grinding results in a considerable increase in the reaction velocity, although the shape of the reaction curve is similar to that of untreated ramie. There is a sudden increase in the rate of reaction when ~58% of the substance has reacted. Treatment of the ground product with H₂O at 100° gives a substance with the X-ray diagram of (I) hydrate. It reacts at almost the same rate as (I) that has not been mechanically treated, but there is a sudden increase in velocity when ~40% of the substance has reacted. Viscose fibres show almost the same curve as (I) hydrate, showing that grinding, followed by recrystallisation from H₂O, causes the same structural changes as the viscose process. Mercerisation produces hardly any change in reaction velocity.

Inhibition of acetoxidation of aldehydes by carcinogenic and related compounds.—See A., 1943, III, 38.

Catalysts—ancient and modern. A. J. V. Underwood (*Chem. and Ind.*, 1942, 476—478).—The scope and efficiency of catalytic and microbiological processes are compared. M. H. M. A.

"Tervalent " carbon. XX. Radicals as catalysts of autoxidation. —See A., 1943, II, 7.

Acidic and basic catalysis in urethane formation. D. S. Tarbell, R. C. Mallatt, and J. W. Wilson (J. Amer. Chem. Soc., 1942, 64,

2229—2230).—Urethane formation from o-cresol and PhNCO, heated without solvent at 100°, is catalysed by Na₂CO₃, NaOAc, C₃H₅N, AcOH, CCl₃·CO₂H, ZnCl₂, and HCl. p-NO₂·C₆H₆·OH and p-OH·C₆H₄·CPh₃ behave similarly but 1:2:4·OH·C₆H₃(NO₂)₂. 1:2:6·OH·C₆H₂Cl(NO₂)₂, and picric acid do not form urethanes. Quant. data for urethane formation from o-cresol and a-C₁₀H₇·NCO indicate the following catalytic activity: NEt₃ > BF₃·Et₂O > C₁H₃N > HCl > CCl₃·CO₂H > NPhMe₂ > CH₂Cl·CO₂H > AcOH. Phenylurethanes were prepared by heating 2 or 3 g. of a tert. alcohol with an equiv. amount of PhNCO and 0·1 g. of NaOAc for 4—5 hr. but the reaction product was contaminated with CO(NHPh)₂ and PhNCO. The following have been prepared: *dimethylbutylcarbinol*, m.p. 62—63°; *diphenylmethylcarbinol*, m.p. 124—125°; *triethylcarbinol*, 61—61-5°; *benzylmethylcarbinol*, m.p. 124—125°; *triethylcarbinol*, m.p. 96—96-5°. The mechanism appears to be one of general acid-base catalysis. W. R. A.

Homogeneous catalysis and solvent effects in a diene synthesis. A. Wassermann (J.C.S., 1942, 623-626).—The course of the diene synthesis of cyclopentadiene-benzoquinone is represented by second velocity coeffs., $v = Ae^{-E/RT}$. The catalytic and solvent effects exhibit a linear relation between log A and E for measurements in $C_{4}H_{6} + CCl_{3}CO_{2}H$, CS_{2} , CCl_{4} , $C_{6}H_{6}$, n- $C_{6}H_{14}$, EtOH, PhCN, PhNO₂, and AcOH. This is interpreted in terms of theory of abs. reaction rates. F. R. G.

Homogeneous catalysis of diene synthesis. New type of thirdorder reaction. A. Wassermann (J.C.S., 1942, 618-621).—Diels-Alder syntheses between cyclopentadiene (I) and benzoquinone, a-naphthaquinone (II), tetrachlorobenzoquinone, cyclopentadienebenzoquinone, and (I) are catalysed by PhOH, Ct₂Br-CO₂H, Ct₂Ct-CO₂H, CCl₃-CO₂H, NMe₃, and (II) in C₆H₆, EtOH, C₆H₁₄, or paraffin, and by AcOH in the gas phase. The primary step is of the third order and the activation energy is near to zero. F. R. G.

Mechanism of the catalytic oxidation of ammonia. F. M. Vainschtein and M. V. Poljakov (*J. Phys. Chem. Russ.*, 1941, **15**, 164– 173).—Air containing 9.5% of NH₃ was passed through Pt wire nets, and the % p of the NH₃ oxidised to NO measured. One Pt net gave, e.g., p = 90, two identical nets in contact gave p = 97, but when the distance between the nets was increased to 17 mm., p fell to 94. This fall was larger when the temp. was farther from the optimum temp. (600°), e.g., at 500° or 700°. Obviously between the gazes a homogeneous reaction which destroys NH₃ takes place. Its nature is unknown. J. J. B.

"Magneto-catalytic" effect in the hydrogenation of carbon dioxide and carbon monoxide on nickel. H. Spingler and O. Reinhard (Z. physikal. Chem., 1942, A, 190, 331-340).—The velocity of reaction of H₂ with CO₂ and with CO on a Ni surface has been studied at 280-380°. No abrupt change in the rate of reduction of CO₂ is observed on passing through the Curie interval (350-360°) but the reduction of CO shows an abrupt increase in velocity at temp. outside this range, indicating a magneto-catalytic effect. I W S.

Preparation of butadiene by catalytic dehydrogenation of butylene. -See B., 1942, II, 417.

Efficiency of electrolytic separation of chlorine isotopes. H. L. Johnston and D. A. Hutchison (*J. Chem. Physics*, 1942, 10, 469–472).—The electrolytic separation factor for Cl isotopes is 1.0060 ± 0.0005 at $25-40^{\circ}$ on Pt electrodes and 1.0068 ± 0.0014 on Acheson graphite. The effects of temp. and c.d. are insignificant.

Electrolytic decomposition of aqueous ammonium chloride solutions. C. B. F. Young and E. G. Lundstrom (*Trans. Electrochem. Soc.*, 1942, **81**, *Preprint* 33, 469–477).—NH₃ and Cl₂ are formed when aq. NH₄Cl (18%) is electrolysed in presence of NaCl (7%) at 50–75° in a cylindrical cell with C anodes and an unsubmerged, cylindrical, perforated steel cathode covered with an asbestos diaphragm. Current efficiency increases with c.d. With anode and cathode c.d. 14.5 and 11 amp. per sq. dm. respectively, anode and cathode current efficiencies of 44.8% and 84.3% and energy efficiencies of 20.7% and 38.9% respectively are obtainable. Of the liberated Cl₂, 36% reacts to form side products. Increase of [NaCl] increases anode current efficiency and reduces the tendency of Cl₂ to form side products. C. R. H.

Anodic behaviour of tin in a stannate bath.--See B., 1942, I, 529.

Preparation of benzaldehyde by oxidation of toluene, using oxidising agents regenerated by electrolysis.—See B., 1942, II, 417.

Effect of intermittent light on a chain reaction with bimolecular and unimolecular chain-breaking steps. O. K. Rice (J. Chem. Physics, 1942, 10, 440—444).—The reaction rate is calc. as a function of illumination frequency for a photo-chain reaction with the mechanism (1) $A_2 + h\nu \rightarrow 2A$, (2) $A + B \rightarrow C + A$, (3) $2A \rightarrow$ stable products, (4) $A \rightarrow$ stable products, induced by intermittent light (e.g., with a rotating sector). The relationship may be used to calculate individual rate consts. from kinetic measurements. **Photochemical decomposition of carbon disulphide.** P. M. Nicholes, N. L. Simmons, and H. D. Crockford (*J. Elisha Mitchell Sci. Soc.*, 1936, **52**, 51–55).—CS₂ contained in a Pyrex bulb was decomposed by light from a quartz-Hg arc, to form (CS)₂, C₃S₂, and a brown solid (C_3S_2)_x. The C_3S_2 remained liquid at -20° . CH. ABS. (e)

Apparatus for investigating photo-reactions of halogen; with organic substances in the liquid phase. Photo-reaction between chlorine and *n*-heptane. J. Stauff and H. J. Schumacher (Z. Elektrochem., 1942, 48, 271–278).—An apparatus for following the course of photo-reactions in the liquid phase is described and its use illustrated by data for the reaction between Cl_2 and n- C_7H_{16} in CCl_4 at 25°. The reaction, which is inhibited by O_2 , has a quantum yield of 7 × 10³ mols. per h_{ν} for a light intensity of 3.51 × 10¹⁶ h_{ν} per min. The kinetics of the reaction are discussed and a reaction scheme is suggested, viz., $Cl_2 + h_{\nu} \rightarrow Cl + Cl$; $C_7H_{16} + Cl \rightarrow C_7H_{15} + HCl$; $C_7H_{15} + Cl_2 \rightarrow C_7H_{15}Cl + Cl$; $C_7H_{16} \rightarrow chain rupture. The third stage is the measured reaction. C. R. H.$

Photosensitised oxidation of ethylenic double bonds. K. Meyer (Cold Spring Harbor Symp. Quant. Biol., 1935, 3, 341–349).—Eosin and isochlorophyllin sensitised the photosensitised oxidation of $AcCO_2H$ in alkaline solution; rhodamine B was slightly active and HCN inhibited it. The solvent influences the yield of peroxide. In the oxidation of oleic acid (which forms hydroxyoleic acid), some terpenes, and ergosterol in presence of chlorophyll, which is more active than eosin, no peroxides could be detected. CH. ABS. (e)

Chain photolysis of acetaldehyde in intermittent light. W. L. Haden, jun., and O. K. Rice (J. Chem. Physics, 1942, 10, 445– 460).—For photolysis of MeCHO the chain mechanism (1) MeCHO + $h\nu \rightarrow Me + CHO$, (2) CHO + MeCHO $\rightarrow CH_4 + CO + CHO$, (3) CHO + CH₃ \rightarrow stable products, (4) CHO \rightarrow stable products, is suggested. Results with intermittent light at 200–300° give 2.6, 11.3, and 7.8 kg.-cal. for activation energies of (2), (3), and (4). k_2 and k_3 agree with the products of collision no. with Arrhenius factor, without postulating mol. orientation. k_4 agrees with statistical requirements for a wall reaction. L. J. J.

Counting of free alkyl radicals. Application to the photolysis of acetone. M. H. Feldman, J. E. Ricci, and M. Burton (J. Chem. Physics, 1942, 10, 618-623).—The Paneth method of determining the metal removed from mirrors by means of free radicals has been modified by using Pb mirrors and converting the collected Pb alkyl into $Pb(NO_g)_2$, which is determined microanalytically according to the Moskowitz method. When applied to the photolysis of COMe₂, the method shows the apparent half-lives of the radicals to be 0.011 and 0.008 sec. at 45° and 100°, respectively. C. R. H.

Photochemical activation of oxidation by complex metallic salts. A. Watanabe (Iwata Inst. Plant Biochem., 1936, Publ. 2, 129– 158).—The photo-oxidation of KI, pyrogallol (I), benzidine, p-C₆H₄(NH₂)₂, and Nadi reagent in presence of certain complex salts of Co was studied. In the oxidation of (I) a definite promoting effect of infra-red radiation was observed. The magnitude of the photoactivity of nuclei of the type Co(NH₃)₅X was influenced by the co-ordinated acid radical in the order CNS > NO₂ > CO₃ > Cl. The effect of light is explained on the assumption that the complex is rendered unstable by the absorbed light, so that attachment of the H₂O or substrate mols. readily occurs. CH. ABS. (e)

IX.—METHODS OF PREPARATION.

Principles for nomenclature of inorganic compounds. H. Remy (Chemie, 1942, 55, 267-272).

Reactions of the type A (solid) + B (solid) $\rightarrow AB$ (solid). IV. Progress of chemical reactions involving solids. G. F. Hüttig (Kolloid-Z., 1942, 99, 262—277).—A list of papers dealing with reactions of this type and a review of progress are presented. C. R. H.

Preparation of deuterium chloride. H. C. Brown and C. Grott (J. Amer. Chem. Soc., 1942, 64, 2223—2224).—DCl has been prepared in high purity by the reactions $BzCl + D_2O \rightarrow BzOD + DCl$; $BzCl + BzOD \rightarrow Bz_2O + DCl$ at "elevated temp." W. R. A.

Alkali and alkaline-earth phosphides. C. Legoux (Ann. Chim., 1942, [xi], 17, 100—180).—The action of PH₃ on Li in liquid NH₃ yields the compound PH₂Li,4NH₃, which in a vac. at 0° yields the compounds PH₂Li,2NH₃ and PH₂Li,NH₃. On heating in a vac. these compounds all yield the compound PHLl₂, which on further heating gives a mixture of phosphides. With liquid NH₃, PHLl₃ yields the compounds PHLl₂,3NH₃ and PHLl₃,2NH₃. The action of PH₃ on Na or K in liquid NH₃ yields only PH₂Na and PHL₄, On heating at 70° in a vac. PH₂Na yields the compound PHLl₃, SNH₃ which distils off at >450°, leaving Na₂P₅. PH₂K decomposes at 175° with liberation of H₂ and K, which distils off at >320° leaving K₂P₅. No evidence of the formation of Na₃P or K₃P has been obtained. The action of PH₃ on Ca in liquid NH₃ yields the compound (PH₂)₂Ca,6NH₃, which in a

vac. at 0° yields the compound $(PH_2)_2Ca,2NH_3$. On heating in a vac. these yield the compound PHCa, which at higher temp. is decomposed with liberation of H_2 . The action of PH_3 on Sr in I. W. S. liquid NH₃ yields only an ill-defined mixture.

Reactions between sodium carbonate and ferric oxide and alumina. V. A. Mazel and S. N. Astanovitzkaja (*Legk. Met.*, 1936, **5**, No. 4, 12–18).—Na₂CO₃ begins to react with Fe₂O₃ and with Al₂O₃ at 500°. The reactions are rapid at 700°. Excess of Na₂CO₃ increases the speed of reaction below 900°, but at bigher terms decreases the speed of reaction below 900°, but at higher temp. decreases it. In all cases, Na₂O,Fe₂O₃ and Na₂O,Al₂O₃, respectively, are the only compounds produced. CH. ABS. (e)

Transformation and reactions before and during the formation of zinc-iron spinel from β -zinc hydroxide and γ -ferric hydroxide in presence of carbonates. I. Thermal behaviour of β -zinc hydroxide. W. Schröder [with H. Schmäh] (Z. Elektrochem., 1942, 48, 241-254) .- Present knowledge of Zn-Fe spinel formation is reviewed. X-Ray and emanation methods applied to β -Zn(OH)₂ containing So that the dissociation methods applied to β -Zn(OH)₂ ($p_{H_{10}} = 1$ atm.) is 120°, and that of ZnCO₃ ($p_{CO_3} = 1$ atm.) is 255°. ZnO has m.p._{cole}. 1900°; it is not volatile at temp. $\gg 1100°$. The thermal behaviour of Zn(OH)₂ and other hydroxides and oxides is compared C. R. H. with that observed by other investigators.

Metaphosphates. K. Karbe and G. Jander (Kolloid-Beih., 1942, F. L. U. 54, 1—146).—A review.

Extraction of vanadium salts. I. Separation of vanadium from ferrous iron. S. Uno and T. Izumo (Bull. Waseda Appl. Chem., Soc., 1936, 28, 1--6).—The change of pH of VOSO₄ on addition of alkali was studied with the Sb electrode. VO(OH)₂ was pptd. at pH 4-5. With FeSO₄, hydroxide is pptd. by NaOH at pH 6--8. Pptn. of V in presence of FeSO₄ at pH 5--6 is complete in conc. solution. In dil. solution, pptn. is incomplete, owing to formation of a sal Сн. Авѕ. (е) of a sol.

Interchange of heavy oxygen between water and certain inorganic oxy-anions. E. R. S. Winter and H. V. A. Briscoe (J.C.S., 1942, 631-637; cf. A., 1940, I, 171).—Contrary to earlier work, interchange of ¹⁸O occurs between H_2O and KH_2PO_4 and $KHSO_4$ respectively. These and the interchange between H_2O and $NaHSO_4$ show that the rate increases with temp. and concn. and is for Na > K. Addition of inert salts and free acid increases the rate. These and the interchange between H_2O and K_2CrO_4 are considered to occur through anhydride formation. F. R. G.

X.—ANALYSIS.

Volumetric solutions. Rapid and convenient preparation of exactly 0·1N-hydrochloric acid and 0·02N-sulphuric acid. E. Schulek and F. Szeghö (Z. anal Chem., 1942, 123, 252-271),— Precise directions are given for the prep. of 0·1N-HCl, 0·02N-H₂SO₄, 0·1N- and 0·01N-AgNO₃, -KH(IO₃)₂, -KBO₃, -NaOH, -KCNS, -I, and -Na₂S₂O₃; 0·1N-KMnO₄, 0·2M- and 0·02M-KCN; 0·1N-K₂Cr₂O₇; and 0·5N-KOH in Pr^aOH. A. A. E.

Application of potentiometric analysis to [photographic] developer analysis.-See B., 1942, II, 449.

Determination of iodide in presence of interfering substances. K. F. Shimizu and E. A. Kelly (*J. Amer. Pharm. Assoc.*, 1942, **31**, 103–105).—Known analytical methods do not give accurate or consistent results for I' in FeI₂ preps. Satisfactory results are obtained by the method of distilling the I from the prep. (e.g., FeI₂ pills) in aq. H_3PO_4 after addition of H_2O_2 and absorbing the I in aq. KI, provided that suitable apparatus and procedure are used.

F. O. H

Colorimetric determination of small amounts of metaphosphate Colorimetric determination of small amounts of metaphosphate and pyrophosphate. Determination of iron with thiocyanate in presence of metaphosphate and pyrophosphate. H. E. Wirth (Ind. Eng. Chem. [Anal.], 1942, 14, 722—725).—The decrease in the colour of Fe(CNS)₃ produced by $P_2O_1^{\prime\prime\prime\prime}$ or PO_3^{\prime} is used as the basis of a method for determining 0.01—5 p.p.m. of these ions. A large excess of Al^{**} releases Fe^{***} from complexes with PO_3^{\prime} and $P_2O_1^{\prime\prime\prime\prime}$, and Fe^{***} can be accurately determined by means of CNS' in presence of relatively high $[PO_3']$ and $[P_2O_1^{\prime\prime\prime\prime}]$ if $Al(NO_3)_3$ -HNO₃ reagent is used. L. S. T. used L. S. T.

Qualitative analysis of the ammonia and ammonium sulphide groups. W. Lohrer (Z. anal. Chem., 1942, 124, 1-17).—The method described by Fischer et al. (A., 1936, 1353) is simplified and shortened by using $(CH_2)_{\theta}N_4$ instead of aq. NH₃ for the pptn. of PO₄^{'''}, W, Al, Be, Cr, V, U, Fe, Zr, Ti, and La (Ce, Th) after adding aq. FeCl₃. The pptn. of Be and La is completed by pptn. with conc. aq. NH₃ as described by Ardagh et al. (A., 1924, ii, 349). The separation of the above-mentioned elements from Zn, Ni, Co, Mn, the alkaline earths, and the alkalis is much sharper. Details of procedure are given. L. S. T. L. S. T.

Determination of silicon in alpax.—See B., 1942, I, 532.

Determination of silicon in commercial aluminium and its alloys. -See B., 1942, I, 532.

Determination of silicon in quartzites, silica bricks, and sands. V. Vepritzkaja (*Ogneuporui*, 1936, **4**, 284–285).—To a sample fused with Na_2CO_3 and then dissolved in conc. HCl, gelatin is added, which leads to a coagulation of SiO leads to a coagulation of SiO_2 .

Determination of sodium by the uranyl zinc acetate method. Anon. (Paper Trade J., 1942, 115, TAPPI Sect., 83-84).—Tappi tentative standard T 623 m-42 is described. H. A. H.

Determination of silver in silver cyanide plating solutions .-- See B., 1942, I, 530.

Reaction for calcium. S. A. Celsi (Anal. farm. bioquim., 1934, 5, 85-89).—A mixture of K₄Fe(CN)₆ and Cu(NH₃)₄SO₄, H₂O gives a sky-blue ppt. with Ca++ Сн. Авз. (е)

Determination [in water] of calcium in presence of magnesium by standard soap solution by rapid titration.—See B., 1942, III, 280.

Analysis of radioactive solutions. A. Becker and I. Schaper (Z. Physik, 1941, 118, 357-374).—Combined measurements of emanation and γ -radiation by the method described enable Ra, meso-Th, and Ra-Th to be determined in mixtures thereof. The sensitivity of the method is << 0.01 mg. Ra-equiv. The effect of Th emanation is taken into account. L. J. J.

Rapid photometric determination of magnesium in aluminium alloys.—See B., 1942, I, 532.

Rapid determination of magnesium in [aluminium] alloys containing zinc .--- See B., 1942, I, 532.

Determination of zinc in aluminium and its alloys.—See B., 1942, I, 532.

Alkalimetric determination of cadmium. M. M. Tillu and M. S Telang (J. Indian Chem. Soc., Ind. Ed., 1942, 5, 134).—The method is based on the treatment of $Cd(OH)_2$ with excess of KI to yield KOH (2 mols.). The liberated alkali must be titrated as gradually as R. J. W. R.

Volumetric determination of lead as an insoluble compound using diphenylcarbazone as indicator. R. Ripan (Z. anal. Chem., 1942, 123, 244–251).—Pb can be determined by titration with aq. K_4 Fe(CN)₆, Na₂C₂O₄, Na₂HPO₄, Na₂CO₃, or Na₂WO₄ in presence of NH₄OAc, or with aq. K_2 SO₄ or Na₂S₂O₃ in presence of EtOH, using diphenylcarbazone, which is more sensitive as an indicator than diphenylcarbazide. diphenylcarbazide. A.A.E.

Rapid determination of copper, manganese, and iron in aluminium alloys.-See B., 1942, I, 532.

Rapid determination of manganese, phosphorus, sulphur, and silicon in pig iron.—See B., 1942, I, 524.

Colorimetric micro-determination of iron. C. P. Sideris (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 756-758).—The green colour formed by Fe^{••} with nitroso-R-salt (I) at pH 8-10 is used as the basis of a colorimetric method for determining $0.2-50 \ \mu\text{g}$. of Fe^{••}. 2NH₂OH,H₂SO₄ is a satisfactory reducing agent for Fe^{•••}. The determination is completed by means of a photo-electric colorimeter determination is completed by means of a photo-electric contributed with appropriate light filters to eliminate the yellow colour of (I). The green colour formed by Fe^{**} and (I) in aq. solution is stable for >48 hr. at room temp. Co interferes, as well as Cu and Ni to a slight extent. The sensitivity of the method equals that of the o-phenanthroline or 2: 2'-dipyridyl methods. L. S. T.

Volumetric determination of iron and titanium. W. M. McNabb and H. Skolnik (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 711—713).—The Fe^{'''} and Ti^{''''} in 4N-H₂SO₄ are reduced by means of 30-mesh Zn in a funnel, collected in Fe^{III} alum solution, which is then titrated with KMnO₄. The Fe^{'''} and Ti^{''''} in another portion are reduced and collected in 4N-H₂SO₄, and the Ti^{'''} oxidised by drawing air through the solution after adding 50 ml. of saturated aq. HgCl₂, and until the violet colour disappears, and then for 5 min. longer. The remaining Fe^{'''} is titrated with KMnO. The time factor for complete oxidation Fe" is titrated with KMnO₄. The time factor for complete oxidation of Ti" is thus definitely controlled. Data for the air-oxidation of $Ti_2(SO_4)_3$, $Ti_2(SO_4)_3$ in presence of HgCl₂, $FeSO_4$ in presence of HgCl₂, $Ti_2(SO_4)_3$ in presence of FeSO₄ and HgCl₂, and $Ti_2(SO_4)_3$ in presence of FeSO₄ are recorded. L. S. T.

Use of hexamminocobaltic salts (luteocobalt salts) in quantitative analysis. I. Gravimetric determination of ferricyanide. I. G. Murgulescu and C. Drägulescu (*Z. anal. Chem.*, 1942, **123**, 272–279).—Fe(CN)₆^{'''} can be determined $(\pm 0.5\%)$ by pptn. with 0.1_{M} -[Co(NH₃)₆]Cl₃ as [Co(NH₃)₆][Fe(CN)₆], 0.5_{H_2} O if the excess of reagent is kept within 0.01— 0.03_{M} . and the vol. of solution is >50 c.c. A. A. E.

Oxidation of nickelous and cobaltous hydroxides by means of per-sulphate. 1. Dede and H. Zieriacks (Z. anal. Chem., 1942, 124, 25—27).—Pttn. of Ni^{**} or Co^{**} in presence of $S_2O_8^{**}$ by means of NaOH under different conditions of temp. and [NaOH], and determinations of the I liberated by dissolving the washed ppt. in H₂SO₄ in presence of KI, show that hydrated oxides of Ni^{III} or Co^{III} are formed, since the ratio metal: O varies between 2 and 3. Co catalyses the decomp. of $S_2O_8^{**}$ more strongly than does Ni. The formation of hydrated oxides of Ni^{IV} or Co^{IV} was not observed. L. S. T.

Determination of tungsten in its minerals. A. de Larmo Cantição (Rev. Quím. Ind., 1942, 11, 132-133).—The method of Jilek and Ryšánek (A., 1933, 584) is described. F. R. G.

Volumetric determination of tin, based on the formation of a dioxalatothiometastannate. H. H. Willard and T. Y. Toribara (Ind. Eng. Chem. [Anal.], 1942, 14, 716-718).—Sn^{VV} is converted into $K_0Sn_2(C_2O_4)_7$ by adding $K_2C_2O_4$ to a definite pH range. $K_0Sn(C_2O_4)_7$ is converted into $K_2SnS(C_2O_4)_2$ by adding H_2S , or preferably K_2S solution at 60° . Excess of H_2S is removed by a current of CO_2 , and S in the complex is titrated with standard I. The reactions are : $K_0Sn_2(C_2O_4)_7 + 2H_2S \rightarrow 2K_2SnS(C_2O_4)_2 + 2H_2C_2O_4 + K_2C_2O_4 - K_6Sn_2(C_2O_4)_7 + 2H_1 + 2S$. In some alloys, Sn must first be separated as SnO_2, nH_2O . The dioxalatothiometastannic acid formed according to Wheeler's method (B., 1939, 159) is relatively unstable, and the method too exacting to be practicable.

unstable, and the method too exacting to be practicable. L. S. T

Determination of tin in secondary aluminium alloys.-See B., 1942, I, 532.

XI.—APPARATUS ETC.

Easily-constfucted electric[ally-heated tube] furnace of glass for temperatures up to 600°. R. Fricke and F. R. Meyer (*Chem.-Zig.*, 1042–66–53) — Apparatus is described. M. H. M. A. 1942, 66, 53).—Apparatus is described.

Device for visual observations at low temperatures. A. Schalamach (J. Sci. Instr., 1942, 19, 169).—The object, insulated by an inverted vac. vessel, is cooled by a Cu rod immersed in liquid air. Thermocouple leads from the object pass through the rod.

Non-fouling hydrogen liquefier. E. R. Blanchard and H. W. Bittner (Rev. Sci. Instr., 1942, 13, 394-405).—The Kapitza circuit is employed for operation with commercial H₂. Solid CO₂ is used as a pre-cooling agent. A combination heat exchanger and trap for freezing out H_2O and oil vapour from large, rapid streams of compressed gas is described. A. A. E.

Analysis of the movements of shadow-edges on the refractometer in the case of biaxial gemstones. E. J. Burbage and B. W. Anderson (Min. Mag., 1942, 26, 246—253).—Curves show the movements of the two shadow-edges as the stone is rotated on the refractometer, and means are given for determining the three principal indices of L. J. S. refraction from observations on one surface.

Photo-electric tristimulus colorimetry with three filters. R. S. Hunter (U.S. Bur. Stand., 1942, Circ. 429, 46 pp.).—The use of a photo-electric reflectometer for measuring the colours of materials is described. It consists of a barrier-layer photo-cell used in con-junction with three selected spectral filters. Errors in photo-electric tristimulus measurements are detailed, and the standards used are discussed. Examples of the use of the method in the determination of the colours of fabrics and pigments are given.

A. J. M

Microscope and back-reflexion X-ray camera. C. Wainwright (J. Sci. Instr., 1942, 19, 165-166).—A specimen table having a geometrical mounting is transferred from the microscope to the backreflexion camera so that the same area of the specimen viewed through the microscope is covered by the X-ray beam. A. A. E.

Large two-lens quartz spectrograph of compact design. S. Jacob-sohn (J. Opt. Soc. Amer., 1942, 32, 164-167).—Apparatus is described. O. D. S.

Ultramicroscopic surface photography by the "replica" method. H. Mahl (Naturwiss., 1942, 30, 207-217).—Electron-microscopic photographs of metallic or other surfaces are obtained by means of a replica obtained by forming a thin film of oxide or lacquer on the surface which may be freed from the surface, usually by dissolving the underlying body, but retains the surface structure. Electron-microscope photographs of such replicas for Al, Ni, and NaCl surfaces are shown, and the significance of the intensity distribution in the image is discussed. The process of dissolution of Al and some alloys in etching media and of primary crystallisation in Al-Mg and Al-Cu-Mg alloys has been followed. O. D. S.

Some characteristics of metal mirrors and a new gonioreflecto-meter. F. Benford and W. A. Ruggles (J. Opt. Soc. Amer., 1942, 32, 174—184).—The reflectivities of mirrors of Ag, Al, Au, Cu, Cd, Rh, Cr, Ni, Pt, Mo, W, brass, Al alloys, stellite, and alzak in evapor-ated and solid forms have been measured at angles of incidence from $\sim 12^{\circ}$ to 84°. Methods of calculating the average reflectance are discussed. The presence of $\frac{1}{2}$ —2% of Mg in Al mirrors improves the reflectance by $\sim 3^{\circ}$. Changes occurring in the mirrors of the reflectance by $\sim 3\%$. Changes occurring in the mirrors on keeping are discussed. Apparatus for measuring reflectivities at varying angles of incidence is described. O. D. S.

Measurement of γ -radiation in Rœntgens. Low-absorption Rœnt-gen-ray measurements for 10—250 kv.—See A., 1942, III, 932.

Portable Geiger-Müller counter. Simplified Geiger-Müller counter tube circuit.—See A., 1942, III, 951.

Compact, supervoltage Rœntgen-ray generator.-See A., 1942, III, 933.

X-Ray investigation of large lattice plane distances and investigation of flowing solutions. H. Kiessig (Kolloid-Z., 1942, 98, 213-221).--A special X-ray camera for the investigation of substances with considerable distances between the lattice planes, which would give Debye rings of very small diameter with the normal apparatus, is described. Cu Ka radiation is used, and an evacuated camera is necessary to avoid absorption and scattering. The camera can be used at high or low temp., and with flowing solutions. Examples of its use for solids and for the investigation of soap solutions are given. A. J. M.

Ellipsoid method of determining dielectric constants. Y. Björnstahl (Z. Physik, 1941, 118, 257–263).—The consequences of the theory of the ellipsoid method of determining dielectric const., ϵ (Fürth, Z. Physik., 1924, 22, 98), have been examined, and lead to a modified theory. The moment of inertia of an ellipsoid of a material of given ϵ and conductivity in an electric field depends on ϵ of the surrounding liquid. The effect of mechanical waves in certain liquids on the moment of inertia is examined. A. J. M.

Effect of conductivity on the determination of dipole moments. A. Parts (Keem. Teated, 1934, 2, 27-29).—In determining the dipole moment of a liquid with high-frequency oscillations, a correction for the conductivity of the liquid must be applied.

Сн. Авз. (е) Photo-electric titrations with selenium cells. Y. Kasai and S. Takii (Repts. Imp. Ind. Res. Inst., Osaka, 1935, 16, No. 3, 1-12). -An apparatus using Se cells is described. Examples of its use are given. Сн. Авз. (е)

Improvement in resolving power in the emission electron micro-scope. H. Boersch (Z. tech. Physik, 1942, 23, 129-130). W. R. A.

Suitability of beryllium for the production of super-microscopic impression foils. O. Rüdiger (*Naturwiss.*, 1942, **30**, 279).—It is possible to investigate the texture of samples of Fe and steel surfaces by means of the electron microscope with the aid of vaporised Al films. The nuclei of the Al foil are sufficiently small to enable a distinguisher in the obtained up to a provident of 10 000. satisfactory image to be obtained up to a magnification of 10,000, but above this the nuclear structure interferes. Be films avoid the disadvantages of AI; because of its lower at. no. scattering causes interference only with very thick films, and the nuclei are so fine that they do not cause distortion. Moreover, the Be film is easily dissolved in very dil. H₂SO₄. A. J. M.

20-Million electron-volt betatron or induction accelerator. D. W Kerst (*Rev. Sci. Instr.*, 1942, 13, 387–394).—The instrument described has a pole 19 in. in diameter and weighs $3\frac{1}{2}$ tons. The X-ray output is 16 r. per min. at 1 m. The orbit is expanded towards an X-ray target by an abrupt change of flux distribution in the air gap produced by auxiliary coils, the final energy of the electrons being determined by timing. A. A. E.

[Preparation of] Ross filter foils by evaporation. J. C. Clark and R. H. Esling (*Rev. Sci. Instr.*, 1942, 13, 383-386).—Powdered Sb was evaporated in vac. from a micro-analysis crucible on to Cello-phane, giving a deposit 0.0015 cm. thick. It was then balanced with a rolled Sci foil with a rolled Sn foil. A. A. E

Apparatus for investigating physico-chemical properties of solutions in liquefied gases and for carrying out reactions in such solutions under pressure. A. I. Schattenstein (J. Phys. Chem. Russ., 1941, 15, 246-253).-25 standard parts of stainless steel are described build be a set of stainless steel and constrained for the set of stainless steel are described for the set of se which can be combined to make many pieces of apparatus. Special glass parts (viscosimeter, capillary rise tube, etc.) also have standard dimensions and can be fitted into the steel holders using joints of metal of low m.p. J. J. B.

Determination of surface tension with the Mohr balance. J. Tagger (*Physikal. Z.*, 1941, 42, 53-55).—A rectangular plate, suspended from the arm of a specially damped Mohr balance and subschedule from the arm of a spectally damped show balance and suitably counterpoised, is immersed in the liquid to such a depth (d) that the surface tension pull is just counterbalanced by the upward thrust of the liquid. γ is then calc. from d. d is measured by attaching the reservoir of liquid to the sliding block of a cathetometer. The effects of impurities and the previous history of the plate on the results are briefly discussed. A. J. E. W

Manipulation of Wollaston wire. H. E. Bennett (J. Sci. Instr., 1942, **19**, 168–169).—Removal of the Ag sheath from Pt wire $< 1 \mu$. in diameter is described. The fine wire can be welded to a thicker one by electrically heating the latter at 1500°. Curves of fusing current for fine Pt wires in air and in vac. are given. A. A. E.

Capillary mercurial barometer. (Sir) C. V. Boys (J. Sci. Instr., 1942, 19, 168).—The technique of making and filling the barometer is fully described. The capillary tube is drawn and blown from quill glass tubing, and requires $\sim \frac{1}{4}$ lb. of Hg. The instrument is robust. A. A. E.

Isothermal diffusion method of preparing highly purified microchemical reagents. E. Abrahamczik (Chemie, 1942, 55, 233-234).

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—The principle of the method is to allow volatilisation to take place in an evacuated desiccator, the vapours being absorbed by pure H_2O or other solvent. Details for preparing several acid and halogen solutions, aq. NH_3 , AcOH, CH_2O , etc. are given. C, R. H.

Absorptiometer, polarograph, and spectrograph. H. K. Whalley (*Chem. and Ind.*, 1942, 495–497).—The limitations and advantages of the instruments are compared. All give results liable to errors of only a few % with speed and economy. A. A. E.

Mechanical manipulator for small pipettes. Precision pipette for volumetric gas analysis.—See A., 1942, III, 951.

Absorption of atmospheric oxygen [during grinding] in a [steel] ball mill.—See B., 1942, I, 490.

Particle size studies. Methods.—See B., 1942, I, 491.

XIII.—GEOCHEMISTRY.

Mineral waters of the state of Paraná. D. T. de Lacerda (*Rev. Brasil. Quím.*, 1942, 14, 150-152).—Analyses of H₂O from the wells of Lambedor and Santa Clara are recorded. F. R. G.

Presence of sulphur bacteria in the "pink" layer waters of the Surachani petroleum deposit and the geochemical importance of this factor. V. T. Malischek, A. A. Malijantz, and E. A. Reinfeld (Azer. Neft. Choz., 1935, No. 7–8, 38–49).—The colour is due to purple S bacteria present up to a depth of 1600 m. The increase of $[SO_4"]$ characterising both the colourless and the "pink" waters is due to the presence of S bacteria. CH. ABS. (e)

is due to the presence of S bacteria. **Chloride content of fluviomarine deposits.** C. Francis-Bœuf (Compt. rend., 1941, **213**, 657-660).—The [Cl'] of estuarine sediments is correlated with their H_2O absorption for varying positions between tide-marks. The H_2O absorbed has a higher [Cl'] than the estuary H_2O . L. J. J.

Pigment in black and red sediments. P. E. Raymond (Amer. J. Sci., 1942, 240, 658-669).—The dark colour of some marine muds is attributed to chitinous debris. X-Ray analysis shows that the red pigment of many soils of warm, moist regions is hæmatite (I). (I) is not the product of dehydration of limonite, but results probably from the combined actions of putrefactive and nitrifying bacteria, which produce $Fe(NO_3)_3$ and NH_3 . These react to form brown Fe_2O_3 , nH_2O which slowly loses H_2O and crystallises to red (I). L. S. T.

Liquefaction of the earth. A. Mercier (Arch. Sci. phys. nat., 1942, [v], 24, Suppl., 82—86).—The author's polytropic model gives more probable conditions for rapid terrestrial liquefaction than does Jeffrey's radiation hypothesis. L. J. J.

Use of ammonium hypophosphite in determinative mineralogy. E. E. Wahlstrom (Amer. Min., 1942, 27, 385-386; cf. A., 1941, I, 430). L. S. T.

Barium-felspars (celsian and paracelsian) from Wales. L. J. Spencer (Min. Mag., 1942, 26, 231–245).—Well-cryst. material from the Benallt Mn-ore mine near Rhiw, Carnarvonshire, includes celsian (I) and paracelsian (II), both of the composition BaAl₂Si₂O₈ and d 3·31–3·33. Detailed analyses [(Miss) H. Bennett] show BaO 38·94%, etc. (I) is monoclinic, a:b:c = 0.6613:1:0.5518, β 64° 51′, with adularia habit and twinned on the Manebach, Manebach-Baveno, and Carlsbad laws. (II) is morphologically orthorhombic, a:b:c = 0.9470:1:0.8956, with habit and angles remarkably close to those of topaz. Optical examination of thin sections shows, however, a complex twinning structure. Rather than representing dimorphous forms, (II) is probably a complex twinned form of (I), but no crystallographic relationship could be traced between them. A review and bibliography of Ba-felspars is given. L. J. S.

Chemical data on a silica-poor argillaceous hornfels and its constituent minerals. F. H. Stewart (*Min. Mag.*, 1942, **26**, 260–266). —Detailed chemical analyses are given of hornfels (SiO₂ 40.77, Al_2O_3 25.90%, etc.) from Sparcraigs, Aberdeenshire, and of garnet, spinel, cordierite, and biotite separated from this rock. The distribution of FeO, MgO, and MnO is noted; practically all the MnO has been taken by the garnet. Optical data are given for these minerals, and the composition and optical data of optically positive cordierites are compared. L. J. S.

Cummingtonite and gedrite from Sutherland. R. S. Collins (*Min. Mag.*, 1942, **26**, 254–259).—Detailed chemical analyses are given of two Ca-poor amphiboles separated from schists near Strathy. and the compositions are correlated with the optical data.

Primary limestone structures of West Virginia. P. H. Price and J. B. Lucke (*Amer. J. Sci.*, 1942, 240, 601—616).—Field and laboratory data are discussed in relation to origin. L. S. T.

Metamorphism of dolomites produced by contact with serpentines in the Divrik (Turkey) region. M. Gysin (Arch. Sci. phys. nat., 1942, [v], 24, Suppl., 33—38).—The stratiform layers of dolomite,

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mixtures of dolomite and serpentine, and more or less carbonated serpentine described result from intrusion of peridotites into sedimentary formations, followed by serpentinisation of the peridotites and carbonation of the serpentines in contact with dolomites. The resulting stratiform dolomite is distinguished from sedimentary dolomite by higher Mg content, residual cellular structure, and presence of grains of chromiferous magnetite. L. J. J.

Mineral and metal variations in the veins of Fresnillo, Zacatecas, Mexico. J. B. Stone and J. C. McCarthy (Amer. Inst. Min. Met. Eng., 1942, Tech. Publ. 1500, 16 pp.).—Changes in the mineralogy and metal content of the principal veins are described and discussed. Data for variations in Ag, Cu, Pb, Au, and Zn in Cueva Santa vein are represented graphically. The mineralogy and paragenesis of the sulphide ores are described. Analyses of an unidentified mineral corresponding with the formula Pb₂₂Ag₃Bi₃SeS₂₂ are recorded. L. S. T.

L. S. T. X-Ray data on several phosphate minerals. D. McConnell (Amer. J. Sci., 1942, 240, 649—657).—X-Ray diffraction patterns show that pseudowavellite (I) and dussertite (II) belong to the alunite and jarosite groups, respectively. The formula of (I) should be rewritten as $CaAI_3(PO_4)_2(OH)_5, H_2O$. (II), $BaFe_3(AsO_4)_2(OH)_5, H_2O$, is an arsenate of Fe and Ba, and not Ca. A chemical analysis [F. A. Gonyer] is given. Sarcopside is not related directly to triplite, and its diffraction pattern is different from that of wagnerite. Zepharovichite is identical with wavellite (III), coeruleolactite is merely turquoise (IV) and callainite is a mixture of (III) and (IV); hence these names should be dropped. Kepoeite, evansite richellite, borickite, and diadochite are amorphous with respect to X-rays. The so-called amorphous minerals collophane, griphite, delvauxite, and palmerite give good diffraction patterns. • L. S. T.

Evidence of sulphide-silicate immiscibility at Gap Nickel Mine, Pennsylvania. L. Moyd (*Amer. Min.*, 1942, 27, 389-393).— Rounded masses of amphibole occurring in the sulphide matrix afford evidence of sulphide-silicate unmixing. L. S. T.

Thermal studies of orthoclase and microcline. J. L. Rosenholtz and D. T. Smith (*Amer. Min.*, 1942, 27, 344—349).—Thermal studies on crystallographically oriented sections of orthoclase (I) and microcline (II) for the range $0-1000^{\circ}$ are described. Coeffs. of linear expansion for (II) parallel to each axis are given. Eleven abrupt vol. changes occur with (I), and 20 with (II). Adularia, (I), and (II) are compared. L. S. T.

Alteration products of olivine and leucite in the leucite-lamproites from the West Kimberley area, W. Australia. R. T. Prider and W. F. Cole (Amer. Min., 1942, 27, 373–384).—The leucite (I) is replaced largely by a turbid substance. X-Ray and optical data and a chemical analysis indicate that (I) has been replaced by an aggregate of orthoclase and an unidentified clay-like mineral. Olivine has been replaced by nontronite. L. S. T.

Nickel chlorite of the W. Kemper-Sai deposits. G. S. Gritzaenko (Min. Suir., 1936, 11, No. 5, 41-44).—Schuchardite or Ni-clinochlore (up to 7.2% Ni) closely resembles clinochlore. Its genesis is discussed. CH. ABS. (e)

Crystallisation of pyroxenes from rock magmas, with special reference to the formation of pigeonite. H. Kuno (*Japan. J. Geol.*, 1936, 13, 141–150).—Analytical data for pyroxenes from a large no. of Japanese rocks are given. The pyroxenic components of intratelluric magmas crystallised as hypersthene and (or) augite if there was little FeSiO₃ (I), and as pigeonite if there was more (I). Usually the two pyroxenes were formed first, and, as the magma became enriched in (I), pigeonite started to form. CH. ABS. (e)

Petrological notes on some pyroxene-andesites from Hakone volcano, with special reference to some types with pigeonite phenocrysts. H. Kuno (Japan. J. Geol., 1936, 13, 107-140).

CH. ABS. (e) Kaersutite from Dogo, Oki Islands, Japan, and its magmatic alteration and resorption. T. Tomita (J. Shanghai Sci. Inst., 1934, [11], 1, 99—136). CH. ABS. (e)

Secondary uranium minerals. R. Nováček (Věst. Král. České Spol. Nauk, 1935, 2, No. 7, 36 pp.).—Microchemical analysis of johannite ($CuO_2UO_2,7H_2O$), uranopilite ($6UO_3,SO_3,16H_2O$), β -uranopilite ($6UO_3,SO_3,10H_2O$), uranotile ($CaO_2UO_3,2iO_2,6H_2O$), β -uranotile, and cuprosklodowskite ($CuO_2UO_3,2SiO_2,6H_2O$) are given. CH. ABS. (e)

Copper-bearing coal seams of Potschendorf and bituminous coal occurrences at Liebenau (Sudetenland). O. Settmacher (Glückauf, 1942, 78, 474-477).—Analyses are given. R. B. C.

1942, 78, 474 477). Analyses are basin. P. Guthörl (*Glückauf*, 1942, 78, 549 553). Analyses of the various types of coal are given. R. B. C.

Germanium in the coals of the Donetz basin. V. A. Zilbermintz (Min. Suir., 1936, 11, No. 6, 16-26).—Some coal ash and coke waste contained >1% of Ge. CH. ABS. (e)

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

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