BRITISH CHEMICAL AND PHYSIOLOGICAL ABSTRACTS

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

DECEMBER, 1942.

I.—SUB-ATOMICS.

Spectrum of Cl I. J. B. Green and J. T. Lynn (*Physical Rev.*, 1942, [ii], **62**, 179).—From Zeeman effect measurements in the region $\lambda\lambda$ 3000—9200, new levels, lines, classifications, g vals., and g sums have been obtained. N. M. B.

Absence of the $M\beta$ X-ray satellite intensity anomaly. F. R. Hirsh, jun. (*Physical Rev.*, 1942, [ii], **62**, 137—140; cf. A., 1940, I, 276).— The absence of the $M\beta$ X-ray satellite intensity max. is shown, and explained in terms of the relative probability of Auger transitions, the relative probabilities being determined by diagram line widths. N. M. B.

Investigation of X-radiation from ¹²¹Te (125 days) by critical absorption and fluorescence. R. D. O'Neal and (Mrs.) G. Scharff-Goldhaber (*Physical Rev.*, 1942, [ii], 62, 83—84; cf. Scaborg, A., 1940, I, 186).—Results reported indicate the absence of an isomeric transition. The observed X-ray component harder than the Sb Ka line is provisionally explained. N. M. B.

Proton production by electron collisions in molecular hydrogen. H. F. Newhall (*Physical Rev.*, 1942, [ii], **62**, 11–18).—With a mass spectrometer the "fast" protons (but not the slow protons) found by Bleakney (cf. A., 1930, 969) were observed. The cross-section for their production reached a max. of ~ 0.015 sq. cm. per c.c. for 10-v. electrons. The initial energy distribution of the ions, approx. calc. by Smith's theory (cf. A., 1941, I, 140), accords with the potential energy curves of H₂. N. M. B.

Mobilities in some free electron gases. W. H. Bennett and L. H. Thomas (*Physical Rev.*, 1942, [ii], **62**, 41-47; cf. A., 1941, I, 66).— Mobility coeffs, for free electrons and mobilities of positive ions are reported for H_2 , D_2 , and for H_2 - N_2 and H_2 -He mixtures for field strengths 1--2 v. per cm. per mm. of Hg gas pressure. The relation between free electron drift velocity and field strength is parabolic in this range for all the gases. Results can be explained qualitatively if electrons excite rotations of the H_2 mol. by collision, and the cross-sections for this process are estimated. N. M. B.

Mercury arc cathode. C. G. Smith (*Physical Rev.*, 1942, [ii], 62, 48-54).—To explain the escape of electrons from the arc spot on the liquid cathode, yielding currents of ~4000 amp. per sq. cm., the theory is advanced that electronic bombardment of the cathode results in the transfer to conduction electrons of enough energy to heat them to ~4000° K. and to produce a thermionic emission yielding the observed arc current plus that coming down from the vapour, the at. configuration temp. being only ~150° c. The theory accords with ideas previously accepted and with known factors in the vapour above the arc spot, and appears to be the only theory compatible with the characteristic behaviour of the arc spot in a transverse magnetic field and with known extinction phenomena. The Thomson-effect heat apparently arrests most of the heat flow into the liquid along the vertical temp. gradient in the electronic part of the thermal conductor and is the factor causing the characteristic c.d. W. J.

Loss of energy of hydrogen ions in traversing various gases. C. M. Crenshaw (*Physical Rev.*, 1942, [ii], **62**, 54-57)...-The loss of energy of H and D ions having initial energies 60-340 ke.v. was measured as a function of their path, in air, H_2O vapour, H_2 , D_2 , and He at various pressures. Results are expressible in terms of the energy loss in ke.v. per cm. of path per mm. of pressure as well as in terms of the stopping power relative to air. N. M. B.

Theory of the magnetron. II. Oscillations in a split-anode magnetron. L. Brillouin (*Physical Rev.*, 1942, [ii], 62, 166-177; cf. A., 1941, I, 444).-Mathematical. N. M. B.

Theoretical values of the physical constants. (Sir) A. Eddington (Proc. Physical Soc., 1942, 54, 491-504).—Vals. calc. on recent theory show satisfactory agreement with those of Birge (Rept. Progr. Physics, 1942, 8, 90). The inclusion of small corrections indicated by the theory eliminates the small discordance between the spectroscopic and deflexion vals. of e/m_c and gives complete agreement of observation and theory. There should be no difference between the direct and indirect vals. of h/e. N. M. B.

International table of stable isotopes. F. W. Aston (*Nature*, 1942, 150, 515).—The sixth report of the Committee on Atoms of 381 M (A., I.)

the International Union of Chemistry covers He, S, Ni, Co, Mo, and Rh. A. A. E.

New packing fractions and the packing fraction curve. H. E. Duckworth (*Physical Rev.*, 1942, [ii], **62**, 19-28).—Descriptions of and data for a no. of mass comparisons, with other recent data, are critically analysed to obtain vals. for the packing fraction (f) curve. An f-at. no. curve suggests that f of an element with odd at. no. is algebraically > the average f of the two adjacent elements with even at. no. This implies that elements with even at. no. are more stable than those of odd at. no., and supports the theory that protons in the nucleus are associated together in groups of two.

N. M. B.

Density of sodium chloride. At. wt. of fluorine by combination of crystal density and X-ray data. H. L. Johnston and D. A. Hutchison (*Physical Rev.*, 1942, [ii], **62**, 32-36).—Precise determinations, by the method of "crystal flotation" in pure $C_2H_4Br_2$, of highly purified NaCl crystals give $d^{20} = 2\cdot16366\pm0\cdot00003$ g. per ml. Combination with data for d of LiF and the lattice const. of LiF gives $0.443640\pm0\cdot000025$ for the LiF/NaCl mol. wt. ratio. With 22·997 (International) for the at. wt. of Na, this ratio yields $18\cdot994\pm0\cdot001$ for the at. wt. of F; with $22\cdot994$ (Birge) for Na, the val. for F is $18\cdot992$. Results accord with $22\cdot995\pm0\cdot002$ based on densities and lattice consts. of fluorite and calcite, but are rather < the mass spectrograph val. $18\cdot999\pm0\cdot001$ for ^{19}F . N. M. B.

High-intensity neutron source.—See A., 1942, I, 378.

Inelastic scattering of neutrons by crystal lattices. R. J. Seeger and E. Teller (*Physical Rev.*, 1942, [ii], **62**, 37-40).—A discussion of the restrictions on inelastic scattering processes imposed by the crystal interference conditions. N. M. B.

Yield of neutrons from deuterons on carbon. C. L. Bailey, (Miss) M. Phillips, and J. H. Williams (*Physical Rev.*, 1942, [ii], **62**, 80; cf. Bonner, A., 1940, I, 383).—The excitation curve for the reaction ${}^{2}D + {}^{12}C \rightarrow ({}^{14}N)^* \rightarrow {}^{13}N + {}^{1}n$ studied in the range 0.70-2.75Me.v. shows resonances at 0.91, 1-28, 1-6 (new), and 2-3 (prominent) Me.v. The total yield, the sharp decrease beyond the 2-3-Me.v. resonance, and the comparative proton yield from the reaction ${}^{2}D + {}^{12}C \rightarrow ({}^{14}N)^* \rightarrow {}^{13}C + {}^{1}p + Q$ are discussed. N. M. B.

Neutron-proton interaction. J. Schwinger (*Physical Rev.*, 1939, [ii], 55, 235).—Consequences of the most general interaction not explicitly involving the particle momenta are examined by introduction of interaction terms of a new type. A. J. E. W.

Excitation functions of intermediate elements. E. J. Konopinski (*Physical Rev.*, 1939, [ii], **55**, 235).—The Breit–Wigner dispersion formula and the Gamow–Condon–Gurney theory of barrier penetration are applied to excitation functions of reactions involving elements with mass-nos. = 10—30. Except in favourable cases [*e.g.*, $!^{4C}$ (*d.*,*n*) $!^{3}N$] the method is limited by uncertainties in the no. and wt. of possible residual states. A. J. E. W.

Low-energy scattering of protons by protons. H. M. Thaxton (Indian J. Physics, 1942, 16, 133-137).—Theoretical calculations for the analysis of the experimental data of Ragan *et al.* (cf. A., 1942, I, 78) are derived. Phase shifts are determined, and Mottratio curves and S-wave scattering effects are given for potential wells. W. R. A.

Experiments on the $\mathbf{F} + {}^{1}\mathbf{H} \gamma$ -radiation and the Klein-Nishina absorption coefficient at 5.7 Me.v. J. Halpern and H. R. Crane (*Physical Rev.*, 1939, [ii], 55, 236-237).—The distribution of recoil electrons ejected from 1.5 mm. of C by γ -radiation from F (as CaF_2) and protons shows that this radiation is monochromatic at ~ 5.7 Me.v. -4-Me.v. electrons (cf. A., 1937, I, 592) are negative members of internal conversion pairs. The Klein-Nishina absorption of the γ -radiation in 10 cm. of Al is in good agreement with theory. A. J. E. W.

Fine structure of nuclear energy levels on the a-model. C. Kittel (*Physical Rev.*, 1942, [ii], **62**, 109—117).—An investigation of the extent to which the fine-structure predictions of any proposed theory of nuclear forces are sensitive to the changes in the nuclear model. The a- and central-field models, with a deuteron group model and simple a group for the a-particle, are applied to the splitting of ⁵He and ⁷Li. N. M. B. 382

Properties of the radio-element ³²/₁₅P obtained by bombardment of sulphur by slow neutrons. M. D. de Souza Santos and A. de Moraes (Anais Assoc. Quim. Brasil, 1942, 1, 79-87).—Results agree with F. R. G. those of earlier workers.

Characteristic radiations of ⁶⁰Co. M. E. Nelson, M. L. Pool, and J. D. Kurbatov (*Physical Rev.*, 1942, [ii], **62**, 1-3; cf. Livingood, J. D. Kurbatov (*Physical Rev.*, 1942, [n], 62, 1—3; cf. livingood, A., 1938, I, 381).—The 10.7-min. activity produced by Co (n, γ) and Ni (n, ρ) reactions is produced with a far higher intensity by a Co (d, ρ) reaction. The β -ray spectrum is continuous with end-point 1.35 ± 0.1 Me.v., and each β -ray is accompanied by $\sim 1 \gamma$ -ray of 1.5 ± 0.2 Me.v. energy. The 5.3-year activity (cf. Risser, *ibid.*, 8) emits a 1.7 ± 0.2 -Me.v. γ -ray and a 220 ± 20 -ke.v. β -ray spectrum. 60Co may consist of isomeric nuclei in which the two activities decay independently. N. M. B.

Disintegration schemes of radioactive substances. IV. 59Fe. M. Disintegration schemes of radioactive substances. 1V. **Fe. M. Deutsch, J. R. Downing, L. G. Elliott, J. W. Irvine, jun., and A. Roberts (*Physical Rev.*, 1942, [ii], 62, 3—7; cf. Livingood, A., 1938, I, 427).—**Fe (47 days) emits a complex β -ray spectrum consisting of two components of approx. equal intensity with end-points 0.257 ± 0.008 and 0.460 ± 0.007 Me.v., accompanied, respectively, by γ -rays of energy 1.30 ± 0.02 and 1.10 ± 0.02 Me.v. The yield of **Fe from an Fe target bombarded by 12-Me.v. deuterons is 0.05μ -curie per μ -amp. hr. Purification and prep. are described. N. M. B.

Excited states of nuclei beyond oxygen. A. Guthrie and R. G. Sachs (*Physical Rev.*, 1942, [ii], **62**, 8-10; cf. Wigner, A., 1937, I, 440).—The difference in energy of the ground states and excited states of the same symmetry is expected to vary smoothly as a function of mass no. Available data on the excited states of ²⁰Ne, ²⁴Mg, ²⁸Si, ³²S, ³⁴A, and ⁴⁰Ca do not disagree with this behaviour. N. M. B.

Energy of y-rays accompanying the decay of 'Be. I. Zlotowski and J. H. Williams (*Physical Rev.*, 1942, [ii], 62, 29–32; cf. Roberts, A, 1938, I, 427).—Coincidence counter measurements on the absorption of secondary electrons produced by the γ -rays accompanying the decay of ⁷Be give 0.77 \pm 0.03 for the max. range in Al and the decay of 'Be give 0.77 ± 0.03 for the max. range in Al and 0.86 ± 0.04 mm, for the γ -rays from the annihilation of ¹³N positrons (used for calibration). The energy of the 'Be γ -ray is 0.485 ± 0.005 , assuming 0.510 Me.v. for the ¹³N γ -rays. The agreement with the low-excited level of 'Li (0.475 Me.v.), deduced from other reactions, confirms the view that the observed 'Be γ -rays originate from this excited state of 'Li which is created by electron capture.

N. M. B.

β-Ray spectra of ⁸⁶Rb, ⁸⁹Sr, ekatantalum, and protactinium. (Miss) E. Haggstrom (*Physical Rev.*, 1942, [ii], **62**, 144–150).—The theory of, and improvements to, a β-ray spectrograph are reported (cf. Witcher, A., 1941, I, 390). β-Ray spectral curves for the above four elements are given. The upper energy end-points are: ⁸⁶Rb 1:60±0.03, ⁸⁹Sr 1:32±0.03 Me.v., ekatantalum 230 ke.v. The Fermi and Konopinski–Uhlenbeck plots of ⁸⁶Rb and ⁸⁹Sr are given. N. M. B.

Cross-section measurements for disintegrations produced by deuterons in the heavy elements. R. S. Krishnan and E. A. Nahum (Proc. Roy. Soc., 1942, A, 180, 321-332).—Cross-sections have been measured for reactions produced by deuterons of 9 Me.v. energy in Pt, Au, Hg, Tl, Pb, Bi, Th, and U. The experimental results are consistent with a standard nuclear radius of 1.47×10^{-13} cm. G. D. P.

Excitation function measurements for disintegrations produced by deuterons in the heavy elements. R. S. Krishnan and E. A. Nahum (Proc. Roy. Soc., 1942, A, 180, 333-345).—Measurements were made, using deuterons up to 9 Me.v. energy, for the (d, p) reaction in Tl, Pb, Bi, and Th, and for the (d, n) reaction in Tl and Bi. The energy-yield curves are compared with those expected on theoretical grounds. The excitation function for (d, n) is approx. that predicted by the Gamow penetration theory; the (d, p) reaction occurs mainly by the Oppenheimer-Phillips process. G. D. P.

K-Electron capture in ¹⁰⁶Ag. J. R. Richardson (*Physical Rev.*, 1939, [ii], **55**, 236).—45% of the electrons emitted by ¹⁰⁶Ag (cf. Pool, A., 1938, I, 113) occur in a narrow energy (*E*) band at <17 ky. and are Auger electrons and photoelectrons associated with K-electron capture. Electrons with E > 20 kv. (max. 800 kv.) are due to the internal conversion process; a similar E distribution is given by photoelectrons ejected from a Pb lamina by γ -radiation. 4. J. E. W.

Evidence for the existence of associated mesons in cosmic-ray showers. M. S. Sinha and R. L. Sengupta (Indian J. Physics, 1942, 16, 129-131).—Using a counter-controlled Wilson chamber, which recorded showers only, evidence of the existence of associated mesons has been obtained. W. R. A.

Anomalous scattering of mesons. W. Heitler and H. W. Peng (*Physical Rev.*, 1942, [ii], 62, 81-82; cf. Code, A., 1941, I, 190; Shutt, A., 1942, I, 162).—Scattering theory is discussed and available experimental data are shown to accord with calculations.

N. M. B.

Radioactive decay of slow mesons. M. D. de Souza Santos (Ann. Acad. Brasil Sci., 1942, 14, 199-201).—A preliminary account

of a counter investigation (see following abstract). The decay curve resembles that of a Gauss distribution and the rate of disintegration is different from that for β -rays. F. R. G.

Decay of slow mesons. M. D. de Souza Santos (*Physical Rev.*, 1942, [ii], 62, 178-179).—The disintegration electron intensity was measured at different time intervals, by means of a variable time delay coincidence set, after the mesons came to rest. The curve is symmetrical about $t_0 = 5 \times 10^{-6}$ sec., and differs entirely from the curve to be expected from radioactive disintegration laws. N. M. B.

Meson theory and the magnetic moments of protons and neutrons. H. Fröhlich (*Physical Rev.*, 1942, [ii], **62**, 180).—Calculations on anomalous magnetic moments favour a vector- and pseudoscalarmeson theory rather than a purely pseudoscalar-meson theory N. M. B.

Electromagnetic properties of nuclei in the meson theory. S. T. Ma and F. C. Yu (*Physical Rev.*, 1942, [ii], 62, 118-126).—Mathem-S. T. atical. Pauli's treatment for a free meson is generalised to include N.M.B. nuclear particles.

Pseudoscalar meson field with strong coupling. W. Pauli and S. M. Dancoff (*Physical Rev.*, 1942, [ii], 62, 85-108).—Mathematical. A treatment of the symmetrical and charged pseudoscalar theories of the meson field, using the strong-coupling approximation, and restricted to the case of a single source. The energy levels of the excited states of the heavy particle, the scattering cross-section for free mesons, and the magnetic moment of the proton or neutron are N. M. B. computed.

Tensor forces and heavy nuclei. G. M. Volkoff (*Physical Rev.*, 1942, [ii], **62**, 126—133; cf. Rarita, A., 1941, I, 236, 289; Bethe, A., 1940, I, 190).—A rough quant. estimate is made of the relative contributions of the central force term and the tensor term to the binding energy of a physical central force term and the tensor term to the binding energy of a nucleus on the basis of a highly simplified nuclear model. Consequences are discussed. N. M. B.

Exchange tensor forces in heavy nuclei. G. M. Volkoff (Physical Rev., 1942, [ii], 62, 134-136) .- If tensor forces, whether of the ordinary or the exchange type, are assumed to be the dominant forces between nuclear particles, they will not lead to saturation, but will permit the existence of nuclei with excessive vals. of binding energy, spin, and isotopic no. A sufficiently strong spherically symmetrical exchange term in the nuclear interaction seems to be required to counteract this effect of the tensor forces. N. M. B.

Theory of particles of spin half and the Compton effect. H. J Bhabha and D. Basu (Proc. Indian Acad. Sci., 1942, 15, A, 105-117, 461-463).-(A) It is shown that, contrary to general acceptance, by the Original Dirac theory, in which a particle of spin $\hbar/2$ is represented by the Dirac equation with all the negative energy states empty, and the hole theory, in which each of these states is filled by an electron, do not in general lead to the same probabilities for second-order processes (taking place in nature in two steps through an intermediate state), although the matrix elements for each first-order process are the same. The formula for scattering of radiation by a free electron is not the same on the hole theory as on the original Dirac theory (the Klein-Nishina formula); the two agree only for low lightquantum energies; for high energies the Klein-Nishina alone agrees with scattering experiments. The hole theory, which qualitatively describes the existence of the positron and the pair-creation process is, however, the only form in which the Dirac theory is logically tenable.

(B) Erratum. The former conclusion is erroneous, and the two theories give the same probabilities for second-order processes

w. J.

II.—MOLECULAR STRUCTURE.

New band-system of boron monoxide. N. L. Singh (Current Sci., 1942, 11, 277-278) .- A new BO system has been observed at 5110-5790 A. in the spectra of a spark between glass electrodes and a Bunsen flame fed with H_3BO_3 . The band-heads are given by $\nu = 21005.6 + (1200\nu' - 15.4\nu'^2) - (1266\nu'' - 10\nu''^2)$. The system is related to the β -system of ¹¹BO, and gives a new electronic level at 63870.8 cm.⁻¹ (7.9 e.v.). The new bands always accompany the "B₃O₃ bands" (which are also ascribed to BO) and afford a more sensitive means of detection of B than the raies ultimes. The initial state of the new system is probably a quarter Σ state arising from B $(2s^2p^2 \, {}^4P)$ and O $(2s^22p^4 \, {}^1D)$, which is reached directly on A. J. E. W. formation of BO from B2O2.

Perturbations causing apparent convergence in the C₂ spectrum. L. Gerö and R. F. Schmid (*Physical Rev.*, 1942, [ii], 62, 82-83).— Experimental data on perturbations in ${}^{1}\Pi \rightarrow {}^{1}\Pi$ bands amplifying the results of rotational analysis by Herzberg (cf. A., 1940, 1, 281) are outlined. N. M. B. are outlined.

Energy of dissociation of carbon monoxide. A. G. Gaydon and W. G. Penney (*Nature*, 1942, **150**, 406-407).—From a review of spectroscopic evidence it appears that D of CO lies between 9.85 and 11.11 e.v., and that all lower vals, proposed are improbable. $D \in N_2$ is $\sim 9 \text{ e.v.}$ W. J. D of Absorption spectra of CdF and SnCl. C. A. Fowler, jun. (*Physical Rev.*, 1942, [ii], 62, 141—143).—CdF₂, vaporised in an electric funace, shows no absorption in $\lambda\lambda$ 1950—7000 below 1350°, but above this temp. a band system of CdF appears at $\lambda\lambda$ 2716—2924, and strong continuous absorption for the first time, consists of the two emission band systems, a new system in the farther ultra-violet, and two continua. Its similarity to the SnF absorption spectrum is discussed. N. M. B.

Force constants and internuclear distances. G. Glockler and G. E. Evans (J. Chem. Physics, 1942, 10, 606).—Application of Badger's rule (A., 1934, 477) to hydrides of the elements of the first row of the periodic table gives results for force consts. in good agreement with those obtained from spectroscopic data.

A. J. M. Luminous radiation from hot gases. W. T. David (*Nature*, 1942, 150, 291-292).—Evidence that normal gases, *e.g.*, CO₂, remain non-luminous at high temp. is reviewed. A. A. E. Abnormelity of former

Abnormality of flame gases. W. T. David (*Nature*, 1942, 150, 320–321).—Gaydon's view that mols. of CO_2 in residual flame gases suffer rapid transition to the ground state and are left in a highly vibrationally excited state is contested. The abnormal structure hypothesis, and the assumption that the mols. reach the ground state only when they come in contact with a surface or when two of them possessing sufficient energy collide, are preferred. A. A. E.

Vibration-rotation spectrum of (A) SiH₄, (B) GeH₄. C. H. Tindal, J. W. Straley, and H. H. Nielsen (*Physical Rev.*, 1942, [ii], 62, 151–160, 161–165).—(A) The infra-red bands of SiH₄ have been remeasured at high resolving power. Full data, identifications, and analyses are given, and vals. of consts., band centres, and valency force consts. are reported.

(B) Corresponding measurements and data for GeH₄ are reported. A new band near 13.0μ , with centre $\nu_4 = 819.3 \text{ cm.}^{-1}$, has been found. N. M. B.

Influence of barrier dimensions on the vibrational spectrum of ethane. A. Charlesby (*Proc. Physical Soc.*, 1942, 54, 471—487).— Mathematical. The effect on the energy levels of a rectangular potential barrier is investigated. A barrier of height V = 1700 g-cal. per mol. and width 1.35 radians gives energy levels substantially similar to those predicted by a sinusoidal barrier of height 3000 g.-cal. per mol. The effect of splitting in the energy levels is slight for levels below V, and considerable for those above V. The energy levels for C₂D₆ are deduced. N. M. B.

Vibration-rotation energies of planar ZXY₂ molecules. I. Vibrational modes and frequencies. S. Silver and E. S. Ebers. II. Quantum-mechanical Hamiltonian and the energy values. S. Silver (*J. Chem. Physics*, 1942, 10, 559-564, 565-574).-I. Mathematical. The normal modes and frequencies of planar ZXY₂ mols. are investigated, using the most general potential function possible.

II. Mathematical. Nielsen's method (A., 1942, I, 131) for vibration-rotation energies of a general polyat. mol. is applied to planar ZXY_2 mols. A. J. M.

Near ultra-violet absorption spectrum of monodeuterobenzene. C. A. Beck and (Miss) H. Sponer (J. Chem. Physics, 1942, 10, 575— 581).—The near ultra-violet absorption spectrum of PhD in the region 2300—2650 A. has been analysed. The system has a great no. of weak bands and is due to a forbidden transition, which is permitted by the 603 vibration (corresponding to the 606 $\epsilon^+_{\rm p}$ vibration in C₈H₆). The 0, 0 band is very weak and occurs at 38124 cm.⁻¹ Many of the bands are double-headed. A. J. M.

Internal rotation in molecules with two or more methyl groups. K. S. Pitzer (J. Chem. Physics, 1942, 10, 605-606).—Thermodynamic data alone do not give definite information concerning cross-terms in the internal rotation potential energy of mols. with two or more Me groups. They should be combined with spectroscopic data. A. J. M.

Light absorption of polycyclic compounds. II. Cupric complexes of the aldimine series. A. von Kiss, G. Bácskai, and P. Csokán (J. pr. Chem., 1942, [ii], 160, 1-20).—Extinction curves, 200— 700 mµ., at room temp., are recorded for a no. of polycyclic innercomplex Cu^{II} salts and their constituents. F. J. G.

Light absorption of polycyclic inner-complex compounds. III. Uranyl complexes of the aldimine series. A. von Kiss and G. Nyiri (Z. anorg. Chem., 1942, 249, 340-356).—Extinction curves (200-700 m μ . at room temp.) are recorded for a no. of polycyclic inner-complex uranyl salts. F. J. G.

Absorption spectra of compounds containing sulpho-groups. H. Böhme and J. Wagner (Ber., 1942, 75, [B], 606—617).—Comparison of the absorption spectra of SO₂Me·CH(SO₂Et)₂ in H₂O and in an excess of 0·1N-NaOH and of SO₂Me·CMe(SO₂Et)₂ shows that electrolytic dissociation causes a slight displacement towards the red. The absorption of NH(SO₂Me)₂ and NMe(SO₂Me)₂ is very slight and little characteristic. The absorption of PhSH with two pairs of lone electrons at S is more marked than that of PhOH, PhSO₃H (**I**),

PhSO₂H (II), or C₆H₈ and has pronounced bands at 237 mµ. and 260—270 mµ. This latter band is present in the spectra of (I), (II), and PhOH, and appears to be due to displacement towards the red and increase in intensity of the characteristic C₆H₆ bands. (I) shows the three strongest C₈H₆ bands probably because all electrons of S are bound in SO₃H, and the saturated atom, like the Me group, has little influence on the absorption in the ultra-violet of medium and longer λ but causes essentially displacement towards the red and increase of intensity. (I) and PhSO₃Na have very similar spectra. PhSO-NH₂ resembles (II) in spectrum in acid but not in neutral or alkaline solution. PhSO₂·NH₂ shows bands similar in position to those of (I) but the intensity is nearly doubled. In alkaline solution the absorption bands have completely disappeared. Similar observations are made with NHAc-SO₄Ph. H. W.

Absorption spectra and X-ray examination of isomeric glucononitriles. P. E. Papadakis (J. Amer. Chem. Soc., 1942, **64**, 1950— 1953).—The two forms of glucononitrile, A and B, m.p. 145° and 120.5°, exhibit the same X-ray powder diffraction spectra but different ultra-violet absorption spectra and optical activities. Aq, solutions of the B form have an absorption band at 2780 A. and an extinction coeff, given by $\log \varepsilon_{molar} = \sim 0.9$. The ultra-violet spectrum also undergoes complex changes with time. The A form shows no absorption max. at λ 2780 A. and has a spectrum similar to that of OH·[CH_a]₂·CN. The band at 2780 A. is probably caused by several cyclic compounds containing CO or NH groups, derivable from the nitrile. Interconversion of these compounds may be responsible for the changes with time in the details of the characteristic band, and for the changes in optical rotation as well as for other spectral changes in the short- λ ultra-violet. A gradual hydrolysis of the B form would not account for some facts, and degradation by loss of HCN is inconsiderable. The possibility that the two cryst, forms A and B differ in the nature of the H-bonding is discussed.

W. R. A. Ultra-violet absorption spectra of nitrogenous heterocyclic [compounds]. IV. Effect of $p_{\rm H}$ and irradiation on the spectra of isoguanine and 6: 8-diamino-2-hydroxypurine. (Miss) M. M. Stimson (J. Amer. Chem. Soc., 1942, 64, 1604—1605).—Substitution of OH in 6-amino-pyrimidine causes $\lambda_{\rm max}$, to shift to shorter $\lambda_{\rm h}$ as $p_{\rm H}$ rises and $\varepsilon_{\rm max}$ to rise at $p_{\rm H}$ 7 and then fall at $p_{\rm H}$ 11·0 to a val. < that at $p_{\rm H}$ 3. In 2-hydroxy-purines and -pyrimidines $\varepsilon_{\rm max}$. is reduced at $p_{\rm H}$ 7. The addition of another NH₂ to give 6: 8-diamino-2-hydroxypurine shows a similar but smaller $p_{\rm H}$ effect on $\lambda_{\rm max}$. On irradiation adenine shows negligible change but isoguanine shows a marked change in extinction. W. R. A.

Structure of proteins. P. Csokán and K. Laki (Z. physikal. Chem., 1942, A, 190, 278–286).—Under the action of thrombin, fibrinogen albumin from pig's blood in a PO₄"' buffer gives a transparent fibrin, the absorption of which has been investigated over the λ range 2000–5000 Å. and compared with the absorption of fibrinogen, turbid fibrin, thyrosin, and tryptophan. The results suggest that the change from fibrinogen to fibrin occurs through the formation of H-bridges. J. W. S.

Preparation and properties of *peri*-hydroxyquinone inner complexes. See A., 1942, II, 410.

plexes. See A., 1972, 4., 1972, and the absorption spectrum of the neodymium ion in crystals. E. L. Kinsey and R. W. Krueger (*Physical Rev.*, 1942, [ii], 62, 82).—A preliminary report and explanation of results for Nd(BrO₃)₃,9H₂O near 5750 A. as influenced by the state of light polarisation. N. M. B.

Isomers of crystal-violet ion. Their absorption and re-emission of light. G. N. Lewis, T. T. Magel, and D. Lipkin (*J. Amer. Chem.* Soc., 1942, 64, 1774—1782).—The absorption of light by crystalviolet (I) has been studied under varying conditions and in numerous solvents. Solvents appear to be of three kinds, typified by EtOH, CHCl₃, and PhMe, with respect to the absorption curves. All three types of curve show two absorption bands, *A* and *B*. In EtOH the curve is independent of every isothermal change; the relative height of the *B* band decreases with diminishing temp., and the two bands belong to two isomerides of (I) ion, A and B, of which B has the higher energy by 580 g.-cal. A theory as to the nature of these stereoisomerides, supported by experiments at low temp. on the absorption curve of malachite-green, is put forward. There is no appreciable no. of free ions in solvents of classes II and III (all of low dielectric const.), but rather ion clusters as described by Fuoss and Kraus (A., 1934, 1304). With increasing concn. of dye, small changes occur in the curves of class III and a remarkable change in the CHCl₃ curve due to a salt effect which can be duplicated by adding other salts; these salt effects are much greater than in any other known cases. The fluorescent and phosphorescent emission from (I) is studied quantitatively. As for fluorescein, visible light of high intensity converts most of (I) into the phosphorescent state so as to change the absorption spectrum considerably. The phosphorescent state gives a and β bands in the red and infra-red. The heat of activation from the phosphorescent to the fluorescent state is only 58 kg.-cal. A new phosphorescent to the fluorescent with ultraviolet light giving a green emission band. All the phosphorescence and fluorescence are attributed to isomeride A. Still another isomeric condition of (I) ion exists, which persists in the dark until the solvent is melted, when produced from a leuco-compound by illumination in a rigid solvent. W. R. A,

Crystal orientation and Raman spectrum of calcite. K. Venkateswarlu (*Currient Sci.*, 1942, **11**, 100; cf. Bhagavantam, A., 1940, I, 195).—Intensity data for the 1085 cm.⁻¹ Raman line from a 1-in. calcite tube, observed in two directions, show that the tensor components are related by $a_{xx} = a_{yy} = 2 \cdot 8a_{xy}$. A. J. E. W.

Raman spectra of iodic acid at different dilutions. J. R. Saraf (*Current Sci.*, 1942, 11, 101).—Raman data (with intensities) are given for 0.03—4.5N-HIO₃ and 0.2N-KIO₂. Changes on dilution conform to other observations suggesting progressive depolymerisation of (HIO₃)₃ (cf. Nayar et al., A., 1939, I, 198; 1941, I, 294).

Raman spectra of crystals excited by mercury resonance radiations. R. Kishore (*Proc. Indian Acad. Sci.*, 1942, 16, A, 36-44).—Raman spectra, excited by Hg 2537 A., are reported for small crystals of quartz, alumina, barytes, celestite, witherite, and gypsum.

W. R. A. Effect of temperature on the intensities of Raman lines. II. Crystals. K. Venkateswarlu (Proc. Indian Acad. Sci., 1942, 16, A, 45-49; A., 1942, I, 227).—The effect of temp. on the intensities of the Raman lines of calcite is investigated. Increased temp. leads to diminished intensity, particularly with lattice lines. Placzek's theory of the dependence of the intensities of the vibrational Raman lines on temp. does not agree with observational data, particularly for lines of low ν . With rise of temp. the lattice lines are displaced towards the exciting line but the other lines are unaltered. W. R. A.

Raman spectrum of 1:3:5-triphenylbenzene. S. K. Mukherji and L. Singh (*Nature*, 1942, 150, 347).—The Raman spectrum of 1:3:5-C₈H₃Ph₃ in CS₂ or CCl₄ closely resembles that of m-C₈H₄Ph₂, but the very strong line at 1309 cm.⁻¹ in the latter is absent, and the stronger frequency of the doublet at 1597 cm.⁻¹ is not observed.

A. A. E. **Raman effect and problems of constitution. XVIII. Hexachloro butadiene and octachlorocyclopentene.** K. W. F. Kohlrausch and H. Wittek (*Ber.*, 1942, **75**, [*B*], 227–232).—The observation of 5 certainly and 4 probably polarised and of 3 certainly and 3 probably depolarised in addition to 4 lines of undetermined degree of polarisation (in all 19 lines) is not compatible with the *trans* form with symmetry C_{20} for hexachlorobutadiene, which requires 9 polarised and 3 depolarised (total 12) lines. A non-planar form (C_2) is indicated which requires 13 polarised and 11 depolarised lines. For the compound C_6C_8 25 lines are observed, of which 8 are certainly and 2 probably polarised and 10 certainly and 4 probably depolarised; there is no contradiction to the symmetry C_2 and 33 lines (11 polarised and 22 depolarised) which are required for octachloro*cyclo*pentene. In both cases it is difficult to assess the extent to which the balance is disturbed by masking and the occurrence of overtones. H. W.

Dipole moment of the C-H bond. C. A. Coulson (*Trans. Faraday* Soc., 1942, **38**, 433-444).—Approx. calculations by the mol. orbital and electron-pair methods give for the C-H bond $\mu = 0.4$ D., the polarity being C⁺H⁻. μ is, with rare exceptions, nearly independent of whether the C is aliphatic, aromatic, ethylenic, or acetylenic. CH₄ is treated in detail with the use of wave functions previously determined (A., 1937, I, 223). The ionic contribution to the C-H bond is > is generally supposed. F. L. U.

Electric polarisation of mercurous trichloroacetate and of quinol bistrichloroacetate. N. R. Davidson and L. E. Sutton (J.C.S., 1942, 565-567).—The apparent electric dipole moments of (CCl₃·CO₃)₂Hg₂ and of quinol bistrichloroacetate, m.p. 136-136.5°, at 25° are $2\cdot65\pm0\cdot10$ and $1\cdot50\pm0\cdot20$ D., respectively, excluding rigid chelate structures and favouring the simple covalent formula for the former, with free rotation about the O-Hg-Hg-O axis. L. J. J.

Angle between the phenyl groups in $\alpha\alpha$ -diphenylethylene from electric dipole moment measurements. G. E. Coates and L. E. Sutton (J.C.S., 1942, 567—570).—The valency angle between the Ph groups in CPh₂:CH₂ (I) is calc. as $125^{\circ}\pm 3^{\circ}$ from electric dipole moment measurements on (I) and on a no. of *p*-substituted derivatives. The larger val. than in CH₂Ph₂ ($115\pm 5^{\circ}$) or for the CH₂ angle (118°) in C₄H₄ indicates resonance involving the Ph rings and the double bond. The rings must be twisted ~30° out of the common plane to allow the min. permissible distance (2·4 A.) between unbonded H. (For new compounds see A., 1942, II, 398.)

L. J. J. Dipole moments of cyclohexanol and cyclohexanone in dioxan. I. F. Halverstadt and W. D. Kumler (J. Amer. Chem. Soc., 1942, 64, 1982).—The vals. for solutions in dioxan at 25° are : cyclohexanol 1.82 and cyclohexanone 2.90 D. W. R. A.

Dipole moments of some bile acids. W. D. Kumler and I. F. Halverstadt (*J. Amer. Chem. Soc.*, 1942, **64**, 1941—1943).—Vals. of dipole moments of bile acids in dioxan at 25° are : lithocholic 2.50, deoxycholic 3.22, hyodeoxycholic 3.12, *apocholic* 2.98, dehydro-

lithocholic 3.72, cholic 3.84, 3-hydroxy-12-ketocholanic 4.26, dehydrodeoxycholic 4.82, reductodehydrocholic 5.16, dehydrocholic 5.63 p. They are not associated in dioxan at concns. < wt.fraction = 0.017, and dielectric const.-concn. curves are linear in this range. Vals, of μ indicate the absence of choleic acids in the solutions. The dipole moment of deoxycholic acid is normal with respect to the moment of other bile acids which do not form choleic acids. W. R. A.

Dipole moment and structure of carbamide and thiocarbamide. W. D. Kumler and G. M. Fohlen (J. Amer, Chem. Soc., 1942, 64, 1944-1948).—The dipole moments of $CO(NH_2)_2$ and $CS(NH_2)_2$ in dioxan at 25° are 4.56 and 4.89 D. Plots of the dielectric const. against wt.-fractions are linear, showing that the mols. are not associated in the solution. The compounds are resonance hybrids with a 20-30% contribution from the forms with a separation of charge, and have almost the same moments as the corresponding symmetrical disubstituted compounds, all of which have two equiv. forms with a separation charge. The moments of the monosubstituted compounds smaller, and those of the unsymmetrical disubstituted compounds smaller still. Steric hindrance probably produces the low moments of the symmetrical tetrasubstituted compounds. The existence of $CO(NH_2)_2$ and $CS(NH_2)_2$ as zwitterions is accounted for by the resonance hybrid structure, whether $CO(NH_2)_2$ is in the solid state, or in dioxan, EtOH, or H_2O solutions. The structure is essentially the same at that of the simple amides for a rather larger contribution of the forms with a separation of charge. W. R. A.

Dissociation constant, dipole moment, and structure of α -nitrotetronic acid. W. D. Kumler (J. Amer. Chem. Soc., 1942, 64, 1948– 1950).— α -Nitrotetronic acid has a pK_a 1.68 and μ 6.1 D. Both the dissociation const. and μ are consistent with the presence of a strong H-bond in the enol form, which, from general stability, is more probable than the *iso*nitro-structure. W. R. A.

Effect of temperature on the validity of Hudson's rules of isorotation. W. Kauzmann (*J. Amer. Chem. Soc.*, 1942, **64**, 1626— 1629).—The temp. variation of the optical rotation of carbohydrates probably accounts for discrepancies observed on the application of Hudson's rules of isorotation to the calculation of optical rotation. The rules should be more accurate at higher temp. W. R. A.

Optical rotatory dispersion of (-)-tetrahydrofurfuryl alcohol. R. S. Airs, M. P. Balfe, M. Irwin, and J. Kenyon (J.C.S., 1942, 531-532).—A two-term Drude equation is derived which fits the rotatory dispersion of the alcohol recorded by Balfe *et al.* (cf. A., 1941, I, 74; II, 231). R. S. C.

Application of the method of von Fedorov's crystallo-chemical analysis to derivatives of β -resorcylaldehyde.—See A., 1942, II, 361.

Quantum-mechanical investigation of orientation of substituents in aromatic molecules.—See A., 1942, II, 303.

Physical constants of homologues of chaulmoogric acid and of their ethyl esters. U. T. Cardoso (*Rev. Brasil Biol.*, 1941, 1, 75— 79).—The parachor values of gorlic and oleic acids and of the Et esters of chaulmoogric, hydnocarpic, and alepric acids are very similar to those calc. according to Sugden's formula. The density, the sp. mol. refraction, and the vals. of the Eötvös-Ramsay-Shields coeff. of these compounds are determined. I. C.

Viscosity and chemical constitution. J. N. Friend (*Nature*, 1932, **150**, 432).—For unassociated liquids over a considerable temp. range, $\sigma \propto \eta^{\frac{1}{2}}$ approx. Replacing $\sigma^{\frac{1}{2}}$ by $\eta^{\frac{1}{2}}$ in Sugden's parachor, $M\eta^{\frac{1}{2}}/D = \text{const.}$ (*R*) ("rheochor"). *R* is additive and a const. fraction of the crit. vol.; it is useful in studying the constitution of liquids. A. A. E.

Volatile vegetable materials. XIX. Parachors, refractometric characteristics, and Raman effect of piperitenone and similar ketones. Y. R. Naves and G. Papazian (*Helv. Chim. Acta*, 1942, 25, 1046–1053).— d_{20}^{20} , $y_{.}$ [*P*], $n_{F.}$ n_{0} , and n_{0} data, and Raman frequencies of piperitenone (I), 1-methyl- Δ^{1} -cyclohexen-3-one (II), piperitone (III), and pulegone (IV) are recorded and compared, with particular reference to the effects of conjugation of the double linkings and possibilities of resonance structures. The [*P*] vals. for (III) and (IV) are > those calc. on the additivity law. From ϵ measurements on $C_{6}H_{6}$ solutions the following vals. of μ are deduced: (I) 2-85, (II) 3-30, and (IV) 3-12 D. J. W. S.

Arrangements with given number of neighbours. T. S. Chang and C. C. Ho (*Proc. Roy. Soc.*, 1942, **A**, 180, 345–365).—The method used to find the no. of ways of arranging n *B* particles on *N* points on a straight line to produce *X* pairs of *BB* nearest neighbours is extended to find the no. of ways of arranging given nos. of *A. B. C.*, . . . particles on *N* points lying in a no. of parallel planes so as to produce given nos. of various kinds of neighbours (*e.g.*, nearest, next nearest, etc.) formed by different pairs of particles. The case of particles on two rows is examined in detail. G. D. P.

III.—CRYSTAL STRUCTURE.

Reflexion of X-rays with change of frequency. (Sir) C. V. Raman (*Nature*, 1942, 150, 366—369).—A review of investigations, showing how the reality of the changes has been demonstrated and their magnitude determined from intensity measurements at various temp. A. A. E.

New synthesis of X-ray data for crystal analysis. S. H. Yü [Nature, 1942, 149, 638-639].—Mathematical. A more efficient method of using Patterson vector diagrams in crystal analysis is developed. Compared with the classical Patterson method, it enables more useful information to be derived from the observational data, and narrows down the choice of alternative structures in an analysis. W. J.

Modified Patterson function. .C. S. Lu (*Nature*, 1942, **150**, 407).— Although a new interpretation of the Patterson function or related functions is desirable in analysis of crystal structure, the method suggested by Yü (preceding abstract) does not appear, for reasons given, to offer a better solution than Patterson's original function. W. J.

Effect of thermal vibrations on the scattering of X-rays. II. (Miss) K. Sarginson (*Proc. Roy. Soc.*, 1942, A, 180, 305—320; cf. A., 1942, I, 135).—The theory previously developed is extended. Only the aconstical branches of the elastic spectrum can produce extra spots. Formulæ for the position and shape of extra spots in the vicinity of Laue spots are given for cubic crystals. G. D. P.

Temperature variation of diffuse scattering of X-rays by crystals. M. Born and K. Lonsdale (*Nature*, 1942, 150, 490).—The theoretical scattering power for single crystals near, or not too far above, the Debye temp. is recalc. (cf. Sarginson, supra) and compared with quant. measurements by Laval for KCl at 290° k., $550\pm10^\circ$ k., and $665\pm15^\circ$ k. The predictions of the thermal theory are confirmed, the agreement being well within the claimed 10% limits of experimental accuracy. It is legitimate to assume constancy of intensity distribution with change of temp. W. J.

Temperature diffuse diffraction maxima and crystal perfection. D. S. Teague (*Physical Rev.*, 1942, [ii], **62**, 179).—Variation of the angle of deviation of Mo Ka with angle of incidence for Fe, Zn blende, barite, calcite, Rochelle salt, and quartz (in order of increasing structural perfection) shows only rough qual. agreement with calc. vals. N. M. B.

Model illustrating intercrystalline boundaries and plastic flow in metals. (Sir) W. L. Bragg (J. Sci. Instr., 1942, 19, 148-150).—A two-dimensional model of a metallic lattice is formed by a raft of small equal bubbles, produced by an orifice under the surface of a soap solution. Adjacent "crystals" in such a lattice show no intercryst. "Beilby amorphous layer," but merely slight dislocation at the boundaries. Stress-strain curves for the model show slip phenomena corresponding with those in metallic lattices.

L. J. J. Machine for rapid summation of Fourier series. D. Macewan and C. A. Beevers (*J. Sci. Instr.*, 1942, 19, 150-156).—The machine described, built from standard telephone and radio accessories, performs automatically the Fourier synthesis process by Beevers' and Lipson's X-ray crystallographic methods. L. J. J.

Improved X-ray tube for diffraction analyses.—See A., 1942, I, 377.

Interatomic distances in carbon. A. Taylor (*Nature*, 1942, 150, 462–463).—The available data for carbons are reviewed in the light of Warren's (A., 1941, I, 325) mathematical treatment of diffraction of X-rays from random layer-lattices. The results lead to an almost const. val. of the C—C distance, namely 1.415 A., the val. in macro-cryst. graphite, and directly confirm Warren's equations. The new cross-lattice dimension equation conforms to the association of the grain-growth of C with plate-like crystallites. W. J.

Symmetry and physico-chemical properties of crystalline compounds. I. Distribution of crystal structures over the 219 spacegroups. W. Nowacki (*Helv. Chim. Acta*, 1942, 25, 863-878).—A statistical analysis. J. W. S.

Diffuse scattering of copper Ka X-rays from single zinc crystals. 0. J. Baltzer and E. M. McNatt (*Physical Rev.*, 1939, [ii], 55, 237). A. I. E. W.

Imperfections in the structure of cobalt. I. Experimental work and proposed structure. (Miss) O. S. Edwards and H. Lipson. II. Mathematical treatment of proposed structure. A. J. C. Wilson (*Proc. Roy. Soc.*, 1942, A, 180, 268-277, 277-285).—I X-Ray powder photographs of hexagonal Co have a mixture of sharp and diffuse lines. This is the result of the presence of a series of faults in the crystal. These faults occur on the basal plane of the crystal and are due to the fact that there are different ways in which neighbouring layers of atoms can be packed.

II. The close-packed structures are made by piling planes of atoms in three different relative positions. A, B, C. In hexagonal close packing only two of these are used, *i.e.*, ABAB . . . or BCBC . . or GACA. . . The intensity of reflexion is calc. for a structure in which regions of ABAB are interleaved with regions of BCBC or CACA. Agreement with experiment is obtained if faults occur on the average once in ten planes. G. D. P.

Simple explanation of austenitic iron. A. Chongoli (*Rev. Brasil. Quim.*, 1942, 13, 256).—Description of the structure and properties of Fe and its alloys. F. R. G.

Structure of LiPb. H. Nowotny (Z. Metallk., 1941, 33, 388).— LiPb has a β -brass structure, a 3.522 A., Li atoms at 000 and Pb at $\frac{1}{2}\frac{1}{2}\frac{1}{2}$, distance Li—Pb 3.05 A. No disorder occurs below 260°. LiPb does not conform to the valency electron concn. rule. A. R. P.

Crystal system and unit cell of acanthite, Ag₂S.—See A., 1942, I, 380.

Crystal structure of the thorium silicide, ThSi₂. G. Brauer and A. Mitius (Z. anorg. Chem., 1942, **249**, 325–339).—ThSi₂ is face-centred tetragonal with a 4·126, c 14·346 A, space-group D_{14}^{18} , 4 mols. in the unit cell, ρ 7·63. At. positions and interat. distances are given. F. J. G.

Disilicides of niobium, tantalum, vanadium, and rhenium. H. J. Wallbaum (Z. Metalik., 1941, 33, 378-381).---VSi₂, TaSi₂, and NbSi₂ have a C-40 type of lattice like CrSi₂; ReSi₂ has a C-11 type lattice like MoSi₂. The lattice consts. are: VSi₂ d 4-562 Å., c/a 1:359; TaSi₂ a 4:773 Å., c/a 1:373; NbSi₂ a 4:785 Å., c/a 1:374; ReSi₂ a 3:123 Å., c/a 2:452. Details of the structures are given and discussed. A. R. P.

Superstructure of Cu_3Sb . W. Hofmann (Z. Metallk., 1941, 33, 373).— Cu_3Sb has a face-centred cubic lattice, a 6.00 A., the unit cell having a substitution superlattice of the Cu_2AlMn type; the phase is stable only above 432° and has a wide range of homogeneity towards both the Sb and the Cu sides. A. R. P.

Crystal structure of calcium cyanamide. M. A. Bredig (J. Amer. Chem. Soc., 1942, **64**, 1730–1731).—CaCN₂ has a structure completely analogous to NaN₃ and c 14.85, a 3.67 A., p 2.29, Ca⁺⁺ ions occupy 000, C atoms $\frac{1}{2}\frac{1}{2}\frac{1}{2}$, and N atoms \pm (*iuuu*); C—N = 1.16 \pm 0.08, Ca—N = 2.49 \pm 0.04 A. W. R. A.

Formation of a double crystal aggregate and the structure of the intermediate temperature modification of $Ni(NO_3)_2.6NH_3$. S. H. Yü (*Nature*, 1942, 150, 347—349).—Although the external shape of the crystal is unchanged, the crystallites must have their crystal axes confined to the two mutually perpendicular axes of the original single crystal. The symmetry shown by the photographs is not the actual symmetry of the structure. A similar consideration may affect other determinations of the space-group of a structure. The cryst, grains in some polycryst, metals may be composed of such aggregates. A. A. E.

Folding of the selenanthren molecule. R. G. Wood and G. Williams (*Nature*, 1942, **150**, 321-322).—A projection made by Fourier synthesis suggests that the angle of fold about the line forming the Se atoms is 127° , the C—Se distance is 1.96 A., and the valency angle of Se is 96° . A. A. E.

Crystal-chemical studies of the alums. IV. Coefficients of linear thermal expansion. H. P. Klug and L. Alexander (*J. Amer. Chem. Soc.*, 1942, **64**, 1819–1820).—Linear thermal expansion coeffs. for several alums for the approx. range $20-50^\circ$, measured by means of X-ray diffraction, are: KAI(SO₄)₂, $11\cdot0\pm0\cdot3$; NH₄AI(SO₄)₂, $9\cdot5\pm0\cdot2$; TIAI(SO₄)₂, $3\cdot1\pm0\cdot3$; and NH₄Cr(SO₄)₂, $10\cdot6\pm0\cdot4\times10^6$ (H₂O of crystallisation omitted from formulæ). W. R. A.

Structures of methylenecyclobutane and hexamethylethane. S. H. Bauer and J. Y. Beach (J. Amer. Chem. Soc., 1942, **64**, 1142—1147). —From electron diffraction data the C atoms of methylenecyclobutane are coplanar, 4 at the corners of a square $(1.56\pm0.03 \text{ A},$ side) and the fifth on the extension of one of the diagonals $(1.34\pm$ 0.02 A.) from the C atom in the ring). The data for C₂Me₆ favour the staggered model but do not completely exclude other mod. models (eclipsed, free rotation). The cratral C—C is 1.58 ± 0.03 ; other C—C, $1.54\pm0.02 \text{ A}.$; C valency angles $111 + 2^\circ$.

W. R. A.

Crystal structure of oxyhæmoglobin.—See A., 1942, III, 873. Structure of o-dinitrosobenzenes.—See A., 1942, II, 380.

X-Ray diffraction measurements on biotin. I. Fankuchen (J. Amer. Chem. Soc., 1942, 64, 1742-1743).—Under the polarising microscope the long thin needles of biotin show straight extinction, and have a rhombus cross-section with acute angle 55°. The crystal is optically negative. These data suggest an orthorhombic crystal, and this has been confirmed by X-ray investigations, which show that the space-group is $P2_12_2$, and has four general positions, 4 mols. per unit cell, ρ 1.41, mol. wt. 245±6, a 5.25, b 10.35, c 21 A. W. R. A.

Supermolecular structure of cellulose. O. Kratky. (Kolloid-Z., 1942, 98, 170—172).—X-Ray investigation shows that the alkalicellulose micelles present in regenerated cellulose from the xanthate process are completely decomposed or greatly distorted on subsequent dissolution in NaOH. Studies of the deformation of cellulose hydrate threads indicate that the micelles are leaf-like, and that

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there is a uniform distortion of the space surrounding the micelles. Small-angle scattering forms a suitable basis for the statistical determination of micelle sizes. If a liquid with the same electron density as cellulose is inserted into the intermicellar spaces, the small-angle scattering disappears, and this provides a method for the determination of electron density. A. J. M.

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Electron microscopy and the structure of cellulose fibres. W. Wergin (Kolloid-Z., 1942, 98, 131-141).—Results of the investigation of cellulose fibres by means of the electron microscope are summarised. The electron microscope confirms the presence of a fibril structure, which has also been observed with the optical microscope. There is also a further division of fibrils into parallel threads of diameter 300-500 Å., though a few are smaller (100 Å.) and a few larger (750 Å.) than this. These are the smallest structural units of the fibre, and may be called micelle threads. The fibril bundles are surrounded by a surface sheath, which makes the bundle into an individual unit. A. J. M.

Investigation of the molecular structure of nitromethane, methyl nitrite, and methyl nitrate in the vapour phase by electron diffraction. F. Rogowski (*Ber.*, 1942, 75, [*B*], 244—269).—Nitromethane probably has a plane CNO skeleton with the distances $C-N = 1.47 \pm$ 0.02 and N—O 1.22 ± 0.02 A. in each case with an angle ONO between 130° and 140°. A non-planar arrangement as in NH₃ or the presence of an oximino-component with nuclear distances >5% outside the indicated experimental error is excluded. Me nitrite has a plane mol. twice bent with the tetrahedron angle and the distances $C-O = 1.44\pm0.02$, $O-N = 1.37\pm0.02$, and $N-O' = 1.22\pm0.02$ A. In the vapour phase Me nitrate has a mol. bent twice in the same In the vapour phase we intrate has a not, bent twice in the same direction and having the central O and N at the points of flexion. N is at the top of an irregular pyramid with O at the three corners. The individual distances are $C-O = 1.44\pm0.03$, $O-N = 1.37\pm0.04$, $N-O' = 1.22\pm0.04$ A. in each case. The angles CON and ONO' are tetrahedron angles and the angle O'NO' is $131^{\circ}\pm5^{\circ}$. H. W.

Electron diffraction investigation of propargyl chloride, bromide, and iodide. L. Pauling, W. Gordy, and J. H. Saylor (J. Amer. Chem. Soc., 1942, 64, 1753-1756).—Investigation of electron diffraction of the propargyl halides yields interat. distances: $C=C1\cdot20$ (assumed), $C-C1\cdot47\pm0\cdot02$, $C-C11\cdot82\pm0\cdot02$, $C-Br1\cdot95\pm0\cdot02$, and $C-I2\cdot13\pm0\cdot03$ A., and the angles C-C-C1111 $\pm2^{\circ}$, C-C-Br $112\pm2^{\circ}$, and C-C-I111 $\pm3^{\circ}$. W. R. A.

Habit and orientation in electron diffraction. R. P. Johnson and W. R. Grams (*Physical Rev.*, 1942, [ii], 62, 77–79).—Electron diffraction patterns of etched W surfaces apparently indicate a preferred orientation of the crystallites, with [100] perpendicular to the surface. Actually, the etching leaves, on grains of a certain orientation, a structure very favourable for diffraction, and these selected grains dominate in the scattering. Analogous results appear in studies of clays and of graphite. It is suggested that crystal habit may often replace preferred crystal orientation as the cause of arcing in reflexion patterns. N. M. B.

Electron-microscope observations on zinc black .-- See A., 1942, I, 361.

Induced colour in crystals by deuteron bombardment. J. M. Cork (Physical Rev., 1942, [ii], 62, 80-81).—The nature and characteristics of changes due to bombardment by 10-Me.v. deuterons in the cyclotron are given for NaF, NaCl, NaI, KCl, KBF, KI, fluorite, quartz, beryl, and diamond. N. M. B.

Disperse structure of solid systems and its thermodynamic basis. IX. D. Balarev [with E. Alexeev] (Kolloid-Z., 1942, 99, 291-293). Data for the temp. of the beginning of grey glow of Au and Ag afford additional evidence for the author's view that the disperse structure of solid systems has a thermodynamic basis, since they can only be explained on the assumption that each temp. corresponds with a definite conglomerate in which the metal particles and their environment form a thermodynamically stable system.

C. R. H.

Disperse structure of solid crystal systems. D. Balarev (*Kolloid-Beih.*, 1940, **51**, 123-140).—The author's theory leads to the conclusion that the differences between typical colloidal systems and ordinary crystals are non-essential and purely quant. Several corollaries of this proposition are specified and discussed. F. L. U.

Theory of finite deformations of elastic crystals. R. Fürth (Proc. Roy. Soc., 1942, A, 180, 285-304).—The theory of finite deformation of cubic crystals at zero temp. is developed to a second-order approximation. A no. of special cases are worked out in detail. The observed deviations from Hooke's law are in agreement with the theory, and other second-order effects are predicted. Methods of determining the interat. force law are indicated. G. D. P.

IV.—PHYSICAL PROPERTIES OF PURE SUBSTANCES.

Dissociation ofhexa-arylethanes. XIII. Halogen substituents .--See A., 1942, II, 399.

Tin tri-o-tolyl and the instability of organo-metallic free radicals.-See A., 1942, II, 431.

Magnetic study of phototropic compounds. Magnetic susceptibilities of *p*-dimethylamino- and *p*-diethylamino-anilocamphor. M. Singh and T. R. Datt (J. Indian Chem. Soc., 1942, 19, 130-134).—The magnetic susceptibilities of these compounds change in light, the change being accompanied by a darkening in colour. The results can be explained by free-radical formation. J. W. S.

Propagation of sound in liquids and viscosity. G. Suryan (*Indian J. Physics*, 1942, **16**, 77-81).—An empirical relation between sound velocity (v) and η of liquids is given. The propagation of sound in liquids is discussed on the basis of energy transference between the source of the sou W. R. A. between mols. $v \propto 1/\sigma^2$, where σ is mol. diameter.

Emissivities and temperature scales of the iron group. H. B. Wahlin and R. Wright (J. Appl. Physics, 13, 40-42).—The emissivities for $\lambda 0.667 \mu$. of pure Fe, Ni, and Co after complete degassing at 1100-1500°, are determined by the disappearing-filament method. They are nearly const. at 0.41, 0.34-0.35, and 0.37-0.38, respectively, except for a sudden change to 0.44-0.45 at the Fe A3 point. L. J. J.

Magnetism and the third law of thermodynamics. Heat capacity of manganous fluoride from 13° to 320° K. J. W. Stout and H. E. Adams (J. Amer. Chem. Soc., 1942, 64, 1535—1538).—The C_p/T curve of MnF₂ in the range 13—320° K. shows a max. at 66-5° K. on account of the changing distribution of magnetic Mn^{**} ions among available energy states. From C_p data the entropy of MnF₂ at 298·16° K. is 22·25 g.-cal. per degree per mol. W. R. A.

B.p. of *n***-alkyl acids.** W. O. Pool and A. W. Ralston (*Ind. Eng. Chem.*, 1942, **34**, 1104—1105; cf. A., 1940, I, 388).—B.p. at various pressures are recorded for *n*-alkyl acids of 6 to 18 C atoms.

A. T. High-temperature heat content of Mn₃O₄, MnSiO₃, and Mn₃C. J. C. Southard and G. E. Moore (*J. Amer. Chem. Soc.*, 1942, 64, 1769–1770).—Heat contents of Mn₃O₄, MnSiO₃, and Mn₃C have been determined from room temp. to temp, between 1140° and 1500°. Transitions of Mn_sO_4 at 1172° and Mn_sC at 1037° are reported. The increments of the heat contents and entropies of these substances above room temp. at 100° intervals have been tabulated

from these and previous available data. (Cf. A., 1942, I., 398.) W. R. A. Thermal expansion of aluminium, A. J. C. Wilson (*Proc. Physical* Soc., 1942, 54, 487–491; cf. A., 1941, I, 200).—The double curvature previously found is characteristic of unsurealed filings and dir. previously found is characteristic of unannealed filings, and disappears after the filings have been heated above 600°. Data for the expansion coeff. of annealed filings are given, and observations on the effect of cold-work are reported. N. M. B.

Pyknometric precision method for liquids and solids. IV. Redeter-Pyknometric precision method for liquids and solids. IV. Redeter-mination of the density of pure potassium chloride, potassium bromide, and sodium bromide at 0°. T. Batuecas and J. J. Cernander-Alonso (Z. physikal. Chem., 1942, A, 190, 272–277; cf. A., 1936, 417; 1938, I, 130).—With the technique described previously and PhMe as pyknometric liquid, the following vals. of d_1^0 have been obtained; KCl 1·9917±0·0003, KBr 2·7548±0·0004, and NaBr 3·2109±0·0005 g. per ml. From these data the lattice consts. are 3·144, 3·298, and 2·986 × 10⁻⁸ cm., respectively. After drying with CaCl₂, PhMe contains active Cl which cannot be removed by U S J. W. S. distillation.

Statistical mechanics of change of state. H. Snyder (*Physical* ev., 1942, [ii], **62**, 63-67).-Mathematical. N. M. B. Rev., 1942, [ii], 62, 63-67).-Mathematical.

Compressibility of liquid *n***-octane.** W. A. Felsing and G. M. Watson (*J. Amer. Chem. Soc.*, 1942, **64**, 1822–1823).—The compressibility of liquid *n*-C₈H₁₈ has been determined from 100° to 275° at 25° intervals, and at pressures from the v.p. to \sim 300 atm. The sp. vol. is related to the pressure at different temp.

W. R. A. Viscosity of cis- and trans-decahydronaphthalene. W. F. Seyer and J. D. Leslie (J. Amer. Chem. Soc., 1942, 64, 1912–1916).— η of cis- and trans-decahydronaphthalene have been measured from -30° to 180°. Straight lines are not obtained when log η is plotted against 1/T, and there is evidence that the *cis*-form undergoes some change at 110°. An explanation is advanced of the high vals. of η and E_{vis} , the average molar activation energy, and the effect of *cis-trans* isomerism on them. W. R. A.

V.—SOLUTIONS AND MIXTURES (INCLUDING COLLOIDS).

Change of sign of thermal diffusion factor. K. E. Grew (Nature, 1942, 150, 320).—Change of sign of the thermal diffusion factor with composition (Chapman, A., 1940, I, 436; 1941, I, 201) occurs in Ne-NH₃ mixtures. For 0—75% Ne the Ne mols. diffuse up the temp. gradient; for >75% Ne they concentrate at the lower end.

A. A. E.

Interpretation of the slope of experimental double refraction curves. H. H. Pfeiffer (*Kolloid-Z.*, 1942, **99**, 259-262).—Frey-Wyssling's explanation (A., 1940, I, 358) of the form of double refraction curves, which is based on the different polar characteristics of cell substance and imbibed liquid, is applied to data of W. J. Schmidt for Thoulet's solution imbibed by the rods of the retina of *Rana temporaria*. C. R. H.

Do all binary systems show an approximation to Raoult's law with increasing dilution P K. Fredenhagen and E. Tramitz (*Kolloid* Z., 1942, 99, 283-290).—Available data lead to the conclusion that all binary systems approximate to Raoult's law with increasing dilution. Errors in an earlier paper (cf. A., 1942, I, 365) are corr.

C. R. H. Interpretation and calculation of osmotic pressure. K. Fredenhagen (Kolloid-Z., 1942, 99, 277-283).—A theory of osmotic pressure differences which demonstrates their identity with the thermal pressure of solutes is presented. C. R. H.

Wave theory of osmotic pressure. R. Lucas (Compt. rend., 1942, 214, 25–27),—Thermal agitation theory gives $\Pi = \{1 + 15(c/D)(dD/dc)\}cRT/M$ (D = diffusion const., M = mol. wt. of solute). The semipermeable membrane is regarded as transparent to thermal agitation waves of solvent mols., those of solute mols. being reflected. A. J. E. W.

Physical effects of progressively diluted substances. E. Heintz (Naturwiss., 1941, 29, 713—725).—Solutions of NaNO₃, Na salicylate, Pb(NO₃)₂, Cu(NO₃)₂, AcOH, N₂H₄, and CaCO₃ were successively diluted 10 times, and the infra-red and ultra-violet absorption and electrical conductivity were determined at each stage. If the original solution is designated as D_1 , the solution obtained by diluting it 10-fold is D_2 , 100-fold D_3 , etc. The infra-red absorption spectrum becomes progressively weaker with dilution, but does not disappear with D_4 , D_5 , or D_6 , as would be expected, but varies rhythmically with dilution down to D_{30} , the position of the absorption being approx. the same as that of the original solution. The max, in the absorption occur at D_4 , D_6 , D_6 , D_{1-12} , D_{14} , D_{17-19} , D_{23} , and D_{28} , and the periodicity is independent of the nature of the solute or solvent. The effect is observed only if the dilution does not bring about this effect. No periodicity was observed in the ultra-violet absorption. The electrical conductivity, however, shows the same periodicity as the infra-red absorption, provided EtOH, not H₂O, is used as the solvent, and all vessels are from the same glass batch. *

Apparent molal volumes of aqueous solutions of sulphuric acid at 25°. I. M. Klotz and C. F. Eckert (J. Amer. Chem. Soc., 1942, 64, 1878–1880).— ρ of aq. H₂SO₄ (0—3M.) have been measured and the apparent molal vols, interpreted in terms of the vols. of H^{*}, SO₄", and HSO₄' ions. The apparent molal vols. of H^{*} and HSO₄' ions have been calc. by a series of successive approximations. W. R. A.

Plumbic acetate-anhydrous acetic acid solutions. A. W. Davidson. W. C. Lanning, and (Miss) M. M. Zeller (*J. Amer. Chem. Soc.*, 1942, 64, 1523—1527).—Pb(OAc)₄ behaves in AcOH as a non-electrolyte, whereas Pb(OAc)₂ behaves as a weak electrolyte. The solubility of Pb(OAc)₄ in AcOH from 16° to 94° is \sim 1/40 that of Pb(OAc)₂; no solvate was isolated. The solubility of Pb(OAc)₄ in AcOH containing NaOAc decreases as [NaOAc] is increased owing to salting out; no evidence of amphoteric behaviour has been found. W. R. A.

Dielectric investigation of polypeptides. II. Dispersion of simple amino-acid polypeptides. W. P. Conner and C. P. Smyth (J. Amer. Chem. Soc., 1942, 64, 1870–1878).—The dielectric consts. (ϵ) of liquids at $\lambda\lambda$ from 40 to 80 cm. have been measured by the first Drude method with an apparatus which is described. η and ϵ of aq, solutions of ten NH_g-acid peptides in this region of anomalous dispersion have been measured. The mechanism of dispersion has been discussed and the results have been combined with previous ϵ measurements at 10 m. to calculate the relaxation times and shape factors for the solute mols. Although the results are not inexplicable in terms of internal rotation around valency bonds in the solute of rotation of the mol. as a whole. W. R. A.

Symbols for heterogeneous equilibria (metallographic shorthand). H. Hanemann (Z. Metallk., 1941, 33, 374-375).—Shorthand characters for various terms used in metallography, e.g., eutectic, peritectic, eutectoid, are proposed and their uses illustrated.

A. R. P.

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Equilibrium diagram of alloys at low temperatures. G. Masing (*Naturwiss.*, 1942, 30, 157-161).—It is pointed out that whilst at high temp. it is possible to ascertain the true equilibria in alloy systems if sufficient time is allowed for the stable state to be reached this is almost impossible at lower temp. since, owing to the slow rate of diffusion and the slow formation of nuclei, very prolonged maintenance at a given temp. is necessary to ensure that the equilibria have been established. Hence the published diagrams for systems at temp. well below the solidus represent only the limiting

positions of the phase fields attainable in a reasonable time. The subject is discussed from the thermodynamic viewpoint with reference to the Fe-Mo, Fe-C, and Au-Ni systems. A. R. P.

Ternary valency compounds in (copper, silver)-(arsenic, antimony, bismuth)-magnesium systems. H. Nowotny and W. Sibert (Z. Metallk., 1941, 33, 391—394).—Compounds of the type A·B:C occur in all these ternary systems, except Ag-Bi-Mg. CuSbMg, CuBiMg, and AgAsMg have a CaF₂ structure with a 6·152, 6·256, and 6·240 A., respectively. CuAsMg has a tetragonal C-38 type lattice, a 6·393 A., c|a 1·576, 6 atoms per unit cell, and AgSbMg has a somewhat similar lattice of lower symmetry. Data on the distribution of the atoms in the lattices are included and the relations between their structures and those of CaF₂ and Mg₃As₂ are discussed.

A. R. P. **Precipitation mechanism in crystals of aluminum-silver alloys** during structural hardening. A. Guinier (*Compt. rend.*, 1942, 214, 34-37).—The mechanism is studied by a special X-ray examination (cf. B., 1940, 534) of a single-crystal (AI 80, Ag 20%) quenched from 540° and reheated at 100—250°. The changes which occur are (a) a progressive concn. of Ag atoms in small nuclei distributed at approx. regular intervals through the lattice, and (b) transformation of the cubic lattice in these nuclei to the hexagonal lattice of the y-phase (\sim Ag₂Al) by slipping of (111) planes. A. J. E. W.

Recrystallisation diagram of manganese-magnesium and ceriummanganese-magnesium alloys. H. Y. Jan and W. Hofmann (Z. Metallk., 1941, 33, 361-369).—Diagrams are constructed showing the effects of annealing temp. and % reduction on the hardness and grain size of Al with (A) Mn 2%, and (B) Mn 2, Ce 0.5%. There is a wide temp. range between the beginning and ending of recrystallisation of cold-rolled A but only a small range with the hot-rolled alloy. Between 350° and 450° the grain size of hot-worked A is a max. after 60% and a min. after 20% reduction; very coarse grain size is obtained on annealing either the hot- or cold-worked alloy at 550°. Alloy B has a much smaller grain size than A after all heat- and mechanical treatments and a much higher recrystallisation temp. and smaller range between the beginning and ending of recrystallisation; there is no coarse grain growth at 550°, and the hot-worked alloy does not develop a granular structure as does A. A. R. P.

System magnesium-copper-antimony. E. Scheil and W. Sibert (Z. Metallk., 1941, 33, 389-391).—The ternary compound MgCuSb (I), m.p. 930°, forms quasibinary systems with Cu, Sb, Mg₃Sb₂, Cu₂Sb, and the e-Cu-Sb phase, and Mg₃Sb similar systems with Mg₄Cu, MgCu₂, and Cu. Binary eutectics occur at 555°, $\sim 4\%$ Sb, between Mg₃Sb₂ and MgCu₂; at 720°, 20% Sb, between Cu and Mg₃Sb₂; at 730°, 23% Sb, between Cu and (I); at 540°, $\sim 43\%$ Sb, between (I) and e-Cu-Sb; and at an undetermined temp. and composition near Mg₃Sb₂ between that compound and (I). Ternary eutectics occur at 455° Cu 3, Mg ~ 36 , Sb $\sim 3\%$ between Mg $_{3}$ Sb₂, and MgCu₂; at 540°, $\sim 43\%$ Sb, between (I) and e-Cu-Sb; and at an undetermined temp. and composition near Mg₃Sb₂ between that compound and (I). Ternary eutectics occur at 470°, Cu 22, Sb 13% between Mg $_{3}$ Sb₂, and Mg₂Cu; at 540°, Cu 75, Sb 13% between Cu, Mg $_{3}$ Sb₂, and Mg2Cu; at 555° Cu 3, Mg 4% between Sb, (I) and Mg3Sb₂; and at 510°, Mg ~ 2 , Cu $\sim 23\%$ between Sb (I) and Mg $_{3}$ Sb₂, and mg2Cu; at 555° Cu 3, Mg 4% between Sb, (I) and Mg $_{3}$ Sb₂, and at 510°, Mg ~ 2 , Cu $\sim 23\%$ between Sb -(I) system. Pptn.-hardening can be produced in Cu containing Mg ~ 0.25 , Sb $\sim 1\%$.

 δ_1 and ζ phases in iron- and cobalt-zinc systems. F. Götzl, F. Halla, and J. Schramm (Z. Metallk., 1941, 33, 375).—Single crystals of ζ-Fe-Zn with 6·3% Fe had a 13·65, b 7·61, c 5·10 A., β 128° 44′; similar crystals of ζ-Co-Zn with 6·9% Co had a 13·46, b 7·49, c 5·06 A., β 127° 5′. The δ_1 Fe-Zn phase has a 12·80 A. (7%) Fe) and a 12·81 A. (8·5% Fe). A. R. P.

Dilatometric study of solid solubility of silicon in aluminium. H. Borchers and H. J. Otto (Aluminium, 1942, 24, 219-221; Bull, Brit. Non-Ferrous Met. Res. Assoc., 1942, 310).—Al containing up to 1.41% of Si was studied by the thermal expansion method The solubility data showed good agreement with those obtained by Durer (Z. Metallk., 1940, 32, 280) using thermoelectric measurement. Conclusions on pptn., balling-up, and solution phenomena are drawn. R. B. C.

Quaternary system aluminium-bismuth-lead-antimony. G. W. Kasten (Wiss. Veröff. Siemens-Werken, Sonderh., 1940, 50-65; Bull. Brit. Non-Ferrous Met. Res. Assoc., 1942, 325).—The equilibrium diagram is worked out and discussed. All the binary and ternary systems involved, with the exception of Al-Bi-Pb and Al-Bi-Sb, were already known. R. B. C.

Crystallographic and X-ray studies of chromium-aluminium alloys. W. Hofmann and H. Wiehr (Z. Metallk., 1941, 33, 369– 372).—AlCr, crystallises in monoclinic prisms, $a \ 20.43$, $b \ 7.62$, $c \ 25.31$ A., $\beta \ 155^\circ \ 10'$; in the 3% Cr-Al alloy it appears as flattened columns or as leaflets which are twins of the columns about the $\{001\}$ plane extended in the [011] direction. Al dissolves $\sim 0.7\%$ of Cr at just below the m.p. but if the cast alloy is immediately quenched $\sim 1.6\%$ of Cr may be retained in supersaturated solid solution. A. R. P. System cobalt-CoAl. J. Schramm (Z. Metallk., 1941, 33, 381– 387).—The Al-Co system was investigated by thermal, micro-graphic, X-ray, and magnetic methods up to 25% Al. The eutectic point is 1400°, Al 10%, the a phase containing 7–9 and the β phase 10.4% Al at this temp. The solubility of Al in a-Co decreases almost linearly with temp. to 1% at 300°, and the Co content of the β phase decreases along a smooth concave curve to 74% at room temp. The Curie point of Co falls linearly with increase in % Al from 720° to 840° at 4:5% Al and then remains const. to 22% Al. Slowly cooled β is non-magnetic but quenched β with >74% Co is magnetic at temp. below a line joining 18% Al at 580° with 25% Al at 20°. The β phase can be considerably, and the a phase appreciably, hardened by suitable heat-treatment. A. R. P. appreciably, hardened by suitable heat-treatment. A. R. P.

Ternary system nickel-cobalt-aluminium. J. Schramm (Z. Metallk., 1941, 33, 403-412).—The equilibria from the Ni-Co side up to 25% Al, as determined by thermal, micrographic, X-ray, and magnetic methods, are shown in quasibinary diagrams for Ni-Co ratios of 90:10, 80:20, 50:50, and 20:80. Only four phases exist, viz.: a, cubic face-centred (Ni-Co)-Al solid solution; a', the ordered form of α ; β , cubic body-centred (Ni, Co)A1; and ϵ , hexagonal Co. The reaction liquid $\rightleftharpoons \alpha + \beta$ in the Co-Al system at 1400° merges with the α + liquid $\rightleftharpoons \alpha'$ reaction at 1362° in the Ni-Al system to the four-phase equilibrium liquid $+ a \rightleftharpoons a' + \beta$ at 1361° in the ternary system. The $a + a', a' + \beta$, and $a + a' + \beta$ phase fields become considerably restricted in area with rise in temp, *i.e.*, the *a* and β solid solution ranges are much broader at high than at low temp. so that alloys containing 5-12 or 15-25%Al can be rendered much harder and more magnetic by appropriate A. R. P., heat-treatment.

Forced directionality in precipitation from solid solution [in ironnickel-titanium alloys]. R. Vogel (Z. Metallk., 1941, 38, 376-377).-In cast Fe-Ti-Ni alloys with Ti 10-20 and Fe <10% the primary crystallites are surrounded by a eutectic of which one component is acicular Ni₃Ti. Frequently these needles appear to penetrate into the primary crystals and this is ascribed to induced pptn. of Ni₃Ti from these crystals, the ppt. growing on the acid act their point of contact with the minute crystals. No needles at their point of contact with the primary crystals. No such effect is obtained if the cast alloy is quenched and then reheated to induce pptn.; in this case the ppt. grows in clusters from nuclei in the centre of the crystals and its orientation is controlled by the lattice forces. These forces are weak in the first case so that the hard Ni3Ti needles are able to grow into the much softer primaries. A. R. P.

Solubility of propylene vapour in water as affected by typical detergents. J. W. McBain and A. M. Soldate (*J. Amer. Chem. Soc.*, 1942, 64, 1556-1557).—An extension of previous work (A., 1941, I, 259) on the effect of added substances on the solubility of CHMe.CH₂ in H₂O shows that all the detergents tested greatly increase the amount dissolved, in spite of any salting-out action which they may otherwise possess. This solubilising effect is shown by anion-active, cation-active, and non-electrolytic detergents. W. R. A

Effect of temperature on the partition of benzoic and salicylic acid between water and benzene. A. Bekturov (*J. Gen. Chem. Russ.*, 1941, 11, 143—145).—The partition coeffs. [H₂O]/[C₆H₆] rise with increasing temp., from 25° to 60°. R. T.

Adsorption of gas from the lowest to the highest pressures. I. Mathematical analysis of equations of ideal absolute and differential adsorption. A. von Antropoff (Kolloid-Z., 1942, 98, 249-257). F. L. U

Photo-activation of adsorption of hydrogen on thorium oxide. A. Luyckx, J. Bodart, and G. Rens (J. Amer. Chem. Soc., 1942, 64, 1731–1732).—Irradiation of the ThO_2-H_2 system (pressure of $H_{g} = 2$ mm.) with light from a Hg lamp produces a regular and continuous decrease in pressure and complete adsorption results from 10 hr. irradiation. Further added H_{g} is adsorbed on irradiation. Since adsorption is observable only with the irradiation from a cold Hg lamp it is resonance radiation that is involved and the mechanism may involve formation of at. H in the gas phase or dissociation of van der Waals adsorbed H, mols. by transference of energy from Hg atoms. At 20—30 mm, no photo-activation occurs. Lowering of the pressure to 2 mm, resulted in slower photoactivation than in a system initially at 2 mm. Evacuation of the system is necessary to attain comparable rates. Experiments at 700-800° are also discussed. W. R. A.

Adsorption of acids by animal charcoal. S. Caspe (Amer. J. Pharm., 1942, 114, 262-266).—Animal C (I) does not adsorb acids; the impurities present—principally phosphates—react with acids to give polybasic acids which contain untitratable H^{*}, e.g., H₃PO₄. After shaking with (I) dil. HCl contains less H^{*} when titrated with phenolphthalein indicator, but there is no reduction in the [Cl']. Both HCl and AcOH contain the same [PO₄"] after shaking with (I); the reduction in titratable H' is also the same. D.D.

Adsorption of organic compounds. I. Adsorption of ampholytes on activated charcoal. V. H. Cheldelin and R. J. Williams (J.

Amer. Chem. Soc., 1942, **64**, 1513-1516).—Adsorption isotherms at ~ 25 -35° for 31 NH₂-acids, vitamins, and related substances on Darco G-60 fit the Freundlich equation and the nature of the adsorption is greatly influenced by the position of polar groups W. R. A. and the presence of aromatic nuclei in the mols.

Surface tension, co-ordination number, and the Eötvös rule. K. L. Wolf and R. Grafe (Kolloid-Z., 1942, 98, 257-262).-Temp. coeffs. of the surface tension of a no. of pure liquids have been redetermined, and the Stefan no. (ϕ) calc. For unassociated liquids ϕ lies between 3 and 4, corresponding with a co-ordination no. of 12 for the bulk liquid and 8 or 9 for the surface. The magnitude and variation with composition of ϕ for liquid mixtures is related to the packing of the mols. F. L. U.

Reproducible contact angles on reproducible metal surfaces. II. Interfacial contact angles between water and organic liquids on surfaces of silver and gold. III. Contact angles of saturated aqueous solutions of different organic liquids on silver and gold. F. E. Bartell and P. H. Cardwell (J. Amer. Chem. Soc., 1942, 64, 1530– 1534, 1641–1643).—II. Interfacial contact angles for H₂O drops on Ag and Au and for drops of *iso*-C₅H₁₁·OH, Bu^oOAc, C₆H₆, C, H₁₆, and 1-C₁₀H₇Br on Ag and Au immersed in H₂O were measured with the sessile drop apparatus (A., 1942, I, 236). For each system a stable advancing and stable receding angle was found. The vals, of these angles for H₂O are equal to those obtained for org. liquid Reproducible contact angles on reproducible metal surfaces. П of these angles for H_2O are equal to those obtained for org. liquid drops on the solids in H_2O . Stable advancing angles for all org. liquids are 128° for Ag and 117° for Au. Stable receding angles for C_8H_8 and C_7H_{18} are 57.5° for Ag and 45° for Au. For the other liquids the val. of the stable receding angle is the greater the greater is the scientific of the liquid in H₂O. is the solubility of the liquid in H2O. The existence of two different stable interfacial contact angles is due to solid surfaces contiguous to fluid phases becoming altered by adsorption from the fluids or by formation of condensed layers of fluid.

III. Measurements of the contact angles of drops of saturated aq. solutions of the org. liquids in Part II indicate that the metal surfaces adsorb air and org. liquid from air and from solution. A drop of solution advancing by stages across a fresh metal surface gives different vals. for contact angle at each advance because of evaporation of org. liquid into the air and resultant adsorption of vapour on the exposed metal. W. R. A.

Thermodynamic theory of electrocapillarity. D. C. Grahame and R. B. Whitney (J. Amer. Chem. Soc., 1942, 64, 1548-1552).—By assuming only equilibrium between phases the thermodynamic equations of electrocapillarity have been derived. Their interpretation is slightly different from what had been previously supposed. A general electro-capillary equation has been derived for a non-polarised electrode and its application to experimental data is W R. A. discussed.

Surface diffusion. I. Experimental. II. Theoretical. R. C. L. Bosworth (J. Proc. Austral. Inst., 1942, 9, 134-142, 169-178).-I. Recent experimental evidence for the mobility of films adsorbed on solid surfaces, especially on Th-W filaments, is reviewed.

II. In the case of a H film on a W surface the migration of H from one W atom to another is compared with the transference of H from one C atom to another in tautomeric changes, the difference being that in the former case H may continue its migration to a third and a fourth W atom, whereas in the latter H transfers between the same two C atoms. This continued migration leads to macro-scopic diffusion over the W surface. This type of diffusion is com-pared with physical diffusion, and the calculation of the mean free path for the former type is discussed. Solutions of Fick's diffusion C. R. H. equation are considered.

Pressure-area-temperature and energy relations of unilayers of "octadecane nifrile." L. E. Copeland and W. D. Harkins (J. *Amer. Chem. Soc.*, 1942, 64, 1600—1603).—Unilayers of "octa-decane nitrile" on H₂O have min. area of 25.8 sq. A. at 15.1° and 18 dynes per cm., giving an extrapolated area of 30 sq. A. at zero pressure. Thus the CN group gives much less condensed films than CO_2H or OH, but the hypothesis that this is due to the greater size of CN is rejected. The pressure-area curves for the intermediate of CN is rejected. The pressure-area curves for the intermediate phase are much steeper than for long-chain acids, showing that nitriles are less compressible, and for the expanded phase they give areas at ow pressures characteristic of the liquid-expanded state. WRA.

Reactions on unimolecular films : ozonisation of double linkings. II. A. Nasini and G. Mattei (Gazzetta, 1941, 71, 302-311; cf. ibid., 1940, 70, 697).-A unimol. film of triolein on H₂O at const. superficial pressure, when treated with O₃ produced by a Hg-vapour lamp, increases in area. The velocity of this increase at various pressures shows that the reaction is in two phases; it is suggested that first O_2 is attached to the ester groups, and then O_3 to give an ozonide of the Harries formula, $\begin{array}{c} -CH-CH-\\ O'O'O \end{array}$. E. W. W.

Spreading experiments with insect viruses .- See A., 1942, III, 846.

Electrochemical properties of mineral membranes. V. Beidellite membranes and the determination of sodium. C. E. Marshall and

C. A. Krinbill (J. Amer. Chem. Soc., 1942, 64, 1814—1819).—Clay membranes have been prepared which are sensitive only to univalent cations (H-montmorillonite 490°); to uni- and bi-valent cations (H-montmorillonite 350°); and to uni-, bi, and ter-valent cations (H-beidellite 600°). Beidellite membranes give good reproducibility for Na determinations. The potentials obtained with solutions of concn. <0.03N. were within 1 mv. of those calc. by the Vernst equation. NaCl, Na₂SO₄, and Na₄Fe(CN)₆ gave practically the theoretical potentials, whereas Na citrate gave low vals. attributed to complex formation. The behaviour of mixtures of cations can be predicted and the mobility ratios of the cations of some mixtures within the clay membranes have been determined. The experimental and theoretical potentials for mixtures of cations agree satisfactorily. W. R. A.

Rubber photogels.-See B., 1942, II, 414.

Rubber-like elasticity, its nature and biological significance. E. Wöhlisch (J. pr. Ghem., 1942, [ii], 160, 217-241).—A discussion in which the elastic properties of rubber-like substances are contrasted with those of ordinary materials. Muscle belongs to the firstnamed group, and the consequences of this classification are considered. F, L. U.

Abstract and mathematical treatment of particle size degradation of cellulose. O. Eisenhut (Kolloid-Z., 1942, 99, 319).—A reply to Matthes (cf. A., 1942, I, 363). C. R. H.

Deformation and orientation of isotropic cellulose nitrate fibres. I. General, anisotropy, and X-ray spectrograms. II. Double refraction in the unswollen state. H. R. Kruyt, D. Vermaas, and P. H. Hermans (Kolloid-Z., 1942, 99, 244—251, 251—253).—I. In EtOH-COMe₂ mixtures the degree of swelling (q) of cellulose nitrate (I) increases with increase in the proportion of COMe₂, q increasing more rapidly when $[COMe_2]$ is >20%. Extensibility also shows a max. val. at this $[COMe_2]$. Orientation increases with the degree of stretch, the increase being greater for high vals. of q. Swelling and X-ray data show that the deformation properties of (I) are similar to those for cellulose hydrate (II).

II. The double refraction of (I) after swelling in EtOH-COMe₂ mixtures and drying increases with degree of stretch and with q. The data are similar to those for (II). C. R. H.

Swelling of cellulose acetate in aqueous phenol.—See B., 1942, II, 399.

Macromolecular compounds. CCCI. H. Staudinger (*J. pr. Chem.*, 1942, [ii], 160, 245-280).—Reply to criticisms by Ostwald [Kolloid-Z., 1940, 90, 370; 1942, 99, 121]. F. L. U.

Theory of solutions of high polymers. M. L. Huggins (J. Amer. Chem. Soc., 1942, 64, 1712—1719).—Theoretical equations derived for the activities of the components of a solution of chain mols. in a small-mol. solvent agree satisfactorily with experimental v.p., osmotic pressure, swelling pressure, and solubility measurements and only one const., μ_1 , partly due to heat of mixing, must be evaluated empirically. Equations for osmotic pressure as a function of composition account for the linear relationship obtained when the ratio of osmotic pressure to concn. is plotted against concn.; for long chains the slope of the line depends on μ_1 but not on chain length. The relationships for flexible chain mols. should also apply to flexible net-work mols. For vals. of $\mu_1 > a$ crit. val. the activity-composition curve indicates separation into two phases, one almost entirely small-mol. component and the other a gel of composition depending essentially on the val. of μ_1 . An equation for the solubility of a solid chain compound in a small-mol. liquid is given; it fits experimental data on the solubilities of $n-C_{34}H_{70}$ and $n-C_{69}H_{122}$ in decalin.

Effect of temperature and solvent type on the intrinsic viscosity of high polymer solutions. T. Alfrey, A. Bartovics, and H. Mark (J. Amer. Chem. Soc., 1942, 64, 1557-1560).—Vals. of η for a dil. solution of polystyrene or rubber depend markedly on the solvent and are high in a good solvent and low in a bad owing to changes in mean mol. shape. Vals. of η for cellulose acetate solutions are less sensitive to the nature of the solvent. Increased temp. lowers η of solutions of polystyrene or rubber in good solvents but increases η of solutions in bad solvents. Explanations are advanced and the relationship between inter- and intra-mol. agglomeration tendency is discussed. W. R. A.

Viscosity and cryoscopic data on polystyrene; Standinger's viscosity rule. A. R. Kemp and H. Peters (Ind. Eng. Chem., 1942, 34, 1097—1102).—The cryoscopic method is unsatisfactory for polystyrenes containing >12 styrene units in the chain, as their solutions do not obey Raoult's law. A new K_{em} val. of 0.45×10^4 , \ll that given by Staudinger (A., 1936, 295), is obtained for C_8H_8 solutions of polystyrene, for use in the equation $M = [\log (\eta/c)]K_{em}$. A K_{em} val. of 0.6×10^4 is also established for C_6H_8 solutions of polyindene.

Swelling and optical refraction of elastoidin fibres. Lecture experiment. W. J. Schmidt (*Kolloid-Z.*, 1942, 99, 254-258).—The physical properties of elastoidin fibres are reviewed. The prep. of fibres with a sharp line of demarcation between swollen and unswollen states, suitable for demonstrating the different physical properties of the two states, is described. Part of the fibre is fixed in Canada balsam, the other extends into the liquid to be adsorbed. C. R. H.

Valency of corpuscular proteins.—See A., 1942, III, 846.

Effect of urea on protein solutions.-See A., 1942, III, 846.

Casein in mixed dispersion media. B. Jirgensons (Kolloid-Z., 1942, 99, 314—319).—The amount of $COMe_2$ and alcohols required to coagulate Na caseinate (I) sols is inversely ∞ concn. of (I). The behaviour with dioxan is more complex. In presence of 0-1N-HCl or 0-2M-CaCl₂ the sols are unstable in presence of 1—20% of org. solvent but become more stable as the amount of solvent is increased to 70%. This stabilising action of the solvent is independent of the character of the solvent, acid (e.g., AcOH), neutral (e.g., alcohols), and basic (e.g., C₃H₅N) solvents being almost equally effective. C. R. H.

Precipitation processes. II. Relationship between precipitation phenomena and the fine structure of the electrokinetic double layer at silver chloride surfaces in aqueous sodium chloride solutions. B. Težak (Z. physikal. Chem., 1942, A, 190, 257—271; cf. A., 1936, 282).—The variation of the velocity of pptn. of AgCl from aq. AgNO₃ with varying [NaCl] has been followed by turbidity measurements in three spectral regions and the mean particle sizes in the ppts. are deduced. At 20° the pptn. curve (graph of turbidity at a definite time t after mixing against [NaCl]) shows two pronounced max. and min., the positions of which vary with the initial [AgNO₃] and with t. The observations are discussed and correlated with the structures of the electrokinetic double layer. J. W. S.

VI.—KINETIC THEORY. THERMODYNAMICS.

Complex ions. III. Spectrophotometric study of complex ions in solution. R. K. Gould and W. C. Vosburgh (*J. Amer. Chem. Soc.*, 1942, **64**, 1630—1634).—The following systems of pairs of ions have been investigated by the method of continuous variations : Fe^{···}-CNS'; Fe^{···}-o-phenanthroline; Ni^{··}-dithio-oxalate; Cu[·](Ni^{··})= NH₃·CH₂·CO₂'. The Cu^{··}-NH₄·CH₂·CO₂' system yields two compounds (1:1 and 1:2), whilst Ni^{··}-NH₂·CH₂·CO₂' yields a 1:3 compound and another (identity not established). W. R. A.

Thermodynamic study of bivalent metal halides in aqueous solution. IX. Activity coefficients of alkaline-earth metal bromides and iodides. R. A. Robinson (*Trans. Faraday Soc.*, 1942, 38, 445—447).—Osmotic and activity coeffs. at 25°, obtained by isopiestic v.p. measurements, are recorded for CaBr₂, CaI₂, SnBr₂, SrI₂, and BaI₂. F. L. U.

High mol. wt. aliphatic amines and their salts. VII. Systems octylamine-, dodecylamine-, and octadecylamine-water. A. W. Ralston, C. W. Hoerr, and E. J. Hoffman (*J. Amer. Chem. Soc.*, 1942, 64, 1516—1523).—The systems $C_{4}H_{12}$ ·NH₂- (I),

Ralston, C. W. Hoerr, and E. J. Holman (J. Amer. Chem. Soc., 1942, 64, 1516—1523).—The systems C_8H_{17} ·NH₂-(I), $C_{12}H_{25}$ ·NH₂-(II), and $C_{18}H_{27}$ ·NH₂-(III) H₂O have been investigated by phase rule methods and the following hydrates have been found : 2(I),3H₂O, decomp. —5·0°; (I),6H₂O, m.p. 35·6°; 3(II),2H₂O, decomp. 24·4°; (II),2H₂O, m.p. 36·5°; (II),4H₂O, decomp. 48·0°; 3(III),H₂O, decomp. 50·5°; and (III),2H₂O, decomp. 64·0°. W, R. A.

Binary system NaAlSiO₄-CaSiO₄.-See A., 1942, I, 380.

Thermal analyses with a hot-stage microscope. IV. Contact method for binary systems with incongruent melting compounds and partial miscibility of liquid phases. A. Kofler (Z. physikal. Chem., 1942, A, 190, 287-306; cf. A., 1942, I, 263).—The following binary systems have been examined microscopically at various temp. and eutectics and mol. compounds with their thermal characteristics are reported: anthracene-pictic acid, $p \cdot C_{\rm g} H_4({\rm NO}_2)_2$ - $C_1 H_7 \cdot {\rm NH}_2$, and carbazole-1:2:4:6- $C_6 H_2 {\rm Me}({\rm NO}_2)_3$. The partial miscibility of the liquid phases in the systems CHPh₃-m- $C_6 H_4({\rm OH})_2$. (NPh:)₂-H₂O, benzil-H₂O, and indole-H₂O has also been studied. I. W. S.

Ternary systems involving cyclohexane, water, and iso- and npropyl alcohols. E. R. Washburn, C. E. Brockway, C. L. Graham, and P. Deming (J. Amer. Chem. Soc., 1942, 64, 1886—1888),—The solubility relationships at 25° for the ternary system containing H_2O , cyclohexane, and $Pr^{\beta}OH$ have been determined. The system containing H_2O , cyclohexane, and $Pr^{0}OH$ has been investigated at 25° and 35° . W. R. A.

System Li₂O-BeO-B₂O₃. I. H. Menzel and S. Sliwinski (Z. anorg. Chem., 1942, 249, 357–385).—The formation and properties of Li₂O-BeO-B₂O₃ glasses have been studied. Glasses occur in a restricted region of the triangular diagram, between 100% B₂O₃ and \sim 65% B₂O₃, 25% Li₂O, 13% BeO. Outside this region partly devitrified or definitely cryst. products are obtained. The latter include *Be orthoborate*, 3BeO,B₂O₃, ρ^{25} 2.4. Data on ρ and n for the glasses, and on their resistance to H₂O vapour and transparency to X-rays, are given. F. J. G.

Heat of formation and high-temperature heat content of manganous oxide and manganous sulphate. High-temperature heat content of

manganese. J. C. Southard and C. H. Shomate (J. Amer. Chem. Soc., 1942, 64, 1770–1774).—At 25° the heats of formation of MnO and MnSO₄ are $\Delta H = -92,040\pm110$ and $-254,180\pm250$ g.-cal. per mol. The heat contents of Mn, MnO, and MnSO₄ have been determined from room temp. to temp. between 811° and 1500° and a transition in Mn at 739° has been found. The increments of heat contents, entropies, and free energies at 100° intervals have been tabulated from these and previous data. (Cf. A., 1942, I, 392.)

W. R. A.

Heats of organic reactions. XIII. Heats of hydrolysis of some acid anhydrides. J. B. Conn, G. B. Kistiakowsky, R. M. Roberts, and E. A. Smith (*J. Amer. Chem. Soc.*, 1942, 64, 1747–1752).—The heats of the hydrolytic reaction have been computed from heats of reaction in cohetication the been computed from heats of reaction in solution for straight-chain and 5-membered cyclic acid anhydrides. Ac₂O, (EtCO)₂O, (Pr^{β}CO)₂O, and (Bu^{γ}CO)₂O have the same heat of hydrolysis, showing no effect due to Me substitution. In the ring compounds Me substitution alters the heat of hydrolysis considerably. Symmetrical substitution of Me in (CH₂·CO)₂O decreases the heat of hydrolysis, whilst unsymmetrical substitution increases it. The heat of hydrolysis is also decreased by the presence of a double bond in the ring. These effects are discussed qualit-atively, and similarities to the trend of heats of hydrogenation of 5membered C ring compounds are indicated. W. R. A.

Entropy of monomeric forms of formic acid and acetic acid. J. O. Halford (J. Chem. Physics, 1942, 10, 582-584).—Combination of the entropy of HCO_2H vapour at its equilibrium v.p. with v.d. data gives 60.0 ± 0.3 for the entropy of monomeric HCO_2H at 25° and 1.5° and 1 atm., and 831 ± 0.3 for the dimeric form. In this substance there is an entropy deficiency of 3.7 ± 0.3 units due to hindrance of internal rotation. The val. for AcOH is corr. to 70.1 ± 1.0 . A. J. M.

VII.—ELECTROCHEMISTRY.

(A) Limiting equivalent conductances of aqueous potassium chloride between 15° and 40°. N.C.C.Li and H. Fang. (B) Limiting ionic mobilities of univalent ions between 15° and 45°. N.C.C. Li and W. Brüll (J. Amer. Chem. Soc., 1942, 64, 1544—1547, 1635—1637).—(A) Vals. of A of aq. KCl (0.0004—0.1x.) have been measured at 15°, 20°, 22°, 25°, 30°, and 40°. At high dilutions the experimental data follow closely the Onsager limiting slope. Only one empirical const. B is needed at other concns. Between 15° and 40° $\Lambda_0 \, cc \, \theta$. The variation with η is given by $A_0\eta_0^* = r$ (s <1). (B) Limiting mobilities of K' and Cl' ions at 15°, 25°, 35°, and 45° based on the conductance data of Li and Fang (see above) and the transference data of Allgood *et al.* (A., 1940, 1, 324) are tabulated. The limiting transference nos. of aq. NaCl and NaOAc, and the approx. vals. for the limiting ionic mobilities of Na^{*} and OAc' ions, are also given. The transference nos. calc. for NaCl solutions show

are also given. The transference nos. calc. for NaCl solutions show the necessity of obtaining accurate conductivity data not only at 25°, but also at different temp. W. R. A.

Formal oxidation-reduction potentials of thallous-thallic salts in aqueous hydrochloric acid solutions. Formation of chlorothallate complex ions. R. H. Hughes and C. S. Garner (J. Amer. Chem. Soc., 1942, 64, 1644–1648).—The oxidation-reduction potentials for TI-TI^{III} oxidation in HCl and in HCl-HClO₄ mixtures has been measured. In the mixed acids chlorothallate ions of the type TlCl₄' and TlCl₆''' are postulated. Thermodynamic consts. for the reaction Tl' + 2H' = Tl''' + H₂ have been computed. W. R. A.

Temperature coefficient of electrode potential of iron. L. V. Nikitin (J. Gen. Chem. Russ., 1941, 11, 146—148).—The potential of Fe anodes in aq. ZnSO₄, ZnSO₄ + H₂SO₄, FeSO₄, or K₂Cr₂O₇ + H₂SO₄ varies positively or negatively during subjection of the metal to deforming stresses. These effects are ascribed chiefly to temp. R. T. changes.

Oxidation-reduction potentials of the metmyoglobin-myoglobin system.—See A., 1942, III, 736.

Polarographic researches in non-aqueous medium. II. Cobaltous chloride in methyl alcohol and in a mixed solvent of methyl alcohol and benzene. G. Sartori (*Gazzetta*, 1941, 71, 263-268; cf. A., 1940, II, 362).—The deposition potential of Co at a Hg cathode from (red) solutions of CoCl₂ of varying concn. and LiCl in MeOH follows the Nernst logarithmic equation; dissociation of the [Co(MeOH),]" ion is thus rapid. Solutions in MeOH–C₆H₆ are blue (owing to reduction of dielectric const. by addition of C₆H₆), and deposition from these is regular, as from blue aq. solutions. E. W. W. from these is regular, as from blue aq. solutions.

Reduction of iodate and bromate at the dropping mercury electrode in neutral and basic media and the effects of salts on current-voltage curves. E. F. Orlemann and I. M. Kolthoff (J. Amer. Chem. Soc., 1942, 64, 1970–1977).—A relation exists in the reduction of iodate and bromate at the dropping Hg electrode in neutral or alkaline media between the potential, the current ratio, and the concn. of the indifferent cation. This relation does not hold in solutions of NMA B.— There is a linear relation between the second of the NMe, Br. There is a linear relation between the concn. of the different cations in the solution (with the exception of NMe,) and

the shift of the half-wave potential. The latter is slightly dependent on the drop time. A mechanism for the reduction of iotate and bromate in salt solutions is proposed. For iodate the following species are reduced : KIO₃, CsIO₃, Na₂IO₃^{*}, Li₂IO₃^{*}, BaIO₃^{*}, CaIO₃^{*}. W. R. A. on the drop time. A mechanism for the reduction of iodate and

Reduction of unsaturated hydrocarbons at the dropping mercury electrode. I. Phenyl-substituted olefines and acetylenes. H. A. Laitinen and S. Wawzonek (J. Amer. Chem. Soc., 1942, 64, 1765– 768).—The polarographic reduction of a series of Ph-substituted olefines and acetylenes has been investigated. The most suitable solvent is a 3:1 dioxan-H₂O mixture, with NBu₁I as a supporting solvent is a 3.1 domain 11.0 mixture, with vibult as a supporting electrolyte. Each compound gives a single reduction wave in neutral or alkaline media with a half-wave potential which is independent of $p_{\rm H}$. The diffusion current is ∞ the hydrocarbon concn. The polarographic method is useful in the detection and determination of olefines and acetylenes with activated double or triple bonds. The half-wave potential is suggested as a measure of the relative activation of ethylenic and acetylenic linkings by substituent groups. Equations of the rising portions of the waves for an olefine and an acetylenic hydrocarbon have been derived, and a reduction mechanism is suggested. The diffusion coeffs, of the hydrocarbons have been calc. from diffusion current data. W. R. A.

VIII.—REACTIONS.

Influence of water vapour on flame gas temperatures. W. T. David and J. Mann (*Nature*, 1942, 150, 521-522).—For H_2 -air flames at any given H_2 content the moist flame gas temp. is $40^{-50^{\circ}}$ > the dry flame gas temp. instead of 15° lower (calc.). Quartzcovered Pt wires were used; the Na line reversal method is unreliable. A. A. E.

Radiation from flames. W. T. David (Nature, 1942, 150, 407-408) .- Helmholtz' observation that the radiation from CO flames is > that from H, flames is attributable to the more rapid cooling of the products surrounding the outer cone of H₂ flames due to more rapid combustion and greater turbulence. Decrease in radiation from the flame on pre-heating the burner gases is similarly explained. A. A. E

Condition of freshly burnt gases. A. G. Gaydon (*Nature*, 1942, 150, 481-483).—A review and discussion. It is concluded that the after-burning and other peculiarities of the combustion of dry CO are best explained in terms of vibrationally activated mols., and cannot well be due to CO_2 mols. of abnormal structure. The persistence of radicals and reactive intermediary products of the combustion may explain some of the abnormalities of "live" flame A. A. E. gases.

Oxidation of n-butylboron. O. Grummitt (*J. Amer. Chem. Soc.*, 1942, **64**, 1811—1814).—In the presence of dry O₂ *n*-butylboron oxide, (Bu^aBO)₃, is quantitatively oxidised and depolymerised to monomeric Bu^aBO₂. There is evidence for the intermediate formation of a peroxidic substance. A suggested reaction mechanism could not be confirmed by rate measurements because the kinetics were complex. NHPh-C₁₀H₇- β retards the oxidation but quinol does not does not. W. R. A.

Kinetics of thermal reaction between hydrogen and cyanogen. N. C. Robertson and R. N. Pease (J. Amer. Chem. Soc., 1942, 64, 1880—1886).—The thermal reaction of H_2 and (CN)₂ to give HCN has been studied in a SiO₂ vessel from 550° to 675°. The nature of the surface of the reaction bulb has some influence on the rate. HCN inhibits the reaction. At low temp, the rate is increased by packing, but this has little effect above 625°. The Bodenstein-Lind expression for the combination of H_2 and Br fits the kinetics at 625° fairly well. Evidence is given which favours a radical chain mechanism involving gas-phase propagation by H atoms and CN radicals with chains starting and breaking on the walls. The steps in this process would starting and breaking on the wans. The steps in $(CN)_2$ replacing the be analogous to those in the H₂-Br reaction with $(CN)_2$ replacing the W. R. A.

Decomposition of cyclohexene oxide and $\Delta^{1:3}$ -cyclohexadiene from the viewpoint of the principle of least motion. F. O. Rice and A. L. the viewpoint of the principle of feast motion. F. O. Rice and A. L. Stallbaumer (J. Amer. Chem. Soc., 1942, **64**, 1527-1530).-Org. decomp. from the viewpoint of the principle of least motion should give rise to relatively few single-step reactions. cycloHexene oxide when heated is rearranged to cyclohexanone and decomposed to $H_{\rm g}O$ and a hydrocarbon, probably $\Delta^{1:4}$ -cyclohexadiene. $\Delta^{1:3}$ -cyclo-Hexadiene yields $H_{\rm g}$ and $C_{\rm g}H_{\rm g}$. W. R. A.

Derivation of general kinetic equation for reaction between ions and dipolar molecules. E. S. Amis and G. Jaffé (*J. Chem. Physics*, 1942, 10, 598-604).—The Debye-Hückel theory of the ionic atm. is extended to the case of dipoles surrounded by ions, and the theory is combined with Onsager's theory of electric moments of mols. in liquids. The result is applied to the deduction of a general kinetic equation for reaction between ions and dipolar mols, which is in satisfactory agreement with experimental data on the dependence of the rate of reaction on concn. and dielectric const. A. J. M.

Variation of reaction mechanism with surface conditions in reduction of silver salts by hydroxylamine. T. H. James (*J. Chem. Physics*, 1942, **10**, 464—468).—The effects of ageing of the ppt., addition of gelatin or pinacyanol, admixture of AgBr with the ppt., and presence of CNS', Br', and I' on the reduction of AgCNS by NH₂OH at $p_{\rm H}$ 10·2—10·8 have been examined. The proportions of N₂ and N₂O in the gaseous product depend markedly on the effect of the above factors on the surface condition of the AgCNS. Small additions of Br' or I' greatly decrease the yield of N₂O; ageing a fresh ppt. mcreases it. The results are consistent with the formation of N₂O by uncatalysed reduction of Ag⁺ by NH₂OH, and of N₂ by the Agcatalysed reaction involving adsorption of Ag⁺. L. J.

Solvent effects on the kinetics of ionic reactions and the choice of the concentration scale. H. G. Davis and V. K. LaMer (J. Chem. Physics, 1940, 10, 585–597).—The mol fraction scale is preferable to the vol. molar scale for the calculation of kinetic data, such as the relations between variables when solvents are changed. The reaction between S_8O_3 '' and $CH_8Br\cdot CO_3$ ' is investigated. Temp. coeffs, have been determined for the reaction in several isodielectric solvents, and are discussed as criteria of electrostatic and non-electrostatic effects. The solubility of TICI has been determined; it does not depend alone on the dielectric const. The use of the mol. fraction scale also gives simple results in connexion with the effect of η on the quenching of fluorescence. A. J. M.

Mutual transformation of sulphato- and aquo-pentamminocobaltic sulphates in presence of dilute sulphuric acid. B. Adell (Z. anorg. Chem., 1942, 249, 251—262).—Equilibrium consts. and velocity coeffs. are recorded for the reaction $[Cr(NH_3)_5SO_4]' + H_2O$ $\approx [Cr(NH_3)_5H_2O]''' + SO_4'' at 25^\circ$. F. J. G.

Hydration of isobutene in dilute nitric acid. G. H. Lucas and L. P. Hammett (J. Amer. Chem. Soc., 1942, 64, 1938—1940).—The distribution of products in the reaction of $Hg(NO_3)_2$ with $Bu^{\nu}Cl$ in various dioxan- H_2O mixtures has been studied. The rate of disappearance of isobutene in dil. HNO₃ decreases rapidly with increasing amount of dioxan. Experimental data show that $Bu^{\nu}NO_3$ is not an intermediate in the hydration of isobutene in dil. HNO_3 and that the pronounced acceleration produced by NO_3' ion is a salt effect. W. R. A.

Rate and mechanism in the reactions of *tert*.-butyl nitrate and of benzyl nitrate with water and with hydroxyl ion. G. R. Lucas and L. P. Hammett (J. Amer. Chem. Soc., 1942, **64**, 1928—1937).—The reactions of Bu'O·NO₂ and of CH₂Ph·O·NO₂ (I) with H₂O and NaOH have been studied in various dioxan-H₂O mixtures. The reaction of Bu'O·NO₂ gives alcohol and olefine in proportions similar to those in which they are formed from Bu' halides, and since the energies of activation of nitrate and halide reactions are almost identical, the same mechanism is strongly indicated. No appreciable reaction with OH' ion or catalysis by acids has been noticed. OH' ion retards, whilst ClO₄' ion accelerates and other ions have intermediate effects which parallel their effect on the activity of H₂O in the medium. This weakens the direct kinetic argument of Ingold and Hughes and of Beste and Hammett for a free carbonium ion intermediate in solvolytic reactions. The solvolysis of (I) to CH₂Ph·OH has a much higher energy and entropy of activation than the analogous reactions of CH₂PhCl, suggesting that the reaction of (I) is more a true solvolysis than a displacement of anion by H₂O mol, than is the reaction of CH₂PhCl. OH' ion gives a considerable acceleration, but acids have no effect. The conversion of (I) into PhCHO and nitrite also shows a kinetically first-order reaction of (I) and a second-order reaction with OH' ion, both being completely suppressed by the addition of quinol. W. R. A.

Velocity of transformation of hydroxymethylene ketones into benzene derivatives. R. Kaushal, (Miss) S. Sovani, and S. S. Deshapande (J. Indian Chem. Soc., 1942, 19, 107—116).—Determinations of the residual ketone at various time intervals indicate that the condensation of COMe·CH₂·CHO (I) and CH₂Bz·CHO (II) in presence of a small amount of HCl or H₂SO₄ to yield C₈H₆ derivatives is a termol. reaction. The corresponding compound (III) formed by interaction of COMeEt and HCO₂Et in the presence of Na undergoes no condensation. The reaction with (I) and (II) is attributed to enolisation to the CHIC(OH) grouping, so it is inferred that (III) has the structure COMe·CO·CHMe·CHO. J. W. S.

Co-polymerisation of alkyl acrylates and maleates.—See A., 1942, II, 391.

Chemical war materials. XXV. Hydrolysis of compounds with a structure similar to that of mustard gas. H. Mohler and J. Hartnagel (*Helv. Chim. Acta*, 1942, 25, 859-863).—The rates of hydrolysis of various Cl-substituted ethers and thioethers have been measured at 20°. a-Cl-compounds are much more rapidly hydrolysed than are β -Cl-compounds. (Cl-[CH₂]₂)₂O (I) is much less rapidly hydrolysed than is (Cl-[CH₂]₂)₂S (II), this being attributed to the sharing of all electron pairs of the O atom of (I) in aq. or EtOH solution by co-ordination, thus making it similar to (Cl-[CH₂]₂)₂SO and (Cl-[CH₂]₂)₂SO₂. It is suggested that (II) has a greater vesicant

action than the other compounds investigated because it is stable enough to penetrate the skin but then undergoes hydrolysis. I. W. S.

Autoxidation of oxygen-active acids. IV. Refractometric analyses of addition of oxygen to the methyl esters.—See A., 1942, II, 392.

Theory of oxidation and tarnishing of metals. II. Growth laws under more general conditions.—See B., 1942, I, 483.

Catalysis of the thermal decomposition of acetaldehyde by hydrogen sulphide. W. L. Roth and G. K. Rollefson (J. Amer. Chem. Soc., 1942, 64, 1707—1711).—The thermal decomp. of McCHO, catalysed by H₂S, yields CO and CH₄ in equiv. amounts and there is no net loss of H₂S. The decomp. is homogeneous and initial rates, given by $-d[MeCHO]/dt + k_1[H_2S][MeCHO] + [H_2S][MeCHO]/(1 + k_2[MeCHO]), increase rapidly with rising temp. in the range 713—787° K. The consts. of the equation have been evaluated. Analysis failed to give any indication of intermediate steps in the catalysis and addition of H₂, S, COS, MeSH, Me₂S, and H₂O gave results indicating that none of them act as important intermediates in the reaction. Admixture of NO and H₂S gave a more powerful catalyst than either used separately. W. R. A.$

Detection and inhibition of free radical chain reactions. I. Comparison of nitric oxide and propylene as inhibitors. II. Inhibition curves for the thermal decomposition of diethyl ether in presence of propylene. III. Inhibition curves for the thermal decomposition of propaldehyde in presence of propylene. IV. Influence of propylene and of nitric oxide on the thermal decomposition of acetaldehyde. V. Comparison of a series of aldehydes. J. R. E. Smith and C. N. Hinshelwood (*Proc. Roy. Soc.*, 1942, A, 180, 237-241, 242-243, 244-246, 246-252, 253-256).—I. The reduction by C_8H_6 of the rate of pressure increase in the decomp. of EtCHO at 550° is shown to represent a true inhibition of the reaction, and not an induced polymerisation of the C_8H_6 . With EtCHO and with Et₂O the limiting vals. to which the decomp. rates are reduced by NO and C_8H_6 are the same. It is concluded that these rates are probably those of independent non-chain processes, rather than those characteristic of stationary states where the inhibitor starts and stops chains with equal efficiency.

II. The curves showing the inhibition of Et_9O decomp. as a function of [NO] are independent of the initial pressure of Et_9O . With C_9H_6 the initial pressure of Et_9O strongly affects the inhibition curve. The contrast is explained by a difference in the ease with which two types of radical combine with NO and C_9H_6 respectively. III. The inhibited reaction is of an order between the first and

III. The inhibited reaction is of an order between the first and the second. The inhibition curves, like those of the $Et_2O-C_3H_8$ system, depend on the initial pressure of EtCHO.

IV. The rate of pressure increase during decomp. is diminished by C_3H_6 and direct chemical analysis shows that this is due to a real decrease in the reaction rate. Re-examination of the effect of NO shows that an inhibition may have been masked by a superimposed catalytic effect.

V. The hypothesis that C_3H_6 and NO repress radical chains, leaving an independent mol. reaction, gives a coherent picture of the decomp. mechanism of simple aldehydes. G. D. P.

Catalysed polymerisation of methyl methacrylate in the liquid phase. R. G. W. Norrish and R. R. Smith (*Nature*, 1942, **150**, 336—337).—Much of the increase in reaction rate observed during polymerisation cannot be attributed to rise in temp. but is probably not due to increase in the rate of initiation of centres since the chain length of polymeride increases. Results for polymerisation in presence of diluents support the view that increasing bulk viscosity is responsible for the rise in rate and chain length in that it decreases the rate "constant" of termination of chains. A. A. E.

Peroxide-catalysed interaction of oxalyl chloride with the sidechains of aralkyl hydrocarbons. Relative reactivity of free radicals.— See A., 1942, II, 393.

Catalysis of dichromate-hydriodic acid reaction by oxalate ion. C. R. Viswanadham and G. Gopalarao (Current Sci., 1942, 11, 102-103).—C₂O₄" (atalyses the reaction between Cr₂O₇" and I', and in presence of C₂O₄" (~0.01n.) K₂Cr₂O₇ can be determined iodometrically at low [H']; reactions between C₂O₄" and I or Cr₂O₇" do not interfere. Citrates and tartrates are less effective catalysts; succinates have no effect. A. J. E. W.

Autoxidation of manganous hydroxide. A. R. Nichols, jun., and J. H. Walton (J. Amer. Chem. Soc., 1942, 64, 1866—1870).—The rate of autoxidation of $Mn(OH)_2$ in ammoniacal solution decreases with increasing $[NH_4CI]$ but an induction period exists when $[NH_4CI]$ is high. The reaction is accelerated and the induction period eliminated by adding powdered MnO_2 , SnO_2 , Fe_2O_3 , Pb_2O_4 , ground glass, and diatomaceous earth. In the presence of PbO₂ no autoxidation of Mn^{II} occurs. CoCl₂ and CuCl₂ accelerate the reaction, whilst glycerol, dextrin, and I retard it. A large no. of other substances have no effect. The autoxidation of $Mn(OH)_2$, does not induce the oxidation of $Na_2C_2O_4$, HCO_2Na , Na_2ASO_3 , $NaNO_2$, or $CH_2:CH-CH_2:OH$. The autoxidation by air is much slower and less complete than that

by pure O2. The autoxidation of Mn(OH)2, pptd. by fixed alkali, is very rapid, and the product depends on the proportions of Mn" ion and alkali and the temp. The X-ray diffraction patterns of the products have been studied. The autoxidation of $Mn(OH)_{2}$ pptd. by $N[[CH_2]_2 \cdot OH]_3$, is very slow, and does not display the induction period encountered in ammoniacal solution. A mechanism has been proposed to account for the results. W. R. A.

Olefine rearrangements. Equilibrium of olefines from pinacolyl alcohol. R. K. Smith (J. Amer. Chem. Soc., 1942, 64, 1733— 1735).—From thermal data on $\beta\gamma$ -dimethyl- Δ^a - and $-\Delta^\beta$ -butene, $\gamma\gamma$ -dimethyl- Δ^a -butene, and $\beta\beta$ - and $\beta\gamma$ -dimethylbutane, the equili-brium mixture of these olefines in the dehydration products of CHMeBu^γ-OH has been calc. Their rearrangement using acidic catalysts agrees with thermodynamic vals. Comparison of dehydr-ations with acidic catalysts and with those which do not furnish H ations with acidic catalysts and with those which do not furnish H ions indicates that the latter act by removing an equiv. of H2O but do not affect the isomerisation of compounds formed. H^{*} ion catalytically promote isomerisation. W. R. A. catalytically promote isomerisation.

Ageing of sodium chloride precipitates. C. Racz (Compt. rend., 1942, 214, 30-31).—The activating effect of solid NaCl on crystalloluminescence of the aq. solution (ibid., 1941, 212, 604) decreases on keeping, the ageing process having an apparent activation energy of 11-5 kg.-cal. The effect of the solid is ascribed to partly-developed nuclei on the crystal faces. A. J. E. W.

Mechanism of the catalytic conversion of para-hydrogen on nickel, platinum, and palladium. A. Farkas and L. Farkas (J. Amer. Chem. Soc., 1942, 64, 1594-1599).—The catalytic conversion of p-H₂ on evaporated layers of Ni, Pd, and Pt at room temp. at ~0.01 mm. has been investigated. A stable layer of H₂ on the catalysts, which is not removed by pumping at room temp. but readily exchanges with mol. H₂ and D₂, gives a measure of the no. of active centres on the catalyst and $\approx 10^{14} - 10^{15}$ per sq. cm. The rate of exchange \approx rate of p-H₂ conversion on Ni, but is smaller on Pd and Pb. Possible mechanisms are discussed. W. R. A.

Catalysis by alloys. VII. Hydrogenation activity of mixed nickel-copper catalysts. G. Rienäcker and R. Burmann (J. pr. Chem., 1941, [ii], 158, 95–108).—The efficiency of mixed crystal Ni-Cu catalysts for hydrogenation of CHPh:CH·CO₂H in aq. EtOH is increased by suspension on kieselguhr (9 pts.) if the Ni content of the catalyst is <95% for equal wts. of catalyst or <40% for equal wts. of metals, but for lower Ni contents the efficiency is unaffected or decreased. The mixed-crystal nature of the catalysts is proved by X-ray spectra. This supports the view that catalest of bid by X-ray spectra. This supports the view that catalysts of high Ni content have a few spots of high activity, their no. being increased by the support, whereas those of low Ni content have many spots of low activity. R. S. C.

Recovery of nickel catalysts poisoned during desulphurisation of Ischimbaev crude oils.—See B., 1942, I, 452.

Chemical action of electric discharges. XXIX. Peculiarities of the spectra of arcs operating at high or low frequency in gaseous mixtures containing water vapour, nitrogen, and oxygen. B. P. Susz, H. Hoefer, and E. Briner. XXX. Influence of diluent gases in the production of ozone by an ozoniser discharge in oxygen. E. Briner and (MIle.) B. Bever (Helv. Chim. Acta, 1942, 25, 889-892, 900-906) .--- XXIX. The emission spectrum of a high- or low-frequency arc in mixtures of N_2 , O_2 , and H_2O vapour shows the presence of H, N_2^+ , NO, OH, and CN particles. The frequency of the arc has little effect on the spectrum. The observations support the view that fixation of N occurs through the production of NO from N_2^+ and subsequent reaction of NO with OH to yield HNO_2 .

XXX. The yields of O3 obtained by the action of an ozoniser XXX. The yields of O_3 obtained by the action of the second discharge in pure O_2 and in O_2 containing various inert gases have been measured. The yields are > would be expected if the added gases acted only as diluents and these gases appear to facilitate the production of O_3 in the order $CO_2 > N_2 > He > Ne > A$. J. W. S.

Influence of diluent gases in the production of ozone by ultra-violet radiation. E. Briner and G. Papazian [with H. Karbassi] (*Helv. Chim. Acta*, 1942, **25**, 892–900).—The yield of O_3 obtained (first, Chini, Atta, 1942, 20, 892–900).—The yield of O_2 obtained during irradiation with a Hg-vapour lamp is much greater when the O_2 is mixed with CO_2 than when mixed with N_2 . With a mixture containing 20% of CO_2 the yield is slightly > in pure O_2 . This behaviour is interpreted by assuming that the diluent mole, absorb energy which would otherwise tend to cause decomp. of the O_3 mols. J. W. S.

Oxidation processes. XIV. Effect of silver on the autoxidation of photographic developing agents. A. Weissberger and D. S. Thomas, jun. (J. Amer. Chem. Soc., 1942, 64, 1561-1567).—Absorp-tion of O₂ by quinol at various rates of shaking has been investigated in order to re-determine the conditions under which the concn. of O_2 in the liquid phase remains const. The rate of autoxidation of quinol between $p_{\rm H}$ 7 and 8.2 increases with [OH']^{ob} and is only very slightly accelerated by Ag. Autoxidation of $o-C_{g}H_{4}(OH)_{g}$, $p-NH_{2}\cdot C_{g}H_{4}\cdot OH$, and glycine is only slightly accelerated by Ag, indicating that the catalysis suggested by Volmer (B., 1921, 239) is unlikely. On the other hand the autoxidation of $p \cdot C_6 H_4(NH_2)_1$ and $p \cdot NH_2 \cdot C_6 H_4 \cdot NMe_2$ is considerably catalysed. Addition of Ag diminishes greatly the total amount of O_2 absorbed by developing agents in alkaline solutions on account of the catalytic effect of Ag on reactions of peroxide formed in the autoxidation.

WRA

Acyclic acids. A. da Silveira Ramos (Anais Assoc. Quim. Brasil, 1942, 1, 55-72).—The sensitivity to light of AgOAc, EtCO₂Ag, and Pr^aCO₂Ag is analogous to the ultra-violet absorption of the corresponding acids. F. R. G.

Vapour-phase photo-decomposition of methyl formate. D. H. Volman (J. Amer. Chem. Soc., 1942, 64, 1820-1821).-MeOH is formed by the photolysis of HCO₂Me. The decomp. quantum for the photolysis of recent results in the determined by the photolysis $\infty 0.75$ for an ester pressure of 75.0 mm, at 25°. The reaction products have the following average % vals.: H₂, 9.5; CO, 40.0; CH₄, 6.0; CO₂, 14.8; C₂H₆, 1.1; MeOH, 29.0. W. R. A.

Photochemical formation of dichloro- and dibromo-ethane from ethylene and chlorine or ethylene and bromine. H. Schmitz, H. J. Schumacher, and A. Jäger (Z. physikal. Chem., 1942, B, 51, 281-305).—The photochemical reaction of C_2H_4 with Cl_2 between 25° and 40° at 4538 A. is homogenous and occurs according to $d[C_2H_4Cl_2]/dt = k[I_{abs}]^{1/2}[Cl_2][C_2H_4]^{1/2}$. $C_2H_4Cl_2$ is formed almost quantitatively. The quantum yield, γ , is ~10°. The reaction is very sensitive to the presence of impurities and is inhibited by O_2 . The temp, coeff. is ~1 per 10°. The reaction of C_2H_4 with Br_2 between 60° and 80° at 5460 A. is homogenous and gives $C_2H_4Br_2$ almost quantitatively. At low pressures $d[C_2H_4Br_2]/dt = k_1T_{abs}$. $P[C_2H_4][Br_2]/([Br_2] + k'')$, at high pressures $d[C_2H_4Br_2]/dt = k_1T_{abs}$. $P[C_2H_4][Dr_2]/([Br_2] + k'')$, where P is the total pressure. The pressure influence of inert gases is sp. O_2 inhibits the reaction; no measurable oxidation of C_2H_4 occurs. The temp, coeff. is small and negative. γ is ~10°. Mechanisms are proposed O. D. S. Photochemical production of branched carbon chains from ether 305) .- The photochemical reaction of C2H4 with Cl2 between 25°

Photochemical production of branched carbon chains from ether and formaldehyde.—See A., 1942, II, 389.

Effect of light on riboflavin solutions .- See A., 1942, III, 909.

Effect of strong electric fields on radiochemical decomposition of gaseous ammonia. M. J. McGuinness, jun., and H. Essex (J. Amer. Chem. Soc., 1942, 64, 1908–1911).—Ion yields in the a-ray decomp. of gaseous NH₃ at 25° and 20 cm. have been determined over a wide range of field strengths. No ion recombination occurs in the absence of a field. The increase in ion field at high field strengths is attributed to electron collisions, which are assumed to result in direct and resonance splitting of the NH_3 mol. The splitting of an NH3 mol. on collision with an electron does not usually involve electron attachment. W. R. A.

Ionisation and dissociation by electron impact: ethane, *n*- and *iso*-butane. D. P. Stevenson and J. A. Hipple, jun. (J. Amer. Chem. Soc., 1942, 64, 1588—1594).—The dissociation products of C_2H_4 and *n*- and *iso*- C_4H_{10} as a result of electron impact have been examined by the mass reactrometer and their relationships. examined by the mass spectrometer and their relative abundances are discussed as a function of the energy of the bombarding electrons. The crit, potentials of some of the processes have been measured and their significance is discussed. Limitations of the mass spectrometer as an analytical tool are considered. W. R. A.

IX.—METHODS OF PREPARATION.

Isomorphous kinds of apatite. P. Dihn and R. Klement (Z. Elektrochem., 1942, 48, 331-333). By sintering the components Elektrochem., 1942, **43**, 331—333.—By sintering the components $[Ca_3(PO_4)_2, Ca_2SiO_4, CaSO_4, CaF_2, Na_2SO_4]$ at 1200°, substances having the apatite structure but with PO₄''' partly or completely replaced by SiO₄''' and/or SO₄'' may be obtained. If SiO₄'''' + SO₄'' replaces 2PO₄''', no change in the cations is necessary; otherwise the charges must be equalised by partly replacing Ca'' by Na'. In some instances structures with 11 metallic ions instead of 10, and the apatite structure, may be obtained, and in many instances by working in presence of H₂O vapour F' may be replaced by OH'. F. Ì. G.

Is carbonate-apatite formed in aqueous systems? R. Klement, F. Hüter, and K. Köhrer (Z. Elektrochem., 1942, 48, 334-336).--Ppts. obtained from aq. solutions containing Ca. and PO₄... in presence of varying quantities of $CO_3^{\prime\prime\prime}$ are mixtures of hydroxyl-apatite and $CaCO_3$. Carbonate-apatite is not formed under these conditions. F. J. G.

Processes of transformation and reaction occurring before and during the formation of zinc iron spinel from β -zinc hydroxide containing carbonate and y-iron hydroxide. II. Thermal behaviour of the mixture of labelled β -zinc hydroxide. II. Internal of enaytour of W. Schröder [with H. Schmäh] (Z. Elektrochem., 1942, 48, 301— 311).—The changes occurring when γ -FeO·OH (I) and β -Zn(OH)₂ (II) containing Ra-Th and a little CO₂ are heated together have been studied by the emanation (III) method. Merely on mixing there is a machine in the mixed of (III) there is a marked increase in the yield of (III). This is because

atoms of (III) stopped by collision with (I) are more easily given up, owing to its lower degree of crystallisation, than those stopped by (II). On heating the dissociation of (II) and of $ZnCO_s$ is not by (II). On nearing the dissociation of (II) and of ZhO's is not affected by the presence of (I). Recrystallisation of ZhO begins at $\sim 120^{\circ}$ and the X-ray interferences of γ -Fe₃O₃ appear at 400° and those of a-Fe₂O₃ at 500°. Change in the yield of (III) in this temp, range corresponds with the formation of the unstable intermediate stage, and there is a sharp max. of the yield of (III) at 730°. Above this temp, recrystallisation of ZnFe₂O₄ occurs.

F. Pure mercury. E. Wichers (News Ed. Amer. Chem. Soc., 1942, 20, Ill1).—Observation of the surface of Hg is the most sensitive method of determining purity, as "tailing" or film formation occurs with 0.1 p.p.m. of base metals. Details of purification methods are given. D. F. R.

Mercury methyl iron tetracarbonyl. F. Hein and E. Heuser (Z. anorg. Chem., 1942, 249, 293-298).—Hg Me Fe tetracarbonyl, $(HgMe)_2Fe(CO)_4$, has been obtained by the interaction of a solution of $Fe(CO)_4H_2$ in aq. Ca(OH)₂ with aq. HgMe·OH. It has m.p. $100-102^{\circ}$ (slight decomp.), is sol. in org. solvents but insol. in H₂O, and when kept or warmed undergoes a slow disproportionation to $HgMe_2 + HgFe(CO)_4$. F. J. G.

Constitution of mannitozirconic and mannitoferric acids. A. Tchakirian (Compt. rend., 1942, 214, 27-29; cf. A., 1940, I, 79).— The ppt. obtained on addition of NaOH to aq. ZrOCl₂ containing mannitol (I) is sol. in a slight excess of NaOH, owing to formation maintrol (1) is sol. in a slight excess of NaOH, owing to formation of a complex with the approx. composition $[Zr_{10}O_{21}(C_eH_{14}O_e)_n]''.$ [a] for the solutions is max. with $[(I])/[ZrOCl_2] < 2$; the solutions exhibit mutarotation. Other polyhydroxylic compounds give similar results. $[Fe_{18}O_{25}(C_eH_{14}O_e)_n]'''$ is similarly formed, and may be used to separate Fe from In etc. The Zr complex is de-composed by addition of aq. NH₃ to a boiling solution acidified with HCl, but boiling with Cu or Fe^H carbonate is necessary with the Fe complex the Fe complex. A. J. E. W.

Preparation and properties of potassium oxalatostannate. H. H. Willard and T. Y. Toribara (*J. Amer. Chem. Soc.*, 1942, **64**, 1759—1761).—Sn is dissolved directly in $H_2C_2O_4$ using H_2O_2 as an oxidising agent. Cryst. *K oxalatostannate* has the formula $K_8Sn_2(C_2O_4)_{7,4}H_2O_7$. The titration of a solution of K oxalatostannate with KOH has been The order of a solution of a

Complex dioxalatothiometastannates. H. H. Willard and T. Y. Toribara (*J. Amer. Chem. Soc.*, 1942, **64**, 1762–1765).— K_2 di-oxalatothiometastannate, $K_2SnS(C_2O_4)_2$, $2H_2O$ (**I**) has been isolated. It is stable enough to allow removal of all H_2O of hydration. The solubilities of (I) in H_2O have been measured at 0° and 25° , and the $p_{\rm H}$ of aq. solutions of various concn. has been determined. The reactions of an aq. solution of (I) with various cations have been investigated. Attempts have been made to determine the concn. of the sulphide ion by e.m.f. measurements in solution of (I) with W. R. A. a Ag-Ag₂S electrode.

Lead oxides. VI. Effect of grinding on the X-ray diffraction patterns of mixtures containing lead oxides. G. L. Clark and S. F. Kern (J. Amer. Chem. Soc., 1942, 64, 1637—1641).—When PbO₂ is ground with either red (tetragonal) or yellow (orthorhombic) PbO the characteristic X-ray diffraction lines of PbO disappear, but when PbO is ground with an abrasive the lines persist. No oxidation of PbO accurs and formation of a solid solution of PbO of PbO to PbO_2 occurs, and formation of a solid solution of PbO in PbO_2 or a compound is unlikely. CO₂ absorption is abnormally high after grinding the oxides in air, indicating increased activity of PbO when produced in the distorted form. The diffracting power of PbO is diminished by grinding with PbSO₄, but with PbI₂ t persists owing to the lubricating and protecting action of PbI, on PbO which prevents distortion of PbO. W. R. A.

Production of lead chromate from lead oxide .- See B., 1942, II, 410.

Corrosion of lead and iron by solutions of potassium chloride containing sodium chloride, potassium chlorate, and sodium hydroxide.-See B., 1942, I, 481.

Salts and complex compounds of nitrilotriacetic acid. H. Brint-zinger and G. Hesse (Z. anorg. Chem., 1942, 249, 299-307).—The following compounds derived from nitrilotriacetic acid, N(CH2+CO2H)3,

Condensed phosphoric acids. P. Bonneman-Bémia (Ann. Chim., 1941, [xi], 76, 395—477).—Of the compounds $Na_4P_2O_7,nNaPO_3$ possible, only $Na_5P_3O_{10}$ (I) could be obtained by heating $Na_4P_2O_7$ with $NaPO_3$. Attempts to prepare higher members of the series resulted in mixtures. (I) has been identified by its X-ray and Parmer action with $NaPO_3$. Raman spectra and cryoscopically in Na₂SO₄,10H₂O. It is formed at a lower temp. by heating NaH₂PO₄, Na₂HPO₄ and NH₄NO₅, or

NaRHPO₄ or NaR₂PO₄ (R = Me or Et). (I) forms hydrates, Na₅P₃O₁₀, 6H₂O and Na₅P₃O₁₀, 8H₂O, which lose H₂O at ~120°, reverting to Na₄P₂O, and NaPO₃. With H₂O₂, it yields the com-pound, Na₅P₃O₁₀, 2H₂O₂, H₂O. The compounds, Na₂ZnP₃O₁₀, 11·5H₂O, Na₈Pb(PaO₁₀)₂, 14H₂O, Pb₅(P₃O₁₀)₂, Na₅CdP₃O₁₀, 12H₂O. NaCd₂P₃O₁₀, 7H₂O, NaCa₂P₃O₁₀, 4H₂O, NaSr₂P₃O₁₀, 12H₂O, Sr₅(P₃O₁₀)₂, Na₂CrP₃O₁₀, 6H₂O, Mn₅(P₃O₁₀)₂, NaBe₂P₃O₁₀, 5H₂O, and Be₆(P₃O₁₀)₂, have been prepared from (I) by double decomp. K₃P₃O₁₀ is also described. The existence of A, A', and B forms of (NaPO₃)₂ and of (NaPO₃)₄ has been confirmed. (NaPO₃)₄ passes into (NaPO₃)₃, when heated at >350°. (NaPO₃)₂, could not be prepared by the method of Travers and Chu (A., 1934, 854) but has been obtained by heating NaRHPO₄ at low temp. It is more reactive than (NaPO₃)₃ and tends to absorb H₂O yielding Na₈H₂P₂O₇. Both A and B forms of (NaPO₃)₃, with H₂O₂ yield the same stable compound (NaPO₃)₃, H₂O₂. No insol. (NaPO₃)₃ is obtained on heating NaRHPO₄ but KEtHPO₅ after heating at 500° yields a product of approx. composition (KPO₃)₃. J. W. S.

Aquo-ammono-phosphoric acids. III. N-Substituted derivatives of hosphoryl and thiophosphoryl triamide as hydrogen bonding agents. I. F. Audrieth and A. D. F. Toy (*J. Amer. Chem. Soc.*, 1942, 64, 1553—1555).—*Phosphoryl triamides* have been prepared from NH₂Ph, CH₂Ph·NH₂, NHPh·NH₂, morpholine, *o*- and *p*-C₄H₄Me·NH₂, *cyclohexylamine*, and *p*-phenetidine, and *thiophosphoryl amides* of piperidine, morpholine, and *cyclohexylamine*. These amides are much more sol. in CHCl₃ than in CCl₄, denoting that their O and N atoms are capable of acting as donor atoms in solvents like CHCl. atoms are capable of acting as donor atoms in solvents like CHCl₃ with which they form H-bonds. W. R. A.

Cyanates and thiocyanates of phosphorus, arsenic, and antimony. H. H. Anderson (J. Amer. Chem. Soc., 1942, **64**, 1757—1759).— *Phosphoryl* isocyanate, PO(NCO)₃, arsenic isocyanate, As(NCO)₃, and antimony isocyanate, Sb(NCO)₃, have been prepared by the action of Ag (*iso*)cyanate with the appropriate chloride. Thermal transformations of these volatile isocyanates into the corresponding nonvolatile cyanates have been observed. Phosphoryl thiocyanate has been isolated. As thiocyanate, provisionally reported by Miquel, is non-volatile. The apparent regularity of b.p. has been observed, and various physical properties have been quantitatively investigated. W. R. A.

Physico-chemical study of antimonic acid. E. Buchholz and H. Viehweger (Kolloid-Beih., 1940, 51, 141-198).-Electrolyte-free Helinoger (holino peak, 1970, 04, 1970, 1 and potentiometric titrations with KOH indicate the formation of and potential interaction and a standard interaction increasing dilution compounds $K_2O: Sb_2O_5 = 1:3$ and 2:3; with increasing dilution the ratio 1:1 is approached. Glycerol and mannitol form strongly ionised complex acids with (I), and in presence of either a sharp end-point is obtained at $K_2O: Sb_2O_5 = 1:1$. F. L. U.

Anhydrous tantalum tribromide. R. C. Young and T. J. Hastings, jun. (J. Amer. Chem. Soc., 1942, 64, 1740), A Pyrex tube (100 cm. Amy down and the formula of the for

Action of sulphur trioxide and oleum on chloroform. E. Mazurs (Z. anorg. Chem., 1942, **249**, 278–280).—Oleum of the composition $H_2S_2O_7 + SO_2$ reacts with CHCl₃ thus: CHCl₃ + $H_2S_2O_7 + SO_3 = CO + 3ClSO_3H$. With higher [SO₃], $S_2O_5Cl_2$ is also formed, whereas with lower [SO₃], H_2SO_4 is formed. F. J. G.

Borides of molybdenum and tungsten. F. Halla and W. Thury (Z. anorg. Chem., 1942, 249, 229-237). Mo and W borides may be obtained by the aluminothermal process. WB₂ has $\rho_4^{16} \sim 13.5$; the powder photograph is consistent with either of two structures with a 6·35, c 16·4 A, and 24 mols. in the unit cell or a 8·24, c 15·60 A, and 36 mols. in the unit cell. Mo₇Al₈B₇ is described. It has a 7·03, c 5·76 A., ρ_4^{15} 5·85, and one mol. in the unit cell. F. J. G.

Reaction of chlorine dioxide. Formation of the compound ClO2F. H. Schmitz and H. J. Schumacher (Z. anorg. Chem., 1942, 249, 238-244).—The compound ClO_2F is obtained by direct union of F_2 and ClO_3 diluted with N_2 at 0°. It has b.p. $\sim -6^\circ$, m.p. $\sim -115^\circ$.

F. J. G. F. J. G. Action of sodium silicate on manganous salts in solution. E. A. Dancaster (J.C.S., 1942, 581).—When solutions of MnSO₄ or MnCl₂ are treated with Na silicates, ppts. of variable composition are obtained. They consist of mixtures of SiO₂ and Mn(OH)₂ formed by the interaction of Mn salts with NaOH derived from the hydrolysis of Na silicates. C. R. H.

X.—ANALYSIS.

Electrographic analysis.-See B., 1942, I, 484.

Standard solutions. R. L. Vandaveer (J. Assoc. Off. Agric. Chem., 1942, 25, 650-653).—The work of Conroy on H₂SO₄, King on HCl, Deal on KCNS, and Johnson on Na₂S₂O₃ (following abstract, and below) is reviewed and recommendations are made. A. A. E.

Constant-boiling hydrochloric acid [as an acidimetric standard]. W. H. King (J. Assoc. Off. Agric. Chem., 1942, 25, 653—659).—The air-wt. of const.-boiling HCl required to give 1 equiv. wt. = (P+7680)/46·8386, where P is the barometric pressure (540—780 mm) in mm. of Hg, corr. to 0°. Collaborative determinations gave satisfactory results. A. A. E.

Electrometric titration of acids [in foods].—See B., 1942, III, 243.

Acidimetric determination of [alkali] chloride. W. Hurka (Z. anal. Chem., 1941, 123, 165–168).—Cl' is pptd. by addition of Ag_2SO_4 , leaving the alkali as alkali sulphate, which is pptd. by means of aq. Ba(OH)₂, yielding an equiv. amount of alkali hydroxide. The excess of Ba(OH)₂ is pptd. by means of $(NH_4)_2CO_3$ and NH_3 , and after boiling to remove NH₃, the alkali carbonate is titrated with 0-1N-HCl (Me-orange). Results are satisfactory for a consumption of 0-1N-HCl ≥ 20 c.c. L. S. T.

Determination of residual chlorine [in water].—See B., 1942, III, 248.

Surgical sodium hypochlorite solution. Control and determination of alkalinity.—See B., 1942, III, 245.

Determination of iodine with the apparatus of Grote and Krekeler or Wurzschmitt and Zimmermann. H. Brintzinger and B. Hesse (Z. anal. Chem., 1941, 123, 13-15; cf. B., 1933, 290).—Details of the combustion, and data for org. and complex inorg. compounds, are given. The liberated I is absorbed in Br in AcOH + NaOAc, and thereby oxidised to IO_3' . Excess of Br is removed by means of HCO₂H, excess of KI added, and the titration completed by means of Na₂S₂O₃. When bases that retain I as iodide are present, anhyd. Na₂S₂O₇ and, if necessary, K₂S₂O₈ are added to the sample before combustion. L. S. T.

Rapid methods for determining iodine in soluble iodides and organic compounds. G. R. Clark and J. H. Jones (J. Assoc. Off. Agric. Chem., 1942, 25, 755-760).—Methods based on that of Groak (A., 1926, 1163) are described; for org. compounds fusion and dry ashing procedures are eliminated. Satisfactory results for various types of compound are tabulated. A. A. E.

Iodide determination by means of ferric chloride, and its application to the separation of chloride ion and to the determination of silver. W. Erber [with G. Lieber] (Z. anal. Chem., 1941, 123, 161—165).— The conditions under which the liberation of I from KI and FeCl₃ in presence of HCl is quant. have been worked out. The I' solution is mixed with suitable quantities of HCl and FeCl₃, heated at 60° for 8-9 min. in a well-closed I flask, cooled, and diluted. After adding NaF, the solution is titrated with Na₂S₂O₃ (CCl₄ end-point). For the determination of Ag, excess of KI is added to ppt. Agj and then excess of I' is determined as above. The reaction between FeCl₃ and I' is applicable to most ratios of I' to Cl', and to limited ratios of I' to Br'. L. S. T.

[Determination of] fluorine [in foods].—See B., 1942, III, 244.

[Analysis of] sulphuric acid. H. W. Conroy (J. Assoc. Off. Agric. Chem., 1942, 25, 664–667).—For determination of ρ the Sprengel tube is preferred to the pyknometer. Tests for impurities are outlined. A. A. E.

[Stability of] standard sodium thiosulphate solutions. G. M. Johnson (J. Assoc. Off. Agric. Chem., 1942, 25, 659-661).—No preservative is necessary when 0-1N. solutions are carefully prepared. Procedure is described. Standardisation using I and using K₂Cr₂O₇ gave identical results. A. A. E.

Oxidimetric methods for the determination of thiosulphate, sulphite, and polythionate. R. Lang and H. Kurtenacker (Z. anal. Chem., 1941, 123, 169–187).— S_2O_3'' is run into an excess of acid or neutral Fe^{III} salt containing CuCl₂ or CuSO₄, and the resulting Fe^{III} titrated with Ce(SO₄)₂ (not KMnO₄), in presence of H₂SO₄. Ferroin is better than NHPh₂ or erioglaucine as indicator. The Fe^{III} oxidises S_2O_3'' quantitatively to S_4O_4'' . SO₄'', S_2O_4'' , and polythionates do not interfere. In presence of SO₃'', CH₂O must be added. S_2O_3'' cannot be determined by direct titration with Ce(SO₄)₂. S₂O₃'' can also be added to excess of H₃VO₄, acidified with H₃SO₄, boiled gently for 30 min., and the VW formed titrated with KMO₄ to give accurate vals.; the S₂O₃'' is oxidised quantitatively to SO₄''. Polythionates and SO₃'' can be determined by similar methods for which details of procedure and typical data are given. L. S. T.

Rapid volumetric determination of sulphate ion. M. Randall and H. O. Stevenson (Ind. Eng. Chem. [Anal], 1942, 14, 620-

621).—Aq. BaCl₂ is added in excess to the solution containing SO₄", and the excess is titrated with ~0.05M-Na₂HPO₄ (I) (Mered) in presence of <27.5 vol.-% of EtOH. The time required is 10—15 min., and the accuracy 0.5%. NH₄° and heavy metals must be absent. Balachovski and Ginsburg's method (A., 1932, 34) using Na₄P₂O₇ instead of (I) is invalid. L. S. T.

[Standardisation of] thiocyanate solutions. E. C. Deal (J. Assoc. Off. Agric. Chem., 1942, 25, 661-664).—AgNO₈ is preferred to HgSO₄ as primary standard. Procedure for the purification of the materials and the titration is detailed. A. A. E.

Rapid determination of sulphur in pyrites and pyrite ash.—See B., 1942, I, 461.

Determination of sulphur in sulphite [wood] pulp.—See B., 1942, II, 400.

[Determination of] sulphur dioxide in wine.—See B., 1942, III, 239.

[Determination of] selenium [in foods].—See B., 1942, III, 243, 244.

Iodometric nitrite determination. E. Schulek and I. Floderer (Z. anal. Chem., 1941, 123, 198–209).—Apparatus, procedure, and typical data are described for the determination of NO_2' by means of the reaction $2HNO_2 + 2HI = 2H_2O + I_3 + 2NO$ in an atm. of CO_2 . The methods are suitable for the determination of NO_3 , NH_4 , I', and Fe^{III} and Fe^{III}. They can be used on both macro- and micro-amounts. L. S. T.

[Determination of] nitrogen [in fertilisers].—See B., 1942, III, 228.

Determination of free and combined nitrogen acids in technical sulphuric acids, especially nitration waste acids.—See B., 1942, I, 460.

Decomposition and determination of sodium nitroprusside.—See A., 1942, III, 772.

Colorimetric method for [determination of] phosphates. Modification of A.O.A.C. molybdenum-blue method. L. S. Stoloff (1nd. Eng. Chem. [Anal.], 1942, 14, 636-637).—The modifications are an increase in vol. of sample and reagents, replacement of Na₂SO₃ by Na succinate, and colour measurements by means of a Coleman Universal spectrophotometer. The effective range is 0-0.35 mg. of P. There is a slow reduction of molybdate in acid solution, the rate of which is reduced to zero when the colour having a transmission max. at 460 m μ , is formed. L. S. T.

[Determination of] P_2O_5 in jams, jellies, and other fruit products. Preparation of stable acid molybdate solution.—See B., 1942, III, 243.

[Determination of] P₂O₅ in fruits and fruit products. Gravimetric and colorimetric methods.—See B., 1942, III, 243.

[Determination of] phosphoric acid [in fertilisers].—See B., 1942, III, 229.

Micro-determination of arsenic in biological materials. Electrolytic cell for production of arsine.—See A., 1942, III, 864.

Determination of arsenic in soils, foods, organic compounds, etc.— See B., 1942, III, 228.

[Determination of] arsenic [in foods etc.].-See B., 1942, III, 243.

[Determination of] boron. C. Krügel, C. Dreyspring, and R. Lotthammer (Z. anal. Chem., 1941, 123, 15–22).—Procedure [involving extraction with H₂O, distillation of the Me₃BO₃, and titration with NaOH (naphtholphthalein) in presence of mannitol] for the determination of H₂O-sol. B compounds in soils is detailed. For amounts of B₂O₃ <70 μ g., the colorimetric determination using quinalizarin replaces titration. Data for seamuds and "Klanxbüll" and "Dagebull" soils show high B₂O₃ contents (8–15 mg. per kg. of air-dried soil). L. S. T.

Determination of boric in presence of acetic acid. S. K. Hagen (Z. anal. Chem., 1941, **123**, 187–197).—The procedure described avoids destroying the AcOH, or distilling the H_3BO_3 as Me_3BO_3 . Total acidity is found by titration with aq. NaOH in presence of mannitol from a $p_{\rm H}$ val. of ~3 (2: 4-dinitrophenol) to a phenol-phthalein end-point. The H_3BO_3 content is determined by means of a similar titration from $p_{\rm H}$ 6.7 (bromothymol-blue) to the same end-point. The H_3BO_3 content is gives the approx. [AcOH]. The H_3BO_3 vals. have to be corr. by two empirical consts. With AcOH: $H_3BO_3 < 2$, the error is <0.2%; for a ratio <10, it is <1%. NH₄', SiO₂, nH₂O, and org. acids must be absent. CO₂ must be eliminated throughout the titrations by means of N₂, and not by boiling. L. S. T.

Determination of boron in soils.—See B., 1942, III, 228.

Determination of boron and fluorine in soils.—See B., 1942, III, 228.

Silicic acid synthesis and its application in analytical chemistry. H. Fuchshuber (Z. anal. Chem., 1941, **123**, 9–13).—A discussion of the mechanism of the formation of SiO_2,nH_2O from alloys ontaining Si when attacked by H_3PO_4 and H_2SO_4 . Data showing that Jena glass is suitable for such determinations of SiO_2 are given. L. S. T.

Discrepancies in colorimetric determination of silicon in hiduminium IR series of aluminium alloys.—See B., 1942, I, 485.

Determination of silica and phosphoric acid in soil extracts .- See B., 1942, III, 228.

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

[Determination of] metals in foods.—See B., 1942, III, 243.

Rapid determination of potassium with dipicrylamine. W. O. Williams (Proc. Amer. Soc. Hort. Sci., 1941, 39, 47-50).-Excess of Li dipicrylamine (saturated with the K salt) is added to the dry residue and the residual dye determined colorimetrically in an aliquot of the solution. The method is standardised by the use of KCl solution and gives results agreeing closely with those obtained by the K. PtCl, method; it is specially useful when multiple sampling is necessary owing to variability of material. L. G. G. W.

Cobaltinitrite method for determination of potassium [in foods] .---See B., 1942, III, 243.

[Determination of] potassium in fruits and fruit products.-See B., 1942, III, 243.

[Determination of] potash [in fertilisers].—See B., 1942, III, 229.

Volumetric determination of sodium chloride in bread.-See B., 1942, III, 240.

[Determination of] sodium and chlorides [in fruit and fruit products]. -See B., 1942, III, 243.

Quantitative spectroscopy. S. Ashauer and G. Occhialini (Anais Assoc. Quim. Brasil, 1942, 1, 32-36).—A method is described for the determination of small amounts of Ag in Pb by the length of lines in the arc spectrum, which are measured by interposing a lens, which can be adjusted by a micrometer, between the arc and the F. R. G. spectrograph.

Photo-electric determination of oxalic acid and calcium, and its application to micro- and ultramicro-analysis of serum .- See A., 1942, III, 788.

[Determination of] calcium and sulphur [in fertilisers].-See B., 1942, III, 229.

Microchemical detection of beryllium with ammonium molybdate. K. E. Stumpf (Z. anal. Chem., 1941, 123, 1-9).—Photomicrographs of the cryst, structure of ppts, obtained by adding powdered NH_4 molybdate to different concns. of Be^{*} in HNO₈ are reproduced. The needles, attributed by Kramer (A., 1938, I, 97) to Be molybdate, are also formed when no Be^{*} is present in the solution, and are due to a spacingly sol. NH, power blacks to a sparingly-sol. NH4 polymolybdate. Kramer's test is invalid.

L. S. T. Determination of magnesium with 8-hydroxyquinoline. Microtitration and photometric procedures. L. Gerber, R. I. Claassen, and C. S. Boruff (*Ind. Eng. Chem. [Anal.]*, 1942, **14**, 658–661).— $5 \mu g$. of Mg can be determined by pptn. as 8-hydroxyquinoline compound, oxidation of the 8-hydroxyquinoline (I) by heating for <15 min. at 95–100° with 0.05 N-NH4 "hexaperchlorato-cerate" in mm, at $95-100^{\circ}$ with 0.05 N-NH₄ hexaperchlorato-cerate in $2^{\rm Mi}$ -HClO₄, and back titration of the excess of cerate with aq. Na₂C₃O₄ (indicator Setopaline C). One Mg requires an empirical val. of 59.7 equivs. of cerate compared with 8 in the bromination method. Ce(SO₄)₂ is much less effective in oxidising the (I). The photometric procedure described gives greater precision. The reen colour obtained on adding FeCl₂ to the Mg 8-hydroxyquinoline compound in 1% AcOH is utilised. In the range 5-100 µg of Mg, the colour conforms to Beer's law. L. S. T.

[Determination of] magnesium and manganese in fertilisers.—See B., 1942, III, 229.

Quantitative spectrographic analysis of zinc and aluminium alloys with the flaming arc.—See B., 1942, I, 485.

[Determination of] zinc [in foods].—See B., 1942, III, 243.

Spectrographic analysis of alloys of pure zinc.-See B., 1942, I, 480.

Spectrographic determination of trace metals in zinc and zinc compounds.—See B., 1942, I, 480.

5-Bromo-2-aminobenzoic acid as an analytical reagent. R. J. Shennan (J.S.C.I., 1942, 61, 164).—In view of its lower conversion factor, 5-bromoanthranilic acid is preferred to anthranilic acid for the determination of Cu, Co, Ni, and Zn. The solubility of the Br-compounds in aq. acetates and tartrates is suppressed by addition of excess of reagent. The determination of Co in absence of other

heavy metals is facilitated by the direct weighing of the complex, which need not be converted into oxide or sulphate. A. A. E.

[Determination of] copper [in foods].-See B., 1942, III, 243.

[Determination of] copper and tin in beer.-See B., 1942, III, 238.

Determination of copper and zinc in soil.-See B., 1942, III, 228.

[Determination of] copper and zinc [in fertilisers].—See B., 1942, III, 229.

Rapid determination of copper, manganese, and magnesium in aluminium-copper-magnesium alloys.—See B., 1942, I, 485.

Photochemical analysis. [Volumetric determination of mercury.] G. Gopalarao and P. T. Ramacharlu (*Current Sci.*, 1942, 11, 102).— Na₂C₂O₄ and UO₂(NO₃)₂ (as photosensitiser) are added to the solution containing HgCl₂, and the mixture is exposed to sunlight for 0.5—1 hr. to ppt. Hg₂Cl₂. Excess of standard I is added, and the residual I titrated with Na₂S₂O₃. Test data for determinations

the residual I titrated with Na₂S₂O₃. Test data for determinations on 1—15 ml. of 0.05m-HgCl₂ show accuracy to ~0.5%. A. J. E. W. **Polarographic determination of cerium.** G. Canneri and D. Cozzi (*Gazzetta*, 1941, 71, 311—319).—Ce is determined polaro-graphically at low concn. by the first reduction band of Ce^{***} (at +0.355 v.) in 0.1n-H₂SO₄. The solution containing Ce (with or without other rare-earths) is treated with Co(NH₃)₃(NO₃)₃, and polarograms are obtained (a) before and (b) after addition of H_2O_2 , which by the reaction 2Ce^{***} + $H_2O_2 \rightarrow 2Ce^{***} + O_2 + 2H^*$ elimin-ates Ce^{***}; thus (b) corresponds with reduction of Co^{***} and (a) - (b) with that of Ce^{****}. In order to avoid reduction of Ce^{***} by Hg, the cathode is separated from the solution by a bridge of Na₂SO₄ in agar. E. W. W. New thermoanalytical methods. II, D. Kaplan (*Chem. and Ind.*,

New thermoanalytical methods. II. D. Kaplan (*Chem. and Ind.*, 1942, 431-432).—The reaction $MnO_2 + 4HCl + CaBr_2 = MnCl_2 + Br_2 + CaCl_2 + 2H_2O$ develops sufficient heat (16° rise for 5 g. of MnO_2 in 100 ml.) for it to be used in determining MnO_2 thermoanalytically. ClO_3' , BrO_3' , OBr', and OCl' may be determined similarly with $CaBr_2$ and HCl. D. F. R.

Volumetric determination of iron by potassium dichromate. Barzaghi and P. Philipp (Anais Assoc. Quim. Brasil, 1942, 1, 113– 119).—Addition of H_3PO_4 in the determination of Fe by the pro-cedure of Sarver and Kolthoff (A., 1931, 1141) has no effect for <0.8 g. Fe. F. R. G.

[Determination of] iron in beer.—See B., 1942, III, 238.

Determination of iron in soils and silicates by the mercurous nitrate method.—See B., 1942, III, 228.

Silicon, manganese, chromium, iron, [titanium,] and copper in a nickel-base alloy. Aliquot method for routine analysis of an electrical heat-resisting alloy.-See B., 1942, I, 482.

Rapid determination of tungsten, chromium, vanadium, and manganese in high-speed steel in splash sample.—See B., 1942, I, 479.

Determination of tin in foods.—See B., 1942, III, 243.

Complexes of titanium with aromatic hydroxy-compounds, and its photometric determination with chromotropic acid. A. von Endrédy and F. Brugger (Z. anorg. Chem., 1942, 249, 263–277).—Solution s of TiO₂ in conc. H_2SO_4 give intense colours with aromatic OH-com -pounds, and approx. absorption spectra are recorded for some of these. With chromotropic acid the complex has the composition TiO₂: $C_{10}H_4(OH)_2(SO_3Na)_2 = 1:1$. Working details are given for the photometric determination of < 0.0005% of TiO₂ with chromotropic acid. F. J. G.

Critical study of reagents for cations. VII. Thorium cations. Wenger and R. Duckert (Helv. Chim. Acta, 1942, 25, 1110-1114) .--A no. of reagents which have been suggested for the detection of ThIV have been tested and the objections to their use are tabulated. The following are recommended : for micro-tests, (NH4)2CO3 atext. The following are recommended. for inforcests, $(1, 1_{4}) \leq 0.5$, $(1, 1_{4})$ reagents are given. I. W. S.

Oxidimetric determination of niobium. W. R. Schoeller (Analyst, 1942, 67, 321-322).—Except in small amounts, Ta interferes with the determination of Nb by Treadwell and Nieriker's method (A., 1942, I, 307). S. B.

Analysis of indium alloys. C. W. Hopkins (*Ind. Eng. Chem.* [Anal.], 1942, 14, 638-639).—The methods of Moser *et al.* (A., 1930, 564) are satisfactory, and were used to prepare In solutions for the notantimetric direction of the solutions. (A., 1928, 38). Analyses of In-Pb, In-Zn, and In-Al were accurate to 0.1 to 0.2%, but those of In-Sn could not be improved to give an accuracy better than 1%. Procedures and typical analyses are recorded. L. S. T.

XI.—APPARATUS ETC.

Determination of extinction angles in monoclinic pyroxenes and amphiboles. F. J. Turner (Amer. J. Sci., 1942, 240, 571-583)— The methods of Burri and of Nemoto for determining extinction angles in augites and hornblendes are discussed critically. Modifications of Nemoto's technique are described. L. S. T.

Self-registering micro-photometer for absorption and emission spectra. H. Mohler (*Helv. Chim. Acta*, 1942, 25, 978—983).—The construction and operation of the instrument are described. J. W. S.

Quantitative spectrographic analysis by the arc method. M. N. Thruston (J.S.C.I., 1942, 61, 144—145).—A spectrographic technique, involving burning impregnated spills in an arc, which is suitable when large nos. of analyses for many elements are required but high accuracy is unnecessary, is described. It is simple and rapid and has been used to determine Na, K, Ca, Mg, Mn, P, and B in small amounts of plant materials with an accuracy of $\sim \pm 5\%$.

Preparation of silver chloride films. P. Fugassi and D. S. Mc-Kinney (*Rev. Sci. Instr.*, 1942, **13**, 335–337).—Fused AgCl wets glass and adheres to it on solidification. It can be used as a glass cement, and owing to the fact that it can be rolled into thin transparent sheets, of which the transmission in the infra-red is >50%, it is useful as a window material for infra-red absorption cells. The prep. of such films is described. Their infra-red absorption has been investigated. They do. not darken appreciably in diffuse light. AgBr and AgI are not easily rolled, and the films crack easily. Films of Ag₂S have been prepared. A. J. M.

Portable indicating X-ray dosimeter. R. P. Krebs and H. Kersten (*Rev. Sci. Instr.*, 1942, 13, 332-334).—An a.c. operated instantaneous-reading X-ray dosimeter, which can be used either after calibration against a standard, or for measuring, in arbitrary units, currents produced by ionising radiations, is described. It may be used with hard or soft radiation. A. J. M.

Phosphorescence microscope. E. N. Harvey and A. M. Chase (*Rev. Sci. Instr.*, 1942, **13**, 365–368).—Four methods of microscopical observation of the phosphorescence of cell structures or products, or microcrystals, are described. The illumination is short ultra-violet, and the specimen must be dry, or nearly so.

A. J. M.

Simplified calibration of dropping mercury electrodes. J. J. Lingane (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 655).—The vol. of the Hg instead of its wt. is measured by means of the apparatus described; this reduces considerably the time required for the determination of the rate of flow of Hg from the electrode. L. S. T.

Platinum electrodes for electrolytic analysis. J. C. Chaston and H. W. Webb (J.S.C.I., 1942, 61, 145-147).—The design of Pt electrodes for routine electrolytic analysis is discussed. Economies in first cost are most readily secured by a drastic reduction in the size of the anodes. Very much smaller anodes than are customary are entirely satisfactory except when anodic deposits of Pb or Mn oxides are to be determined. The strength of the frameworks may be greatly increased by the use of hardened Pt, and attention should be given to some details of fabrication. Stationary and rotating electrodes recommended for use in stirred and unstirred solutions are illustrated.

Cæsium sulphide and cæsium selenide photocathodes.--See B., 1942, I, 444.

Multiple-electrode high-voltage arc for spectrographic analysis. W. D. Owsley and R. C. McReynolds (*Rev. Sci. Instr.*, 1942, 13, 342—345).—An apparatus is described with a multiple electrode unit arranged so that 12 samples can be investigated without renewing the electrodes. The lower electrodes rotate at 400 r.p.m. during arcing. All adjustment controls are insulated and placed outside a safety cage. A. J. M.

outside a safety cage. **Production of an atomic stream of known intensity.** R. W. Ditchburn (*Rev. Sci. Instr.*, 1942, 13, 349–350).—Possible errors in the use of the usual type of " atom gun" for producing at, beams of known intensity are described, all of which make the calc. v.p. too low, and film thickness too high. A form of apparatus which eliminates a no. of the errors is described. A. J. M.

Magnetic field measurement in β -ray spectroscopy. J. M. Cork and W. G. Wadey (*Rev. Sci. Instr.*, 1942, 13, 369).—The magnetic field is determined by rotating a Ag disc in the field and measuring the e.m.f. produced. A. J. M.

Permanent magnet β -ray spectrograph. E. H. Plesset, G. P. Harnwell, and F. G. P. Seidl (*Rev. Sci. Instr.*, 1942, 13, 351-361).— The construction of a large permanent magnet giving a highly homogeneous field of 3000 oersteds is described. The instrument is used in a β -ray spectrograph. A. J. M.

Simultaneous measurement of magnetic and dilatometric changes. O. Zmeskal and M. Cohen (*Rev. Sci. Instr.*, 1942, **13**, 346–348).– A combined magnet and dilatometer, for tracing simultaneously the magnetisation and dilatation of alloys undergoing phase transformations, is described. It may be used for rising, falling, or const. temp. The apparatus has been used for studying phase transformations occurring in the tempering of hardened steel, and some typical results are given. A. J. M.

Evaporation of standard solutions from the tips of micro-burettes. A. A. Benedetti-Pichler and S. Siggia (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 662—663).—With U-shaped burettes having remote control and with non-volatile active agents no error results when the simple precautions described are taken. Data for 0.5M-HCl and 0.1N-I are recorded and discussed. L. S. T.

Laboratory pressure flowmeter [for low gas rates under pressure]. L. J. Brady and B. B. Corson (Ind. Eng. Chem. [Anal.], 1942, 14. 656-657), L. S. T.

Pipette-type capillary viscometer for substances which are solid or highly viscous at room temperature. J. F. Weiler (*Ind. Eng. Chem.* [Anal.], 1942, 14, 634). L. S. T.

Oil manometer-manostat to control column throughput [distillation rate]. S. A. Hall and S. Palkin (*Ind. Eng. Chem. [Anal.*], 1942, **14**, 652-654). L. S. T.

Design of still heads for batch fractionation in laboratory columns. Vapour take-off system. A. R. Richards (*Ind. Eng. Chem. [Anal.*], 1942, 14, 649-652). L. S. T.

Preparation of slides for particle-size determination. L. Silverman and W. Franklin (*J. Ind. Hyg.*, 1942, 24, 51—52).—During spreading of a dust with a glass rod the particle size of cryst. materials is markedly reduced by pressure; dispersion by dilution and evaporation is therefore substituted. E. M. K.

Efficiencies for particle determination of the Electrotor, ultramicroscope, and Settlement Counter. S. C. Blacktin (J.S.C.I., 1942, 61, 161-162),...The particles, ranging from 0.4μ . to 4μ . diameter and 13,000 to 220,000 per ml., in dispersions of MgO and match-head smokes, are counted by the Electrotor Meter (A), the ultramicroscope, and the Settlement Counter. Comparison of results shows the instruments to have equal count efficiencies although each embodies a distinct fundamental principle, together exhaustive. The effective efficiency ranges of the three instruments are max. and reach ~10? particles per c.c. The superior efficiency of A for lighter dispersions is explained as due to its innovation of a rotating record, and to its variable deposit area which includes one of <0.5 sq. mm.

Generator for air-free carbon dioxide or hydrogen. S. H. Tucker (Analyst, 1942, 67, 320).—The generator previously described (A., 1939, I., 434) has been improved. S. B.

Frictional phenomena. VI. A. Gemant (J. Appl. Physics, 1942, 13, 22-29; cf. A., 1942, I, 140).—A review of methods of viscosity measurements. L. J. J.

Treating bark corks. E. A. M. Bradford and A. W. Haynes (*Chem. and Ind.*, 1942, 369).—Bark corks coated with a thin film of Durofix adhesive can replace rubber bungs for use with certain solvents. Corks might be coated with other plastic or resinous materials known to be insol. in the particular solvent against which protection is required. R. G. W.

XII.-LECTURE EXPERIMENTS AND HISTORICAL.

History of Nernst's heat theorem. H. Ulich (Angew. Chem., 1942, 55, 211-215).

XIII.—GEOCHEMISTRY.

Manganese in the soil of the state of São Paulo. J. E. de Paiva Netto (Anais Assoc. Quim. Brasil, 1942, 1, 42-54).—A review of the geochemistry of Mn. F. R. G

Isomorphous kinds of apatite.—See A., 1942, I, 404.

Is carbonate-apatite formed in aqueous systems P—See A., 1942, I, 404.

Relationship of the granites, aplites, microgranites, and rhyolites of the east of the Guéret massif, and the problem of their genesis. A. Demay (Compt. rend., 1941, 213, 455-457).—A discussion.

L. S. T.

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