BRITISH CHEMICAL AND PHYSIOLOGICAL ABSTRACTS

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

NOVEMBER, 1942.

I.—SUB-ATOMICS.

Energy of the 1s 2s ³S state of the helium atom and related two-electron ions. T. S. Wheeler (*Proc. Roy. Irish Acad.*, 1942, A, 48, 43-53).—Vals. of energy deduced from calculations, using the variation function of Pauling and Wilson, agree with experiment. The results confirm the approx. validity of the empirical rules concerting screening consts, viz, the interaction between an inner electron and the nucleus is not appreciably affected by an electron in an outer orbit and, for related atoms and ions, the screening effect of an inner on an outer electron is independent of the at. no. A simple, approx. expression connecting the energy of a state with the A. J. M. at. no. is given.

Polarisation and intensity dissymmetry of positive-ray glow. J. Stark (Physikal. Z., 1942, 43, 140-145).-From results of determinations of the longitudinal and transverse polarisation of lines and series in the spectrum of the positive-ray glow it is concluded that atoms have an axial structure. The existence of such polarisations cannot be reconciled with any theory of at. structure which supposes that the extra-nuclear electrons move in orbits about the nucleus, or are at rest on a cubic surface. The dissymmetry of the intensity of the positive-ray glow is determined by the direction of the magnetic moment of the excited electron, and the fact of its existence cannot be reconciled with the usual theories. The dissymmetry in the case of isomeric atoms is discussed. The theory is advanced that the elementary process of light emission from an atom is eddy-like and A. J. M. takes place in one direction only.

Dissymmetry of intensity of light emission in the axis of the electric field. J. Stark (*Physikal. Z.*, 1942, 43, 146-151).—The dissymmetry of intensity of H and He lines in the axis of the electric field is discussed. Observations on the intensity ratio of the shortand $long-\lambda$ components in a transverse magnetic field indicate that these atoms are arranged axially in the electric field, with a preponderance of anodic over cathodic arrangements. In a direction opposite to that of the electric field the intensity of the anodic arranged ortho-He atoms is > the intensity of the cathodic arranged atoms in the direction of the field. The converse holds for paraatoms. The phenomena agree with the view of the nature of the elementary process of light emission previously advanced (see A. J. M. preceding abstract).

Electrodeless discharge in mercury and the hyperfine structure of some Hg II lines. T. S. Subbaraya, R. L. Narasimhaiya, and S. Srinivasamurthy (J. Mysore Univ., 1942, B, 2, 81–87).—The $\lambda\lambda$ of A. J. M. observed lines are given.

First spark spectrum of thorium : classification and Zeeman effect **data of Th II.** J. R. McNally, jun., G. R. Harrison, and (Miss) H. B. Park (*J. Opt. Soc. Amer.*, 1942, **32**, 334–347).—From Zeeman patterns for >800 lines in fields up to 93,000 oersteds, and improved A measurements, 1091 lines of Th II, arising from 219 levels, are classified. Data and classifications are tabulated. L. J. J.

Arc spectra with carbon electrodes for 2×10^{-4} , 2×10^{-5} , 2×10^{-6} , and 2×10^{-7} g, of erbium and thulium between 2200 and 5000 A. J. M. López de Azcona (Anal. Fis. Quim., 1941, 37, 184–191).— Persistencies of sensitive lines of Er and Tm are recorded.

F. R. G.

Spectrum of Mira Ceti in the violet and near ultra-violet. H. Grouiller (*Compt. rend.*, 1942, **214**, 211—213).—Microphotometric examination of the spectrum of Mira Ceti indicates the presence of H, Mg, Al, Si, Ca, Ca⁺, Sc, Sc⁺, Ti, Ti⁺, V, V⁺, Cr, Mn, Fe, Fe⁺, Co, Ni, Ni⁺, Y, Y⁺, Zr, Zr⁺, Ba⁺, La⁺, Ce⁺, Nd⁺. A. J. M.

Photometric instruments used in spectrographic analysis.-See A., 1942, I, 341.

Outer levels of heavy atoms shown by high-frequency X-ray spectra. Bismuth. (Miles) Y. Cauchois (Compt. rend., 1942, 214, 68-70). -Frequencies of M levels calc. from L emission and L_{III} absorption frequencies differ from *M* absorption frequencies. Differences calc. from recent data are tabulated for Ta, W, Ir, Pt, Au, Hg, Tl, Rb, Bi, Th, Pa, and U. Data for Bi are considered in detail (cf. Phelps, A., 1934, 1149). N. M. B.

Influence of oxygen, carbon dioxide, nitrogen, and mercury on the photo-effect of barium and potassium. A. V. Afanasieva and J. I. 349 L (A., I.)

Lunikova (J. Tech. Phys. U.S.S.R., 1935, 5, 1000–1006).—Photo-electric emission from a Ba surface passes through a max. with increasing adsorption of O_2 or Hg. N_2 increases the emission to relation and the subscription of O_2 or Hg. N_2 increases the emission to saturation, whilst CO_2 decreases it. Emission from K passes through a max. for CO2, O2, or N2, but Hg always decreases emission.

TECHNIK

Сн. Авз. (е) Irregularities in the behaviour of certain photo-electic cells .- See A., 1942, I, 342.

Excitation of rarefied gases by high-frequency electromagnetic waves. G. Goudet, P. Herreng, and G. Nief (*Compt. rend.*, 1942, 214, 62-65).—A new method for use at \sim 154 M-cycles (λ 1.94 m.) is described. N. M. B.

Measurement of the work of removal of an electron. E. N. Gribanov (J. Tech. Phys. U.S.S.R., 1935, 5, 1356-1361).-A method based on the heat of evaporation of electrons is described. Data are given for Th wires. CH. ABS. (e)

Electronic timer.—See A., 1942, I, 342.

Surface studies with the electron microscope.—See A., 1942, I. 342.

Electrometer for measurement of voltage on small ionisation chambers.—See A., 1942, I, 342.

Ion source with mass chromator for neutron generators .-- See A., 1942; I, 342.

Scattering of potassium ions in mercury vapour. A. Rouse (Proc. Iowa Acad. Sci., 1935, 42, 152).-Measurements of the angular distribution loss of K ions scattered in Hg vapour are described.

Сн. Авз. (е) Separation of isotopes and thermal diffusion. J. Kendall (Nature, 1942, 150, 136-140).-A.lecture. A. A. E.

Radioactivity of material exposed to the weather in Salamanca. J. Baltá Elías (Anal. Fís. Quím., 1941, 37, 180–183).—No radio-activity was found to have arisen from metals, especially Pb, exposed to the sun in old roofing. The electrometer employed was, however, less sensitive than that used by Maracineanu (A., 1928, 455) and Boutaric and Roy (A., 1930, 393). F. R. G. Boutaric and Roy (A., 1930, 393).

Ionisation measurements on fast neutrons.-See A., 1942, I, 342.

High-voltage apparatus for atomic disintegration experiments.-See A., 1942, I, 342.

Energy distribution of the various modes of uranium-nucleus fission by neutrons. C. Magnan (Compt. rend., 1942, 214, 110-113). —There is evidence for the existence of two types of fission; corre-sponding energies are 100—60 and 90—70 Me.v. N. M. B.

The "second maximum " of the shower transition curve of cosmic radiation. E. P. George, L. Jánossy, and M. McCaig (Proc. Roy. Soc., 1942, A, 180, 219-224).—Measurements of the Rossi curve with various counter systems show no indication of the second max. which has been reported. A spurious max. can be obtained in certain circumstances. G. D. P.

Calculations on the cascade theory with collision loss. H. J. Bhabha and S. K. Chakrabarty, (Proc. Indian Acad. Sci., 1942, 15, A, 464-476).-Mathematical. W. R. A.

Solution of certain problems in quantum mechanics by successive removal of terms from the Hamiltonian by contact transformations of the dynamical variables. I. General theory. II. Power series in a co-ordinate and its conjugate momentum. The anharmonic oscillator by perturbation theory. L. H. Thomas (J. Chem. Physics, 1942, 10, 532-537, 538-545).-Mathematical. Tables for the use of the method described are given. L. J. J.

Impossibility of a simple algebraic solution of a problem of magnetism. P. Rossier (Arch. Sci. phys. nat., 1941, [v], 23, Suppl., 254-256).—It is impossible to express the relation between magnetic field and induction in simple algebraic form. J. W. S.

II.—MOLECULAR STRUCTURE.

Six-place table of the Einstein functions. J. Sherman and R. B. Ewell (*J. Physical Chem.*, 1942, **46**, 641–662).—Vals. of $x/(e^{x} - 1)$, $x^{2}e^{x}/(e^{x} - 1)^{2}$, and $-\log_{e}(1 - e^{-x})$ are tabulated for x = 0 to 3.000, 350 3.00 to 8.00, and 8.00 to 15.00 at intervals of 0.005, 0.01, and 0.05, C. R. H. respectively.

Band spectrum of manganese hydride, MnH. I. Structure of the λ 5677 and λ 6237 bands. T. E. Nevin (*Proc. Roy. Irish Acad.*, 1942, A, 48, 1-42).—The bands at 5677 and 6237 A. consist of at least 50 branches and are due to a 711 \rightarrow 72 transition. The 'II state is normal; the lower rotational levels of all the components are considerably perturbed. The 7 components of each $^{7}\Sigma$ rotational level are resolved, the separation of each of the 6 pairs of adjacent sub-levels of given K increasing linearly with K. The mol. consts, of the ' Σ state, which is the ground state of the mol., are given provisionally as $B_e^{\prime\prime} = 5.6855$ cm⁻¹; $I = 4.923 \times 10^{-40}$ g.cm^{.2}; $r_e^{\prime\prime} = 2.230 \times 10^{-8}$ A. J. M. cm.

Goldstein-Kaplan bands of nitrogen. (Mme.) R. Herman and L. Herman (Compt. rend., 1942, 214, 220-223).—The spectrum of N₂, excited in air between two glass plates a few mm. apart, contains some bands of the Goldstein system in the region $\lambda 2745-3175$ A. but they are displaced somewhat from their formerly observed positions. The vibrational analysis is given and the excitation of the N2 is discussed. A. J. M.

Polarisability and internuclear distance. R. P. Bell (Trans. Faraday Soc., 1942, 38, 422-429; cf. A., 1938, I, 601).-Experimental vals. of the difference between the refractivities of H and D compounds, due to asymmetry of the zero-point vibrations, are used compounds, due to asymmetry of the zero-point violations, are used to calculate a', the variation of polarisability with internuclear distance \tilde{r} , for H_2 , HCl, HBr, and CH₄. Expressions are given, and vals, calc., for the effect of temp. on the mean \tilde{r} for H_2 , HCl, HBr, N₂, O₂, and Cl₂. Vals. of a' obtained from the isotope effect are used to calculate the intensities of Raman lines for H_2 , HCl, HBr, and CH₄, relative to one another and to the Rayleigh scattering. F. L. U.

Influence of temperature on the absorption spectrum of ozone (Huggins bands). D. Barbier and D. Chalonge (*Compt. rend.*, 1941, **213**, 650–652).—Measurements of the absorption coeff. of O_3 between —95° and 120° show that the max. vals. vary with temp., and that the min. vals. do not vary linearly with temp. Data are recorded for the max. 3401–3135 Å. and the min. 3357–3130 Å. The max. : min. absorption ratio varies approx. linearly with temp. L. J. J. for temp. $<18^{\circ}$.

Effect of temperature on the absorption spectrum of ozone in the Huggins bands. E. Vassy (Compt. rend., 1942, 214, 219-220).-Results obtained are compared with those of Barbier et al. (preceding A. J. M. abstract). There is general agreement.

Ultra-violet absorption of solutions of sodium azide and hydrazoic acid. M. Bonnemay and E. T. Verdier (Compt. rend., 1942, 214, active the pointenary and 2. The volume (completence) 2450, 212, 228-230).—The ultra-violet absorption is a min, between 2450 and 2550 A. according to concn. Beer's law applies only for concns. between 0.0005N, and 0.0002N, and in the λ range 2500—2600 A. When monochromatic radiation is used the absorption is different when the detailed of the concentration of the detailed of the concentration. from that observed when composite radiation is employed. Substances which readily decompose photochemically can, when exposed to radiation beyond a certain threshold λ , undergo either pre-dissociation or activation. The absorption of non-activated mols. will be different from that of activated or predissociated mols.

A. J. M. **Transmission of photographic layers in the ultra-violet.** M. H. Sweet (J. Opt. Soc. Amer., 1942, 32, 324–325).—Developed Ag images show a narrow band of relatively high transmission at λ 320 m μ . Its effect on the accuracy of published results based on density measurements is indicated. L. J. J.

Ultra-violet absorption of simple metallic nitrates and of some double nitrates in the solid state. A. Berton (Compt. rend., 1941, 213, 653-655).-Data from powder reflexion spectra show a characteristic NO₃⁻ band with absorption max, and min. at 3000–2800 Å. and 2650–2550 Å., respectively, with a sharp long- λ limit at 3350– 3000 Å. Band positions and intensities depend on the cation and degree of hydration, and for double salts differ from those corresponding with the simple constituents. L. J. J.

Absorption spectrum of a $\beta\gamma$ -unsaturated aldehyde. H. Böhme and J. Wagner (Ber., 1942, 75, [B], 614—617).—CHEt:CH-CHEt:CHO (I) exhibits a band at 230 m μ . in EtOH or 224 m μ . in n-C₆H₁₄ and a longer-wave CO band at 317 m μ . in EtOH or 326 m μ . in n-C₆H₁₄. CHPr⁴:CEt-CHO (II) shows a less marked displacement of the CO band at a remembrance band to be a straight which articize needs. The band towards longer λ and a remarkably high extinction coeff. The mol. refractions of (I) and (II) are 39.3 and 39.7, respectively. H. W.

Absorption spectrum of some polymethine dyes. K. F. Herzfeld (J. Chem. Physics, 1942, 10, 508-520).—Energy levels of a no. of polymethine dyes are calc. approx. by the Heitler-London-Pauling-Slater valency bond method and the Hückel-Hund-Mulliken mol. orbital method. The results by the two methods different in the orbital method. The results by the two methods differ only in the numerical val. of the consts. and the final application of the formula. L. J. J.

Energy levels and colour of polymethine dyes. A. L. Sklar (J. Chem. Physics, 1942, 10, 521-531).—The results of Herzfeld's

calculations (cf. preceding abstract) are applied to the longest- λ electronic band of symmetrical and unsymmetrical polymethines. L. I.

Isomerism and absorption by cyclic pyrrole colouring materials. IV. Light absorption and constitution of chlorophyll derivatives. F. Pruckner (Z. physikal. Chem., 1942, A, 190, 101-125).—The absorption spectra of various related groups of porphin and porphyrin derivatives in various solvents have been measured and compared. The results indicate that several porphyrins described by Knorr and Albers (A., 1941, I, 238) as " nuclear isomerides " should I. W. S. be regarded as distinct compounds.

Light absorption of polycyclic internally complex compounds. I. Light absorption of polycyclic internally complex compounds. I. Salicylaldehyde-ethylenedi-imine complexes. A. von Kiss, P. Csokán, and G. Nyiri (Z. *physikal. Chem.*, 1942, A, 190, 65–80).—The extinction curves of glycine (I), salicylaldehyde-ethylenedi-imine (II), and their Na, K, Ca, Ba, Mg, Zn, Cu, Fe, Ni, and UO₂ complexes in EtOH have been determined at room temp, and over the λ range 2000—7000 A. Comparison measurements have also been made with Cu^{II}, Fe^{III}, Ni^{II}, and UO₂^{II} perchlorates, the extinction curves of which are due to the completely hydrated metal ions, absorption arising through excitation of the outermost electrons of the ion and arising through excitation of the outermost electrons of the ion and the electrons of the co-ordinate linkages. The absorption by (II) is the electrons of the co-ordinate images. The absorption by (II) is attributed to excitation of the π electrons of the C₆H₆ nucleus and of the CH.N group with one band due to the H-bridge. The absorp-tion curves of the complex salts of (I) are combinations of the absorptions of the metal ion and of the co-ordinate linkages. With (II) complexes the org. mol. itself also contributes and various factors cause a modification of the extinction curve, particularly when the metallic ion has no absorption. J. W. S.

Ultra-violet absorption and photochemical decomposition of aqueous solutions of ascorbic acid in the ultra-violet.—See A., 1942, I, 304, 333.

Chemiluminescence of adsorbed dyes. H. Kautsky and G. O. Müller (*Naturwiss.*, 1942, **30**, 315) — When certain fluorescent dyes, chiefly of the rhodamine type, are adsorbed on SiO₂ gel or Al₂O₃ gel, and are oxidised by O_3 , they show chemiluminescence, the colour of which is approx. that of the fluorescence. A. J. M.

Luminescence of luminol. I. Influence of acidity and effect of the addition of foreign substances on the fluorescence of luminol. K. Weber (*Ber.*, 1942, 75, [*B*], 565–573).—Evidence is adduced for the following equilibria in solutions of luminol (**I**): $(\mathbf{I}) \rightleftharpoons \mathrm{NH}_2 \cdot \mathrm{C}_6 \mathrm{H}_3 < \overset{\mathrm{CO}^-;\mathrm{N}}{\operatorname{CO}^-;\mathrm{N}} (\mathbf{II}) + \mathrm{H}^+; (\mathbf{II}) \rightleftharpoons \mathrm{NH}_2 \cdot \mathrm{C}_6 \mathrm{H}_3 < \overset{\mathrm{CO}^-;\mathrm{N}}{\operatorname{CO}^-;\mathrm{N}} + \mathrm{H}^+.$

Only the neutral mols. fluoresce and, under otherwise identical conditions, the brightness of the fluorescence depends essentially on the ditions, the brightness of the fluorescence depends essentially on the $p_{\rm H}$ of the solution. Extinction is caused by foreign substances (acids, bases, acidic, basic, or hydrolysable salts) which change the acidity of the solution and hence displace the equilibria, by org. solvents (EtOH, COMe₂), which behave similarly towards the equilibria, by halogen ions (I', CNS', Br', but only slightly by Cl'), by org. inhibitors [PhOH, metol, o-cresol, o-, m-, and p-c_{\rm g}H_{4}(OH)_{2}, o-OH \cdot C_{\rm g}H_{4} \cdot OMe, 1:2:3 \cdot C_{\rm g}H_{3}(OH)_{3}, NH_{2}Ph] and by complex formation (HgCl₂).

Fatigue effect in luminescent materials. N. C. Beese and J. W. Marden (J. Opt. Soc. Amer., 1942, 32, 317–323).—Loss of luminescence efficiency with continued exposure to light of $\lambda\lambda$ 2537 and 3650 A. is found with cryst. Zn silicate, Cd borate, Zn Be silicate, Mg and Ca tungstate phosphors, fluorescent canary glass, rhodamine, and anthracene and fluorescein both dry and in solution in MeOH and EtOH. The effect increases with time and intensity of irradiation, reaching equilibrium in ~ 10 min. Zn silicate and canary glass show recovery after resting in the dark. ZnS and Zn-Cd sulphide phosphors show no fatigue with λ 3650 A. L. J. J.

Effect of flux on zinc sulphide and cadmium sulphide phosphors. H. Schlegel (*Naturwiss.*, 1942, 30, 242).—The effect of the flux on The efficiency of sulphide phosphors is explained. If NaCl is added in the prep. of ZnS or CdS phosphors, a more intense phosphor is obtained. Na₂SO₄ is ineffective. Reactions occurring are ZnS + 2NaCl \rightarrow ZnCl₂ + 2Na^{*} + S''; ZnCl₂ + 2Na^{*} \rightarrow 2NaCl + Zn^{*}.

A. J. M. A. J. M. M. L. Delwaulle and F. François (*Compt. rend.*, 1942, **214**, 226– 227).—The Raman spectra of CCIBr₃, CCl₂Br₂, and CCl₃Br have been investigated, and the intensity, degree of polarisation, and classific-ation of the lines are given. ation of the lines are given.

Conductivity of gelatin-dye phosphors. L. Gombay (Kolloid-Z., 1942, 99, 28-35).—The conductivity (κ) of gelatin-dye phosphors decreases with rise of temp. to a min. and then increases to an approx. const. val. The initial decrease is greater for large than for small external e.m.f. and for cases where the external e.m.f. has been applied for a period prior to the rise in temp. Increase in external e.m.f. also lowers the val. of the const. κ attained at the higher temp. (~150°). The temp. at which min. κ is attained is ~40—50° and appears to depend little on the val. of the external e.m.f. or its preliminary duration. C. R. H.

Magnitude of the solvent effect in dipole-moment measurements. VI. Induced and mesomeric moments of the alkyl halides and the halogenobenzenes. A. Audsley and F. R. Goss (J.C.S., 1942, 497— 500).-The prep. of tert.-amyl fluoride, b.p. 38°/458 mm., is described. Dipole moments and solvent-effect consts. at 20° for CCl4 solutions of *n*- and $tert.-C_5H_{11}F$, Bu^aBr, Bu^aCl, Bu^aBr, and PhI are recorded. The influence of the spatial effect on each of the three parts of the radical effect (cf. A., 1942, I, 258) varies through a series of alkyl halides in the order F > Cl > Br > I (negligible). The mesomeric moment (μ_M) for aromatic halides can be expressed by $\mu_M = 1.15 - 0.012Z$ (Z = at. no.). C. R. H.

Scattering of light by an aggregate of small dielectric particles. R. Landshoff (J. Physical Chem., 1942, 46, 778-781).-Mathematical. C. R. H.

Molecular volume nomograph for liquid alkanes. D. S. Davis (Ind. Eng. Chem., 1942, 34, 797).—From the data of Egloff and (*Int. Eng. Chem.*, 1942, 54, 191).—Four the computation of the Kuder (A., 1942, I, 195) a nonograph to permit computation of the mol. vols. of liquid *n*-hydrocarbons from CH₄ to C_8H_{18} at -170° to 70° has been constructed. J. W. S. 70° has been constructed.

Applicability of the Hartmann formula for calculation of dispersion in the near infra-red region of the spectrum. V. G. Vafiadi and M. S. Zelitzer (J. Tech. Phys. U.S.S.R., 1936, 6, 53-59).-Data are given for fluorite, NaCl, quartz, and optical glass, and corrections to the formula are discussed. Сн. Авз. (е)

Specific dispersion of pure hydrocarbons. R. E. Thorpe and R. G. Larsen (*Ind. Eng. Chem.*, 1942, 34, 853—863).—The sp. dispersions (x) of a large no. of pure hydrocarbons have been analysed. They can be predicted by the formula $x = (98\cdot4p + 98\cdot3n + 189\cdot3u)/c$, where p and n are the nos. of paraffinic and naphthenic C atoms, the present of p of C atoms of paraffinic and naphthenic C atoms, the parameter p and n are the nos. of paraffinic and naphthenic C atoms, the parameter p and n are the nos. of paraffinic and naphthenic C atoms, the parameter p and n are the nos. of paraffinic and naphthenic C atoms, the parameter p and n and p and p and p are the nos. of paraffinic and naphthenic C atoms, the parameter p and p and p and p and p are the nos. of paraffinic and naphthenic C atoms, the parameter p and p and p and p and p are the nos. of paraffinic and naphthenic C atoms, the parameter p and u the apparent no. of C atoms associated with double linkings, and c is the total no. of C atoms in the mol. In conjugated double linkage systems the conjugation increases the effect of these linkings and the method of calculating this increase is discussed in detail. The possibility of utilising determinations of x in identifying the structures of hydrocarbons is also discussed. J. W. S.

Dispersion of ultra-short waves in polar liquids with multiple relaxation times. G. Klages (*Physikal. Z.*, 1942, 43, 151–166).— The dispersion of waves of $\lambda 8 \text{ cm.} - 2 \text{ m.}$ in liquids which, on account of their form, polarity, and freely rotating polar group, have a no. of relaxation times, is determined with 3-chlorodiphenyl, and octyl, decyl, lauryl, and cetyl chlorides. If a liquid has two relaxation times for the different three to be account of the different to be a set of the different to be a set. times which are not widely different, there is a smoothing out of the dispersion curve. In the case of the aliphatic chlorides, a relaxation time distribution is discussed in connexion with the inner rotation of the mol. A. J. M.

Influence of lyotropic substances on the specific rotation of β -*l*-glucosan. J. R. Katz and J. Seiberlich (*J. Physical Chem.*, 1942, 46, 640-641).—Data for the sp. rotation of β -*l*-glucosan mixed with various lyotropic substances confirm earlier conclusions that compound formation is unlikely. C. R. H.

Temperature concept. M. K. Barnett (J. Physical Chem., 1942, 46, 715—723).—Theoretical. A method for ordering any given no. of bodies, existing in certain states, into a "temp. series" is devel-oped, and the derivation of an "arbitrary temp. scale" and its nature are discussed. C. R. H.

Joule's law and the laws of thermodynamics. (A) J. Palacios. (B) O. R. Foz (Anal. Fis. Quim., 1941, 37, 199-203, 204-206).--(A) A proof of Joule's law. (B) The author's previous contention (A., 1941, I, 292) that Joule's law is empirical is upheld. F. R. G.

Natural periodic system of the compounds. III. J. N. Frers (Z. anorg. Chem., 1942, 249, 281-292).—Theoretical. F. J. G. F. J. G.

Statistical distribution laws for rate processes. I. [Systems in which velocities are non-Maxwellian.] II. Non-uniform distributions. B. Longtin (J. Chem. Physics, 1942, 10, 546-550, 551-556).—I. The method of deriving distribution laws for systems not in equilibrium is outlined, e.g., for mol. groups having non-Maxwellian velocities.

II. Forms of statistical distribution law suitable for rate processes are determined. L. J. J.

Structure of substituted ethylenes and their isomerisation, poly-merisation, and "peroxide addition" reactions. R. A. Harman and H. Eyring (J. Chem. Physics, 1942, 10, 557).—cis-trans-Isomerisation, polymerisation, and peroxide addition of ethylenic compounds show two types of mechanism : (a) triplet mechanism involving transition from singlet ground state with opposite electron spins into triplet state with like spins ~ 25 kg-cal. above, (b) singlet mechanism involving rotational adiabatic transition to an upper singlet state ~ 40 kg-cal, above. In each case the double bond dissociates to a single bond. (a) operates in catalysis by paramagnetic substances, free radicals and atoms, e.g., in the initiation of polymerisation in styrene, reversal of Markovnikov rule by paramagnetic catalysts. (b) operates with catalysts of the Friedel-Crafts type. L. J. J.

Inorganic compounds of nitric oxide. Structure and valency theory of inorganic nitric oxide complexes. W. Hieber and F. Seel (Z. anorg. Chem., 1942, 249, 308-324).—The structures and be-haviour of a no. of inorg. NO compounds are discussed in the light of the theory that the NO functions as the ion NO⁺, which is then co-ordinatively bound to the central atom. F. J. G.

Chemical behaviour and structure of the azide group N_3 . E. Oliveri-Mandalà and G. Caronna (*Gazzetta*, 1941, 71, 182–188).— Theoretical. On chemical grounds a cyclic formula is favoured for HN₃ and a linear formula for PhN₃. E. W. W.

Resonance in substituted diphenyls.—See A., 1942, II, 354.

Influence of the "hydrogen bond" on magnetic susceptibility. H. S. Venkataramiah (J. Mysore Univ., 1942, B. 3, 19-22).—The magnetic susceptibility of solutions of alcohols in CCl₄ is > the calc. val. owing to breaking up of H bonds. For solutions of $CHCl_3$ in Et_2O , the susceptibility is < the calc. val., owing to association of unlike mols. A. I. M.

Mean free path of gas molecules in mercury vapour. J. A. Eldridge (*Proc. Iowa Acad. Sci.*, 1935, 42, 155).—The mean free paths were obtained for H_2 , He, N_2 , CO₂, CH₄, C_2H_8 , C_3H_8 , *n*- and *iso*-C₄H₁₀ in Hg vapour, by observing the decrease in intensity as a beam of the gas was passed through the vapour. The vals, were < those deduced from η data. Сн. Авз. (е)

Mechanism of metallic friction. F. P. Bowden and D. Tabor (Nature, 1942, 150, 197-199).—A lecture. A. A. E.

III.—CRYSTAL STRUCTURE.

Diffraction of X-rays by liquid oxygen. P. C. Sharrah and N. S. Gingrich (*J. Chem. Physics*, 1942, **10**, 504–507).—Liquid O at 89° κ . shows an intense peak at sin $\theta/\lambda = 0.157$ and very weak peaks at Shows an interse peak at sin $0/\lambda = 0.107$ and very weak peaks at 0.35 and 0.5. Corresponding vals. at 62° K, are 0.159, 0.35, 0.5, 0.5, At. distribution peaks are at 1.3, 2.2, 3.4, 4.2 A, at 89° K, and 1.25, 2.15, 3.2, 4.1 A, at 62° K, and are ascribed to O_2 , O_3 , and higher mol. aggregates, respectively. L. J. J.

Indexing of X-ray goniometer photographs. G. Menzer (Z. Krist., 1941, 103, 403-414).- A simplification of Schneider's method (ibid., 1928, 69, 41) employing polar co-ordinates, suitable for construction of reciprocal lattices from Weissenberg and Schiebold-Sauter X-A. J. E. W. radiograms, is described.

Photometric instruments used in X-ray diffraction.-See A., 1942, I, 341.

Determination of absolute from relative X-ray intensity data. (A) S. H. Yü. (B) A. J. C. Wilson (*Nature*, 1942, **150**, 151, 152).-Mathematical. A. A. E.

X-Ray diagram of dehydrated muscle.-See A., 1942, III, 715.

Fine structure of wool keratin. H. Nowotny and H. Zahn (Z. physikal. Chem., 1942, B, 51, 265-280).—X-Ray diffraction evidence for the fine structure of wool and other forms of keratin is O. D. S. discussed.

Crystal orientation in tarnish layers (Anlaufenschichten). G. M. Schwab (Z. physikal, Chem., 1942, B, 51, 245-264).—The orientation of films formed by chemical reaction on single crystals is investigated by X-ray reflexion photography. AgCl and AgBr on Ag, AgCl on AgBr, and AgBr on AgI are oriented. Unoriented films are formed by CuCl, CuI, and Cu₂O on Cu, PbS and PbSe on Pb, and AgBr on AgCl. Orientation occurs when the film has a larger mol. vol. than the ground crystal and the two lattices contain planes in which the spacing of similar atoms corresponds periodically with an error >5%. O. D. S.

>5%. 0. D. S. X-Ray study of alloys of composition AB₂ of iron-group metals with titanium, zirconium, niobium, and tantalum. H. J. Wallbaum (Z. Krist, 1941, 103, 391-402).—Powder X-radiograms show that Mn₂Zr, Mn₂Nb, Mn₂Ta, Fe₂Nb, Mn₂Ti, and Fe₂Ta have MgZn₂ (Cl4 type) structures (a 5·029, 4·865, 4·861, 4·821, 4·81, 4·80; c 8·223, 7·955, 7·936, 7·866, 7·88 A.; c/a 1·635, 1·635, 1·634, 1·632, 1·638, 1·633, respectively). Fe_{2:19}Zr_{0·81}, Co_{2:18}Nb_{0·81}, and Co_{2:19}Ta_{0·81}, have MgNi₂ (C36 type) structures (a 4·952, 4·729, 4·722; c 16·12, 15·43, 15·39 A.; c/a 1·628, 1·631, 1·630), whereas Fe₂Zr, Co₂Nb, Co₂Ta, and Co₂Zr have MgCu₂ (Cl5 type) structures (a 7·639, 6·745, 6·719, 6·887 A.). Indexed visually-estimated intensities and complete interat. distance data are tabulated. Ni gives compounds of the type Ni₃X instead of Laves phases (Ni₂X); these have ordered, partly deformed, close-packed structures. A. J. E. W. partly deformed, close-packed structures. A. J. E. W.

Arrangement of atoms in amorphous solid substances. R. Glocker and H. Hendus (Z. anorg. Chem., 1942, 48, 327-331).—With strictly monochromatic radiation, X-ray photographs of explosive Sb and glassy Se have been obtained which show several clearly-marked interference bands. Interpretation shows that the at, arrangement is similar to that in liquids, each Sb atom having four nearest neighbours and each Se atom two. The concept "amor-phous" is discussed. F. J. G. Distribution of metallic atoms in two-component glasses. J. S. Lukesh (Proc. Nat. Acad. Sci., 1942, 28, 277-281).-If the radial distribution curve of a Na2O-SiO2 glass, obtained by application of the Fourier integral to the intensity curve from the X-ray diffraction pattern, is compared with the curve for a pure SiO₂ glass, and the ordinates of the second curve are subtracted from those of the first, a curve is obtained the peaks of which are due to the radial distribution of the scattering matter about the Na, thus giving information about the distribution of the metallic atoms. The max. of the differential curve correspond with the interat. distances of the additional metal in the two-component glass. Sources of error involved in the method are discussed. The method is also applied to Na_2O- and $K_2O-B_2O_3$ glasses, but the error in these cases is greater and the curves are more difficult to interpret. The method can readily be extended to liquids and solutions, and, in some cases, to A. J. M. gases.

New Fourier series technique for crystal structure determination. M. J. Buerger (*Proc. Nat. Acad. Sci.*, 1942, 28, 281-285).—The principle of the differential curve obtained by Lukesh (cf. preceding abstract), which gives the interat. distances of metal atoms in a twocomponent system, has been applied to Fourier functions, the difference function for two crystals of related structure being found. The properties of the Patterson diagram and the difference diagram are discussed. It is not easy to interpret the difference diagram in terms of the plane pattern projection of a crystal, though it is much easier than deriving the latter from a Patterson diagram. Difference diagrams can be obtained directly without first plotting Patterson diagrams. The difference diagrams can be used to determine the nature of solid solutions. A. I. M.

Structure of sulphanilamide. G. Giacomello and (Signa.) P. Riverso (Gazzetta, 1941, 71, 209-216).-Sulphanilamide is shown by X-ray diffraction to have a rhombic cell with a 14.8, b 5.6, and c 18.4 A., space-group D_{28}^{18} , 8 mols. per unit cell. Fourier projection on the bc plane, and Patterson projection, show that the aromatic nuclei are at normal intermol. distances, but the O and the N atoms of different and adjacent SO₂·NH₂ groups are at a closer (*i.e.*, ionic) distance. The lattice is thus of mixed type, mol. and filiform ionic, embodying the system $-S_{O\cdots H} = S_{O\cdots H} = S_{O\cdots H}$, the presence of which

may be relevant to the pharmacological action of sulphanilamide. W.W

Crystal structure of mercury chlorobromide, $H_{\rm C}({\rm R},{\rm Br})_2$. W. Scholten and J. M. Bijvoet (Z. Krist., 1941, 103, 415–419; cf. A., 1939, I, 524).—The β -phase (HgBr₂ 55–60 mol.-%) has (from rotation X-radiograms) a 6.78, b 13.17, c 4.10 A., a : b : c = 0.515 : 1:0.301; 4 mols. per unit cell; $\rho_{\rm calc}$ 5.62; space-group $P2_12_12_1$ (V4). At parameters are fully determined, partly by analogy with HgCl₂; the structure contains linear X–Hg–X mols. A. J. E. W.

X-Ray studies on the oxyhalide minerals nadorite (ochrolite), PbSb0₂Cl, and ekdemite. L. G. Sillén and L. Melander (Z. Krist., 1941, 103, 420-430).-Nadorite (shown by X-radiograms to be identical with ochrolite) has (from rotation and Weissenberg photo-graphs) $a 5 \cdot 59$, $b 5 \cdot 43_1$, $c 12 \cdot 20$ A., $a \cdot b : c = 1 : 0 \cdot 971 : 2 \cdot 181 ; 4$ mols. per unit cell; $\rho_{\text{cale.}}$ 7 $\cdot 05$; space-group D_{27}^{17} . Complete at, parameters are derived from observed intensities; the structure is closely related to that of a tetragonal phase ($a \cdot 3 \cdot 887$, $c \cdot 12 \cdot 26$ A.), also PbSbO₂Cl, which is formed with nadorite and a phase containing no Sb on fusing a mixture of PbCl₂, PbO, and Sb₂O₃; the tetragonal phase is isomorphous with " X_1 " compounds of the M₂O₂X type (cf. A., 1939, I, 457). Ekdemite is pseudo-tetragonal (a 10.8, c 25.6 A.; symmetry 4/mmm), the crystals containing uni- and bi-axial phases; it contains no As^{v} and cannot be synthesised from $PbCl_2$, PbO, and As_2O_3 . (Cf. A., 1941, I, 380.) A. J. E. W.

Crystal lattice of colemanite (Ca₂B₆O₁₁₅5H₂O). Z. Dér (Z. Krist., 1941, 103, 431-433).—From Laue and Schiebold X-radiograms,

1941, 103, 431–433).—From Late and Schedold A-radiograms, colemanite has a 8.61, b 11.12, c 6.10 A., a: b: c = 0.7743: 1: 0.5480; V 548.1 cu. A.; 2 mols. per unit cell; probable space-group C_{22}^{δ} . A. J. E. W. Isotypism of PbK₂(SO₄)₂ and Ca₃(PO₄)₂. H. Strunz (*Naturwiss.*, 1942, 30, 242).—X-Ray investigation shows that palmierite, PbK₂(SO₄)₂, and whitlockite, Ca₃(PO₄)₂, are of similar structural type and have similar formulæ. They are not, however, iso-markenes. morphous. A. J. M.

Crystallo-chemical classification of inorganic compounds. H. Strunz (Naturwiss., 1942, 30, 243).-A classification is proposed in which both chemical and crystallographic properties are taken into account. A. J. M.

Distribution of autelectronic emission from single crystal metal points. II. Adsorption, migration, and evaporation of thorium, barium, and sodium on tungsten and molybdenum. M. Benjamin and R. O. Jenkins (*Proc. Roy. Soc.*, A, 180, 225–235; cf. A., 1941, I, 32).—Migration occurs at relatively low temp. e.g., 870° for Th on a W or Mo point, and for an optimum thermionic covering there is a unique distribution of the migrating atoms on the metal crystal. Certain crystal zones are avoided by the migrating atoms. Evaporation takes place preferentially from certain zones, and the differences in the temp. for complete migration and for evaporation lead with Ba. The study of thoriated W shows that diffusion of Th occurs through the crystal lattice along certain preferred directions and that the final distribution of Th is identical with that obtained by deposition from an external source. G.D.P.

Orientation of liquid crystals by rubbed surfaces. P. Chatelain (Compt. rend., 1942, 214, 32-34; cf. A., 1942, I, 291).—Rubbing of a surface causes orientation of electric dipoles, introduced by impurities, in the plane of the surface; this induces a corresponding orientation of mols. in a superimposed layer of a nematic liquid. Experiments with p-azoxy-anisole and -phenetole are described which indicate that the initial dipole orientation may also be caused by growth of solid crystals on the surface. A. J. E. W. solid crystals on the surface.

Interpretation of etched figures on aluminium crystal surfaces. I. N. Stranski (Ber., 1942, 75, [A], 105-113).—A lecture. H. W.

Molecular rotation in organic crystals. A. H. White (Bell Labs. Rec., 1936, 15, 11-14).—In contrast to aromatic compounds, the dielectric const. of d-camphor, cyclo-hexene, -hexanol, and -hexanone, and chlorocyclohexane does not increase abruptly on solidification, showing that mol. rotation persists in the solid state. At the lower transition temp., where this rotation begins, the heat capacity increases with temp. Two strainless forms of the C_6H_{12} ring exist, and illustrate how the change in at. vibration with temp. is possible. The increase in mol. symmetry caused by changes in the at. vibration probably causes the concurrent mol. rotation. Сн. Авз. (е)

Plasticity of zinc. M. N. Davidenkov and I. N. Miroljubov (J. Tach. Phys. U.S.S.R., 1936, 6, 60–77). When Zn monocrystals are stretched at a const. rate of 5×10^{-3} mm. per hr., the tension diagrams obtained are the same as those from more rapid stretching, both as to the limiting plasticity and the presence of irregular jumpy changes in the pull required. Сн. Авз. (е)

Isomorphism and allotropy in compounds of the type A2XO4 M. A. Bredig (J. Physical Chem., 1942, 46, 747-764).-A detailed interpretation of earlier data (cf. A., 1932, 469 and subsequently) on the formation and structure of Ca phosphates, silicophosphates, and C. R. H. alkali phosphates is presented.

Liquid crystalline and isotropic states with special reference to p-azoxyanisole. G. W. Stewart and H. R. Letner (Proc. Iowa Acad. Sci., 1935, 42, 153).—A review and discussion. CH. ABS. (e)

Distortion of the zinc crystal lattice during mechanical twinning. E. S. Jakovleva and M. D. Motschalov (J. Tech. Phys. U.S.S.R., 1935, 5, 1085–1092).—The centres of recrystallisation occur on the border of the twin and the original crystal. At 300-400°, they were observed in places not containing twins. Сн. Авз. (е)

Liquid-crystalline substances with side-chains of the type OR (CH₂]_{*}:O.—Soe A., 1942, II, 361.

IV.—PHYSICAL PROPERTIES OF PURE SUBSTANCES.

Significance of low-temperature research.-See A., 1942, I, 341.

Velocity of sound in liquids and molecular volume. M. R. Rao (J. Mysore Univ., 1942, B, 2, 89–93).—The velocity of sound (v) in a liquid of density ρ and mol. wt. M is given by $v!(M|\rho) = R$, where R is a const. for a given liquid and is an additive function of the chemical composition. The function may be written $R = a(\theta_e/M)^{\frac{1}{2}} V_e$. where θ_e is the crit. temp. and V_e is the crit. vol. a is const. for a large no. of liquids. A. J. M.

Effect of ultrasonic waves on velocity of corrosion of copper.--See A., 1942, I, 333.

Equations for the specific heats of gases. J. C. Smallwood (*Ind. Eng. Chem.*, 1942, 34, 863—864).—The sp. heats (c_p) of O_2 , N_2 , CO, H_2O , CO₂, and air can all be represented by relations of the form $c_p = a + xT^{-\frac{1}{2}} + yT^{-1} + zT^{-2}$, where a, x, y, and z are consts. the value of which are tabulated vals. of which are tabulated. I. W. S.

Variation of the vertical temperature gradient in certain states of some fluids. F. Morán (Anal. Fís. Quím., 1941, 37, 192-198).— The variation of sp. heat with altitude is expressed as a function of temp. F. R. G.

Specific heat as a function of temperature. F. Morán (Anal. Fis. Quim., 1941, 37, 405-412).—The state in which the sp. heat is a uniform function of temp. is called thermotropy. Formulæ are developed to express this function. F. R. G.

Measurement of latent heat [of water] by the gas-current method. A. Goff and J. B. Hunter (J. Appl. Mech., 1942, 9, A22-25). The apparatus used is diagrammatically described and the technique outlined. Sufficiently reliable vals, of the interaction const, for mixtures of air and H₂O vapour have been determined to permit an adequate thermodynamic analysis of the gas-current method.

R. B. C Thermal properties and constitution. XIV. M.p. and b.p. of the elements. Werner Fischer (*J. pr. Chem.*, 1941, [ii], 158, 200-210). -The regularities which are observed when the m.p. and b.p. of the elements are plotted according to the periods of the periodic table are discussed. J. L. E.

Physical constants of low-boiling hydrocarbons. R. Matteson and W. S. Hanna (*Oil and Gas J.*, 1942, **41**, No. 2, 33–37).—Mol. wts., C: H ratios, m.p., b.p., crit. consts., liquid density (g. per ml., A.P.I., and lb. per gal.), gas d, gas-law deviation factor, C_p/C_e , heats of combustion, vaporisation, and fusion, air required for combustion, limits of inflammability, m_D , NH₂Ph points, and C_8H_{18} nos. are given for a no. of paraffin and olefine hydrocarbons, C_8H_6 , PhMe, xylenes, MeOH, EtOH, and a few other common compounds. J. W.

Relations between physical properties of paraffin hydrocarbons. A. W. Francis (*Ind. Eng. Chem.*, 1941, **33**, 554—560).—B.p., m.p., *d*, *n*, NH₂Ph point (*A*), and C₈H₁₈ no. (*O*) for the paraffins up to C₁₀H₂₂ are tabulated and empirical equations for determining b.p., *d*, and *n* for some of the compounds have been devised. For each group of isomeric paraffins *A* is nearly a linear function of *d* or *n*, and *O* is nearly a linear function of $1000d - 2 \times b.p.$ and of b.p. + *A*.

C. R. H. Determination of volatility of organic substances. L. Kofler and H. Doser (Angew. Chem., 1942, 55, 13-14).—A method for determining the approx. temp. of sublimation of an org. substance is described; the results are relative, the vals. obtained being dependent mainly on the rate of heating. A linear relation exists between mp. and average sublimation temp. of org. substances, the difference between the two vals. increasing with increase in mp. F. O. H.

Relation between b.p. and critical temperatures and pressures. C. Chen and C. Tseng (J. Chem. Eng., China, 1936, 3, 110–112).—The following empirical equation is given: $T_b = 0.53796T_e + 0.23755P_e$, where $T_b = b.p.$, and T_e and P_e are the crit. temp. and pressure. CH. ABS. (e)

Gas imperfections determined from heat of vaporisation and vapour pressure. C. F. Curtiss and J. O. Hirschfelder (J. Chem. Physics, 1942, 10, 491-496).—Deviations from the gas laws calc. by combining heats of vaporisation and v.p. data with the Clausius-Clapeyron equation are compared with experimental second virial coeffs. for a no. of gases and vapours. Vals. for dimerisation in HI, NHMe₂, MeOH, EtOH, and HCN are obtained. L. J. J.

Vapour density of mercury. W. Klemm and H. Kilian (Z. physikal. Chem., 1942, B, 51, 306—308; cf. A., 1942, I, 167).—An error in calculation is corr. The deviations from the ideal gas laws for Hg are in the direction expected for a real gas. Hg vapour is monat. O. D. S.

Vapour pressure nomograph for unsaturated hydrocarbons. D. S. Davis (*Ind. Eng. Chem.*, 1941, **33**, 553).—A nomograph giving the v.p. of 8 unsaturated hydrocarbons at temp. —130° to 20° has been constructed. C. R. H.

Equation of state and the heat of phase transformation in solid bodies. J. A. Trotzki (J. Tech. Phys. U.S.S.R., 1936, 6, 125–136). —The formula $\phi = qRT^2(2a_2 - 3a_1)$ is derived thermodynamically, where $\phi =$ the heat of transformation from phase I to phase II, and a_1 and a_2 are the linear expansion coeffs. of I and II. The calc. val. for the $\gamma \rightarrow \beta$ transition in Fe is 375 kg.-cal. per g.-atom; the observed val. is 372 kg.-cal. CH. ABS. (e)

Calculation of the efficiency of the Carnot cycle for a given substance. F. Morán (Anal. Fis. Quim., 1941, 37, 549-556).—The calculation is more complex but more logical than for a perfect gas.

Tension of vaporisation and sublimation. J. P. E. Duclaux (Compt. rend., 1942, 214, 78-80; cf. ibid., 1941, 213, 482, 674).—Mathematical. N. M. B.

Adiabatic compressibilities of oils. (Mrs.) Sree (J. Mysore Univ., 1942, B, 2, 95-97).-Determination of the velocity of ultrasonic waves in oils enables the adiabatic compressibilities of the oils to be calc. Results are given for almond, mustard, coconut, cod-liver, shaliverol, thyme, and turpentine oils. A. J. M.

Viscosity-temperature function of liquids. E. P. Irany (*Phil. Mag.*, 1942, [vii], **33**, 685-688).—The author claims to have anticipated Nissan (cf. A., 1942, I, 50) with his method of graphical analysis (cf. A., 1938, I, 610). C. R. H.

Relationships between viscosity and surface tension of liquids. R. C. Tripathi (*J. Indian Chem. Soc.*, 1942, **19**, 51–54).—Buehler's equation (A., 1938, I, 63) has been modified to log log $\eta = m\gamma^4 + c$, where *m* is a const. characteristic of each liquid, and *c* is a const. The equation is satisfactory for simple and associated liquids and at temp. > their b.p. D. F. R.

Viscosity of propane, butane, and isobutane. M. R. Lipkin, J. A. Davison, and S. S. Kurtz, jun. (*Ind. Eng. Chem.*, 1942, **34**, 976–978).—The η of liquid C₃H₅, *n*- and iso-C₄H₁₀, determined over a wide temp. range, vary linearly with temp. C. R. H.

V.—SOLUTIONS AND MIXTURES (INCLUDING COLLOIDS).

Dew points and b.p. for mixtures of nitrogen with carbon monoxide at pressures up to seventeen atmospheres. F. Schtekkel (*J. Tech. Phys. U.S.S.R.*, 1936, **6**, 137—140).—Data are given for the range 84—113° K., At 17 atm. the liquid and vapour phases have almost the same composition. The dew-point pressure is given by $P_{\rm H} = (P_{\rm co} P_{\rm Ni})/P_{\rm co} X_{\rm Ni} + P_{\rm Ni} X_{\rm co})$, and the b.p. pressure by $P_{\rm K} = P_{\rm CO} + X_{\rm Ni} (P_{\rm Ni} - P_{\rm CO})$, where $P_{\rm H}$ and $P_{\rm K}$ are the pressures of initial and complete condensation and X is the composition of the mixture in mols.-% CO. CH. ABS. (e)

Critical states of two-component paraffin systems. F. D. Mayfield (Ind. Eng. Chem., 1942, 34, 843—849).—The crit. temp. of binary mixtures of lower n-hydrocarbons vary almost linearly with the composition in wt.-%. The crit. pressure, however, is always > the val. calc. by this law, and an empirical relation which permits the approx. prediction of the crit. temp.-crit. pressure-composition relationship has been developed. Except for the systems $CH_4-C_5H_{12}$ and $CH_4-C_6H_{14}$ the calc. vals. are within 1.3% of the observed vals. J. W. S. P-V-T-r relations of the system propane-isopentane. W. E.

P-V-T-x relations of the system propane-isopentane. W. E. Vaughan and F. C. Collins (*Ind. Eng. Chem.*, 1942, 34, 885-890).—The P-V-T-composition relationships of five C_3H_8 -CHMe₂Et mixtures have been studied at 0—300° and 2—80 atm. The crit. data for the system are presented and the phase equilibrium consts. are calc. J. W. S.

Changes in volume on mixing solutions. P. W. Parsons and F. J. Estrada (*Ind. Eng. Chem.*, 1942, **34**, 949–952).—The "shrinkage factor" (*F*) is a function of the composition of a solution, its *d*, and the *d* of the pure components. Vol. fraction- and wt. fraction-*F* for EtOH-H₂O mixtures and wt. fraction-*F* for H₂SO₄-H₂O mixtures have been graphically recorded, and from the graphs amounts of vol. change on mixing EtOH or H₂SO₄ with H₂O can be calc.

Azeotrope of nicotine and water. D. F. Kelly, (Miss) M. J. O'Connor, and J. Reilly (J.C.S., 1942, 511—513).—An azeotropic mixture of nicotine (I) and H₂O boils at 99.6°/760 mm. and contains 2.45% of (I).

Vapour pressure of mixtures of chlorosulphonic acid and sulphur trioxide. S. A. Kudjavtzev, B. D. Melnik, I. G. Lesochin, and B. A. Kopilev (J. Appl. Chem. Russ., 1941, 14, 478–482).—The v.p. of ClSO₃H is 8.65 mm. Hg at 20° and 24.80 mm. at 50°. Vals. are given for the partial v.p. of four SO₃-ClSO₃H mixtures between 20° and 50°. J. J. B.

Useful solvent for the determination of mol. wt. according to Rast. G. Wendt (Ber., 1942, 75, [B],-425-429).—The use of the lactam, m.p. 196°, of cis-4-aminohexahydrobenzoic acid is recommended. It is obtained by rapid distillation of the mixture of cis- and trans-H_a acids obtained by hydrogenation (PtO₂ in H₂O) of p-NH₂·C₆H₄·CO₂H. It is particularly suitable for the determination of mol. wt. of tripeptides, disaccharides, and nucleosides. H. W.

Viscosity of zinc chloride solutions of various concentrations. P. A. Kopuitschev and V. A. Gusikov (*Ugol*, 1935, No. 120, 109-110).—Data for fresh and used aq. ZnCl₂ employed in flotation are given. CH. ABS. (e)

Dilatometric studies on supersaturation. I. A. C. Chatterji and R. Gopal (*J. Indian Chem. Soc.*, 1942, **19**, 55—60).—When aq. solutions of KNO_3 , $NaNO_3$, K_2SO_4 , NaOAc, or $H_2C_2O_4$ are cooled from the unsaturated to the supersaturated state sudden vol. changes do not occur until crystallisation takes place, either automatically or by inoculation. No vol. changes occur at the lower limit of the metastable range. D. F. R.

Graphical method for interconversion of ternary compositions. K. H. Sun and A. Silverman (*Ind. Eng. Chem.*, 1942, 34, 872-873). —A graphical method for determining wt.-%, mol.-%, or vol.-% compositions of ternary systems from data expressed in another form is described. J. W. S.

Nature of the phases formed by the mutual diffusions of copper-zinc and iron-zinc and the kinetics of their growth. V. Bugukov and D. Gluschkin (J. Tech. Phys. U.S.S.R., 1936, **6**, 263–289).—From the kinetics of the growth of the γ phase at 300—600°, the diffusion coeff. obeys the law $D = Ae^{-Q/4}$, both for solid solutions, and for the transformation from the liquid to the solid state of low-melting alloys. With Fe-Zn, the ϵ phase FeZn, and the γ phase Fe₃Zn₁₀ were formed at 600° (a = 2.79 and 8.90 Å, respectively). The Q vals. were ~15,200 for Cu-Zn and 17,700 for Fe-Zn.

CH. ABS. (e)

X-Ray analysis of crystal orientation in entectic melts of zinc and cadmium. D. M. Zagorodskitsch (*Tzvet. Met.*, 1935, 10, No, 7, 114-120).—The unit cells of Cd and Zn in the eutectic single crystals possess definite orientation with respect to each other, the relative positions being in the direction [100]. CH. ABS. (e)

Irreversible transformations in solid solutions. J. B. Fridman (J. Tech. Phys. U.S.S.R., 1936, 6, 78-82).—In the binary alloys Fe-Ni

and Fe-Mn, hysteresis between the transformations $\gamma \rightarrow a$ on cooling and $a \rightarrow \gamma$ on heating is a linear function of concn. The effect ∞ the at. radius. For Fe-Cr-Ni and for carbides in 18-8 Cr-Ni steel, hysteresis depends similarly on concn. By the simultaneous action of temp. and deformation, hysteresis is decreased 17-25%. The absence of the $\gamma \rightarrow a$ transformation of austenite steels at >150° is due to hysteresis. CH. ABS. (e)

Diffusion of elements in iron. D. A. Prokoschkin (*Metallurg*, 1936, 11, No. 1, 35-45).—If diffusion occurs at a temp. interval in which an increase of the diffusing element in the Fe causes the phase change $a \rightleftharpoons \gamma$, there will be a sharp drop in the concn. of the diffusing element in passing from the γ to the *a* layer. If at the diffusion temp, the field of solid solutions is continuous, the concn. of the diffusing element will decrease uniformly with distance.

Alloys of the system Fe-C-Ti. I. S. Gaev (*Rep. Centr. Inst. Met. Leningrad*, 1935, No. 18, 68–93).—The alloys had C 0.08—2.70 and Ti 0.1—4.47%. The carbides are stable, take no part in the transformation process under heat-treatment, and prevent the enlargement of crystals of the solid solution in steels having no $a \rightleftharpoons \gamma$ (changes. TiC in hypereutectoid steel prevents formation of cementite needles during overheating. Ti is very active in closing the γ field. CH. ABS. (e)

Solubility of gases in organic solvents. I. Nitric oxide in methyl alcohol. L. Riccoboni (*Gazzetta*, 1941, 71, 139—153; cf. Klemenc *et al.*, A., 1929, 1375).—The solubility of highly purified NO in MeOH is determined (apparatus described) at 0°, 10°, 20°, and 30°. As temp. increases, the Ostwald solubility coeff. decreases slightly. E. W. W.

Raman effect in partially miscible liquid systems. (Mrs.) Stee (J. Mysore Univ., 1942, B, 2, 105-107).—If two partly miscible liquids are shaken together and the Raman spectra of the two phases are studied simultaneously, it is possible to obtain the solubility of one liquid in the other. The Raman spectra of both phases are photographed at the same time, and the intensities of the Raman lines of each liquid in the light scattered by each phase give a measure of their mutual solubility. Pairs of liquids investigated in this way were MeOH-CS₂, H₂O-CCl₄, H₂O-CS₂, H₂O-BuOH, and CS₂, CCl₄-, and C₆H₆-glycerol. A. J. M.

Hydrocarbon-water solubilities at elevated temperatures and pressures. J. Griswold and J. E. Kasch (Ind. Eng. Chem., 1942, 34, 804-806).—The solubilities in H_2O of three petroleum fractions (mean mol. wt. 147, 173, and 425, respectively) have been determined at $0-280^\circ$. The results expressed in mol.-% are independent of the mol. wt. of the oil, and permit the prediction of the solubility of H_2O in petroleum fractions for any steam pressure at temp. $\geq 300^\circ$. The solubility of petroleum in H_2O is \ll that of H_2O in the oil and at const. temp, decreases with increasing mean mol. wt. The solubility of aromatic hydrocarbons is > that of petroleum fractions of equal mol. wt.

Effect of water on the solidification points of fatty acids. Solubility of water in fatty acids. C. W. Hoerr, W. O. Pool, and A. W. Ralston (*Oil and Soap*, 1942, 19, 126—128).—The depression of the f.p. of the *n*-saturated fatty acids from C₆ to C₁₈ has been investigated, and the solubility of H₂O in pure preps. of the C₆, C₇, C₁₁, C₁₂, C₁₃, and C₁₈ acids at temp. from their f.p. to 100° determined experimentally; from the data, the approx. solubility of H₂O decreases with the no. of C atoms in the fatty acid chain, with the exception of hexoic acid which dissolves less H₂O than heptoic acid; the temp. coeff. of solubility of H₂O also decreases as the series is ascended.

E. L. Solubilities of some chlorides and double chlorides in aqueous hydrochloric acid as a basis of separations. W. Seidel and W. Fischer (Z. anorg. Chem., 1941, 247, 367–383).—Data are presented for the solubility (S) of NaCl, KCl, NH₄Cl, BeCl₂, and AlCl₃ in aq. HCl of different concns. at 0°. With increasing [HCl] S for NaCl falls continuously and reaches 0.032% at 44.5% HCl, whilst for KCl and NH₄Cl S shows min. of 1.0 and 2.0 respectively at \sim 32% HCl. Continuous lowering of S is shown by both BeCl₂ and AlCl₃, but whilst BeCl₂ remains fairly sol. at the highest [HCl], S for AlCl₄ falls to 0.8 mg. Al per 100 c.c. in 44.3% HCl. Separation of Al from Be is almost as complete in aq. HCl as in Et₂O-aq. HCl (cf. A., 1942, I, 307). The S of (NH₄)₂SnCl₄ and of (NH₄)₄TiCl₄ (composition established by analysis) in saturated aq. HCl at 0° falls with increasing [NH₄Cl] to vals. corresponding with 0.4 mg. of Sn and 0.5 mg. of T i per 100 c.c. at 4% NH₄Cl. In this form Sn can be sharply separated from Pb, and Ti from H₃PO₄, H₂SO₄, tartaric acid, and Be. Cu²⁰, Sh²⁰, and Sb² are co-pptd. with (NH₄)₂SnCl₆, and V^{IV}, Fe^{II}, and Fe^{III} with (NH₄)₂TiCl₆. F. L. U.

Barium sulphide. Products of its decomposition, analytical methods and solubility II. Solubility. C. Chorower (Anal. Fis. Quim., 1941, 37, 490—544; cf. A., 1942, I, 340).—The solubility of BaS in H₂O has been determined between 0° and 103°, when decomp. occurs. The solubility is represented by $3\cdot4 + 0\cdot13\theta + 0\cdot04\theta^2$ in the range 0—90°; at higher temp. there is a fall in solubility.

Comparison is made with the solubility of BaO, which exhibits a discontinuity at 70°. F. R. G.

Solubility of silver chloride in hydrochloric acid.—See A., 1942, I, 366.

Solubility of silver acetate in aqueous solutions.—See A., 1942, I. 366.

Solubility of salts and salt mixtures at temperatures above 100°. IV. A. Benrath (Z. anorg. Chem., 1942, 249, 245–250).—Solubility data are recorded for the substances and temp. ranges shown: Na₂B₄O₇, 108–140°; Na₂S₂O₃, 111–179°; H₃BO₃, 110–181°; sucrose, 107–144°; succinic acid, 108–160°; N₂H₄,H₂SO₄, 94– 216°; UO₂(NO₃)₂, 80–187°; Sr(NO₃)₂, 179–475°; Na₂CrO₄, 140–372°; K₂C₂O₄, 130–330°; KHC₂O₄, 116–150°; (NH₄)₂C₂O₄, 114–195°. The solid phases are anhyd. over these ranges with the following exceptions: Na₃B₄O₇,5H₂O is stable up to a congruent m.p. at 140°; the solid phase for UO₂(NO₃)₂ from 58.6° upwards is a lower hydrate, possibly the trihydrate; K₂C₂O₄ undergoes a transition at 177°, probably from monohydrate to anhyd. salt. F. I. G.

Solubility in the system $Na_2CO_3-Na_3PO_4-H_2O$ at 25°. D. K. Korf and A. M. Baliasnaja (*J. Appl. Chem. Russ.*, 1941, 14, 475–477).— The solution simultaneously saturated with Na_3PO_4 , 12 H_2O and Na_2CO_3 , $10H_2O$ contains Na_3PO_4 6·4, Na_2CO_3 19·3, and H_2O 74·3%. I. B.

 Adsorption isotherms and the law of mass action.
 J. J. B.

 Schwab. (B) H. Dunken (Z. physikal. Chem., 1940, A, 187, 313, 314).—(A) The fact that the usual kinetic derivation of Langmuir's isotherm is almost identical with the derivation of the mass action law, as shown by Dunken (A., 1942, I, 19), had been demonstrated previously by several biochemists.

 (B) A reply.
 J. W. S.

Adsorption of gases from lowest to highest pressures. II. Derivation and discussion of equations for ideal adsorption. A. von Antropoff (*Kolloid-Z.*, 1942, 99, 35–52; cf. A., 1940, I, 208).— Theoretical. Equations for abs. and differential adsorption as functions of density and pressure have been developed. C. R. H.

Basis of the separation methods employing surface effects. J. Palacios and R. Salcedo (Anal. Fis. Quim., 1941, 37, 167–176).— The Freundlich equation $\gamma_0 - \gamma = Ac^{1/b}$ connecting surface tension with the concn. of absorbed particles c can be derived from Gibbs' equation if it is admitted that the association of the mols. in solution is b times that in the surface layer. F. R. G.

Time of collapse of spherical soap bubbles. S. Venkatesha (J. Mysore Univ., 1942, B, 3, 13-17).—The time of collapse of spherical soap bubbles depends on the η of the moist gas in the bubble, the surface tension of the solution, the initial radius of the bubble, and the diameter of the tube on which the bubble is blown. Experimental results agree with a formula given. A. J. M.

Surface energy relations in liquid-solid systems. I. Adhesion of liquids to solids and a new method of determining the surface tension of liquids. G. Macdougall and C. Ockrent (*Proc. Roy. Soc.*, 1942, A, 180, 151–173).—A new method of measuring the surface tension of liquids is described. It consists of measuring the advancing and receding angles of contact of a liquid drop lying on an inclined plane surface. Accurate measurement of the angles is secured by optical projection of an enlarged image of the drop on a screen. The method is applied to a variety of solid-liquid systems and the results are in agreement with accepted vals. The advancing and receding contact angles are characteristic consts. of liquid-solid systems and the calculate and measured vals, of the min. receding angle are in agreement. The difference between the adhesions corresponding with the advancing and receding angles is ascribed to the work done in removing an adsorbed layer. It is suggested that the method may be useful in investigating the structure of monofilms and built-up layers of monofilms.

Relations between the spreading pressure, adsorption, and wetting. H. H. Rowley and W. B. Innes (*J. Physical Chem.*, 1942, 46, 694–705).—Theoretical. The thermodynamic treatment of multilayers is discussed. The spreading pressure due to layers other than the first is subdivided into cases where the pressure is < and > saturation, and vals. for the spreading pressure of the first layer, when equilibrium exists between all the phases, have been calc. for several org. compounds adsorbed on C. The relation between contact angle and the reversible work of wetting a solid or an adsorbed layer is discussed. C. R. H.

Stability of multimolecular films of hydrocarbon oils, containing spreaders, on water surfaces. E. Heymann and A. Yoffe (*Trans. Faraday Soc.*, 1942, **38**, 408—417).—Although many spreading agents can reduce the val. of γ_{oll-H_0} (be oil-H₂O interfacial tension, to an extent that permits the spreading coeff. F_* to assume positive vals., multimol. films of hydrocarbon oils on H₂O obtained by their use usually become unstable in time, owing chiefly to migration of spreader mols. from the oil-H₂O to the air-H₂O interface. These processes have been observed in experiments with paraffin oil, Nujol, and kerosene containing spreaders, the various tensions being

measured at the beginning and end of the experiments, and the extent of the oil film being estimated from the rate of evaporation of H2O. With all the simple amphipathic substances used (fatty acids, alcohols, etc.) the film, initially 5—10 μ , thick, gradually contracted to a lens surrounded by a unimol. layer. Polymerised substances (stand oil, polyricinoleic acid, etc.) give rise to films which may be stable for many months. In all such films the interfacial layer is rigid, and the final vals. of F_s are usually negative, so that the films are thermodynamically metastable. Stable thick films can also be obtained by the use of certain dyes (Me-violet, malachite-green, methylene-blue) that cause a large reduction in $\gamma_{oll-H=0}$ but have little influence on YH20. F. L. U.

Membrane equilibria. N. Barbulescu (Kolloid-Z., 1942, 99, 78-85).—Theoretical. Donnan's membrane equilibrium law is criticised as being only a special case of a more general law. General relations governing many types of membrane equilibria are derived. CRH

Electro-optical properties of colloids. H. Müeller and B. W. Sakmann (J. Opt. Soc. Amer., 1942, 32, 309-317).—The photo-electric method described has been employed in a study of anomalous electric and magnetic birefringence in bentonite and mosaic virus sols. L. J. J.

New methods for the determination of stoicheiological quantities in colloidal systems. E. M. Galvez Laguarta (Anal. Fis. Quim., 1941, 37, 227-231).—The micelle concn. and size can be determined by the rate of flow and a method of Brownian compensation respectively. No details of the procedure are recorded. F. R. G.

Viscometric estimation of particle dimensions. I. System stearic acid-carbon tetrachloride. J. P. Hollihan and D. R. Briggs (J. Physical Chem., 1942, 46, 685-693).— η data for stearic acid (I)-CCl₄ solutions substantially confirm published data provided the data are handled according to the Sakurada procedure. This procedure is critically examined, and it is shown that particle-shape data obtained by its use may be mathematical artifacts. Over the data obtained by its use may be mathematical artifacts. Over the flow rates studied the (I) particles are spherical. C. R. H.

Lange reaction. New reducing agent in the preparation of aurosol. L. S. V. de Bollini (*Rev. Fac. Cienc. Quim., La Plata*, 1941, **16**, 103-108).—The use of arabinose as a reducing agent in the prep. of aurosol is described. F. R. G.

Electron-microscopic observations on zinc-black. J. Gundermann and H. Külz (Kolloid-Z., 1942, 98, 287-289).—Zn-black (I), pre-pared by evaporation of Zn metal at 0.3-2 Torr., when examined in the ultramicroscope, was observed to consist of single, clearly-defined haragonal Zn constate which was id in single form 0.0 defined hexagonal Zn crystals, which varied in size from 0.1 to 1μ . These observations were confirmed when (I) was examined in the electron microscope. In the first photograph the crystals were completely opaque, in the second some were transparent, and in a third many were transparent. This increase in transparency may be due to volatilisation of Zn by the electronic irradiation, the ZnO formed as a surface coating being thus left behind as transparent hexagonal skins. N. G.

Colloidal carbon as revealed by the electron microscope.-See B., 1942, I, 402.

(A) Dispersion of aqueous graphite suspensions and the effect thereon of the addition of sodium hydroxide. V. S. Veselovski. (B) Stabilisation of graphite suspensions by means of tannin in in-creasing concentration. Stabilisation isotherms and the method of their determination. E. V. Chalapsina. (c) Stabilisation effect of tannin on suspensions of different kinds of graphite at different $p_{\rm H}$ values of the dispersion medium. N. N. Serb-Serbina. (d) Stabilis-ation of graphite suspensions in non-aqueous dispersion media (hydrocarbons) by polar substances. E. K. Venström and E. M. Svereva. (e) Stabilising power of surface-active substances (pro-tective colloids) and especially of alizarin-red. P. A. Rehbinder and N. N. Serb-Serbina (Issledov. Fiz.-Chim. tech. Suspensii, 83-90, 91-101, 102-116, 117-130, 131-143).--(A) When the dispersion medium is gradually displaced by pure H_2O (by washing) a stabilis-ation max. is observed. With further washing the degree of dis-persion decreases, owing to autocoagulation. The ash content and condition of oxidation of the graphite influence the results. (B) Increase in tannin concn. from 0 to 0.07% in a 5% graphite suspension in 0.1N-NaOH produces marked stabilisation. The most probable size falls from 75 to 37 μ . Further additions up to 0.5% increase the stability only slightly. (B) Stabilisation of graphite suspensions by means of tannin in in-

increase the stability only slightly. (c) In absence of tannin, the max. dispersion is in 10^{-4} N-NaOH. For graphite oxidised with H₂CrO₄, considerably greater stability is observed during washing than during the reverse process of adding NaOH. For oxidised Aliberov graphite the reverse is true. (b) Fatty acids, alcohols, amines, and phenols act as stabilisers for graphite suspensions in C_8H_8 and in C_8H_6 mixed with other hydro-

carbons.

(E) The action of alizarin-red as an emulsifier for C₆H₆ and Hg in relation to pH, its surface activity on the liquid boundary surface, the adsorption on graphite, and the stabilising action on aq. graphite suspensions were investigated. Сн. Авз. (е)

Ageing and coprecipitation. XXXVI. Mixed-crystal formation of lead molybdate with colloidal and flocculated lead chromate. I. M. Kolthoff and F. T. Eggertsen (J. Physical Chem., 1942, **46**, 616–620).—When colloidal PbCrO₄ is shaken with a solution of Na_2MoO_4 only surface exchange occurs, interaction not taking place until the $PbCrO_4$ has been flocculated. This behaviour contrasts with that of colloidal AgBr and is typical of colloidal solutions of particles that C. R. H. are not subject to thermal ageing at room temp.

Influence of chemical structure on the imbibition of liquids by rubber. I. G. S. Whitby, A. B. A. Evans, and D. S. Pasternack (Trans. Faraday Soc., 1942, 38, 269-275).-Measurements are recorded of the swelling of raw and of vulcanised rubber in a large no. of org. liquids representative of hydrocarbons, alcohols, chlorohydrins, aldehydes, ketones, nitriles, acids, acid anhydrides, acid chlorides, NO₂-compounds, and S compounds. In no liquid is a sharp max. of imbibition observed within 1 month; in some the increase is slight, in others large, after 24 hr. Polar groups are unfavourable to swelling, more so in aliphatic than in aromatic compounds; the largest inhibitory effect is shown by OH. Swelling is increased by unsaturation. In a strictly homologous series swelling is usually in the order of decreasing dielectric const., but is not quantitatively related to it; among compounds of different classes the dielectric const. is not a trustworthy guide. F. L. U.

Interaction between rubber and liquids. II. Thermodynamical basis of the swelling and dissolution of rubber. III. Swelling of vulcanised rubber in various liquids. G. Gee (*Trans. Faraday Soc.*, 1942, 38, 276–282, 418–422; cf. A., 1942, I, 204).—II. Approx. formulæ are derived for the relation between the Gibbs free energies of dissolution and dilution and the temp. and vol. fraction of rubber in its mixtures with org. liquids. Temp. coeffs. of solubility of the right order of magnitude are thus calc. In the fractional pptn. or dissolution of mixed rubbers it is shown that (1) the efficiency of separation should be greatly improved by the use of dil. solutions, and (2) no single-stage fractionation can give even an approx. complete separation between rubbers of mol. wt. differing by a factor <2.

III. An expression is derived giving an approx. relation between the swelling power of a liquid and its mol. vol. and cohesive energy. The calc. swelling of vulcanised rubber in various org. liquids agrees substantially with experimental data (cf. preceding abstract), provided the formulæ used have different numerical consts. for aliphatic and aromatic liquids. A val. of 66 g.-cal. per c.c. is deduced F. L. U. for the cohesive energy density of rubber.

Kinetics of rubber-like elasticity. D. D. Eley (Trans. Faraday Soc., 1942, 38, 299-305).—Relaxation phenomena in polymerides are discussed with special reference to their treatment by Kuhn (A., 1939, I, 192) and Alexandrov and Lazurkin (A., 1941, I, 112). In rubber, the movement of segments (~ 10 isoprene units) is held to occur without appreciable internal rotation, but to be accompanied by a high degree of rotation during activation in elastic orientation.

F. L. U. **Kinetics of high elasticity in synthetic polymerides.** R. F. Tuckett (*Trans. Faraday Soc.*, 1942, 38, 310-316).—The Mark-Kuhn theory of high elasticity in rubber has been extended to include the elastic properties of other polymerides. elastic properties of other polymerides. It is assumed that high elasticity is developed only when rotation of the main C-C chain is relatively free. The influence of mol. structure, plasticiser, and FL.U. cross-linkings is discussed.

Permeability in relation to viscosity and structure of rubber. R. M. Barrer (*Trans. Faraday Soc.*, 1942, **38**, 322–330; cf. A., 1939, I, 317; 1940, I. 292).—A discussion of the statistics of activated zones in rubber shows that functional relationships should exist between the Arrhenius energy of activation for diffusion or viscous flow and log (diffusion coeff. for simple solutes), log viscosity, and entropy of activation. Available data confirm this prediction and show further that there is no discontinuity between rubber and liquids as diffusion media. F. L. U.

Stereochemistry of the rubber molecule. C. W. Bunn (Trans. Faraday Soc., 1942, 38, 372-376).—The influence of geometrical factors on the internal rotation and the m.p. of rubber is discussed. F. L. U.

Long spacing in rubber. A. Schallamach (*Trans. Faraday Soc.*, 1942, 38, 376-380).—The long spacing found in the X-ray diagram of some rubbers is shown to be due to COMe₂-sol. impurities, which probably occur in flake-shaped crystals. Orientation effects of these crystals in deformed rubber are discussed. F. L. U.

Conductances of solutions of several alkyl sulphates and sulpho-succinates. F. D. Haffner, G. A. Piccione, and C. Rosenblum (J.*Physical Chem.*, 1942, **46**, 662-670).—Equiv. conductivities (Λ) of several Na alkyl sulphates and sulphosuccinates show that aggregation occurs with the latter just as with the former. Crit. concns. for micelle formation and Λ_{∞} vals, have been evaluated. C. R. H.

Macromolecular compounds. CCLXXVIII, CCLXXIX. Hetero-polar molecular colloids. III. Polymeric amines as an albumin model. IV. Polymeric amine salts and polyethyleneimines. W. Kern and E. Brenneisen (J. pr. Chem., 1941, [ii], 159, 193—218, 219—240).—III. Polymeric amines have been prepared by thermal condensation of NN'-tetramethyldiamines with $Br\cdot[CH_2]_n$ ·Br (n = 3, 5, 10) at 20—100°, and by the polymerisation of $(CH_2)_2$ NH with acid catalysts (40—66% HBr best). Kinetic data show that the polymerisation reaction is of the second order. Several poly-ethyleneimine derivatives have been prepared

ethyleneimine derivatives have been prepared. IV. Osmotic, conductivity, and η data for aq. solutions of polymeric amine salts and polyethyleneimines are recorded. C. R. H.

Spheritical nature of starch granules. A. Wieler (Kolloid-Z., 1942, 99, 95-98).-Discussion. C. R. H.

Relation of the concentration of starch suspensions to their viscosity. W. C. Davison (J. Biol. Chem., 1942, 144, 419-422).—Aq. suspensions of sol. starch made by successive dilution show a direct relation between concn. and sp. fluidity, whereas those made up by direct weighing do not. The discrepancy is attributed to the presence of visible granules which do not contribute to the viscosity, and occur in varying proportions in freshly made suspensions, but remain const. in dilutions from a single suspension. R. L. E.

Mol. wt. determinations by precipitation of hydrolytically degraded glycogens. E. Husemann (J. pr. Chem., 1941, [ii], 158, 163-175).--A series of ten degradation products of glycogen was prepared by A series of the degradation products of glycogen was prepared by progressive hydrolysis with 2n-HCl, and a middle fraction (by pptn. with MeOH) of each product, dissolved in 0.1n-CaCl₂, was used for osmotic pressure measurements. The calc. mol. wts. of the products varied from 20,300 to 1,530,000, showing degrees of polymerisation R = 5125-2500 More than the product of the products of the products of the product of P of 125—9500. Measurements of η with 1% solutions in 0-1N-CaCl₂ at 20° gave a const. val. for $\eta_{sps}/c = 0.012 \pm 0.001$, confirming the Einstein equation, the higher val. of η_{sps}/c (theoretical val. 0.0025) probably being due to solvation. Titration of aq. solutions of the degradation products with MeOH at 25° and 35° to the turbidof the degradation products with MeOH at 25° and 35° to the turbid-ity point (results reproducible to $\pm 1\%$) did not give a straight line for no. of ml. MeOH against mol. wt.; a straight line was obtained by plotting γ^* (vol. fraction of MeOH at turbidity point) against $1/P^{\frac{1}{2}}$ or $1/P^{\frac{1}{2}}$ (but not 1/P), thus showing the applicability of the Schulz and Jirgenson equation $\gamma^* = a + \beta/P^m$ where m = 1 for linear mols. and $\frac{2}{3}$ for spherical mols. Decrease in the conc. of the solutions from 1 to 0.02129 (size a decrease in the col. of the solutions from 1 to 0.0313% gave a decrease in the val. of γ^* of $\sim 15\%$. The vals. of P calc. by this method differed from those derived from osmotic pressure measurements by 0-10%.

Ideal and mathematical treatment of particle size degradation in cellulose. A. Matthes (Kolloid-Z., 1942, 98, 319-329).—The degree of division (S) ("Spaltungsgrad") is defined as 1/P, where P is the degree of polymerisation of a macromol. material; S can then be used to characterise the particle size distribution. The uses of this concept are outlined, and with its aid the kinetics of a no. of depolymerisation reactions is considered mathematically. It is shown that, when pairs from six cellulose fractions are mixed in equal proportions, P (from η measurements) of the resulting mixture is near the arithmetic means of the P vals. of the two components, but is different from the P val. calc. on the basis of the actual particles present. The deviation is greatest where the constituents show the greatest difference in P vals. The variation of the function $P_{\rm visc.}/P_{\rm osm.}$ is given for the depolymerisation of cellulose from P = 2000 to P = 1.

Influence of the milling process on the properties of high polymers (cellulose and polystyrene) and the nature of the milling process. II. K. Hess, E. Steurer, and H. Fromm (*Kolloid-Z.*, 1942, 98, 290— 304).—The mathematical consideration of the action of a swing mill is continued (*ibid.*, 148). It is deduced that for cellulose (I) the average no. of C–O or C–C bonds broken per collision is $\sim 4 \times 10^{10}$; of the total energy given out per collision, only $\sim 0.013\%$ is used in causing mol. breakdown, the rest being employed in elastic deformation of the balls, the mill walls, and the material being ground (when it reappears as heat), and in breaking down the van der Waals forces in (I). The no. of bonds broken per collision may der Waals forces in (I). The no. of bonds broken per collision may be increased by the presence of finely ground material from the mill and/or the balls. The electron microscope showed torn fibres to consist of bundles of "primary" fibrils ~150 A. thick. The break-down of polystyrene (II) is accompanied by a rapid fall in the η of solutions, as had previously been found for (I). The η of the solutions of ground (II) in C₆H₈ is the same whether it is ground at 20°, 40°, or 60°. The mol. breakdown of (II) by grinding is confirmed by comptic pressure measurements: its rate is the same as for (II). by osmotic pressure measurements; its rate is the same as for (I). For both (I) and (II) the mol. breakdown is probably not due to hydrolysis, oxidation, or thermal decomp., but to the stresses and strains set up during the collisions. It is concluded that the grinding process consists in a direct conversion of the collision energy of the balls into mol. vibrational energy in the material being ground, which then undergoes mol. scission. N. G.

Rheometry and colloidal properties of the system sodium celluloseglycollate-water. F. Höppler (Kolloid-Z., 1942, 98, 348-358).-The rheo-viscometer (described) is used to determine the rheological

properties of aq. sols and gels of Na celluloseglycollate (H_2O -sol. cellulose) (**I**). Even at low concns., the sols of (**I**) possess structural viscosity, so that Staudinger's rule is not observed. Thixotropy is absent. With more viscous samples, both rheopexy and "rheo-exy and "rheopexy and" rheopexy and "rheopexy and" the relative transformer of the relative transformation of the relative trans destruction " (irreversible mechanical breakdown of the gel structure by flow processes) are observed when successive flow times are deterby how processes and 4% sols. Photomicrographs taken before and after treatment of the sols in the viscometer confirm the rheodestruction deduced from η measurements. When the ultra-filterable part of (I) sols is dried to a film, the latter gives the same X-ray diffraction pattern as (I). It is concluded from this that aq. suspensions of (I) contain the reversible system xerogel \rightleftharpoons . lyogel \Rightarrow lyosol, the equilibrium positions depending on the conc. The interaction between Na-cellulose and CH₂Cl-CO₂Na is considered to take place first in the amorphous region of the cellulose threads, then on the surface of the crystallites, and finally inside the crystallites. Microscopically, (I) made from pinewood material is not distinguishable from the latter. Photomicrographs of (I) are given for each stage of the swelling process and the mechanism of the NG swelling process is discussed.

Solubility state of high polymers. I. Activity of solvents towards cellulose acetates, nitrates, and aceto-nitrates. M. Takei (Kolloid-Z., 1942, 98, 312-318).—The solubility of cellulose acetate (I), nitrate (II), and aceto-nitrate (III) was investigated with reference to the dipole moment (μ), the dielectric const. (ϵ), and the surface tension (γ) of the solvent, by determining the val. of $a = \mu^2 / \epsilon \gamma$ (cf. A., 1942, I, 144) for 63 solvents. (I) is sol, in solvents possessing relatively low vals. of a, and (II) in solvents having relatively large vals. of a. (III) behaves in an intermediate fashion, approximating to (I) or (II) according to the relative proportions of Ac or NO2 groups present. N. G.

Extension and rupture of cellulose acetate and celluloid. R. N. Haward (*Trans. Faraday Soc.*, 1942, 38, 394-403).-Measurements of the extension and rupture of cellulose acetate and celluloid at 26° indicate that the two processes are largely independent. Superposed on a time-independent extension obeying Hooke's law is a much larger slow extension, which is elastic in the sense that is a much tager slow extension, which is claster in each scatter recovery is complete on raising the temp. to $65-70^{\circ}$. Weakening of the material accompanies extension, and subsequent extensions (after recovery) are more rapid, and the breaking time is shorter, for the same load. Equations relating stress, strain, and time are derived. F. L. U.

Thermodynamics of high polymer solutions. P. J. Flory (J. Chem. Physics, 1942, 10, 51-61).—By a statistical-mechanical treatment of high polymeride solutions the entropy of mixing n solvent and N linear polymeride mols. has been derived. The entropy of discrete formation of a polymeride mols. entropy of disorientation of a perfectly arranged linear polymeride is $\sim R$ g-cal, per chain segment. Partial molal free energies have been computed and phase equilibria have been calc, in the region of partial miscibility. Theoretical and observed vals, are compared. W. R. A.

Viscosity and mol. wt. of high polymers. H. Staudinger (*Kolloid-Z.*, 1942, 98, 330-332).—Reply to Meyer (cf. A., 1942, I, 237). N. G.

Mol. wt. determinations on macromolecular substances. IX. Equation for the calculation of the viscosity number at very small concentrations. G. V. Schulz and F. Blaschke (*J. pr. Chem.*, 1941, [ii], 158, 130–135).—The viscosity no. of a solution, η_{ep}/c , where $\eta_{ep} = (\eta_1 - \eta_0)/\eta_0$, η_1 being the sp. viscosity of the solution and η_0 $\eta_{ap} = (\eta_1 - \eta_0)/\eta_0$, η_1 being the spin test, only at very low concest, that of the solvent, approaches a const. val. only at very low concest, as expressed in the Standinger equation $\eta_{ap}/c = K_m P$ where P is the degree of polymerisation. For the η of solutions of various concns. of both fractionated and unfractionated poly-Me methacrylate, determined in CHCl₃, the limit of η_{sp}/c as c approaches zero is a const. for each sample. Given the val. of $(\eta_{sp}/c)/(1 + K_n\eta_{sp})$, where K_n is a const. depending on the substance, the val. of K_n may be found from the linear plot of η_{sp}/c against η_{sp} ; a typical series of I. L. E. curves is given.

Calculation of the limiting value $\lim_{e\to 0} (\eta_{ep}/c)$. (A) H. L. Bredée. (B) G. V. Schulz and F. Blaschke (*J. pr. Chem.*, 1941, [ii], **159**, 146— 152, 153—154).—(A) The η -concn. formula of Schulz and Blaschke (cf. preceding abstract) is shown to be the well-known equation of Fikentscher and Mark in another form. The importance of Bredée's η formula and his idea of "voluminosity at infinite dilution" (cf. A., 1937, I, 303) is stressed.

(B) A reply to the above.

C. R. H.

Mol. wt. determinations on a series of methyl polymethacrylates by different methods (osmotic, viscometric, and by precipitation-titration). G. V. Schulz and A. Dinglinger (*J. pr. Chem.*, 1941, [ii], 158, 136—162).—The mol. wts. of poly-Me methacrylate fractions obtained by fractional pptn. of C_6H_6 solutions with cyclohexane were calc. from osmotic pressure measurements carried out on their COME solutions the counting M_{-} BTs[c]] (*b*[10]) being word CoMe₂ solutions, the equation $M = RTc/p[1 - c(k/p)]^{1/2}$ being used, where c = conc., p = osmotic pressure, and k and v are const. for the whole series of polymerides in the given solvent; the mol. wts. thus found vary from 13,350 to 650,000. p/c-c curves for various

fractions at 27° are reproduced. Vals. of $K_{\rm m}$ in the Staudinger equation, calc. from measurements of $\eta_{\rm sp}$ in CHCl₃, were not const., but became nearly const. when $K_{\rm m}$ was replaced by A + B/P, where the consts. A and B are 0.47×10^{-4} and 95×10^{-4} , respectively, and P is the degree of polymerisation. P was determined for polymeride fractions with mol. wts. up to 100,000 by pptg. their $C_{\rm g}H_{\rm g}$ solutions with cyclohexane and using the équation $\gamma^* = a + \beta/P$, where γ^* is the consts. The vals. of P so obtained agree with those determined from osmotic pressure data. The viscometric method is valid for both fractionated and unfractionated poly-Meethat this mol. wts. from 15,000 to 900,000; the results indicate that this mol. is linear or only slightly branched. J. L. E.

Physicochemical properties of gelatin fractions. L. N. Putilova (Kolloid. Shurn., 1935, 1, 49–55).—Fractionation by means of H_2O at 22° give micellar wts. ranging from 26,000 to 98,000 and heats of swelling from 0.2 to 30 g.-cal. per g. The mol. wts. of the chains bound by principal valency bonds vary from 1400 to 1600. Various fractions are due, not to keto-enol tautomerism, but to an NH₃-acid-internal NH₄ salt isomerism. CH. ABS. (e)

Viscosity measurements during the coagulation and gelation of concentrated sols of zirconium and stannic hydroxides. M. Prasad and K. V. Modak (*Proc. Indian Acad. Sci.*, 1942, **15**, **A**, 445—455).— Addition of electrolytes to extremely dialysed Sn(OH)₄ sol produces gelation, whereas similar addition to $Zr(OH)_4$ sol, and to $Sn(OH)_4$ sols undialysed or dialysed for 12 days, produces coagulation. Changes in η during gelation and coagulation under a variety of conditions and coagulators have been measured; the η -time curves for both processes in the same sol show similar characteristics. Measurements of η do not yield information regarding the gelation process which occurs after primary coagulation. W. R. A.

Reversible aggregations of colloidal particles. II. Isothermal and reversible changes of absorption in thixotropic iron oxide sols. W. Heller and G. Quimfe (*J. Physical Chem.*, 1942, 46, 765-777).— The reversible change in absorption which accompanies thixotropic sol-gel transformations in systems with strongly diffracting goethite crystals is explained by assuming the formation of two phases, a conc. phase of "geloids" and a dil. phase of primary particles.

Coagulation of lyophilic sols by means of organic substances and salts. VIII. B. Jirgensons (*Kolloid-Z.*, 1942, 99, 89–95).—The influence of chlorides on the coagulation by alcohols and COMe₂ of deaminocasein (I), casein (II), and a (II) decomp. product (III) has been investigated. At low coagulant concns. (I) is less easily coagulated than (II), but increase in coagulant concn. tends to stabilise (II). (III) is less easily coagulated by PrOH + NaCl than (II). C. R. H.

Electrokinetic study of octadecyl alcohol. Comparison of mobility values obtained by electrophoresis and by electro-osmosis. A. J. Ham and H. W. Douglas (*Trans. Faraday Soc.*, 1942, 38, 404—408). — Apparatus and procedure suitable for electro-osmotic experiments with substances lighter than H₂O are described (cf. A., 1942, 1, 217). Measurements with octadecyl alcohol (I) in the $p_{\rm H}$ range 2—12 give vals. of the ζ -potential in numerical agreement with those obtained from electrophoresis, although the particles of (I) used in the latter were 100 times smaller in diameter than those used for electrosomosis. Both methods give the same isoelectric point at a $p_{\rm H}$ between 2 and 3.

Potential in a solution near a charged wall. W. G. Eversole (J. Chem. Physics, 1942, 10, 78).—An extension to salts of different valency types (cf. A., 1941, I, 413; 1942, I, 98). W. R. A.

Sensitisation and surface charge of lyophilic colloids. E. A. Hauser and M. R. Cines (J. Physical Chem., 1942, 46, 705-709).— There is a slight decrease in the coagulation val. of NaCl towards Fe_aO_a sols on the addition of increasingly neutralised agar. This is the reverse of what would be expected were the surface charge of the agar effective in sensitising the sol. The data are discussed with reference to theories of sensitisation. C. R. H.

Electrokinetic equations for gels and the absolute magnitude of electrokinetic potentials. J. J. Bikerman (J. Physical Chem., 1942, 46, 724-730).—Membranes of swelling substances offer a greater resistance to liquid flow than to ionic migration. The significance of this is discussed with reference to electro-osmosis, streaming potential, and cataphoresis. C. R. H.

VI.--KINETIC THEORY. THERMODYNAMICS.

Theory of binary systems. K. Fredenhagen and E. Tramitz (Kolloid-Z., 1942, 99, 52-73).—A general discussion on energy relations in homogeneous binary systems. C. R. H.

Equilibrium in the gas reaction, $\text{CHBr}_3 + \text{Br}_2 \rightleftharpoons \text{CBr}_4 + \text{HBr}$. J. W. Strong and R. N. Pease (J. Chem. Physics, 1942, 10, 79-80). Determinations of equilibrium in the reaction $\text{CHBr}_3 + \text{Br}_2 \rightleftharpoons$ $\text{CBr}_4 + \text{HBr}$ indicate incomplete substitution in the gas phase as predicted by Stevenson and Beach (A., 1938, I, 185, 399). W. R. A. Equilibrium of formaldehyde with glycine and alanine.—See A., 1942, II, 348.

Associating effect of the hydrogen atom. X. N-H-N bond. Constitution of the benztriazoles. T. G. Heafield and L. Hunter (J.C.S., 1942, 420-422).—Cryoscopic measurements in $C_{10}H_8$ solution indicate that benztriazoles with a free NH group are strongly associated but that substitution of the H by aryl or acyl prevents association. It is considered that in the former H-bonds tend to link the 1- and 3-N atoms in separate mols., and to a smaller extent 1- and 2-N atoms. This behaviour is in accord with the tautomeric character of the compounds. J. W. S.

Hydration of unsaturated compounds. IX. Oxonium complex constant of mesityl oxide. X. Rôle of oxonium complexes in the hydration of mesityl oxide and the dehydration of diacetone alcohol. D. Pressman, L. Brewer, and H. J. Lucas (J. Amer. Chem. Soc., 1942, 64, 1117-1122, 1122-1128; cf. A., 1942, I, 371).-IX. The oxonium complex const. for mesityl oxide (I) (= mesO), viz., $K = [\text{mesO-H'}]/[(I)][\text{H}_9\text{O'}]$, is determined at 25° by a distribution method to be 0.44 and 0.45 in aq. solutions of ionic strengths (μ) 2 and 1 respectively. The partition coeff. $[(I)]_{cci} > 0.26$, at 25° and 28.0 at 30°, is const. when $[(I)]_{cci} > 0.26$, $CM_9 \sim 0.44$ and 0.45 in aq. solutions of ionic strengths (μ) 2 and 1 respectively. The partition coeff. $[(I)]_{cci} > 0.26$, at 25° and 28.0 at 30°, is const. when $[(I)]_{cci} > 0.26$, $M_9 \sim 0.26$ at 30° at 25° at 25° and 28.0 at 30°, is const. when $[(I)]_{cci} > 0.26$, $M_9 \sim 0.26$, $CM_9 \sim 0.26$, $CM_9 \sim 0.26$, $M_9 \sim 0.26$

X. (I) and mesO·H' become hydrated in aq. solution at 25°, and under the same conditions (II) and its oxonium salt become dehydrated. Each reaction is unimol, with respect to the org. reactant and to [H₃O']. By measuring the displacement of the equilibrium const. between (I) and (II) with varying [H₃O'] the oxonium complex const. K_{00} is found to be 0.3 at 25°. Heat of hydration of (I) = 7.5 ± 0.3 kg.-cal.; heat of activation = 12.8 ± 0.15 kg.-cal. for the hydration of (I) and 20.4 ± 0.3 kg.-cal. for the dehydration of (II). F. L. U,

Solubility of silver chloride in hydrochloric acid (complex salt formation). W. Erber and A. Schühly (*J. pr. Chem.*, 1941, [ii], **158**, 176—185).—With increase of concn. of aq. HCl between 11.8 and 23.7 mol.-% the solubility of AgCl steadily increases. Tables and solubility curves for 0° and 25° are given. The dissociation const. for AgCl₄'' as given by $[a_{Ac} \times ac_1^{c4}][a_{Ac}c_{O}\omega_{c}]$ for [Cl'] = 4M. is 1.2×10^{-6} , the stability const. is 0.8×10^{6} , and the free energy of formation (ΔF°) is 8 kg-cal. The temp, coeffs. of solubility and heats of dissolution are calc. The heat of the reaction Ag dissolved + 4Cl'_dissolved = AgCl₄''' dissolved is 14 kg-cal. per mol. J. L. E.

Solubility of silver acetate in aqueous solutions of some other acetates. Formation of diacetato-argentate ion. F. H. Mac-Dougall and M. Allen (J. Physical Chem., 1942, 46, 730-737).-Solubility data at 25° for AgOAc in solutions of NaOAc, KOAc, Ca(OAc)₂, and Sr(OAc)₂ are recorded. The effect of added electrolytes on the solubility product of AgOAc is discussed, and the existence of Ag(OAc)₂' is suggested to account for deviations from Debye's theory. The dissociation const. of $Ag(OAc)_{2}' = 0.28 \pm 0.05$.

Solubility of silver acetate in aqueous solutions of silver nitrate and of silver perchlorate. Complex ions formed from silver and acetate ions. F. H. MacDougall (*J. Physical Chem.*, 1942, 46, 738— 747).—Solubility data at 25° for AgOAc in solutions of AgNO₃ and AgClO₄ are recorded. Deviations from Debye's theory are explained as before (cf. preceding abstract) and on the additional assumption of the existence of Ag₃OAc^{*}, the dissociation const. of which is 0.073 \pm 0.007. The comparative stability of Ag₂OAc^{*} is probably due to appreciable resonance energy. C. R. H.

Diffusion and hydration of cupric and nickel ions in aqueous, acid, neutral, and ammoniacal solutions. G. Jander and H. Möhr (Z. physikal. Chem., 1942, A, 190, 81–100).—The diffusion coeffs. of Cu and Ni in aq. Cu(ClO₄)₂, CuCl₂, Ni(NO₃)₂, and NiCl₂ remain const. over wide ranges of variation of foreign electrolyte concn. and $\rho_{\rm H}$ val. There is no tendency for Cu and Ni salts to associate with increasing degree of hydrolysis. In the presence of an excess of alkali metal sulphate, CuSO₄ and NiSO₄ show some complex ion formation, whilst CuCl₂ shows some evidence of the formation ot ions of the type CuCl₄' or CuCl₄'' in the presence of HCl or a readily sol. chloride. In aq. NH₃ Cu and Ni diffuse more rapidly than in neutral or acid solution and the diffusion coeff. is independent of concn. and of the nature of the anion, indicating the stability of the Cu(NH₃)₄'' and Ni(NH₃)₆'' ions. Diffusion measurements indicate that the Cu'' and Ni' ions have 7—8 and ~10 mols. of H₂O of hydration, respectively. J. W. S.

Ionic concentration gradients and their biochemical significance. I, II. F. Almasy (*Helv. Chim. Acta*, 1941, 24, 1025-1039, 1480-1495).—Systems in which there are steady ionic conen, gradients are discussed theoretically, with particular reference to systems containing polybasic acids, polyacid bases, and redox systems, such as reproduce the conditions present in living cells. J. W. S. Ionisation in non-aqueous solvents. V. Formation of certain methoxides and ethoxides in methyl and in ethyl alcohol. W. L. German and T. W. Brandon (f.C.S., 1942, 526-528). EtOH and MeOH solutions of AgNO₃, NiCl₂, CdI₂, CuCl₂, CoCl₂, and HgCl₂ ppt. metallic ethoxides and methoxides when treated with NaOEt and NaOMe, respectively. C. R. H.

Strengths of the hypohalogenous acids. Treatment of simultaneous reactions. A. Skrabal (Z. Elektrochem., 1942, 48, 314–327, 448).—The work of Shilov (A., 1988, I, 196) on the dissociation consts. of HOCl and HOBr fails to allow for the formation of chlorate or bromate in the experimental solutions. Calculations from his results with allowance for the effects of the side reactions give the vals. $k = 3.6 \times 10^{-8}$ for HOCl and 2×10^{-11} for HOBr at 25°. For HOI a val. $k = 5 \times 10^{-13}$ is estimated. F. J. G.

Basic dissociation constants and electrolyte action in glacial acetic acid. S. Kilpi and M. Puranen (Z. physikal. Chem., 1940, A, 187, 276—284).—The basic dissociation const. of o-NH₂·C₆H₄·CO₂H (I) in pure AcOH has been determined with and without the presence of LiClO₄ as neutral salt. The results can be expressed by the Debye-Hückel equation if the ionic diameter is taken as 8·1 A. and ϵ as 6·13. At 20° the thermodynamic dissociation const. of (I) in pure AcOH is 3·5 × 10⁻⁷. J. W. S.

Theory of the isoelectric point. III. T. L. Hill (*J. Physical Chem.*, 1942, 46, 621-624).—The theory of the isoelectric point when developed by the exclusive use of activities leads to the same conclusions as in earlier papers (cf. A., 1942, I, 328). C. R. H.

Buffer capacity. L. F. Beste (J. Chem. Educ., 1942, 19, 296; cf. A., 1942, I, 328). L. S. T.

Methane-isobutane system. R. H. Olds, B. H. Sage, and W. N. Lacey (*Ind. Eng. Chem.*, 1942, 34, 1008—1013).—Data for the vol. and phase behaviours of the system CH_4 -iso- C_4H_{10} at pressures up to 5000 lb. per sq. in. and over the range 38—328° are recorded in tabular and graphical form. C. R. H.

Ethylene-ethane and propylene-propane equilibria. G. B. Kistiakowsky (J. Chem. Physics, 1942, 10, 78-79, 146).—The thermal equilibrium consts. in $C_{3}H_{6} = C_{2}H_{4} + H_{2}$ have been determined at 380° and 450° and those in $C_{3}H_{8} = C_{3}H_{6} + H_{2}$ at 310° and 375°. Equilibrium was approached from both sides using an aged $Cr_{2}O_{3}$ catalyst. Heats of reaction calc. from the van't Hoff isochore agree with vals. extrapolated from C_{p} date. Vals. of K_{p} calc. statistically from heats of reaction and mol. consts. agree satisfactorily with those from thermal equilibrium. This substantiates the view that $C_{3}H_{6}$ has a potential barrier of ~2100 g.-cal. W. R. A.

Vapour-liquid equilibrium data on ethyl alcohol-water and on isopropyl alcohol-water. W. M. Langdon and D. B. Keyes (Ind. Eng. Chem., 1942, 34, 938–942).—New data for both systems have been obtained with accuracies of 0.2 (Pr^{β}OH) and 0.05 (EtOH) mol.-%. The azeotrope of Pr^{β}OH-H₂O contains 68.35 ± 0.03 mol.-% of Pr^{β}OH. C. R. H.

Phase behaviour in the methane-propane-*n*-pentane system. R. H. Dourson, B. H. Sage, and W. N. Lacey (*Amer. Inst. Min. Met. Eng.*, 1942, *Tech. Publ.* 1490, 10 pp.).—The compositions of the co-existing phases in the above system were determined at 160° and 220° F., for pressures of 500–2000 lb. per sq. in. The gas-liquid equilibrium consts. (e) for the components of the system were calc. The product of pressure (p) and e for CH₄ is plotted as a function of p for various vals. of the parameter $C = X_1/(X_1 + X_2)$ where X_1 is the mol. fraction of C₃H₈ in the liquid phase, and X_2 is that of C₃H₁₂. There is a regular decrease of e of CH₄ with increase in e with increase of C. The product of e and p increases with rise of temp. for both C₃H₈ and C₅H₁₂.

Heat of formation of several mineral carbonates. W. A. Roth (J. pr. Chem., 1941, [ii], 158, 117-124).—The heats of formation of cerussite (100% PbCO₃), witherite (99.4% BaCO₃), and magnesite (pure MgCO₃) have been determined at const. pressure and ~20°. Those of cerussite and witherite have been found by measuring the heats of dissolution of the corresponding oxides and carbonates in HNO₃ solutions, corrections being made for the heats of evaporation and dilution of the solutions used; the heat of formation of PbCO₃ from yellow PbO and gaseous CO₂ is 18.91±0.11 kg.-cal. per mol., and of BaCO₃ is 61 kg.-cal. per mol. The heat of formation of magnesite from MgO and CO₂, measured by a new bomb calorimeter method, is 22.6±0.5 kg.-cal. per mol. The following are the most reliable vals. for heat of formation in the reaction MO + CO₄ \rightarrow MCO₃ at 20° (M = metal) : Cu 7--10 (malachite 13.8, azurite 20.9); Mg 23; Ca (calcite) 42.5 (aragonite only slightly higher); Sr 55 (uncertain); Ba 61; Zn 16.9; Cd 19 (uncertain); Pb 18.9; Mn 15 (to be checked); Fe 16 (to be checked); Co 17-20; Ni ~10.

Correlating gas solubilities and partial pressure data. D. F. Othmer and R. E. White (*Ind. Eng. Chem.*, 1942, 34, 952–959).— For a gas dissolved in a liquid log $p = (Q/L)\log P + C$, where p is the partial pressure of the gas, P the v.p. of the solvent, Q the differential heat of dissolution of 1 mol. of gas in its saturated solu-

tion, L the latent heat of vaporisation of the solvent, and C a const. Logarithmic plots of this equation for solutions of gases in H_2O and org, solvents are reproduced. Straight lines indicate constancy of Q/L and absence of chemical change, whereas abrupt changes of slope indicate a chemical change. Heats of dissolution can be cale. from the slopes of the lines. C. R. H.

Phase equilibria in hydrocarbon systems. Joule-Thomson coefficients in the methane-propane system. R. A. Budenholzer, D. F. Botkin, B. H. Sage, and W. N. Lacey (Ind. Eng. Chem., 1942, 34, 878-882).—Joule-Thomson coeffs. of three $CH_4-C_3H_8$ mixtures have been determined at 70-310° F. and pressures >1500 lb. per sq. in. By combining the results with heat capacity data for the components at infinite vol., the isothermal enthalpy-pressure coeffs. and the partial enthalpies of the conponents have been deterved. L. W. S.

System nitric acid-sulphuric acid-water. Enthalpy-temperature nomograph. J. L. McCurdy and C. McKinley (*Ind. Eng. Chem.*, 1942, 34, 1002—1004).—Two nomographs, one for calculating enthalpy change with temp. for the system and the other showing the relative enthalpy of the system referred to each pure component at 0°, are reproduced. C. R. H.

Disperse structure of solid systems and its thermodynamic basis. VII. D. Balarev (*Kolloid-Z.*, 1942, 99, 73-77).—Additional evidence in support of the author's theory is presented. C. R. H.

VII.—ELECTROCHEMISTRY.

Physico-chemical properties of rare metals. III. Electric conductivity of the systems $ZrCl_4$ -NaCl and NbCl_5-NaCl. N. A. Belozerski and B. A. Freidlina (J. Appl. Chem. Russ., 1941, 14, 466–468).— The conductivity of NaCl at 800—850° is reduced by $ZrCl_4$ (up to 32 mol.-%) and by NbCl_5 (up to 22 mol.-%) more than is the mol. fraction or the vol.-% of NaCl; this shows that $ZrCl_4$ and NbCl_5 form with NaCl poorly conducting complexes. J. J. B.

Conductances of alkyl sulphates and sulphosuccinates.—See A., 1942, I, 362.

Dicyanotriazole. I. Conductivity of dilute aqueous solutions of dicyanotriazole at 25°. E. G. Taylor (*Canad. J. Res.*, 1942, 20, B, 161–167).—Measurements of Λ for dil. aq. dicyanotriazole show that its dissociation const. at 25° is $3\cdot378 \times 10^{-2}$; Λ_0 is 384.9. A. LI.

Metal-solution contact difference of potential through thin metal films. G. Destrian and (Miss) P. Legendre (*Compt. rend.*, 1942, 214, 65-67).—For a cell M'|solution of salt of M|M, in which M is electrolytically deposited on M', the polarisation e.m.f. as a function of thickness ε of deposited M is investigated. Data and curves are given for cells in which M = Zn, Cu, and M' = Pb, Ag, Au. As the concn. increases, ε tends to decrease in the case of Zn and to increase in the case of Cu. N. M. B.

Attempt to correlate the constitution of glass with the potential at glass-electrolyte interfaces. R. C. Ray, P. B. Ganguly, and B. P. Sarkar (*J. Indian Chem. Soc.*, 1942, **19**, 61-66).—The e.m.f. of cells of the type calomel|powdered glass, aq. $K_2SiO_3|Ca$, Hg has been measured, the results indicating that powdered glass behaves as a sparingly sol. salt. Some evidence is obtained for the existence in glass of the complex silicate, $6SiO_3,CaO,Na_2O$. D. F. R.

Potentiometric study of the oxidation of phenylhydrazine by cupric ions, including the titration of Fehling's solution with phenylhydrazine. H. T. S. Britton and E. M. Clissold (J.C.S., 1942, 528—531).— Fehling's solution (I) can be titrated with NHPh-NH₂,HCl (II) at $93^{\circ}\pm1^{\circ}$ in an atm. of N₂ by means of the cell bright Pt (2 electrodes) 100 c.c. of (I) + x c.c. of (II) saturated KCl|N-KCl|N-KCl + Hg₂Cl₂,|Hg. Oxidation takes place according to two concurrent reactions, viz., (II) + 2CuO \rightarrow C₆H₈ + N₂ + H₂O + Cu₂O and (II) + 4CuO \rightarrow PhOH + N₂ + H₂O + 2Cu₂O, the rates of the two reactions being affected by the concus. of the reactants. The effect of buffers has also been investigated. C. R. H.

VIII.—REACTIONS.

Velocity coefficient of chemical reactions. J. Rodriguez Velasco (Anal. Fts. Quim., 1941, 37, 487–489).—The observations of González Barredo (A., 1942, I, 332) do not affect the validity of the author's conclusions (A., 1935, 179; 1936, 940; 1937, I, 142). F. R. G.

Influence of a constant error in the calculation of reaction velocities-J. Rodriguez Velasco (Anal. Fis. Quim., 1941, 37, 263-265).— Systematic errors in the val. of k may be eliminated by determinations made at the val. of t for which the error is a min. F. R. G.

Principles and significance of modern chemical thermodynamics and reaction kinetics. F. Müller (Angew. Chem., 1942, 54, 334-343).—A review and discussion. A. A. E.

Development of reaction kinetics with special reference to homogeneous gas reactions. H. J. Schumacher (Angew. Chem., 1942, 54, 329-333).—A review of the work of Bodenstein and others.

A. A. E.

Empirical correlation of the activation energies of gaseous unimolecular reactions with vibrational frequencies. P. Fugassi and B. Warrick (*J. Physical Chem.*, 1942, **46**, 630–639).—The empirical equation $E_{\rm act.} = 2.8581\overline{\nu} [35\cdot5 - 900\cdot45\overline{\nu}/D_e]$, where $E_{\rm act.} =$ activation energy, $\overline{\nu} =$ frequency in wave nos., and D_e = heat of dissociation in g.-cal., is proposed. The equation has been applied to existing data for the proposed. C. R. H. data for numerous reactions.

Isentropic changes of state in dissociating gases and the sound dispersion method of investigating very rapid homogeneous gas reactions. G. Damköhler (Z. Elektrochem., 1942, 48, 62-82, 116-.C. R. H. 131).-Mathematical.

Mathematical explanation of the time equation for calculation of velocity of oxidation of nitric oxide to nitrogen peroxide.—See B., 1942, I, 416.

Chemical kinetics and equilibria. D. Porret (Helv. Chim. Acta, 1942, 25, 472-473).—The examples quoted by Baur (A., 1942, I, 331) do not throw doubt on the fundamental principles of the classical theory of chemical equilibria, as he suggests. I. W. S.

Kinetics of pyrogallolcarboxylic acid. E. Baur and P. Giger (Helv. Chim. Acta, 1942, 25, 527-528).—A reply to Porret (cf. preceding abstract). C. R. H. abstract).

Limits of inflammability and ignition temperature of ethyl mercaptan in air. G. W. Jones, R. E. Kennedy, and W. E. Miller (U.S. Bur. Mines, 1942, Rept. Invest. 3648, 6 pp.).—At room temp. and pressure mixtures containing 2.8—18.2% of EtSH in dry air are inflammable. EtSH ignites at 299° in air and at 261° in O₂. J. W. S.

Mechanism of the thermal reaction between hydrogen and oxygen. G. von Elbe and B. Lewis (J. Chem. Physics, 1942, **10**, 366—393).— Explosion limits and reaction rates of H_2 and O_2 have been measured in spherical quartz and Pyrex vessels of different diameter, clean and coated with various substances, at different temp., pressures, ratio of reactants, and with admixture of inert gases. The surface chainbreaking efficiency (ϵ) is related to λ/d (mean free path \div diameter of vessel). For B_2O_3 -coated surfaces $\epsilon \ll \lambda/d$, for KCl, $BaCl_2$, $K_3B_2O_4$, $K_2B_4O_7$ and $Na_2WO_4 \epsilon \gg \lambda/d$ between the second and third explosion limits, but for $K_2B_4O_7 \epsilon \approx \lambda/d$ for small reaction rates. The chain-breaking mechanism on different surfaces is discussed. Vals of activation energies and rate coeffs, are given. W. R. A

W. R. A. Hydrolysis of acid chlorides. II. Thionyl and sulphuryl chlor-ides. J. Rodriguez Velasco and J. R. Borbolla. III. Benzoyl, o-toluoyl and phenyl-acetyl chlorides. J. Rodriguez Velasco and A. Ollero. IV. Acetyl, propionyl and butyryl chlorides. J. Rodriguez Velasco and A. Ollero. V. Carbonyl chloride and sulphur dichloride. J. Rodriguez Velasco (Anal. Fis. Quim., 1941, 37, 232-237, 238-245, 246-253, 254-262).-II. The velocities of hydrolysis of SOCl₂ and SO₂Cl₂ in PhMe at 25° are 17.25 × 10⁻² and 39.67 × 10⁻⁴, respectively. They are inversely \propto the square roots of the second dissociation consts. of H₂SO₃ and H₂SO₄. III. The velocities of hydrolysis in C₆H₆ at 25° of BzCl, o-C₆H₄Me⁻COCl, and CH₂Ph⁻COCl are 0-00023, 0-00130, and 0-00080, respectively. They are not inversely \propto the square roots of the dissociation consts. of the corresponding acids.

dissociation consts. of the corresponding acids. IV. The velocities of hydrolysis in PhMe of AcCl, EtCOCl, and Pr^aCOCl are 0.0978, 0.0409, and 0.0208 at 25° and 0.1836, 0.0748, and 0.0372 at 45°. These vals. and those for CH₂Ph-COCl and o-C₈H₄Me-COCl can be expressed as log $(k_2/k_1) = 0.30(n_2 - n_1)$, where *n* is the no. of C atoms. There is no great variation in the energies of activation of AcCl, EtCOCl, and Pr^aCOCl whilst their burd locities are abalanced by H^a hydrolysis is not catalysed by H'.

V. The velocities of hydrolysis of COCl₂ and SCl₂ in PhMe are 0.0130 and 0.0203 at 25°, 0.0286 and 0.0606 at 45°. Energies of activation are recorded. F. R. G.

Variation of the velocity of decomposition of the hypochlorous ion as a function of concentration of the chloride ion. J. M. González Barredo (Anal. Ffs. Quím., 1941, 37, 220-226).—The velocity ∞ [Cl'] and [OCl']². F. R. G.

Autoxidation reactions in olefinic and polyolefinic substances.-See A., 1942, II, 341.

Hydrolysis of propionitrile in concentrated hydrochloric acid solutions. B. S. Babinovitch, C. A. Winkler, and A. R. P. Stewart (*Canad. J. Res.*, 1942, **20**, **B**, 121–132).—For [HCI] <4N. the rate of hydrolysis of EtCN is measured by rate of NH₃ production. For concns. 5-10N, where there is an induction period which is especially concas. b—10N, where there is an induction period which is especially prominent at $6 \cdot 5 - 8 \cdot 5_N$, the rate of hydrolysis is measured by rate of formation of NH₈ + EtCO·NH₂. At lower [HCI] the rate of amide formation (k_1) is \ll rate of acid formation (k_2) , but with increase in [HCI] k_1 increases rapidly whereas k_2 , after increasing to a max. in 3N-HCl, decreases. In 1N- and 10N-HCl $k_2/k_1 = 2000$ and 0.025 respectively. The change of k_1 with [HCI] is partly accounted for by a decrease of 6.7 kg.-cal. in the activation energy over this range over this range. C. R. H.

Hydrolysis of propionitrile in concentrated solutions of mineral acids. J. D. McLean, B. S. Rabinovitch, and C. A. Winkler (*Canad*.

J. Res., 1942, 20, B, 168-173).—The vals. of k_1 and k_2 for the unimol. reactions $EtCN \rightarrow (k_1)$ amide $\rightarrow (k_2)$ acid in different concess of HBr, HNO_3 , and H_2SO_4 have been determined. For acid concess. <4N, $k_1 \ll k_2$, At higher concess, k_1 and k_2 are of the same order, but above 20N., $k_1 \gg k_2$. The observed activation energy decreases with increasing acid concn. A. LI.

Decomposition of benzoyl peroxide in benzene. J. H. McClure, R. E. Robertson, and A. C. Cuthbertson (*Canad. J. Res.*, 1942, 20, B, 103—113).—The decomp. of Bz_2O_2 in C_3H_3 has been studied at 66— 78° by determination of the CO_2 formed, Bz_2O_2 present, and BzOH produced. It is inferred that the initial slow process involves the formation of two OBz radicals, but the fact that the total CO_2 evolved in the reaction varies with temp. indicates that the mechanism involves two parallel fast reactions evolving one and two moles of involves two parallel fast reactions, evolving one and two mols. of CO_2 , respectively, per mol. of Bz_2O_2 decomposed. The latter reaction predominates at higher temp. If H atoms are formed in the decomp., there is no appreciable union of these to form H_2 mols. The reaction is of first order and the energy of activation is \sim 31,000 J. W. S. g.-cal. per g.-mol.

Affinity. J. Rodriguez Velasco (Anal. Fis. Quim., 1941, 37, 557-570).—Reaction velocities of AcCl, CH₂Cl·COCl, SOCl₂, SO₂Cl₂, AcBr, and CH₂Br·COBr in PhMe at 25° and 35° are in agreement with Dimroth's theory of the relation between reaction velocity and chemical efficiency. and chemical affinity. F. R. G.

Hydrolysis of thiolactones and lactonisation of mercapto-acids.-See A., 1942, II, 347.

Ether-like compounds. XXVI. Rate of reaction and intra-molecular forces.—See A., 1942, II, 297.

Rate of reaction of oleic acid with oxygen. J. L. Henderson and H. A. Young (J. Physical Chem., 1942, 46, 670-684).—After a 5-hr. induction period the absorption of O_2 by oleic acid at 80° is expressible by $-dO_2/dt = k_1 + k_2$ [oleic acid]_{initial} \times $[O_2]^{0.5}$ where, since peroxide formation occurs, [oleic acid]_{initial} can be replaced by [peroxide]. Double bond destruction is involved in the peroxide formation C. R. H.

Degradation of long chain-form molecules. I. Sakurada and S. Okamura (Z. physikal. Chem., 1940, A, 187, 289-296).—On the basis of Kuhn's statistical treatment (A., 1930, 1025) an equation relating the mol wt. of the degradation product, as determined viscosimetrically by Staudinger's method, with the no. of linkages broken in the original long-chain mol, has been derived. The equation is in accord with observation for the hydrolytic degradation of cellulose in 7.7-10.75M-H₂SO₄. J. W. S.

Systematics of mixed polymerisates. E. Jenckel (Z. physikal. Chem., 1941, A. 190, 24-42).—The types of product resulting, and the effects of fractionation on them, when a mixture of two polymerisable substances is subjected to polymerisation are considered theoretically and a new of pressile access depending on the relative theoretically, and a no. of special cases, depending on the relative rates of the various reactions of chain-growth, are distinguished. Approximations to some of these have been realised experimentally.

F. J. G. Periodic dissolution of lead amalgams. F. Halla and E. Neusser (Naturwiss., 1942, 30, 198-199).—Pb amalgams dissolve in HNO₂ intermittently, the periods of dissolution and rest varying with the temp. and concn. of the acid. For a 3.5% Pb amalgam in 9.1M-HNO₃ at 21° the period is 40 sec. and in 11M-acid 2-8 sec. For a Finds at 21 the period is 40 sec. and in Timath 2-5 sec. For a 0.1% Pb amalgam in 3m-HNO₃ the period is reduced to $\frac{1}{2}$ of its original val. by a rise in temp. from 31° to 41° ; the gas evolved contains NO₂ 8, O₂ 2, NO 69, and undetermined gas 21 vol.-%. Prolonged action of the acid results in the formation of a yellow powder, mostly $HgNO_2$, free from Pb. HNO_2 , KCN, and Na_3AsO_3 are active catalysts and $CO(NH_2)_2$, urethane, CH_2O , and KI are inhibitors of the reaction. No pulsations occur with $HCIO_4$.

A. R. P. Chemical kinetics and chemical catalysis. A. Skrabal (Angew. Chem., 1942, 54, 343-346) .- A lecture. A. A. E.

Active nitrogen. III. Experiments to show that traces of oxygen or other impurity affect primarily the walls of the vessel, and not the phenomena in the gas space. IV. Ionisation associated with active nitrogen. (Lord) Rayleigh (*Proc. Roy. Soc.*, 1942, **A**, 180, 123–139, 140–150; cf. A., 1941, I, 429).—III. The effect of minute gaseous impurities in promoting the formation of active N is studied. The effect of O intermediate the clear wall of the reaction used. effect of O2 is to modify the glass wall of the reaction vessel in such a way as to favour the accumulation of active N. The restoration of the afterglow by the addition of a tributary stream of O2 was observed in an electrodeless discharge at low pressure. The phenomena are complicated and not susceptible to simple explanation. The effect of various treatments of the glass vessel was also studied; heating in vac. or N₂ destroys the glow, whilst heating in O₂ at 1 mm. pressure restores the glow. These effects are not easily explained by the formation and removal of gas layers. The behaviour of the gas away from the surface of the vessel was investigated and it was found that the addition of a trace of O_2 has no effect in promoting the active N phenomena.

IV. The ionisation which is associated with the afterglow in

Briner, J. G. de Werra, and J. P. Jacob (*Helv. Chim. Acta*, 1941, **24**, 1006–1010, 1010–1013).—XXV. At pressures <45 mm. and using an arc of frequency 10⁷ cycles per sec. the gas obtained by distillation of wood, mixed with excess of N₂, yields both HCN and NH₃. The optimum energy yields were HCN 25 g. and NH₃ 2 g. per kw.-hr.

XXVI. At <45 mm. pressure the high-frequency arc gives a yield of >100 g. of C_2H_2 her kw.-hr. when operating in wood-gas alone, but only ~ 55 g. per kw.-hr. in the presence of excess of N_2 when greater yields of HCN and NH₃ are obtained. These conditions, however, permit the utilisation of both the H₂ and CH₄ in the gas. I. W. S.

Mechanism of processes initiated by excited atoms. I. Quenching of excited sodium. II. Phootsensitisation. by excited mercury and cadmium. K. J. Laidler (J. Chem. Physics, 1942, 10, 34-42, 43-50).—I. Potential energy surfaces relevant to a no. of simple processes involving excited ${}^{s}P$ Na have been constructed and the mechanism of the reactions is discussed in terms of these and of the theory of abs. reaction rates. Quenching by atoms is normally very inefficient and addition of atoms in a quencher stabilises a quenched complex, usually polar, which finally decomposes to give the deactivated atom and a vibrationally excited product. Quenching by H and other atoms, H₂, halogen mols., and hydrocarbons is of a physical nature. Saturated hydrocarbons appear to quench like H₂ but unsaturated hydrocarbons quench by interaction between Na atoms and the unsaturated group.

II. An extension to excited Hg and Cd in their triplet and singlet states. With H_2 quenching of a physical nature is prohibited for the triplet atoms by the need for conserving spin angular momentum and dissociation must occur with initial formation of the metal hydrides. These are formed also with ${}^{3}P_{0}$ Hg and with ${}^{3}P_{0}$ and ${}^{3}P_{1}$ Cd but with ${}^{3}P_{1}$ Hg and the singlet excited atoms the hydride dissociates into the metal and a H atom immediately. Quenching to the metastable state is usually inefficient. The atoms react with saturated hydrocarbons by splitting off H, but unsaturated hydrocarbons usually interact with initial formation of excited mols. which, when activated by singlet atoms, have vibrational energy only but when activated by triplet atoms are excited to triplet electronic states. The subsequent reactions of the excited olefines are discussed. W. R. A.

Effect of gradual light absorption in photographic exposure. L. Silberstein (J. Opt. Soc. Amer., 1942, 32, 326-331).—The author's theoretical treatment (cf. e.g., A., 1940, I, 79), for the one- or twoquantum hypothesis, is generalised to cover any elementary exposure law. L. J. J.

Temperature and interrupted photographic exposure. J. M. Blair (J. Opt. Soc. Amer., 1942, 32, 332-333).—A second exposure of an exposed Azo 0 emulsion after a rest period causes an initial decrease in developable density for high, but not for low, densities. The effect extends to lower densities with increasing temp. up to 80°.

L J. J. L. J. J. Desensitisation of silver bromide. V. Girtanner (Helv. Chim. Acta, 1941, 24, 725-746).—The theory of desensitising action is reviewed. 27 org. and inorg. compounds have been tested for such action with a liquid AgBr emulsion; positive effects are given by phenosafranine, pinakryptol-yellow, HgCl₂, and KBr. The effect of concn. on desensitisation has been studied with 15 org. desensitisers in dried AgBr emulsions. The results confirm Baur's theory of photolysis and desensitisation. A colorimetric method for determination of Ag produced photolytically in liquid AgBr emulsions is described. A. J. E. W.

Desensitisation and anticatalysis. E. Baur (*Helv. Chim. Acta*, 1941, 24, 747-753).—A review and discussion, illustrated by tables comparing numerous known reactions, of the mechanism of desensitisation and its relation to anticatalysis. A. J. E. W.

Photosensitive complexes in the photolysis of uranyl oxalate and their dissociation constants. L. J. Heidt (J. Physical Chem., 1942), 46, 624—630).—New data confirm the conclusion that in UO_2SO_4 -H₂C₂O₄ solutions there exist three photosensitive clusters, viz., $UO_2H_2C_2O_4$ ", $UO_2C_3O_4$, and $UO_2(C_2O_4)_2$ ". The data are discussed with reference to gross and net quantum yields, as is also the observation that H_2SO_4 lowers the gross quantum yield > is expected. C. R. H.

Polymerisation of ethylene photosensitised by $5^{1}P_{1}$ cadmium atoms. E. W. R. Steacie and D. J. LeRoy (*J. Chem. Physics*, 1942, 10, 22– 34).—Unlike $5^{3}P_{1}$ Cd atoms, $5^{1}P_{1}$ atoms photosensitise reactions of $C_{2}H_{4}$ readily and the chief products are olefines ($C_{3}H_{6}$, $C_{4}H_{8}$, $C_{6}H_{19}$, and higher members) with smaller amounts of $C_{2}H_{3}$ and H_{2} . $C_{2}H_{3}$ is a much less important product than when Hg photosensitisation is employed. No rise in pressure is detectable in the early stages of the reaction. Alternative primary steps are Cd ($^{1}P_{1}$) + $C_{2}H_{4}$ = Cd ($^{1}S_{0}$) + $C_{2}H_{3}$ + H and = Cd ($^{1}S_{0}$) + $C_{2}H_{4}$ *. Subsequent polymerisation takes place probably by a free radical mechanism. W. R. A.

Photolysis of dimethylhydrazine. W. L. Kay and H. A. Taylor (J. Chem. Physics, 1942, 10, 497-504).-(NHMe)₂ shows continuous absorption from 2800 A. to <2000 A. Photolysis, initiated by

active N is not a photo-electric effect produced by light of $\lambda > 1580$ A., nor is it increased by allowing the surface temp. of the Au test cathode to rise to red heat. The material of the cathode has but little effect except in the case of Cu, which, when clean, gives an effect several times larger than after it is dulled by use. There may be some surface emission of electrons which is usually \ll the vol. ionisation in the gas. The ratio of the no. of light quanta emitted to the no. of ion pairs generated per c.c. of gas diminishes from about 10 to 1 as the glow decays. The introduction of inert N₂ increases both the emission of photons and the ionisation.

G. D. P

Effect of inhibitors on the rate of oxidation of copper by oxygen in phosphoric acid solutions. R. W. Lawrence and J. H. Walton (J. Physical Chem., 1942, 46, 609-616).—The rate of corrosion of Cu powder in $2n \cdot H_3PO_4 \propto [O_2]$ and [Cu"]. Corrosion is inhibited by amines as a result of adsorption of amine cations on the cathodic areas of Cu, the order of effectiveness being $NR_3 > NHR_2 > NH_2R$. In the case of NH_2R increase in size of R increases inhibitory action. C. R. H.

Hydration of unsaturated compounds. VIII. Rate of hydration of $\beta\beta'$ -dimethylacrylic acid; rates of dehydration and decarboxylation of β -hydroxyisovaleric acid. D. Pressman and H. J. Lucas (J. Amer. Chem. Soc., 1940, 62, 2069—2080; cf. A., 1939, I, 570).— Kinetic data are given for the acid-catalysed hydration of $\beta\beta'$ -dimethylacrylic acid (I) to β -hydroxyisovaleric acid (II) (prep. of Ag salt described) and the reverse dehydration process at 82-45° (hydration only), 99:85°, and 111:85°, in aq. HCiO₄ and NaClO₄ at different [H^{*}] and ionic strengths (I). Interference by the simultaneous decarboxylation of (II) to Bu^{*}OH, studied under similar conditions, renders necessary a new mathematical treatment of reactions of the type $A \rightleftharpoons B \rightarrow C$ in which the k vals. are comparable. All the reactions cited are first-order with respect to [H^{*}] and the org. acid concn.; the k vals. increase rapidly with I, and slowly as Na^{*} replaces H^{*} at const. I. The uncatalysed decarboxylation of (II) in H₂O and aq. NaClO₄ (99:85° and 111:85°) is also first-order with respect to [[II]], and involves non-ionised acid mols.; k is < in the catalysed freaction, and increases moderately with I. The rate of decarboxylation of (I) is negligible. The heat of activation of the hydration of (I) is independent of I and [H^{*}]; $\Delta H = -8.1$ kg.-cal. [corr. val. for crotonic acid (*loc. cit.*), -5.4 kg.-cal.]. A. J. E. W.

Thermal fission of p-cymene.—See A., 1942, II, 304.

Influence of catalysts on oxidation of turpentine.—See B., 1942, II, 380.

Copper-nickel catalyst for hydrogenation of oils.—See B., 1942, II, 377.

Valency states of metals of group VIa attainable in a pure state in aqueous solution. W. D. Treadwell and R. Nieriker (*Helv. Chim. Acta*, 1941, 24, 1067—1079).—An electrolytic reduction vessel which permits quant. reduction of dil. solutions without concn. change is described. With this apparatus in presence of H_2SO_4 , $K_2Cr_2O_7$ is reduced to $CrSO_4$ and UO_2SO_4 to $U_2(SO_4)_3$, whilst in the presence of H_3PO_4 , W^{II} and U^{VI} are reduced to W^{IV} and U^{IV} . Reduction of Cr^{VI} to Cr^{II} is incomplete in H_3PO_4 , but evidence is obtained of the reduction of Mo^{VI} to Mo^{II} . In a Cd reducer H_2WO_4 in dil. H_3PO_4 is reduced quantitatively to the light-sensitive deep blue WV phosphate. Electrometric titration curves of the reduced solutions with KMnO₄ are given. A method for titrating H_2WO_4 with $V_3(PO_4)_2$ is described. J. W. S.

Chemical action of electric discharges. XXIII. Partition of electrical energy used in production of ozone and oxidation of nitrogen in oyxgen-nitrogen mixtures submitted to the action of the discharge. E. Briner and D. Monnier. XXIV. Formation of nitrogen oxides by action of the discharge on commercial oxygen. E. Briner and G. Papazian (*Helv. Chim. Acta*, 1941, 24, 844–851, 919–921; cf. A., 1940, I, 226).—XXIII. The distribution of energy between formation of NO and of O₃ in an a.c. arc in N₂-O₂ mixtures has been studied. In all cases the energy consumed on O₃ formation largely predominates. The NO yield is little affected by changes in pressure or the rate of gas flow, but is reduced by ~50% by cooling the discharge zone to -75° . The effect of mixture composition (N₂ 2-98%) is examined; the highest NO yields are obtained with 90-95% of N₂.

predominates. The NO yield is little affected by changes in pressure or the rate of gas flow, but is reduced by ~50% by cooling the discharge zone to -75° . The effect of mixture composition (N₂ 2 -98%) is examined; the highest NO yields are obtained with 90-95% of N₂. XXIV. The quantity of N oxides (1.4 \times 10⁻⁴ vol.-% of NO under conditions favourable to NO formation) produced during ozonisation of commercial O₂ (containing 2.2% of N₂) in an a.c. arc is insufficient to render the O₃ unsuitable for use, e.g., for medical purposes. If necessary the N oxides can be removed by keeping the gas over H₂O. A. J. E. W.

Chemical action of electric discharges. XXV. Production of hydrogen cyanide and ammonia by means of the high-frequency arc operating in gas from the distillation of wood. E. Briner and H. Hoefer. XXVI. Production of acetylene by means of the highfrequency arc operating in gas from the distillation of wood. E. scission of a H atom, yields H_2 , N_2 , CH_4 , NH_3 , NH_2Me , and $(NMe:CH_2)_2$ from $3(NHMe)_2$, with overall quantum yield'0.3.

Experiments on chlorophyll and photosynthesis using radioactive tracers.—See A., 1942, III, 861.

Sulphochlorination and chlorination of gaseous hydrocarbons.— See A., 1942, II, 296.

Mechanism of the action of ionising rays on water. R. Latarjet (Compt. rend., 1942, 214, 73-75).—The formation of H_2O_2 by direct decomp. of H_2O and by a secondary process originating in the liberated O_2 is examined. N. M. B.

Electronic exchanges in water under the action of X-rays. J. Loiseleur (*Compt. rend.*, 1942, **214**, 76–78; cf. preceding abstract). —Theoretical. Evidence indicates that the ionisation of O_2 is due to direct transfer, under the action of X-rays, of electrons from two OH ions to the O_2 mol., *i.e.*, $2OH^- + O_2 \rightarrow H_2O_2 + -O-O_-$.

N. M. B. **Photographic action of electrons in the range between 40 and 212 kv.** R. F. Baker, E. G. Ramberg, and J. Hillier (*J. Appl. Physics*, 1942, **13**, 450–456).—The intensity-log exposure curves of photographic plates are similar for electrons from 40 to 212 kv. The abs. sensitivity of the plate increases with voltage up to $\sim 100 \text{ v}$, after which it decreases sharply. The sensitivity at high voltages may be increased by a thin high-density screen, of Ag or Cellophane, on the surface of the plate. O. D. S.

IX.-METHODS OF PREPARATION.

Transmutation of the elements. O. Hahn (Naturwiss., 1942, 30, 245-250).—A review. A. J. M.

Exchange of radioactive silver with silver chloride suspensions. A. Langer (J. Chem. Physics, 1942, 10, 321-327).—Ag* ions in solution exchange constantly with Ag' ions of a AgCl suspension not only on the surface but, probably by self-diffusion, throughout the particles until a steady radioactive state of homogeneous distribution of Ag* throughout the system is obtained. The area of the crystal surface is the determining factor on the time necessary to obtain a given fraction of complete exchange for a given amount of ppt. W. R. A.

Gallium. IV. Gallium hydroxylammonium alum and double sulphates of gallium and primary, secondary, and tertiary aliphatic amines. P. Neogi and K. L. Mondal (*J. Indian Chem. Soc.*, 1942, 19, 67-68).—The following compounds have been prepared

$(NH_{2}OH)_{2}, H_{2}SO_{4}, Ga_{2}(SO_{4})_{3}, 24H_{2}O,$	
$(C_{5}H_{11} \cdot NH_{2})_{2}, H_{2}SO_{4}, Ga_{2}(SO_{4})_{3}, 16H_{2}O_{4}$	
(NH ₂ Bu) ₂ ,H ₂ SO ₄ ,Ga ₂ (SO ₄) ₃ ,16H ₂ O,	
(NHEt ₂) ₂ , H ₂ SO ₄ , Ga ₂ (SO ₄) ₃ , 18H ₂ O,	
[N(C,H11)3]2,H2SO4,Ga2(SO4)3,16H2O, and	
(NMe ₂) ₂ , H ₂ SO ₄ , Ga ₂ (SO ₄) ₃ , 18H ₂ O.	D. F. R.

Rare-earth metal amalgams. II. Separation of neodymium, samarium, and gadolinium. J. K. Marsh (J.C.S., 1942, 523-526). —Sm can be separated from Sm-Nd and Sm-Gd mixtures by treating a solution of the acetates with Na amalgam at $p_{\rm H}$ 8-9. Where Sm is present in small amount, $p_{\rm H}$ 4-5 is more suitable, max. production of the amalgam with Nd or Gd being formed instead of the amalgam with Sm. C. R. H.

Chemistry of metal carbonyls. W. Hieber (Angew. Chem., 1942, 55, 7-11, 24-28). A lecture.

Alkaline earth arsenates. System As_2O_5 -CaO-H₂O. H. Guérin (Ann. Chim., 1941, [xi], 16, 101–153; cf. A., 1938, I, 359; 1939, I, 27).—The following salts were prepared and characterised at the temp. stated: at 17° CaH₄(AsO₄)₂ (I), $Ca_2H_2(AsO_4)_2$, 6 (II), 4 (III), and 2 (IV) H_2O , $5CaO, 2As_2O_5$, $10H_2O$ (V), $Ca_2(AsO_4)_2$, $10H_2O$ (VII), $4CaO, As_2O_5, 5H_2O$; at 40° (I), (III), (III), (IV), (V), $5CaO, 2As_2O_5, 5H_2O$ (VII), $4CaO, As_2O_5, H_2O$ (II), (III); at 90° CaO, As_2O_5 , $10H_2O$ (VII), $Ca_2H_2(AsO_4)_2$, $10H_2O$ (VII); at 90° CaO, As_2O_5 , $10H_2O$ (VII), $Ca_2H_2(AsO_4)_2$, $10H_2O$ (VII), $10H_2O$ (VII) is metastable at 90° . The unstable at 60° , and (V) and (VI) at 40° ; (VII) is metastable at 90° . The unstable hydrate (II) is formed by the action of As_2O_5 on $Ca(OH)_2$ or $CaCO_3$ in aq. suspension, but not by double decomp. between CaCl₂ and Na_2HASO_4 . It is transformed into pharmacolite (III) or haidingerite (IV) according to whether the $p_{\rm H}$ of the liquid is > or <6. Hydrolysis is generally marked at the higher temp. and is shown by the displacement of the fields of stability of the various salts towards more acid solutions. $Ca_2(ASO_4)_2$ is not hydrolysed, even at 90° . Cryst. and other properties are described. F. L. U.

Chemistry of sulphur trioxide. P. Baumgarten (Angew. Chem., 1942, 55, 115-118).-A lecture.

Reaction of sulphur dioxide with sodium thiosulphate. C. Chorower (Anal. Fis. Quim., 1941, 37, 571–593).—In the reaction between SO_2 and $Na_2S_2O_3$ the absorption of $SO_2 \propto [Na_2S_2O_3]$; the formation of Na_2SO_4 is insignificant until the solution is exposed to the air during evaporation. This results in the decomp. of the polythion-

ates which, on complete evaporation, form Na_2SO_4 and S. The completed reaction is $2Na_2S_2O_3 + SO_2 = 2Na_2SO_4 + 3S$. F. R. G.

F. R. G. F. R. G. F. R. G. Calcium sulphate as a source of sulphur chlorides. I. Chlorination of calcium sulphate in presence of reducing agents. II. Optimum conditions for the chlorination process. P. P. Budnikov and E. I. Kretsch (J. Appl. Chem. Russ., 1941, 14, 747-754, 755-765; cf. A., 1936, 1211).—I. When the mixture CaSO₄ (gypsum) + 4C (lignin C) was chlorinated over the range 225-850°, the CaSO₄ began to decompose at 345° to give S chlorides (I), the yield of S as SO₃ rising rapidly as the temp. increased to 725° (96% yield). The max. yield of S at 740-750° was obtained with the mixture CaSO₄ + 3C. Under these conditions, max. yields were obtained using soot or lignin C or sugar C (98:5-98:7%), and the lowest yield with coke (87.4%); anthracite, bone C, or electrode C gave intermediate yields. At the optimum conditions [740-750°, CaSO₄ + 3C (lignin)], the reaction was very rapid, a 96% yield being obtained in 15 min. The addition of NaCl or Na₂SO₄ (0.1 g.-mol. per g.-mol. CaSO₄) increased the speed of the reaction at 630-640°; addition of Fe₂O₃ or of SiO₂ decreased the yield of S. All experiments were carried out with small samples. II. Repetition confirmed the above results for larger quantities

II. Repetition confirmed the above results for larger quantities of the reactants. The optimum temp. for the prep. of (I) by chlorinating the stoicheiometric mixture $CaSO_4 + 3C$ (anthracite) + $0\cdot Im - Na_2SO_4$ (all previously baked together at $600 - 800^\circ$) was $700 - 750^\circ$. Chlorination of the stoicheiometric mixture $CaSO_4 + 4C + 0\cdot Im - Na_2SO_4$ produced both CS_2 and (I). The heat produced during these reactions is calc. N. G.

Statistics in sulphide and phosphide chemistry. W. Biltz (Angew. Chem., 1942, 54, 320-321).—A lecture. A. A. E.

Isolation and some properties of element 93. F. Strassmann and O. Hahn (*Naturwiss.*, 1942, 30, 256-260).—A method of separating element 93 (I) from U, U-X, etc. is described. The separation of U as Na uranyl acetate is discussed. (I) is not pptd. by oxine, and a method of separation is based on this fact. Some analytical reactions of (I) are described. It is not pptd. by H₂S, but is completely pptd. by aq. NH₃ when it is in either the oxidised or the reduced state. It is only partly pptd. from dil. HCl solution by H₂C₂O₄ or (NH₄)₂C₂O₄, or by tartaric acid and aq. NH₃. Bolling with NaOAc and H₂O₂ ppts. (I) in the presence of La and Ce. It is also pptd. from a conc. HNO₃ solution containing bromate and U by the addition of NaOAc. (NH₄)₂S ppts. (I). A. J. M.

X.—ANALYSIS.

Colour nomenclature in qualitative analysis. I. Inter-Society Colour Council nomenclature. L. P. Biefeld and M. Griffing (*J. Chem. Educ.*, 1942, 19, 282-286). L. S. T.

Adsorption analysis of gases and vapours. G. Hesse and B. Tschachotin (*Naturwiss.*, 1942, 30, 387-392).—The method of chromatographic analysis has been extended to substances of low mol. wt. and to gases. The mixture is vaporised, and passed with a carrier gas (corresponding with the solvent) into a heated adsorption tube containing SiO₂ gel. The vapour passing through is condensed and analysed. The method has been applied to the separation of C₆H₆ and cyclohexane (I). The initial and final fractions were optically pure, and it was possible to obtain 52% of the (I) containing <1% of C₆H₆. The separation of a C₆H₆-cyclohexene (II) mixture was difficult, but with a greater quantity of adsorbent 25% of (II) was obtained optically pure. C₆H₆ and CCl₄ were easily separated, but Pr⁶OH and Bu³OH could not be separated. cis- and trans-C₂H₄Cl₂ were partly separated. SiO₂ is a better adsorbent than activated C. H₂, N₂, CO₂, N₂O, and NH₃ were used as carrier gases, and of these H₂ was the best. The optimum flow was 11. per hr. The temp. of the adsorbent should be as low as possible. Earlier experiments are reviewed. A. J. M.

Micro-determination of bromide as pentabromorosaniline. W. J. Turner (Ind. Eng. Chem. [Anal.], 1942, 14, 599-600).—Br' is oxidised to Br by means of $K_2S_2O_8$ and conc. H_2SO_4 , and substituted in rosaniline. The pentabromorosaniline is extracted by means of CH_2Ph ·OH from 7N-H₂SO₄, and determined photometrically. The method can be applied to biological fluids without preliminary separation from Cl'. L. S. T.

Micro-test for iodide. D. Hart and R. Meyrowitz (Ind. Eng. Chem. [Anal.], 1942, 14, 606; cf. A., 1941, I, 119).—The catalytic effect of I' on the NO₃'-AsO₃''' oxidation-reduction reaction is utilised for detecting 1 μ g, of I' in a concn. of 1 in 5 × 10⁴ in presence of 500 μ g, of CNS', Br, or Cl'. 1 drop of M-Na₃AsO₃ and 2 of H₂O are mixed with 1 of test solution. 2 drops of conc. HNO₃, and after 2 min., 3 drops of 0-5M-AgNO₃ and 1.5M-Na₂CO₃ are added. A redbrown ppt. of Ag₃AsO₄ shows the presence of I'. L. S. T.

Ozone as an analytical reagent. II. Determination of iodides. H. H. Willard and L. L. Merritt, jun. (*Ind. Eng. Chem.*, [Anal.], 1942, 14, 489–490).—I' and other I compounds are oxidised quantitatively to IO_4' by O_3 in 1—10% NaOH. Br' in concns. >0.6 g., but not Cl', interferes. The IO_4' is allowed to react with I' in a neutral or acid solution, and the I liberated titrated with ${\rm AsO}_{a}{}^{\prime\prime\prime}$ or ${\rm Na}_2{\rm S}_2{\rm O}_3.$

Determination of dissolved oxygen [in boiler feed water].—See B., 1942, I, 393.

Detection of peroxides with luminol. H. Druckrey and R. Richter (*Naturwiss.*, 1941, 29, 28–29).—Luminescence is produced when esters are hydrolysed with aq. KOH or when acids are neutralised with alkali in presence of luminol (I) at room temp. Dissolution of alkali in aq. (I) or heating of aq. alkali containing (I), especially in presence of hæmin (II), also produce luminescence. In all cases there is no luminescence in absence of atm. O_2 . Glucose, lactates, salicylic acid, and glycerol in alkaline solution and in presence of O_2 cause luminescence of (I) with or without the presence of (II), in accord with the paradox that many reducing agents, but few oxidising agents, give the reaction attributed to H_2O_2 . It is suggested that (I) acts both as a substratum for dehydrogenation by atm. O_2 and as a chemiluminescent substance through the H_2O_2 formed in this reaction. The rate of dehydrogenation of (I) at room temp, is so slow that no visible luminescence appears until higher temp, are reached. The energy liberated by neutralisation, dissolution, sound waves, or by other oxidation processes may accelerate this dehydrogenation and so cause luminescence. I. W. S.

Direct determination of sulphur. G. L. Mack and J. M. Hamilton (*Ind. Eng. Chem. [Anal.*], 1942, 14, 604—606).—Colloidal Cu₂SO formed by the reaction between S in COMe₂ with ammoniacal Cu₂SO₄ reagent (prep. from CuSO₄, aq. NH₃, and NH₂OH,HCl) is determined turbidimetrically. 1 μ g. of S in 10 ml. of solution can be detected. CS₂, inorg. sulphides, and xanthates, but not SO₄", SO₃", S₂O₃", CNS', org. sulphides, sulphones, mercaptans, and phenols, react with the reagent. CCl₄ produces a red colour. The method has been applied to S in spray residues. L. S. T.

Oxidimetric determination of dithionate. R. Lang and H. Kurtenacker (Z. anal. Chem., 1942, 123, 81-96).—The use of various oxidising agents in the determination of S_2O_6'' has been investigated. HVO₃ is the most suitable, as it is not decomposed by prolonged boiling in conc. acid, it oxidises S_2O_6'' quantitatively to SO_4'' , and the VO' produced can be titrated with KMnO₄. The solution, containing $\Rightarrow 0.24$ g. of S_2O_6'' , is treated with 0.2N-HVO₃ (20 c.c.) and 10N-H₂SO₄ (30-50 c.c.) and the mixture is diluted to 100 c.c. It is then boiled gently in a flask closed with a funnel for 20 min., the boiling solution then being titrated with 0.1N-KMnO₄ until the colour changes from yellow to brownish-violet. Other S compounds which may interfere should be oxidised to SO_4'' by treating with NaOH and KMnO₄. After 15-20 min. excess of 2% aq. MnSO₄ is added, the solution is diluted to a definite vol., filtered, and an aliquot used for S_2O_6'' determination. H_2O_2 can be used to remove SO_3'' but is unsuitable in the presence of S_2O_3'' , S_3O_6'' , or S'. The presence of ≥ 2 g. of Cl' does not interfere with the S_2O_6'' determination. J. W. S.

- Determination of selenium in copper.—See B., 1942, I, 429.

Determination of ortho-, pyro-, meta-, and poly-phosphates in presence of one another. L. T. Jones (Ind. Eng. Chem. [Anal], 1942, 14, 536-542).—Procedures for determining ortho-, pyro-, hexameta-, trimeta-, and poly-phosphates are described. Hexametaphosphate (I) is separated as the Ba salt in acid solution, and $P_2O_r^{(m)}$ is pptd. as $Mn_2P_2O_r$ at p_{II} 4·1 in presence of COMe₂ after removal of (I). Polyphosphates are obtained from the difference between total P_2O_s and the sum of the P_2O_s vals. of the other phosphates. Data showing the application of the methods to synthetic phosphate and carbonate and silicate mixtures, and commercial phosphates, are given. L. S. T.

Detection of orthophosphates by means of drop reactions. P. W. West and T. Houtman (*Ind. Eng. Chem. [Anal.*], 1942, 14, 597– 599).—Interferences to which the strychnine-molybdate, the NH₄ molybdate (I)-SnCl₂, and the (I)-benzidine (II) tests are subject are recorded. A modified strychnine-molybdate test, in which the yellow ppt, formed is reduced by means of (II) (blue-green colour), and which is more selective, but still subject to certain interferences, is described. L. S. T.

Fluorescein as an indicator in bromometric titrations. F. L. Hahn (*Ind. Eng. Chem. [Anal.*], 1942, **14**, 571).—In the titration of AsO_3''' in acid solution with BrO_3' —Br', 1 drop of 0·1% fluorescein per 10 ml of solution gives a reddish-brown colour at the end-point. Heating to 40—50° accelerates the reaction. L. S. T.

Determination of quartz in finely grained minerals. H. Jung (*Naturwiss.*, 1942, 30, 266—267).—The mineral is treated with HBF, which dissolves felspar, mica, and clays, but does not attack quartz. A. J. M.

Determination of the quartz content of industrial dusts.—See B., 1942, III, 224.

Spectrographic analysis of inclusions [in steel] containing silica and alumina.—See B., 1942, I, 426.

Chromatographic methods in organic chemistry. III. Determination of potassium and sodium ions. H. Erlenmeyer and J.

Schmidlin (*Helv. Chim. Acta*, 1941, 24, 1213—1218).—When passed through a mixture of starch (2 parts) and 5-keto-4-oximino-3-phenylisooxazoline (I) (1 part), KOAc yields a sharp yellow zone not removed by washing, whereas the corresponding red zone with NaOAc is removed by washing. If the mixture containing (I) is packed into the upper half of a tube and a mixture of starch (3 parts) with violuric acid (1 part) in the lower half of the tube, the Na when washed down forms a stable red zone. The method can be used for the determination of Na and K in presence of one another, but when these elements are in the same ratio as in body fluids $(17\cdot25:1)$ it is necessary to use two tubes, of different diameters, for accurate measurements, as the use of a tube narrow enough to give a reasonably long K zone demands very prolonged washing to obtain the full Na zone. J. W. S.

Gravimetric micro-determination of magnesium. P. F. Holt (Analyst, 1942, **67**, 256-257).—The ppt. obtained in the micro-determination of Mg as $NH_4MgPO_4, 6H_2O$ (A., 1930, 1544) gives a max. error of 0.8% when the time of pptn. is fixed at 5 hr. and the factor for conversion of wt. of ppt. towt. of Mg is 0.09703 (substantially < the theoretical). S. B.

Electrolytic determination of zinc in aluminium solutions.—See B., 1942, I, 433.

Volumetric determination of lead. P. C. Banetjee (*J. Indian Chem. Soc.*, 1942, **19**, 87–88).—Pb is pptd. with excess of KIO₃ and titrated back with Na₂S₂O₃. D. F. R.

Dye extremely sensitive to copper. F. L. Stearns (Ind. Eng. Chem. [Anal.], 1942, 14, 568-569).—Benzo Fast Yellow 5GL (Colour Index, No. 346) is 40 times as sensitive to Cu^{**} as $NEt_2 \cdot CS_2Na$ (I) and by its use 10^{-7} g, of Cu^{**} per l. can be determined with the spectrophotometer. In visual determination the sensitivity of the test equals that of (I) since the colour change of yellow to red is not so pronounced as the colour developed by (I). J. D. R.

Qualitative reagents for cations. VI. Reagents for gallium cations. P. Wenger and R. Duckert (*Helv. Chim. Acta*, 1942, 25, 699-704).—The characteristics of various reagents which have been suggested for the detection of Ga^{***} are tabulated. Details of the sensitivities and specificities of four reagents recommended for use under various conditions are given. J. W. S.

Qualitative reagents for cations. III. Reagents for manganese cations. P. Wenger and R. Duckert [with M. L. Busset] (*Helv. Chim. Acta*, 1941, 24, 1143—1150).—A no. of reagents which have been suggested for the detection of Mn^{*} have been tested with regard to sensitivity and specificity. Of these, 9 are recommended for use under various conditions and their characteristics are tabulated. The sensitivities of NHPh₂ in conc. H₂SO₄ and of benzidine in HCl for the detection of MnO₄^{*} are also recorded. J. W. S.

Reaction between hydrogen peroxide and potassium permanganate. A. Rius and J. M. Gomeza (Anal. Fis. Quim., 1941, 37, 442– 458).—The difference observed by Foz (*ibid.*, 1940, 36, 300) between the factor of normality when H_2O_2 or KMnO₄ is in excess in the determination of H_2O_2 is attributed to a side-reaction 4KMnO₄ + $5H_2O_2 + 6H_2SO_4 = 4$ MnSO₄ + $2K_2SO_4 + 11H_2O + 7\cdot5O_2$. The factor obtained when H_2O_2 is in excess agrees with that obtained iodometrically, and unlike the factor obtained when KMnO₄ is in excess, is independent of the conc. of the reactants. F. R. G.

Determination of ferric iron in pharmacopœial preparations by the mercurous nitrate method.—See B., 1942, III, 220.

Rapid colorimetric determination of iron in aluminium alloys.—See B., 1942, I, 433.

Sensitivity of detection by spectrum analysis of alloying elements in steel and iron.—See B., 1942, I, 428.

Titrations with chromous salt solutions. I. Apparatus for chromometric titration. R. Flatt and F. Sommer (*Helv. Chim. Acta*, 1942, 25, 684—694).—An apparatus for electrometric titrations with CrSO₄ and CrCl₂ in the complete absence of O₂ is described. The methods of producing O₂-free CO₂ and N₂ and the electrolytic reduction processes for preparing 0·1n-CrSO₄ and -CrCl₂ are detailed. These solutions are fairly stable in the absence of O₂. Titration curves with CuSO₄, W¹, Fe^{III}, Ti^{IV}, and Mo^V and mixtures of these compounds are given. J. W. S.

Potentiometric series titrations of tungsten and molybdenum compounds in presence of vanadium and iron. W. D. Treadwell and R. Nieriker (*Helv. Chim. Acta*, 1941, 24, 1098—1105).—When a mixture of H₂WO₄ and HVO₃ in M-H₃PO₄ is reduced in a Cd reducer and titrated potentiometrically with KMnO₄ in an atm. of N₂ the potential jumps are indistinct until V^{II} is oxidised to V^{IV} and W^V to W^{VI}, but the KMnO₄ required to cause potential change from 0-600 to 1-030 v., *i.e.*, to oxidise V^{IV} to V^V, can be determined accurately and hence the concns. of W and V can be calc. Mixtures containing H₂MoO₄ and HVO₃ in M-H₂SO₄ or -H₃PO₄ can be reduced to Mo^{IV} and V^{II} and analysed similarly. In the presence of W, V can also be determined by allowing the reduced solution to oxidise in air until the deep blue colour of W^V phosphate disappears and then titrating the V^{III} with KMnO₄ in an atm. of N₂. Fe^{II} does not inter-

fere with the potentiometric titration of W in a solution reduced in the Cd reducer, the break at 0-200 v. indicating complete oxidation to W^{II}. The WV phosphate can also be titrated directly with KMnO₄ or FeCl₂, the disappearance of the blue colour being taken as the end-point. J. W. S.

Analytical use of 3-hydroxybenzthiazole. H. Erlenmeyer and E. H. Schmid (*Helv. Chim. Acta*, 1941, 24, 1159—1162).—Unlike. 8-hydroxyquinoline, 3-hydroxybenzthiazole (I) forms no insol. compounds with TiO", V_2O_1 "'', MOQ_4 ", or WO_4 " and hence can be used for the determination of various cations in presence of these ions. For the determination of Ni" or Zn" in the solution is treated with NH₄Cl and NH₃ and 4% (I) in MeOH is added in slight excess. The mixture is heated on the water-bath for 10 min, and the remaining MeOH removed by careful reduction of pressure. After keeping for 1 hr. the ppt. is separated, washed, and dried. It is then washed with C₆H₆ to remove excess of reagent and the residue is dissolved in warm 2n-HCl, treated with KBr, and titrated with 0-1n-KBrO₈. Examples of the determination of Ni and Zn in presence of TiO", V_2O_7 "'', MoO₄", and WO₄" are given. J. W. S.

Ozone as an analytical reagent. I. Determination of vanadium, cerium, and manganese. II. Determination of iodides. H. H. Willard and L. L. Merritt, jun. (Ind. Eng. Chem. [Anal.], 1942, 14, 486-489)-Mn ($\geqslant 9$ mg.) is oxidised quantitatively to MnO₄' by O₃ in 1:16-2:32M-HClO₄ (not HNO₃, H₃PO₄, or H₂SO₄), using AgNO₃ as catalyst. Oxidation requires 15 min. when O₂ containing 5 wt.-% O₄ is used. Procedures for determining Mn in steel and Fe ore are given. Ce ($\geqslant 100$ mg.) is oxidised to Ce₃(PO₄)₄ in 1 hr. by O₃ in dil. H₂SO₄ and H₃PO₄. Ce₃(PO₁)₄ separates as a white gel which is dissolved by H₂SO₄; the Ce⁻⁻⁻ is titrated with FeSO₄. V in Cr-V and Cr-V-W steels can be determined after oxidation to H₃VO₄ by O₃. I'. SeO₃", TeO₃", NO₂', PO₂"'', PO₃"', Hg', As⁻⁻, and Sb⁻⁻⁻ are oxidised by O₃. Cr⁻⁻⁻ and Br' are partly oxidised. L. S. T.

Rapid detection of gold by the electrographic method. J. A. Calamari, R. Hubata, and P. B. Roth (*Ind. Eng. Chem. [Anal.*], 1942, **14**, 535).—Filter-paper moistened with $NaNO_3-H_2O_2$ is placed on the test metal (anode) and a graphite cathode applied to the paper. With an e.m.f. of 6—9 v. a purple stain appears on the paper if Au is present. The method detects Au in many alloys, but not very thin Au plate on Cu or brass. Cr gives a transient blue spot, V a red, and Ag a black spot. L. S. T.

Spectro-docimastic analysis. P. Pardo (Anal. Fis. Quim., 1941, 37, 321-323).—Docimastic technique for determination of Au and Ag is supplemented by spectrophotometric determination of Pt, Pd, Ru, and Ir. F. R. G.

XI.—APPARATUS ETC.

Attenuated superconductors. I. For measuring infra-red radiation. D. H. Andrews, W. F. Brucksch, jun., W. T. Ziegler, and E. R. Blanchard (*Rev. Sci. Instr.*, 1942, 13, 281–292).—By means of a coil of fine W wire at $3\cdot22-3\cdot23^{\circ}$ K., use is made of the large temp. coeff. of change of resistance of a superconductor between the superconducting and normal conducting states. The instrument described permits measurement of the infra-red flux between 50 and 120 μ . with a limit of accuracy of $\sim 10^{-3}$ erg sec.⁻¹ A. A. E.

Photometric performance of optical systems at low luminosities. J. M. Otero de Navascués and A. Durán Miranda (*Anal. Fis. Quím.*, 1941, **37**, 459–477).—A survey of the effect of the geometrical and physiological properties of the eye and loss of luminosity by reflexion on the performance of telescopic systems. F. R. G.

Measurement of the depth of ultra-microscopic objects. H. O. Müller (*Kolloid-Z.*, 1942, **99**, 6-28).—A method is given for determining the depth of objects from measurements of photographs obtained with a stereoscopic electron microscope. C. R. H.

Improved X-ray tube for diffraction analysis. R. R. Machlett (J. Appl. Physics, 1942, 13, 398-401).—Thin sheets of Be, made malleable by the addition of a very small amount of Ti, are used for windows in the metal wall of an X-ray tube, thus enabling greater beam intensity and a purer spectrum to be obtained. A. J. M.

Maximum photometric contrast and its application to the technique of radiography of metallic substances. Determination of the size of internal defects of homogeneity. M. Abbad and L. Rivoir (Anal. Fis. Quim., 1941, 37, 419-441).—A graphical method is developed to obtain the optimum time (t') of exposure to give max. contrast in terms of the blackening of a plate due to X-rays (S_r) and of the background S_r in time t_0 according to $t' = t_0[\log (S_r/S_f)]/(S_r - S_f)$. A formula is deduced for determining the size of pores and other defects of homogeneity. F. R. G.

Radiography by reflexion. A. Guinier and J. Devaux (Compt. rend., 1942, 214, 223—225).—X-Ray photographs by reflexion, using long- λ X-rays, have been obtained. The val. of the method of radiography by reflexion depends on the different reflexion of X-rays from various elements in the surface to be examined, and the fact that the effect varies with the λ of the X-rays. The use of X-rays

of different $\lambda\lambda$ to investigate the same surface extends the possibilities of this method. A. J. M.

Iron-iron oxide electrode for acid-base potentiometric titrations and for H-ion concentration determination. B. R. Agarwal and J. B. Jha (J. Indian Chem. Soc., 1942, **19**, 76–78).—The electrode was prepared by oxidising with HNO₃ mild steel wire or Fe deposited electrolytically on Pt wire. Satisfactory results were obtained in acid solution. D. F. R.

Simplified dropping mercury electrode for polarographic analysis. R. C. McReynolds (*Ind. Eng. Chem. [Anal.*], 1942, 14, 586-587).

Dropping mercury electrode. G. J. Kahan (Ind. Eng. Chem. [Anal.], 1942, 14, 549). L. S. T.

Apparatus for determination of soluble bromide. J. Ehrlich (*Trans. Faraday Soc.*, 1942, **38**, 389—391).—A cell for the electrometric determination of Br' is described. The chain Pb (5% amalgam)|PbSO4|1M-MgSO4|solution|AgBr|Ag gives reproducible results. The method is applicable to the examination of photographic emulsions and washings. F. L. U.

Testing of magnetic materials using a cathode-ray oscillograph with electrostatic deflexion only. K. Kreielsheimer (J. Sci. Instr., 1942, 19, 137-139).—A method is described, and formulæ are derived, for determining induction, field strength, and losses.

A. A. E. Detection of free radicals by the mass-spectrometer.—See A., 1942, II, 341.

Surface replicas for use in the electron microscope. V. J. Schaefer and D. Harker (J. Appl. Physics, 1942, 13, 427–433).—Films of polyvinyl formal resin from 500 to 750 A. thick are formed on the surface by evaporation of a solution and are stripped off under H_2O . Similar films may be used for mounting specimens for observation by the electron microscope. O. D. S.

Electron microscope.—See B., 1942, I, 395.

High-intensity neutron source. M. Morand (*Rev. Sci. Instr.*, 1942, **13**, 301).—By means of a pump having a pumping speed of 1·3 cu. m. per sec. for H_2 an ion current of 5 ma. at ~40 kv. has been obtained. The reaction D + Be affords a neutron source of considerable intensity. A. A. E.

Apparatus for micro-determination of carbonates. G. H. Wyatt (Analyst, 1942, 67, 260-261).—An absorption train constructed from a Schrötter apparatus and other standard components is described. S. B.

High-speed rotational viscosimeter of wide range. Confirmation of the Reiner equation of flow. H. Green (Ind. Eng. Chem. [Anal.], 1942, 14, 576-585). L. S. T.

Simple viscosimeter. F. C. Croxton (Ind. Eng. Chem. [Anal.], 1942, 14, 593-595). L. S. T.

Capillary viscosimeter to measure viscosities in excess of 10 poises. —See B., 1942, I, 394.

Glass-to-metal seals .--- See B., 1942, I, 435.

Electromagnetic densitometer. A. R. Richards (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 595—596).— ρ for liquids can be determined with a precision of 1 in 800 for ρ between 0.62 and 0.82 g. per ml. L. S. T.

Fractionation of colloidal systems. Selection of operating conditions for the supercentrifuge. G. Fancher, S. C. Oliphant, and C. R. Houssiere, jun. (Ind. Eng. Chem. [Anal.], 1942, 14, 552-554). L. S. T.

Compensation method for determining micelle size. E. M. G. Laguarta (Kolloid-Z., 1942, 99, 85-89).—Micelle size is calc. from the extent of Brownian movement which can be ascertained by superimposing a measurable translational velocity which balances the Brownian movement. C. R. H.

Simple rubber stopper economiser. R. C. Peter (*Chem. and Ind.*, 1942, 383).—A glass plate with a central hole for a small rubber stopper may be used in place of a large rubber bung for vac.-distillations from a bolt-necked flask. H. G. R.

Injection and sampling stopcock [for gas analysis]. E. H. Brown (Ind. Eng. Chem. [Anal.], 1942, 14, 551). L. S. T.

Large-capacity metal stopcock. J. Bannon (J. Sci. Instr., 1942, 19, 140).—A compact stopcock which combines large pumping capacity with great reliability is sealing in described and figured. A. A. E.

Graphic method of studying the separation of mixtures by immiscible solvents. L. F. Knudsen and D. C. Grove (*Ind. Eng. Chem.* [Anal.], 1942, 14, 556-557).—A graphical procedure is described by which it is possible to predict the ratio of the vols. of solvents and the no. of funnels and separations required to give the best separation of the components of a mixture by the use of immiscible solvents. J. D. R.

Apparatus for continuous concentration of a solution under reduced pressure. B. L. Davis (Ind. Eng. Chem. [Anal.], 1942, 14, 548). L. S. T.

Simple hydrogen sulphide generator. B. W. Pocock, L. Scholten, and P. J. Erickson (Ind. Eng. Chem. [Anal.], 1942, 14, 575).

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Pressure-measuring device for moderate vacua [0.05-2 mm.]. E. R. Kline (Ind. Eng. Chem. [Anal.], 1942, 14, 542). L. S. T.

Cleaning porcelain crucibles. J. E. D. Carwardine (Ind. Eng. Chem. [Anal.], 1942, 14, 533).—The crucible is placed in a dish of fused KHSO₄ for 5 min., cooled, and washed with hot H_2O . The L. S. T. glaze is not attacked.

Energy consumption in the Clusius separation tube when working continuously. H. Steinwedel (Angew. Chem., 1942, 55, 152-153).tube for separation of gaseous isotopes. It is applied to the calculation of the heat expended in the separation of the Cl_2 isotopes.

Preparation of silver mirrors. P. de La Cierva and A. Durán (*Anal. Fís. Quím.*, 1941, **37**, 177–179).—A mirror reflecting 90% of the incident light and suitable for use in the Pulfrich photometer can be prepared by reducing AgNO₃ in NH₃ by glucose and CH₂O with a little HNO₃ and KOH in aq. EtOH. F. R. G.

"Perspex " in laboratory work. J. A. Radley (Analyst, 1942, 67, 288).—Possible uses of "Perspex," polymerised Me methacrylate, are suggested. The resin has n_p 1.4896 (unplasticised optical quality), 1.4949 (normal commercial quality); thermal expansion 97.5 \times 10⁻⁶ per 1°; H₂O absorption after 24 hr. 0.4%; softens at 120°, may be moulded and will take an impression. It is unattacked by 100°, HNO. 310°, HO. in 14 days at room temp by 10% HNO₃, 31% HCl, or 20% H₂SO₄ in 14 days at room temp. and is unaffected by many org. solvents and by saturated aq. NaOCI. S. B.

XII.—LECTURE EXPERIMENTS AND HISTORICAL.

, Bernhard Tollens, 1841-1918. C. A. Browne (J. Chem. Educ., 1942, 19, 253-259).

XIII.—GEOCHEMISTRY.

discussed. L. S. T.

Sediments of Grassy Lake, Villas Co., a large bog lake of northern Wisconsin. W. H. Twenhofel, S. L. Carter, and V. E. McKelvey (Amer. J. Sci., 1942, 240, 529-546).—The dry sediments contain 65— 70% of org. matter which consists largely of a pale greenish-yellow gel in which are enmeshed detrital particles, diatom tests, sponge spicules, pollen grains, and vegetable matter. The greenish colour is attributed to chlorophyll. Chemical analyses are given. The max. thickness of the sediments, which have accumulated since the Ice Age, is 30 ft. 4 in., and since the H_2O content is $\sim 95\%$, this reduces to 1.5 ft. of solid matter. The sediments contain oils with a yield by destructive distillation of 19 gals. per ton, and by extraction with Et₂O and CHCl₃, 5 and 8 gals. per ton, respectively. L.S.T.

Albite-schists of Antrim and their petrogenetic relationship to Caledonian orogenesis. D. L. Reynolds (Proc. Roy. Irish Acad., 1942, 48, B, 43-66).—Chemical analyses [Lady Gibbs] of biotiteand albite-schists and of gritty phyllites are recorded. The evidence of soda impregnation provided by the albite-schists, and the geo-chemical migration in orogenic belts, are discussed. L. S. T.

Quartz outcrops and their interpretation. B. Du Faur (Chem. Eng. Min. Rev., 1942, 34, 247-253).—The significance of outcrops in prospecting classification in respect of wall rock type is disin prospecting classification in respect of an and examples of economic mineralisation underlying apparently barren exposed quartz are described. LS

Olivine-hypersthene-gabbros and -dolerites in Santal Parganas, Bihar. S. K. Ray (*Quart. J. Geol. Soc., India*, 1941, **13**, 103–163).— Rock-types, petrology, chemical and mineralogical changes are described, and chemical analyses recorded. L. S. T.

Merwinite as an artificial mineral. J. Phemister, with R. W. Nurse and F. A. Bannister (*Min. Mag.*, 1942, 26, 225-230).—The orthosilicate $(a_{3}Mg(SiO_{4})_{a}$ was not recognised by Ferguson and Merwin (1919) in their study of the system $CaO-MgO-SiO_{2}$. It has since been found as a natural mineral in contact-altered limestone (Larsen and Foshag, 1921), in refractory bricks and blast-furnace slags, and it is prepared by heating the mixed oxides at 1500°. It would be that the more recording it for the state of th melts incongruently at 1590°. In the slags it forms needles, plates, or irregular grains and is accompanied by melilite. It shows lamellar twinning and has α 1.708, β 1.714, γ 1.728, 2V 69°, positive. L. J. S.

Kalsilite, a polymorph of KAISiO₄, from Uganda. F. A. Bannister, with M. H. Hey (*Min. Mag.*, 1942, 26, 218-224).—This new mineral occurring as minute grains in potash-rich volcanic rocks was at first thought to be nepheline or kaliophilite, but although hexagonal and giving very close optical data it gives a much simpler X-ray pattern than these. The unit cell, $a 5 \cdot 17$, $c 8 \cdot 67$ A., contains 2KAISiO₄, and the space-group is $D_6^6 = C6_3 \cdot 2$. Micro-analysis gave SiO₂ 39 \cdot 6, Al₂O₃ 21 \cdot 3, K₂O 20 \cdot 1% etc. Sp. gr. 2 \cdot 59, $\omega 1 \cdot 542$, $\epsilon 1 \cdot 57$. L. J. S.

Volcanic rocks from S.W. Uganda containing kalsilite (a poly-morph of KAlSiO₄). A. Holmes (*Min. Mag.*, 1942, 26, 197-217). Eight detailed chemical analyses are given of lavas and ejected blocks from the Bunyaruguru volcanic field. They are ultra-basic $(SiO_2 33.22-40.47\%)$ rocks rich in K (K₂O 3.46-7.04\%) and are named mafurite, ugandite, and katungite, of which several varieties (leucite-mafurite, mellilite-ugandite, kalsilite-katungite, etc.) are distinguished according to the relative abundance of the constituent minerals minerals. L., J. S.

Formula and systematic grouping of ekdemite and heliophyllite. H. Strunz (*Naturwiss.*, 1942, **30**, 89; cf. Sillén and Melander, A., 1942, I, 355).—The elementary cell of ekdemite, $Pb_8ASO_{<4}Cl_{<2}$, is analogous to that of nadorite. The metal at. lattices are similar but O. D. S. the O-Cl lattice is incomplete.

X-Ray studies on nadorite (ochrolite) PbSO₂Cl, and ekdemite.—See A., 1942, I, 355.

New (?) phosphate-sulphate of aluminium from Utah. W. T., Schaller (Amer. Min., 1940, 25, 213).—A white scaly mineral, 2Al₂O₃,4SO₃,P₂O₅,24H₂O, occurs in the Tintic Standard mine, Dividend, Utah, associated intimately with halotrichite, siderotile, and szomolnokite. It is readily sol. in cold H2O; on warming, the solution gives a curdy white ppt. which redissolves on cooling. $24H_2O$ is retained at 105°. The mineral appears to be a new species, and not merely a variety of alunogen. L. S. T.

Rarer metallic constituents of some American igneous rocks, E. B. Sandell and S. S. Goldich (Amer. Min., 1940, 25, 213).—Cu, Pb, Zn, Co, Ni, and Mo have been determined in 31 samples from three igneous areas, and Co and Ni in 19 samples of the Keweenawan flows from the Michigan Cu district. L. S. T.

Crystal system and unit cell of acanthite, Ag₂S. L. S. Ramsdel (*Amer. Min.*, 1940, **25**, 212).—Weissenberg photographs indicate a monoclinic unit cell with a_0 4·20, b_0 6·93, c_0 9·50 A., and β 55°. L. S. T.

Isotypism of PbK₂(SO₄)₂ and Ca₃(PO₄)₂.—See A., 1942, I, 355.

Binary system albite (NaAlSi₃O₈)-sphene (CaTiSiO₅). A. T. Prince (Amer. Min., 1940, 25, 212).—The liquidus curve has been determined. L. S. T.

Binary system NaAlSiO₄-CaSiO₅. W. R. Foster (Amer. Min., 1940, 25, 207).—Equilibrium relations of the system carnegieite, nephelite-pseudowollastonite, wollastonite have been determined. L. S.

Spectrographic study of cinnabar [from twenty deposits]. R. M. Dreyer (*Amer. Min.*, 1940, **25**, 207).—Certain heavy metals, viz., Fe, Cr, Mn, Ag, Cu, Zn, Ni, Ge, Pb, and Co, are associated invariably with cinnabar (**I**) ores. Cu, Pb, Co, Ge, and Ag are conc. differentially, presumably in solid solution, and these concns. are independent of geographical or geological occurrence. The different shades of (**I**) constituent of the advantage of the advantage of the dimension of th (I) coloration are independent of the elements conc. differentially in (I). L.S.T.

In (1). Structural crystallography and composition of jamesonite. L. G. Berry (*Amer. Min.*, 1940, 25, 204).—Jamesonites from Cornwall and the Itos Mine, Bolivia, are identical (*X*-rays): a_0 15-68±0.05, b_0 19-01±0.05, c_0 4.03±0.01 A., β 91° 48′±30′; space-group $P2_1/a$, $\rho_{calc.}$ is 5.67, and $\rho_{obs.}$ 5.63. The unit cell is 2[4PbS, FeS, 3Sb₂S₂]. L. S. T.

Mineralogy and paragenesis of the variscite nodules from near Fairfield, Utah. I—III. E. S. Larsen, 3rd (Amer. Min., 1942, 27, 281—300, 350—372, 441—451).—The phosphate and other minerals occurring in or associated with the nodules are described.

minerals occurring in or associated with the nodules are described. Weissenberg X-ray studies show that wardite, $CaNa_4Al_{12}(PO_4)_8(OH)_{18}, 6H_2O$, has a_0 7.04, c_0 18.88 A. (± 0.02 A.); space-group C_42-P4_1 or C_44-P4_3 , and gordonite, $MgAl_2(PO_4)_2(OH)_2, 8H_2O$, a_0 5.25, b_0 10.49, c_0 6.97 A. (all ± 0.02 A.), a 107° 20′, β 111° 12′, γ 72° 12′, probable space-group $PI-C_4$ 1. The paragenetic relations of the minerals are described, and the form-time form interaction with a comparison of the mineral space for the mineral space of the space of t ation of variscite from phosphatic groundwaters reacting with aluminous material is discussed. L.S.T.

Mineralogical character and origin of pyrites in coal. E. Stach (Z. Ver. deut. Ing. Beih. Verfahrenstech., 1941, 98-101).—Primary pyrites which is derived from melnikowite is dispersed in fine particles throughout the coal mass, mostly so fine as to be scarcely visible to the naked eye. The particles average $6-10 \mu$. in diameter and are composed of cubes of equal size but most irregularly grouped. Secondary pyrites fills the cracks and fissures in the coal and is formed later. R. B. C.

LIST OF ABBREVIATIONS ETC. USED IN ABSTRACTS.

absolute a	bs.	electrocardiogram	e.c.g.	parts per million	p.p.m.
alternating current a	c.	electromotive force	e.m.f.	per cent	%
ampere a	mp.	electron-volt(s)	e.v.	potential difference .	p.d.
Angström unit A		equivalent	equiv.	precipitate	ppt.
anhydrous a	nhyd.	feet, foot	ft.	precipitated	pptd.
approximat-e, -ly a	pprox.	for example	e.g.	precipitating	pptg.
aqueous a	iq.	freezing point'	f.p.	precipitation	pptn.
Assignor) in patent titles (A	Assr.	gallon(s)	gal.	preparation	prep.
Assignee only A	Assee.	gram(s)	g.	qualitative	qual.
atmosphere, -es, -ic a	tm.	horse power	h.p. •	quantitative	quant.
atomic a	it.	hour(s)	hr.	recrystallised	recryst.
atomic weight a	t. wt.	hydrogen-ion concentration	[H]	refractive index	71
boiling point b	D.D.	inch(es)	in.	relative humidity	R.H.
British thermal unit	3.Th.U.	inorganic	inorg.	respiratory quotient .	R.Q.
calculated c	alc.	insoluble	insol.	revolutions per minute .	r.p.m.
Calorie (large) k	gcal.	kilogram(s)	kg.	Roentgen unit	r.
calorie (small) g	cal.	kilovolt(s)	kv.	saponification value .	sap. val.
candle power c	.p.	kilowatt(s)	kw.	second(s) (time only) .	sec.
centimetre c	m.	litre(s)	1.	tsecondary	sec.
cerebrospinal fluid c	.s.f.	maximum	max.	soluble	sol.
coefficient c	oeff.	melting point	m.p.	specific	sp.
concentrated c	conc.	metre(s)	m	specific gravity	sp. gr.
concentration c	oncn.	micron(s)	μ.	square centimetre(s) .	sq. cm.
constant c	const.	milliampere(s)	ma.	temperature(s) , .	temp.
corrected c	corr.	milligram(s)	mg.	tertiary	tert.
critical c	rit.	millilitre(s)	ml.	vacuum	vac.
crystalline).		millimetre(s)	mm.	value	val.
crystallised (adjective only)	Lyst.	millivolt(s)	mv.	vapour density	v.d.
cubic centimetre(s) c		minimum	min.	vapour pressure	v.p.
cubic metre(s) c	u.m. •	minute(s)	min.	viscosity	η
current density c	.d.	molecul-e, -ar	mol.	volt(s)	v.
decimetre(s) d	lm.	molecular weight	mol. wt.	volume	vol.
decompos-ing, -ition d	lecomp.	namely	viz.	watt(s)	w.
density p	o, d.	normal	N.	wave-length	λ
dilute d	lil.	number	no.	weight	wt.
direct current d	l.c.	organic	org.		

† The abbreviations for secondary and tertiary are used only in connexion with organic compounds.

In addition, elements, groups, and easily recognised substances are denoted in the text by symbols and formulæ. (In Section A., III this applies only to inorganic compounds, excluding water, and to chloroform and carbon tetrachloride.) "Oleum" is allowed to describe fuming sulphuric acid and "room temp." for "the ordinary temperature." The symbol for 10 A. is mµ. (not $\mu\mu$.) and for the International X-ray unit it is X, not XU. The symbol for 10^{-6} g. is μ g. (not γ).

The following symbols are used except in Section A., III : >, greater than; \gg , much greater than; \Rightarrow , not greater than (and <, \ll , \ll conversely); \propto , (is) proportional to; \sim , of the order of, or approximately. The principal Pharmacopœias are denoted by B.P., U.S.P., and D.A.B., followed in each case by the

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