BRITISH CHEMICAL AND PHYSIOLOGICAL ABSTRACTS

FEBRUARY, 1944

A I—GENERAL, PHYSICAL, AND INORGANIC CHEMISTRY

CONTENTS

	PAGE		P	ACE
1,	Sub-atomics	vi, Kinetic Theory. Thermodynamics		37
п,	Molecular Structure	vII, Electrochemistry		39
II,	Crystal Structure	vIII, Reactions		40
1V,	Physical Properties of Substances	IX, Preparation of Inorganic Substances .		43
	(not included above) 31	x, Lecture Experiments and Historical .		
v,	Solutions, Dispersions, and Mixtures . 33	xI, Geochemistry	100	46

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BRITISH CHEMICAL AND PHYSIOLOGICAL ABSTRACTS

A I-General, Physical, and Inorganic Chemistry.

FEBRUARY, 1944.

I.—SUB-ATOMICS.

Absorption lines of potassium vapour under varying conditions of temperature and pressure. D. K. Bhattacharya and S. P. Sinha (Indian J. Physics, 1943, 17, 131–134).—The intensity and no. of lines in the range 4586-2225 A. of the absorption spectrum of K vapour at $388-695^\circ$ and 3-400 mm. partial pressure, with total and partial pressure. L. J. J.

Arc spectrum of oxygen, O1. B. Edlén (K. Svenska Vet. Akad. Handl., 1943, 20, No. 10, 31 pp.).— λ and (visual) intensities of 81 lines (15 new) in O 1 from 5958 to 9760 A. have been measured. All lines in the range, excepting the weak multiplet at 8420—8429 A., are included; older vals. are corr. The whole spectrum has been re-examined and new identifications (43 lines in the long- λ region, and 4 multiplets in the far-ultra-violet) made, including lines corresponding to $sp^{53}P$, singlets of 3p-configuration, and 28 levels in the $(^{3}D)nd$ series; previous assignments of the $(^{2}D)3p^{3}D$ and $(^{2}D)3d^{3}P$ terms are corr. The groups at 9487—9760 A. (2566—6374 A., and 5404—5492 A. are identified as combinations of $(^{2}D)3p^{3}F$ and ^{1}F with $(^{2}D)nd^{3}G_{5}$, $^{3}G_{4}$, $^{1}G_{4}$, and $^{3}F_{4}$, indicating a selective auto-ionisation effect with extensive disruption of the LS coupling. The complete term system of O I has been recale. and tabulated; previous triplet and quintet limits are corr.; the (^{2}D) -singlets now fit accurately into the general framework. The fine structure of $(^{4}S)3p^{3}P$ has been worked out, and a small negative splitting demonstrated for $(^{4}S)nd^{5}D$ (n = 3 and 4). Strong perturbations of $(^{4}S)np^{3}P$ by $(^{2}D)3p^{3}P$, and of $(^{2}D)nd^{3}P$ by $sp^{5^{3}}P$, have been established and are discussed. The interlinked deep terms $s^{2}p^{4^{3}}P$, ^{3}D , and ^{1}S are related to the rest of the term system, permitting very accurate calculation of most lines from 769 to 1358 A. Slater's method gives accurate cale. terms vals. in the $2s^{2}2p^{2}3s$ and $2s^{2}2p^{2}3p$

Arc spectrum of tungsten in the ultra-violet. F. Poggio Mcsorana (Anal. fis. quim., 1943, 39, 10-20).—In the region 1990—2400 A., 169 new lines are recorded and some lines previously attributed to other elements are now assigned to WI. F. R. G.

New ultra-violet lines in the spark spectrum of tungsten. F. Poggio Mesorana and J. M. Poggio (Anal. fis. quim., 1943, 39, 21— 30).—208 new lines in the 1960—2210 A. region are recorded. Some of these are assigned to W II, and others to impurities. F. R. G.

Use of iron lines as intensity standards. G. H. Dieke and H. M. Crosswhite (J. Opt. Soc. Amer., 1943, 33, 425-434).—The group of Fe lines between 3140 and 3240 A. is exhaustively examined and found to be satisfactory for intensity standards for the rapid and reliable calibration of plates. The causes of intensity variation are investigated. In general, the relative intensity of lines of Fe I selected at random is changed much more by self-reversal than by changes in excitation. Conditions for min. self-reversal are given. Weak or moderately strong lines based on all but the lowest levels are free from self-reversal under the usual operating conditions of arcs or sparks. Groups of lines can be chosen so that self-reversal is a function of true intensity only, and conversely, by measuring self-reversal of groups of Fe lines in different regions it is possible to determine their true intensities, and hence the relative intensities of groups in all regions. These groups can be used as standards to eliminate plate sensitivity and instrumental effects when the intensities of widely separated lines are to be measured. The method may be applied to analytical spectroscopy where suitable lines of all the constituents cannot be found close together. A. J. M.

Corona in gases at low pressures. J. D. Craggs and J. M. Meek (*Physical Rev.*, 1943, [ii], **64**, 249–250).—A preliminary report of oscillograms obtained at pressures <3 cm. in air, H₂, O₂, and CCl₂F₃. Use of a.c. instead of d.c. has advantages, positive and negative corona, synchronised with the supply voltage, being shown together. A two-beam oscillograph enables tube current to be observed simultaneously with tube voltage or time-calibrating wave. Observations support those of Weissler (cf. A., 1943, I, 173) and show some new effects. N. M. B.

Factors influencing the plateau characteristics of self-quenching Geiger-Müller counters. W. D. B. Spatz (*Physical Rev.*, 1943, [ii], 64, 236-240).—Investigations show that air or O₂ impurities in-25 B (A., I.) crease the plateau slope and starting potential of A-alcohol counters. Changes in the plateau and recovery powers of the counter with duration of use are reported. Pressure in an A-alcohol counter increases as a function of the total no. of counts, and the useful life is $\sim 10^9-10^{10}$ counts; for A-CH₄, it is 10^7-10^8 counts. Changes are attributed to decomp. of org. vapour by the discharge. N. M. B.

DENECHNIC

β-Ray spectrum of antimony, ¹²¹Sb. E. B. Hales and E. B. Jordan (*Physical Rev.*, 1943, [ii], **64**, 202–206).—The continuous β-ray spectrum, investigated with a 180° type of spectrometer, consists of two components, the end-points of which are 0.74 ± 0.03 and 2.45 ± 0.07 Me.v. The difference, 1.71 ± 0.03 , agrees with the known val. of the hard y-ray from ¹²⁴Sb. In addition, internal conversion lines, corresponding with y-ray energies of 0.23 and 0.61 Me.v. and probably due to the decay of a long-lived Te isotope present in the source, were observed. A possible energy-level scheme representing this transition is discussed. N. M. B.

Burst production in a gas volume. M. Sinha (*Physical Rev.*, 1943, [ii], 64, 248—249).—A photograph, taken under large thickness of Pb, of a burst inside a Wilson chamber is discussed. Possible explanations of the origin of the burst are considered. N. M. B.

Multiple production of secondary cosmic-ray particles in the lower atmosphere. V. H. Regener (*Physical Rev.*, 1943, [ii], **64**, 250— 252).—With an arrangement of 125 counter tubes above and between 6 layers of Pb, investigations were made at altitudes sea level— 14,000 ft. A study of 200,000 photographs shows two processes of production of secondary particles : in the first, a neutral radiation produces in the 1-cm. top layer of Pb single non-multiplying particles, mostly of range <5 cm. Pb (cf. following abstract); in the second, the particles produced invariably come in showers, 0.1 of the observed production processes being initiated by penetrating ionising rays, and 0.9 by penetrating non-ionising rays. Data for cross-sections of processes, particle range, and altitude dependence of production are briefly indicated. N. M. B.

Absorption curve and production of slow cosmic-ray protons at low altitude. V. H. Regener (*Physical Rev.*, 1943, [ii], 64, 252— 253; cf. preceding abstract).—An absorption curve of the noncascade-forming particles produced by a non-ionising radiation is given and discussed. The particles are identified with the protons reported by Powell (cf. A., 1942, I, 312). N. M. B.

Production of secondaries in paraffin by primary cosmic-ray particles. M. Schein, M. Iona, jun., and J. Tabin (*Physical Rev.*, 1943, [ii], **64**, 253—254).—Balloon experiments at high altitudes (5—17 cm. Hg pressure) show that a large fraction of the penetrating ionising rays are accompanied by secondaries produced in the paraffin. The approx. cross-section for production is $\sim 10^{-24}$ sq. cm. There is evidence that the primaries are protons, and the decrease in intensity at decreasing altitudes gives an absorption cross-section of 2×10^{-25} sq. cm., or approx. the area of a N or O nucleus. N. M. B.

Origin of large bursts under thick shields. R. E. Lapp (*Physical Rev.*, 1943, [ii], 64, 254–255).—Experiments with a high-pressure ionisation chamber, shielded by 35 cm. of Fe, to record cosmic-ray bursts containing >100 particles show that the bursts are produced mainly by mesotrons, and that only 4-7% of the bursts are due to atm. showers (cf. A., 1944, I, 2). N. M. B.

Spin of the mesotron from burst measurements. R. E. Lapp (*Physical Rev.*, 1943, [ii], 64, 255-256).—A size-frequency distribution curve for bursts in an ionisation chamber under 10.7 cm. Pb shielding is compared with the theoretical curves for bursts produced by mesotrons of spin 0, $\frac{1}{2}$, and 1 (cf. Christy, A., 1941, I, 235). Very close agreement with the theoretical curve for spin 0 is shown, but the possibility of spin $\frac{1}{2}$ is discussed (cf. following abstract).

N. M. B. Effect of radiation damping on burst production. S. Kusaka (*Physical Rev.*, 1943, [ii], 64, 256—257).—Possible causes of differences in the calculations and results of Christy (cf. A., 1941, I, 235) and Chakrabarty (cf. A., 1943, I, 247) are discussed; the findings by the latter of meson spin 1, but not 0 or $\frac{1}{2}$, are discredited. N. M. B.

Multiple production of penetrating particles by cosmic-ray protons and neutrons. W. E. Hazen (*Physical Rev.*, 1943, [ii], 64, 257).— Experiments showed no direct evidence for a cascade production of

21

mesotrons in close nuclear encounters by protons or neutrons as calc. by Hamilton (cf. A., 1944, I, 2), but several cases of multiple production of energetic penetrating particles in a single event have been photographed. N. M. B.

Disintegration curve of mesotrons. N. Nereson and B. Rossi (*Physical Rev.*, 1943, [ii], 64, 199–201; cf. A., 1943, I, 79).— Extensive further measurements summarised and plotted give $2:15 \pm 0.07$ μ -sec. for the mean life, as calc. from the differential disintegration curve. N. M. B.

Scattering of mesons under the influence of radiation damping. S. T. Ma (*Proc. Camb. Phil. Soc.*, 1943, **39**, 168—172).—Exact solutions of the relativistic equations for the scattering of a positive meson by a neutron and of a negative meson by a proton, radiation damping being taken into account, lead to vals. of the cross-sections very close to those obtained by Heitler (A., 1941, I, 291) for the nonrelativistic approximation. It is suggested that non-relativistic calculations should also give correct results for the scattering of positive and negative mesons by protons and neutrons, respectively, for which processes the relativistic theory is more difficult.

H. J. W. Algebra of meson matrices. N. Kemmer (*Proc. Camb. Phil. Soc.*, 1943, 39, 189—196).—The algebra normally used in meson theory, defined by the relation $\beta_{\lambda}\beta_{\mu}\beta_{\nu} + \beta_{\nu}\beta_{\mu}\beta_{\lambda} = \beta_{\lambda}\delta_{\mu\nu} + \beta_{\nu}\delta_{\mu\lambda}$, and in which only four β elements exist, is extended to cover the existence of any no. of elements. Expressions are deduced for the no. of linearly independent elements, for the no. of algebraically independent irreducible representations, and for their ranks. A method is given for constructing these representations. H. J. W.

Statistical mechanics of processes observed in cosmic-ray phenomena. G. Wataghin (*Physical Rev.*, 1943, [ii], 64, 248).—Mathematical. In processes involving emission of neutrinos an appreciable fraction of the successively transformed energy of a primary particle escapes observation, and the statistical laws for such processes differ from the usual ones. A modification of the usual statistical laws is outlined. N. M. B.

Theory of spin of elementary particles. V. L. Ginzburg (Compt. rend. Acad. Sci. U.R.S.S., 1941, 31, 319-323). A. J. M.

The hydrogen atom and the classical theory of radiation. C. J. Eliezer (*Proc. Camb. Phil. Soc.*, 1943, **39**, 173—180).—The equations of motion of an electron in an external electromagnetic field (using Dirac's relativistic theory) are considered. For an electron moving in a straight line towards a fixed proton or towards another electron, and for the three-dimensional motion around a fixed proton, there appear to be no solutions corresponding with an actual collision.

H. J. W. Interaction of two point charges. E. A. Milne (*Phil. Mag.*, 1943, [vii], 34, 712-716).—A simplified derivation of the energy and angular momentum integrals for a pair of point charges, using τ -measures instead of the *i*-measures used previously (cf. A., 1943, I, 141). H. J. W.

II.—MOLECULAR STRUCTURE.

Spectrum physics and thermodynamics. Calculation of free energy, entropy, specific heat, and equilibria from spectroscopic data, and the validity of the third law. H. Zeise (*Z. Elektrochem.*, 1941, 47, 595-617). J. H. BA.

Absorption spectrum of nitrogen in the extreme ultra-violet. R. E. Worley (*Physical Rev.*, 1943, [ii], 64, 207–224).—Investigations, at large dispersion, of the spectrum corresponding with excited states in the range $12\cdot2-17\cdot0$ e.v. give data tabulated for an extensive Rydberg series of bands. The ionisation potential of N₂ corresponding with the series limit is $15\cdot577$ v. Interpretation of results and evaluation of consts. are given and discussed. N. M. B.

Band spectrum of phosphorus. I. Rotational structure. II. Alternating intensity and nuclear spin. K. N. Rao (Indian J. Physics, 1943, 17, 135—140, 149—152).—I. The bands (9, 21), (5, 21), (5, 18), and (4, 18) of P_2 vapour excited in a discharge tube have been measured. Rotational consts. found are: B'_4 0·2346, B'_5 0·2323, B'_9 0·2255, B''_{18} 0·2799, B''_{21} 0·2736. No rotational perturbations are found. Those reported by Herzberg (A., 1933, 199) must be vibrational.

199) must be vibrational. II. The alternating intensity in the rotational structure of the (5, 21), (5, 18), (9, 21), and (6, 22) bands of P_2 has been measured. All except the (5, 21) band give an intensity ratio 3.0; the (5, 21) band gives 3.3. The anomaly is not due to perturbations. A val. $\frac{1}{2}$ is found for the nuclear spin quantum no. for P. L. J. J.

Intensity distribution in molecular spectra : class I systems of mercurous chloride and mercurous bromide. M. G. Sastry (Indian J. Physics, 1943, 17, 141-148).—Peak intensities for bands of the $Hg^{ss}Cl$ and $Hg^{st}Br$ (class I) systems at 2650-2400 Å. have been determined by the slit-width method. Transition probabilities and effective temp. are calc. L. J. J.

Intensity of solar radiation in the Arctic. N. N. Kalitin (Compt. rend. Acad. Sci. U.R.S.S., 1941, 31, 329–332).—There is a min. in the intensity of solar radiation in the summer months, and a max. in the winter. This is attributed to changes in H_2O vapour concn. in the atm. A. J. M.

Ultra-violet absorption spectra of arylethylenes. R. N. Jones (J. Amer. Chem. Soc., 1943, 65, 1818-1824).—The ultra-violet absorption spectrum of tetra-(9-phenanthryl)ethylene in EtOH-dioxan has been investigated and compared with that of 4M-phenanthrene. Substances having the formula CRR'CR''R''' (R, R', R'', and R''' = H or Ph) give spectra resembling those of either styrene or *Irans*-stilbene, *cis*-stilbene being the sole exception. This behaviour is explained by steric considerations. W. R. A.

Ultra-violet absorption spectra of derivatives of chrysene. R. N. Jones (J. Amer. Chem. Soc., 1943, 65, 1815-1818).—The ultra violet absorption spectra of 6-isopropenyl- (I), 6-acetyl-, isomeric acetyl-, and diacetyl-chrysene have been measured. The similarity between the spectra of (I) and 6-methylchrysene is attributed to steric effects which prevent the C:C group from acquiring a configuration coplanar with the chrysene ring system; consequently, interaction between the aromatic ring and the C:C linking does not occur. W. R. A,

Effect of molecular environment on the absorption spectra of organic compounds in solution. III. Compounds containing the chromophore :C:C:C:C:N: L. K. Evans and A. E. Gillam (J.C.S., 1943, 565-571).—The absorption spectra of oximes, semicarbazones, methylsemicarbazones, and thiosemicarbazones of a no. of saturated aldehydes and ketones and $a\beta$ -unsaturated aldehydes, in EtOH solution, are recorded. The thiosemicarbazones of saturated aldehydes and ketones have absorption bands at ~2700 A., ~600 times as intense as those of the parent 'CO' compounds, and provide a method of detecting isolated 'CO' groups. L. J. J.

Lignin and related compounds. LXXII. Ultra-violet absorption spectra of compounds related to lignin. R. F. Patterson and H. Hibbert (J. Amer. Chem. Soc., 1943, 65, 1862—1869; cf. A., 1943, II, 347).—Ultra-violet absorption spectra in EtOH are recorded for 42 compounds of the types, ArOH, ArOMe, CHAr:CHMe, CH₂Ar·CH:CH₂, COR·CHMe·OH, OH·CHAr·COMe, ArCHO, and CH₂Ar·CH:CH₂, COR·CHMe·OH, OH·CHAr·COMe, ArCHO, and CH₂Ar·OH, in which Ar = 3:4:1-OH·C₆H₃(OMe)·and -(OMe)₂C₆H₃. 3:4:5:1-(OMe)₃C₆H₂., and 4:3:5:1-OH·C₆H₂(OMe)₂. Max. are recorded in Fresnel units (f) [= 0·03 ν (cm.⁻¹)]. Compounds containing 3:4:1-OH·C₆H₃(OMe)· or -(OMe)₂C₆H₃. conjugated with unsaturation in the C₃-side-chain have max. at 980 f due to the conjugated unsaturation, 1070 f due to the free m-position, and 1300 f due to an unexplained characteristic of the aromatic nucleus. The m-position is not free in compounds containing 4:3:5:1-OH·C₆H₂(OMe)₂, similarly conjugated, which accordingly have max. only at 980 and 1300 f. Similar compounds containing 3:4:5:1-(OMe)₃C₆H₂, have max. at 1070 and 1300 f, the 980 f max. having suffered a shift of 80—90 f. Methylation of the phenolic OH slightly decreases the extinction at 980 f in both series, but the 1300 f max. is probably unaffected. The 980 f band due to conjugation affords a Clear distinction between CH:CHMe and allyl, CO·CHMe·OH and OH·COMe, or CHO and CH₂·OH. R. S. C.

Dependence of fluorescence efficiency of solutions on the wavelength of the exciting light. S. S. Solomin (*Compt. rend. Acad. Sci.* U.R.S.S., 1941, 31, 742—746).—Vavilov's rule that the quantum efficiency of fluorescence is const. up to a crit. λ , and then falls off rapidly to zero, has been verified experimentally for 14 org. substances. A. J. M.

Effect of naphthacene on the fluorescence of hydrocarbons. J. A. Miller and C. A. Baumann (*Cancer Res.*, 1943, **3**, 217-222).-Details are given for the purification of carcinogenic and related hydrocarbons, for the quant. determination of fluorescence in liquid solution, and for the photography of the fluorescence spectra of these hydrocarbons in solution and in the solid state. 0.1% solid solutions of naphthacene (I) in 3 : 4-benzpyrene (II), 20-methylcholanthrene, 9 : 10-dimethyl-1 : 2-benzanthracene, 1 : 2-benzanthracene, or in anthracene show fluorescence bands, which differ from those of either component and appear to be characteristic of the fluorescence of (I) in solid hydrocarbon solutions. The solid hydrocarbons and their solid solutions with (I) lose their ability to fluorescence. (I) does not inquid solution to its m.p., retains its fluorescence. (I) does not inhibit the fluorescence of liquid solutions of the hydrocarbons. F. L. W.

Factors that alter the fluorescence of certain carcinogens. J. A. Miller and C. A. Baumann (*Cancer Res.*, 1943, **3**, 223–229),—The intensity of fluorescence in solution has been measured for 7 hydrocarbons in 37 solvents. In most solvents fluorescence increases progressively in the order: naphthacene, 1:2:5:6-dibenzanthracene (I), 1:2-benzanthracene, anthracene, 9:10-dimethyl-1:2-benzanthracene, 20-methylcholanthrene, 3: 4-benzpyrene. Fluorescence is most intense in tetrahydrofurfuryl alcohol, C_8H_3N , OH-[CH₂]₂·OMe, and dioxan; it is low in the lower alkanes, and zero in CS₂ or NH₂Ph. The fluorescence of these hydrocarbons, with the

exception of (I), is partly destroyed in solution by prolonged exposure to ultra-violet. Each hydrocarbon is stable to refluxing in 10% alcoholic KOH for 1 hr. The most potent inhibitor of fluorescence is $C(NO_2)_4$. The inhibition is irreversible. The fluorescence of the properties between the proton of mouse times is measured in 18 columnts unsaponifiable matter of mouse tissue is measured in 18 solvents. The fluorescence is very weak as compared with that of the hydro-carbons and does not vary greatly with solvent. In mixtures it is strictly additive to the hydrocarbon fluorescence. F. L. W.

Method for determining depolarisation factors in Raman spectra. ---See C., 1944, Part 1.

Normal vibrations and structure of germanium hydride. K. Schäfer and J. M. Gonzalez Barredo (Anal. fis. quim., 1943, 39, 297-305).—The Raman spectrum of GeH₄ confirms its tetrahedral structure. Calc. force consts. correspond with an intermediate mol. model. F. R. G.

Raman spectrum of O-methylisourea hydrochloride. J. T. Edsall (J. Amer. Chem. Soc., 1943, 65, 1814–1815).—The Raman spectrum of $OMe^{-}C(NH_2)_2^{+}Cl^{-}$ in H_2O is essentially the spectrum of the cation, W. R. A. which is similar to the methylguanidinium ion.

Molecular complexity of some gases in the high-frequency dis-charge. H. O. McMahon and M. J. Marshall (*Trans. Electrochem.* Soc., 1943, 84, Preprint 24, 255-266).—An equation is obtained giving the degree of dissociation of a gas when subjected to a highgiving the degree of dissociation of a gas when subjected to a high-frequency discharge, as a function of the temp. gradient of the fractional increase of pressure (p) caused by the discharge, corr. for the effect of temp. on the thermal conductivity of the gas. The increase of p was determined for H₂, A, and H₂-A mixtures on passage of a discharge at various temp. Results indicate that H₂ is <0.5% dissociated. In a H₂-A mixture containing 46.8% of H₂, 2.6% of the H₂ is dissociated, and in a mixture containing 9.2% of H₂, 76% is dissociated. N₂ and O₂, present as impurities in the A, are almost completely dissociated by the discharge. The dissociation of a polyat, gas mixed with A increases of p observed when the discharge is passed through a gas is largely due to the heatwhen the discharge is passed through a gas is largely due to the heating of the gas. A. I. M.

Hyperconjugation in methylbutadienes as shown by dipole moments. N. B. Hannay and C. P. Smyth (J. Amer. Chem. Soc., 1943, 65, 1931—1934).—Vals. of μ are given for butadiene 0, a- (trans) 0.68, and β -methyl- 0.38, and $\beta\gamma$ -dimethyl-butadiene (I) 0.52 D. Mols. of (I) are predominantly in a *cis*-form with respect to the central C-C linking. The vals. support hyperconjugation. W. R. A. Dipole moments of the chief constituents of less and row G. N.

Dipole moments of the chief constituents of lac and rosin. G. N. Bhattacharya (*Indian J. Physics*, 1943, 17, 153—161).—Dipole moments found for abietic acid, soft lac resin, and pure lac resin, in dil. dioxan solutions at 25°, are 1.35, 4.61, and 7.45 D., respectively.

Effect of various organic radicals on the atomic refractivities of the halogens. W. K. Plucknett (*Iowa State Coll. J. Sci.*, 1943, 18, 77-79).—Vals. of b.p. or m.p., ρ^{20} , n_{20}^{20} , $[R]_D$, $[R]_{\infty}$, and at. dispersion are recorded for C_6H_6 , PhMe, PhX, $p-C_6H_4$ MeX, PhNO₃, BzCl, BzBr, $n-C_7H_{16}$, $n-C_7H_{15}$ Br, $n-C_7H_{15}$ I, and solutions (mol. fractions 0.2 and 0.4) of PhNO₃ and o- and $m-C_6H_4X\cdot NO_2$ in dioxan (X = Cl, Br I). The at refractivity of the halogen decreases in the following Br, I). The at. refractivity of the halogen decreases in the following order of attached groups: Bz, p-C₆H₄Me, Ph, n-C₇H₁₅. No correlation is observed between at. refractivity and electron-sharing capacity, electronegativity, mol. wt., or reactivity; at. refraction is attributed to a complex combination of forces. A. J. E. W.

Molecular arrangement in high-polymeric substances. Optical double refraction, chemical structure, and orientation in substances with felted and netted molecules. F. H. Muller (Angew. Chem., 1940, 1940, with felted and netted molecules. F. H. Muller (Angew. Chem., 1940, 53, 425-428).—Optical anisotropy arises when the random arrangement of mols. is modified, e.g., by application of an electric field (Kerr effect). High-polymeric substances become double-refracting when subjected to mechanical deformation. The double refraction is related to the relative extension and the polarisabilities of the monomer. Proportionality between the tension in stretched materials and the double refraction is deduced, and confirmed experimentally for polystyrene and polyvinyl chloride. Branching and netting of chains does not substantially alter the results. The relations do not hold if crystallites or micelles are present or are formed on stretching. The significance of double refraction as a measure of mol. arrangement in practical problems is indicated. measure of mol. arrangement in practical problems is indicated. R. H. F.

Absorption of light by small drops of water. R. Ruedy (Canad. J. Res., 1943, 21, A, 79-88).—The effect of drop size on the extinction coeff. (k) of H₂O particles in and near spectral regions of strong absorption is calc. by means of Mie's theory. k is < the val. for perfectly transparent particles when λ is < the radius of the particles, the change in k being $\geq 10\%$, and negligible when λ is <1 μ . The main features of the scattering are unchanged by absorption. L.

Valency-force model and dissociation of polyatomic molecules. M. Wehrli and G. Milazzo (*Helv. Chim. Acta*, 1943, 26, 1025-1033). -Differences between the bond energies for individual linkings and B 2 (A., I.)

the dissociation energies for triat. mols. are due to electron shifts. Under suitable conditions, vals. for the bond energy and the elastic const. for a particular linking in one mol. may be assigned to the corresponding linking in another mol. The dissociation energies for the splitting-off of the heavier halogen atom (from fluorescence spectra) for HgClBr and HgBrI are 69.6 and 63.5 kg.-cal. per g.-mol.

F. J. G. Momentum distribution in molecular systems. VII. Momentum distribution and shape of the Compton line for Li₂ and N₂. W. E. Duncanson (*Proc. Camb. Phil. Soc.*, 1943, **39**, 180–188).—For Li₂ the radial momentum distribution and the Compton profile are calc., using three types of wave-function. For N₂ the wave-function used is of the Fock type, with exponents slightly different from Slater's. There is a considerable discrepancy between theory and experiment for the Compton profile for N₂, possibly due in part to the inexact wave-function and in part to uncertainties in the to the inexact wave-function and in part to uncertainties in the experimental results. (Cf. A., 1942, I, 134.) H. J. W.

Definition of surface tension .- See A., 1943, I, 303.

Contact angles.-See A., 1943, I, 303.

Relation between surface tension and vapour pressure of liquids.-See A., 1943, I, 304.

Surface tension of oils containing dissolved gases .-- See B., 1944, I. 10.

III.—CRYSTAL STRUCTURE.

Diffraction of X-rays by binary alloys. R. Smoluchowski (Physical Rev., 1943, [ii], 64, 257-258).—Mathematical. N. M. B.

Width of X-ray diffraction lines from cold-worked tungsten and a-brass. C. S. Smith and E. E. Stickley (*Physical Rev.*, 1943, [ii], 64, 191-198).—Measurements as a function of Bragg angle and X-ray A agree with the micro-stress theory of broadening. In a-brass, but not in W, the line width depends in a systematic manner on crystallographic direction. Observations are explained on the elastic properties of the materials. N. M. B.

Relation between the external form of sucrose crystals, homo-geneity, and supersaturation. N. N. Scheftal (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **31**, 33—36).—Experiments on the growth of sucrose crystals from pure solution are described. The close relation-ship between the external form of the crystals and their homogeneity, and the dependence of these properties on very small changes in concn. in the neighbourhood of saturation, are detailed.

L. S. T. Arrangement of double molecules on a lattice. S. K. Kao and T. S. Chang (*Trans. Faraday Soc.*, 1943, **39**, 288-294).—Mathe-matical. The validity of the approx. formula obtained previously (A., 1939, I, 315) is investigated. F. L. U.

Crystal structure of Pb₃**O**₄ and SnPb₂**O**₄. A. Byström and A. Westgren (*Arkiv Kemi, Min., Geol.,* 1943, **16**, **B**, No. 14, 7 pp.).— Pb₃**O**₄ is tetragonal with a 8.80, c 6.56 A., agreeing with Straumanis (A., 1943, I, 83). There are 4 Pb₃**O**₄ mols. in the unit cell. The structure corresponds with that of antimonites such as ZnSb₂**O**₄. $SnPb_2O_4$, the only compound of this type that could be obtained, has a 8.72, c 6.30 A. A. J. M.

Crystal structure of Al₂CuMg. H. Perlitz and A. Westgren (Arkiv Kemi, Min., Geol., 1943, 16, B, No. 13, 5 pp.).—The crystals are orthorhombic with a 4.00, b 9.23, c 7.14 A.; 16 atoms per unit cell.

A. f. M. Structure of rhombic thallous nitrate. L. Rivoir and M. Abbad (Anal. fis. quim., 1943, 39, 306–331).—Rhombic TINO₃ probably belongs to the crystal class D_3^2 having a 6.17, b 12.27, c 3.98 A., 4 mols. per cell. F. R. G.

Structure of martensite. H. Lipson and (Miss) A. M. B. Parker (*Iron and Steel Inst.*, Nov. 1943, *Advance copy*, 13 pp.).—Martensite may be considered as ferrite supersaturated with C. Measurements of the intensity ratios of the X-ray line doublets given by the tetragonal structure suggest that the Fe atoms may be displaced from the corners and centres of the unit cell by different amounts in different parts of the same crystal. As a consequence, sufficient of the octahedral interstices are enlarged to accommodate the C atoms. . C. C.

X-Ray diffraction of sodium laurate, palmitate, and stearate at room temperature. J. W. McBain, O. E. A. Boldaun, and S. Ross (J. Amer. Chem. Soc., 1943, 65, 1873–1876).—Fibre and powder photographs of Na laurate, palmitate, and stearate confirm the unit cell of β -monoclinic soap and give the unit cell for a "hydrated y-form" of monoclinic soap at room temp. $a -, \beta$ -, and y-forms differ primarily in long spacings and to a smaller extent in lines correspondent. primarily in long spacings and to a smaller extent in lines correspond-ing with side spacings. In the powder diagram the strongest characteristic β -line corresponds with d/n = 4.28 A., whereas that of the γ -phase is d/n = 4.00 A. W. R. A. of the γ -phase is d/n = 4.00 A.

Solid soap phases.—See A., 1943, I, 306.

Crystal structure of the low-temperature form of abietic acid. H. S. Shdanov, M. J. Lazarev, and N. G. Sevastianov (Compt. rend.

Acad. Sci. U.R.S.S., 1941, **31**, 767–768).—Abietic acid is monoclinic and has a 11.7, b 11.6, c 14.1 A.; β 112°; V 1780 cu. A.; ρ 1.132; 4 mols, in unit cell; probable space-group C_2^2 . A, J. M.

Axial lengths of phloroglucinol dihydrate crystals. C. R. Bose and R. Sen (Indian J. Physics, 1943, 17, 163-165).—Rotation and oscillation X-radiograms give a 6.740, b 8.090, c 13.604 A. Goniometric measurements give a:b:c=0.8324:1:3.366. $\rho=1.453$. L. J. J.

Structure of rubber.-See A., 1943, I, 306.

Electron diffraction study of hydrogen peroxide and hydrazine. P. A. Giguère and V. Schomaker (J. Amer. Chem. Soc., 1943, 65, 2025-2029).-Diffraction patterns for N₂H₄ show no evidence for dimerisation and give N-H distance as 1.04 ± 0.06 A. and angle H-N-H as $108\pm10^{\circ}$. For H₂O₂ a new Pyrex nozzle is used; decomp. at ~140° is inhibited by small quantities of NaPO₃ solution; the O-O distance is 1.47 ± 0.02 A. W. R. A.

Visual investigation of glycogen molecules. E. Husemann and H. Ruska (J. pr. Chem., 1940, [ii], **156**, 1–10).—Two specimens of glycogen, mol. wts. 1.5×10^6 and 6.5×10^4 , have been investigated with the electron microscope. The mol. is spherical, confirming the evidence of measurements of η and π and explaining the form of the evaporation figures. Mol. diameter calc. from the mol. wt. agrees well with the photographic val. W. R. A.

IV.—PHYSICAL PROPERTIES OF SUBSTANCES.

Physical constants of butadiene and styrene. C. A. Wood and C. F. Higgins (Petrol. Refiner, 1943, 22, 87-88).—A review. R. B. C.

Molecular concept in micro- and macro-molecular chemistry. H. Staudinger (J. pr. Chem., 1940, [ii], 156, 11-26).—A review. "Physical" and "chemical" mols. are defined, and discussed with particular reference to colloidal and macromol. substances.

W. R. A.

Macromolecular structure of lichenin. H. Staudinger and B. Lantzsch $(J. pr. Chem., 1940, [ii], 156, 65-96). - \eta, \pi, and <math>[a]_{D}^{20}$ of lichenin (I), its acetates (II), and nitrates have been determined in various solvents. Mol. wts., η_{rp} , and K_m consts. have been calc. Mol. wt. determinations on the original (I) and on that recovered from (II) by hydrolysis prove that lichenin is macromol. and not colloidal. Vals. of K_m are consistent with an elongated mol., somewhat shorter than a cellulose mol. of the same degree of polymerisation. Whether branching or twisting of the mol. causes this shorter ening cannot be decided. W. R. A.

Determination of mol. wts. by dialysis.-See A., 1943, I, 304.

Thermal and electrical conductivities of tungsten and tantalum. (Miss) M. Cox (*Physical Rev.*, 1943, [ii], **64**, 241—247).—Since available data are exiguous and conflicting, an investigation was made of the variation with temp of the resistance, thermal conductivity, and Wiedemann-Fraz ratio of pure W and Ta wires at $77-373^{\circ}$ s. A method of calculating the thermal conductivity from the resistance at zero power-input and the slope of the resistance-power-input curve is developed. Limitations of the method lead to inconclusive results. An anomaly in the variation with temp. of the resistance of Ta was observed. N. M. B.

Critical fields of superconductive vanadium. N. E. Alexeevski (Compl. rend. Acad. Sci. U.R.S.S., 1941, **31**, 327–328).—V shows very high vals. for the crit. field. dH/dT = 2400 Gauss per degree, a val. which is \gg that for any other superconductive metal. The crit. temp. obtained by extrapolation is $4\cdot73^\circ$ x., which is somewhat > the val. obtained by Meissner et al. (A., 1934, 246). A. J. M.

Properties of low-reflexion films produced by the action of hydrofluoric acid vapour. F. H. Nicoll and F. E. Williams (J. Opt. Soc. Amer., 1943, 33, 434—435).—Glass exposed to vapour from dil. HF is covered with a white deposit, which is sol. in H₂O. When this is removed, a hard, insol., low-reflexion film remains. Such films are produced only in a relatively narrow concn. range, and consist of skeletonised SiO₂. The method can be used with any type of glass, and produces a film which is more durable than the best evaporated films. The film is highly resistant to abrasion, and the very low scattering makes it useful where good transmission is required (cf. C, 1944, Part 1). A. J. M.

Heat of formation of iron disulphide.—See A., 1943, I, 308.

Thermal properties of isopentane. J. G. Aston (J. Amer. Chem. Soc., 1943, 65, 2041).—Anomalies found by Guthrie and Huffmann (A., 1943, I, 253) are attributed to inherent differences in methods of measurement. W. R. A.

Determination of thermal and calorific properties of diffuoromonochloroethane. L. Riedel (Z. ges. Kalte-Ind., 1941, 48, 105–107; Chem. Zentr., 1942, I, 738).—Determinations of the sp. vol.-of the liquid between -79.5° and 30.1° , of the equation of state of the vapour, of the v.p. curve, and of the sp. heat of the liquid in the saturated state were made on pure CMeF₃Cl, and the enthalpy and entropy of the saturated liquid were calc. The normal b.p. was calc. as -9.21° . The heat of vaporisation was calc. with the aid of the Clausius-Clapeyron equation. R. B. C.

Physical states of anhydrous sodium soaps. W. Gallay and I. E. Puddington (*Canad. J. Res.*, 1943, 21, B, 202-210).—Cooling curves for Na stearate and oleate show for the former a unidimensional m.p. at 70°, a phase transition, probably due to melting in a second direction at right angles to the mol. axis, at ~100°, and a further transition at 125-130° leading to a plastic state corresponding to complete two-dimensional melting. The next phase change is at 200°, giving the liquid crystal, with probable disruption of the polar linkages. Only the latter transition, at ~135°, is found with Na oleate. L. J. J.

Effect of certain addition agents on the physical states of sodium soaps. W. Gallay and I. E. Puddington (*Canad. J. Res.*, 1943, 21, B, 211—218).—Non-polar mineral oils, *e.g.*, those of high η index, have no effect on the density-temp. curves of Na stearate and oleate. Glycerol and polar oils of low η index have no effect up to the unidimensional m.p. at 70° for Na stearate, but markedly lower transition points and m.p. at higher temp., particularly above the plasticity points. The presence of free alkali does not influence the effects. L. J. J.

Pressure-volume-temperature relations of $\beta\beta$ -dimethylbutane. W. A. Felsing and G. M. Watson (*J. Amer. Chem. Soc.*, 1940, 65, 1889–1891).— $p-v-\theta$ relations of EtBu^{γ} are determined at 25° intervals from 100° to 275° at pressures from 1 to 2 atm. > v.p. to ~300 atm. Sp. vols. are related to pressures at different temp.

W. R. A.

Form of condensed water vapour on metal surfaces at low temperatures, below 0°. V. A. Bazikailo (Compt. rend. Acad. Sci. U.R.S.S., 1941, 31, 333-334).—When a polished metal surface is cooled well below 0° in an atm. containing H_2O vapour, drops of H_2O form and disappear again on cooling through a further 0·1-0·2°. At lower temp. (<-20°) there is occasional spontaneous formation of the solid from the liquid phase, though this occurs only on definite small areas of the surface. If the condensate is in contact with light objects, such as cotton wool, the original liquid phase always passes into the solid. A. J. M.

Nomograph of Dittus-Boelter equation. C. J. Ryant, jun. (Ind. Eng. Chem., 1943, 35, 1187—1188).—A nomograph of the equation $h = 0.0243(k/D)(Dup/\eta)^{0.3}(\mu C_p/k)^{0.4}$ (h = coeff. of heat transfer, k = thermal conductivity, D = characteristic length of pipe in which turbulent flow is occurring, u = linear velocity) has been constructed and is reproduced. C. R. H.

Dynamic viscosity of nitrogen. W. L. Sibbitt, G. A. Hawkins, and H. L. Solberg (*Trans. Amer. Soc. Mech. Eng.*, 1943, **65**, 401– 405).—A Ni capillary 118 ft. long was used in the investigation. Data are reported for 45 calibration tests and 395 tests on N_2 up to 1020 lb. per sq. in. and 495°. An equation which expresses the results is presented. R. B. C.

Viscosity of substances in liquid and gaseous state. Measurement of viscosity of liquid nitrogen. W. Fritz and J. Hennenhöfer (Z. ges. Kälte-Ind., 1942, 49, 41-46; Chem. Zentr., 1942, II, 1211).— The relation of η for the liquid and saturated vapour states at a given temp. can be expressed by the same curve for CO₂, SO₂, NH₃, and MeCl. If the η is known for one state it can be calc. approx. from the curve for the other state. The η of liquid N₂ (96% pure) was determined at 77.7° x.; the val. for the gaseous state determined from the curve agrees with the val. determined by other methods. R. B. C.

Size of gas bubbles. I. Evolution from a single capillary. II. Evolution from filter-plates. A. Guyer and E. Peterhans (*Helv. Chim. Acta*, 1943, 26, 1099–1107, 1107–1113).—I. The diameter (D) of gas bubbles from a single capillary in various liquids depends chiefly on η for the liquid, γ , and the diameter (d) of the capillary, according to $D = [K_1\gamma + K_2 \log \eta + K_3]d^{1/3}$, where the consts. K_1 , K_2 , and K_3 have empirical vals. 0.012, 0.07, and 1.90, respectively. II. The diameter (D) of gas bubbles from filter-plates in various liquids increases with increase of γ , streaming velocity, and pore diameter. With increasing η , D first falls to a min. and then increases. F. J. G.

Gas-dynamical contribution to the evaluation of flame experiments in tubes. G. Damkohler and A. Schmidt (Z. Elektrochem., 1941, 47, 547-567).—By the use of a one-dimensional treatment of streaming processes, relations are obtained between pressure (p), sp. vol., temp., mean streaming velocity, and position along the tube for a gas flowing along a straight tube. These are derived for a primary percussion wave in front of a piston moving with const. velocity (corresponding with a flame front of const. velocity), the reflexion of the wave from a rigid wall, the wave at the open end of a tube, and in the wave front of an accelerating piston (corresponding with an accelerating flame). Curves of p, temp., and d changes with distance, for known flame or percussion wave velocities, and for

31

various vals. of the isentropic exponent, are given, and can be used in the evaluation of flame or schlieren photographs. J. H. BA.

Viscosity and working properties of glass.---See B., 1944, I, 23.

V.—SOLUTIONS, DISPERSIONS, AND MIXTURES.

Ultrasonic wave velocity in aqueous mixtures of some organic liquids. I. G. Michailov (Compt. rend. Acad. Sci. U.R.S.S., 1941, **31**, 324—326).—The velocity of ultrasonic waves in aq. solutions of MeOH, EtOH, COMe₂, AcOH, and C₆H₆N, and in NH₂Ph-AcOH mixtures has been determined. Aq. solutions of MeOH, EtOH, and COMe₂ fall into one class, in which d varies almost linearly with concn. and the velocity of sound is a max. at ~30% concn. for all these solutions. The max η also occurs for these solutions in the range 40—50%. AcOH-H₂O has a max. d and η at a concn. of 80%, and max. velocity of sound at 20%. For C₆H₆N-H₂O, max. velocity occurs at 60%, and coincides approx. with max. d and η . For NH₂Ph-AcOH there is a max. d at 70%, and max. η at 60%, but no velocity max.

Ultrasonic wave velocity in formic acid-water mixtures. I. G. Michailov (Compt. rend. Acad. Sci. U.R.S.S., 1941, 31, 550-552). —At concns. of 1 mol. HCO_2H to 1 mol. H_2O , and 1 mol. HCO_2H to 2 mols. H_2O , there are definite changes in ultrasonic velocity, the effect being greater for the first mixture than for the second. Similar changes in d, η , and other properties have also been observed at these concns. The velocity-concn. curve shows a max. at a concn. of ~20% HCO_2H . A. I. M.

Dependence of fluorescence efficiency of solutions on the wavelength of exciting light.—See A., 1944, I, 28.

Kinetics of recrystallisation process. K. S. Lialikov (Compt. rend. Acad. Sci. U.R.S.S., 1941, 31, 585–587).—The applicability of Smoluchowsky's equation to recrystallisation under conditions eliminating coagulation has been investigated. Four series of $\rm NH_3$ photographic emulsions were used, the recrystallisation of AgBr being determined for different solubilities, various concess. of KBr being present. Smoluchowsky's equation holds approx., the discrepancy being ascribed to the presence of different quantities of complex compounds. A. J. M.

Molal depression constant for camphor. W. B. Meldrum, L. P. Saxer, and T. O. Jones (J. Amer. Chem. Soc., 1943, 65, 2023—2025). —The val. of K for camphor has been determined using different concns. of $C_{10}H_8$, p- C_6H_4 PhBr, CH_2 Ph· CO_2H , and NPhEtAc. At >0.2M. K has a const. val. of 39.7° per kg., but at <0.2M. K increases with decreasing concn. to a max. of 50°. W. R. A.

Vapour pressure of metals. I. Vapour pressure of magnesium over aluminium-magnesium alloys. II. Vapour pressure of zinc over aluminium-zinc alloys. A. Schneider and E. K. Stoll (Z. Elektrochem., 1941, 47, 519-526, 527-535).—I. The v.p. of Mg over a series of Al-Mg alloys was determined at 600-850° by the transpiration method using electrolytic H₂ as carrier gas. The results were combined with those of Eucken (A., 1936, 418) to extend the range down to 544°. Heats of vaporisation (λ) were calc. from the Clausius-Clapeyron equation. The partial molar heats of mixing at 719° were obtained from the vals. of $\lambda_{\rm alloy} - \lambda_{\rm Mg}$. Also calc. were the Mg-activities in the alloys and the corresponding vals. of $-\Delta G$. The departure from ideal is less at higher temp. II. The v.p. of Zn over a series of Al-Zn alloys was determined by Hargreaves' method (A., 1939, I, 314), which depends on making the v.p. of Zn over the alloy equal to the v.p. of pure Zn at a lower

II. The v.p. of Zn over a series of Al-Zn alloys was determined by Hargreaves' method (A., 1939, I, 314), which depends on making the v.p. of Zn over the alloy equal to the v.p. of pure Zn at a lower temp. While the melt remains homogeneous, the graph log p-1/Tis a straight line. Below the liquidus line, a Zn-enriched liquid and a solid solution are obtained, causing an increase in the v.p. of Zn. Below the solidus line, log p again lies on the straight line. The partial molar heat of mixing is very small and the heat of vaporisation is almost independent of the composition of the alloy. Zn-activities and $-\Delta G$ vals. were calc. for two temp. The results indicate that the system Al-Zn behaves as a mixture. I. F. H.

Constitution of silver-magnesium alloys in the region 0-40 at.-% magnesium. K. W. Andrews and W. Hume-Rothery (J. Inst. Metals, 1943, 69, 485-493).—Thermal analysis and X-ray examination show that the solubility of Mg in Ag rises from 26.5 at.-% at 300° to 29.3 at.-% at the eutectic temp. (759.3°) while the β' phase is homogeneous at ~40 at.-% Mg at 300° and 35.5 at.-% Mg at 759.3°. The eutectic composition is 33.4 at.-% Mg. Prolonged annealing of alloys with ~25 at.-% Mg appears to produce a superlattice structure. A. R. P.

Constitution of magnesium-manganese-zinc-aluminium alloys in the range 0-5% Mg, 0-2% Mn, and 0-8% Zn. IV. Equilibrium diagram below 400°. A. T. Little, G. V. Raynor, and W. Hume-Rothery (J. Inst. Metals, 1943, 69, 467-484).—The Mg-Zn-Al system from the Al-Zn line up to the Al₂Mg₂Zn₃ (T) point has been examined by thermal, X-ray and micrographic methods at temp. below 400°. The a/(a + T) boundary is of the form [Mg][Zn] = K where K varies with the temp. according to the expression d log $K/d\theta = Q/R\theta^2$ (θ is abs. temp.). In alloys with $>\sim 50\%$ Zn and low Mg ($\alpha + MgZn_s$) and MgZn_s fields exist but MgZn_s is never formed under ordinary annealing conditions in alloys richer in Al. The decomp. of the binary α -Al-Zn solid solution into two face-centred cubic structures of different compositions introduces complications into the ternary system, some of which are described with reference to diagrams. Introduction of Mn into the ternary alloys results in the formation of MnAl_s which is practically insol. in Mg-Zn-Al alloys below 400°; the equilibria in the quaternary system can therefore be calc. from those in the ternary by deducting the Al combined with Mn and treating the remainder of the alloy as a ternary Mg-Zn-Al alloy. A. R. P.

The iron-nickel phase diagram by magnetic analysis and the effects of cold-work. K. Hoselitz (Iron and Steel Inst., Nov., 1943, Advance copy, 13 pp.).—The rate of approach of quenched alloys in the Fe-Ni system towards equilibrium at low temp. appears to be hastened by cold-work. In alloy's containing 29-35% of Ni, this treatment causes the original single-phase alloy to separate into two phases which are readily detected by measuring the force exerted on a small specimen in a strong inhomogeneous magnetic field. Inconclusive results, however, were obtained when cold-worked samples were annealed at ~500°. J. C. C.

Ionisation constant of carbonic acid and solubility of carbon dioxide in water and aqueous salt solutions from 0° to 50°.—See A., 1944, I, 37.

Solubility of deuterium in solid nickel. A. Sieverts and W. Danz (Z. anorg. Chem., 1941, 247, 131-134).—The solubility of D_2 in solid Ni at 200-1120° has been determined. It is somewhat < that of H_2 . F. J. G.

Solutions of oxygen in metallic titanium. P. Ehrlich (Z. anorg. Chem., 1941, 247, 53-64).—Ti forms solid solutions with O up to the composition $TiO_{0.42}$. With increasing O content, a increases to 2.96 A. at $TiO_{0.2}$ and then remains const., whereas c increases continuously to 1.623 A., so that c/a approaches the ideal val. for hexagonal close-packing. At the same time ρ increases to 4.92 at $TiO_{0.4}$. The O atoms occupy the octahedral spaces in the Ti lattice. There is a max. of v.p. at $TiO_{0.2}$. F. J. G.

Solubilities of normal aliphatic amides, anilides, and NN-diphenyl-Solubilities of normal alphatic amides, and NN-diphengi-amides. A. W. Ralston, C. W. Hoerr, and W. O. Pool (J. Org. Chem., 1943, 8, 473–488).—The solubilities of octo-, deco-, laur-, myrist-, palmit-, and stear-amide, and of the anilides and NN-diphenylamides of decoic, lauric, palmitic, and stearic acid have been determined in C₈H₈, cyclohexane (I), CCl₄, EtOAc, BuOAc, COMe₂, COMeEt, MeOH, 95% EtOH, Pr^BOH, Bu^aOH, EtNO₂, and MeCN. Unstable modifications of deco- and laur-anilide have been observed. The absence of a homologous influence in the amide series is striking since there appears to be no orderly arrangement of the solubility since there appears to be obtain y arrangement of bottomy arrangements of these compounds in the less polar solvents. In the three highly polar solvents, EtNO₂, MeOH, and MeCN, the solubilities decrease with increasing mol. wt. although the intervals between the curves are not regular. All the N-substituted derivatives appear in orderly sequence in all solvents. The solubility curves for the NAT device the relative devic NN-diphenylamides in $C_{e}H_{e}$ are characteristic of compounds which are associated in solution, in that the concn. is practically a linear function of the temp. The amides and anilides exhibit the marked deviation from linearity which is typical of the solubility curves of long-chained compounds which are associated in solution. Only in C_6H_6 are the solubilities of all the NN-diphenylamides linear with temp.; in all other solvents the curves of the higher members deviate from linearity and in the most polar solvents even the lower members of the series give irregular solubility curves. The general correlation appears between the solubilities of the amides and the polarities of the solvents. Generally, the solubilities of a given compound at a given temp. are relatively the same in non-polar solvents as in the most polar solvents investigated whilst the solubilities are relatively much greater in the solvents of intermediate polarity, being greatest in the alcohols. Even in solvents of the same polarity, e.g. $C_{g}H_{g}$ and (I), there is at 70° for instance as much as 25-to 50-fold difference in the solubilities of a given amide. In general, the substituted amides behave similarly to the amides with respect to the polarities of the solvents except that the solubilities of the VM discussion of the solvents except that the solubilities of the NN-diphenylamides decrease markedly with increased polarity of the solvent. None of the structures yet proposed for the amides and their derivatives can adequately explain the anomalous behaviour of these compounds. All the proposed theories imply a semblance of homology. The assumption of polymeride formation does not in itself explain the anomalous solubilities of octo- and myristamide. The fact that the Ph substituent of the anilides precludes the formation of polymerides larger than dimerides by H-bonding does not explain why the slopes of the anilide solubility curves are less steep and break more sharply in dil. solutions than do those of the corresponding amides. There is no present explanation of the deviation from linearity of the solubility curves of the NN-diphenyl-amides if it is assumed that NN-disubstitution prevents association H. W. by H-bonding.

Solubility of salts and salt mixtures in water at temperatures above 100°. III. A. Benrath (Z. anorg. Chem., 1941, 247, 147 above 100. III. A. Benrath (2. anorg. Chem., 1941, 247, 147– 160).—Solubility data at high temp. are recorded for MnCl₂, SrCl₂, SrBr₂, BaBr₂, CdCl₂, and CdBr₂. Transition points are indicated as follows: MnCl₂,2H₂O \rightleftharpoons MnCl₂,H₂O, 198°; MnCl₂,H₂O \rightleftharpoons MnCl₂, 362°; SrCl₂,2H₂O \rightleftharpoons SrCl₂,H₂O, 230°; SrCl₂,H₂O \rightleftharpoons SrCl₂, 320°; SrBr₂,6H₂O \rightleftharpoons SrBr₂,H₂O, 88.62°; SrBr₂,H₂O \rightleftharpoons SrBr₂,345°; BaBr₂,H₂O \rightleftharpoons BaBr₂, 350°; CdCl₂,H₂O \rightleftharpoons CdCl₂, 174°; CdBr₃,4H₂O \rightleftharpoons CdBr₂, 36°. Fused MnCl₂, SrCl₂, SrBr₂, and BaBr₂ are completely miscible with H₂O. miscible with H₂O. F. I. G.

Solubility of gold and silver in thiocarbamide. I. N. Plaksin and M. A. Koshuchova (Compt. rend. Acad. Sci. U.R.S.S., 1941, 31, 671-674).-The influence of acids, alkalis, and oxidising agents on the rate of dissolution of Au and Ag in aq. CS(NH2)2 has been investigated. Deposition of S on the metal is retarded by the addition of FeCl₃, which also accelerates the dissolution of the metal. Ag is W. R. A. dissolved more quickly than Au.

Diffusion of gases into solids : iron oxide and iron oxide-alumina. G. Graue and H. W. Koch (*Ber.*, 1940, 73, [*B*], 984—995).—The no. and/or openness of the capillaries in Fe₂O₃ is measured by incorporating during its prep. a trace of ThO₂, carrying off the emitted emanation in a stream of very pure N₂, and measuring the a-activity in an electroscope (cf. Hahn, A., 1929, 737). Fe(OH)₃ is prepared by pptn. from the nitrate by NH₃ at 20°, washed, and dried by EtOH-Et₂O; 10% of Al(OH)₃ may be incorporated; the pro-ducts are radiographically amorphous. Subsequent heating de-creases the rate of evolution of emanation from Fe₂O₃-Al₂O₃ (10% of Al₂O₃ in this and other cases); from ~500° to ~600° the decrease is very rapid; from ~600° to ~850° it is approx.const.; thereafter a rapid rise occurs. The decrease is due to orientation of the mols. occurring with consequent sealing off of the capillaries. With Fe₂O₃ Diffusion of gases into solids : iron oxide and iron oxide-alumina. occurring with consequent sealing off of the capillaries. With Fe_2O_3 the changes occur ~100° earlier (cf. Gotte, A., 1938, I, 412), showing that Al_2O_3 stabilises the condition of disorientation. When d of powders is determined by immersion in a liquid, e.g., xylene, the capillaries remain filled with air; if a powder is introduced into a pyknometer filled with air containing emanation, the capillaries are filled with radioactive air and measurement of the activity of the air in the pyknometer gives the displacement and thus another val. for in the pyknometer gives the displacement and thus another val. for d. Differences between the two vals. of d indicate the vol. of the capillaries. d of Fe(OH)₃ at 20° is 2.3; heating at 250—1000° gradually increases d to 5·1, the xylene method giving regularly a lower val. Long heating at 450° gives an oxide which has $d \sim 5\cdot1$ at 150—510°. Similar measurements for Fe₃O₃-Al₂O₃ show rather longer persistence of the fine pores. When Fe₂O₃ or Fe₂O₃-Al₂O₃ containing emanation, heated to const. d at 450°, is heated, the rate of evolution of emanation remains const. to ~620° and ~820°, respectively, thereafter rising very rapidly; this rise is due to movement of mols. temporarily uniting holes in the solid; the Al₂O₃ has the same effect as in other measurements. Hahn's capsule method the same effect as in other measurements. Hahn's capsule method (A., 1935, 32) shows a similar effect. Diffusion of gas into Fe_2O_3 , determined by emanation, rises rapidly from ~620°; this change occurs at higher temp. for Fe_2O_3 -Al₂O₃. Adsorption on Fe_2O_3 falls rapidly from 20° to ~150°, becoming thereafter nearly const. Fe_2O_3 and Fe_3O_3 -Al₂O₃ give identical X-ray spectra, indicating that the Al₂O₃ " dissolves " in the Fe_2O_3 lattice. R. S. C.

Electrification and luminescence phenomena accompanying de-sorption of gases from metals. J. W. McBain and C. I. Glassbrook (J. Amer. Chem. Soc., 1943, 65, 1908–1909).—When H_2 , O_2 , air, natural gas, or H_2O , MeOH, or CCl, vapours are passed over cooling Pt or Ni, previously heated to 1000—1500° in a vac., the escaping gases become electrified and can cause luminescence on the walls of a SiO₂ tube. The effect is ascribed to electrified ultramicroscopic particles ejected from the metal by sorption and desorption, the luminescence being due to the gaseons ionisation they produce. luminescence being due to the gaseous ionisation they produce. W. R. A.

Sorption and surface area in silica aerogel. S. S. Kistler, E. A. Fischer and I. R. Freeman (J. Amer. Chem. Soc., 1943, 65, 1909–1919).—Sorption of vapours of H_2O , CCl_4 , $SiCl_4$, and C_6H_6 on SiO_2 aero- and xero-gels has been determined at various temp. The area under the surface determined at various temp. area under the wt. adsorbed-log (p_0/p) curve $(p = \text{partial v.p.}, p_0 = \text{saturation v.p.})$ is a measure of the total surface area of the gel. Capillary condensation, for non-aq. liquids on SiO₂ gel, may account for nearly all the measured adsorption. Removal of H₂O from the gel does not alter the form of the adsorption curve. W. R. A.

Absorption of nitrous gases by silica [and alumina] gel and by calcium and beryllium hydroxides. E. Briner and E. Löwy (*Helv. Chim. Acta*, 1943, 26, 1054—1064).—Al(OH)₃ gel is rather less effective than SiO₃ gel for the reversible absorption of dil. nitrous gases. Be(OH)₂ has a slight but definite effectiveness, Ca(OH)₂ none. F. J. G.

Influence of sorption on electrical conductivity of pulverised sorbents.---See A., 1944, I, 39.

Gibbs' formula and so-called negative adsorption. J. Palacios and R. Salcedo (Anal. fis. quim., 1943, 39, 215-218).—An approx. expression $\gamma - \gamma_0 = ATc$ is deduced for dil. solutions (γ and γ_0 are

the surface tensions of the solution and solvent, A is a const., and c F. R. G. the concn.).

Surface tension of Wisconsin Lake waters. Y. Hardman (Trans. Wisconsin Acad. Sci., 1941, 33, 395-404).-When a film of organisms is present a depression of the surface tension of the H₂O is L. G. G. W. found.

Potential, impedance, and rectification in membranes. D. E. Goldman (J. Gen. Physiol., 1943, 27, 37-60).—Membranes of collodion, collodion-lecithin, collodion-kephalin, onion cuticle, and proteins behave as parallel resistance-capacity combinations when separating solutions of electrolytes. The capacities of the above membranes vary slightly with the concn. and nature of the solutions and have phase angles $88-89^\circ$, $79-82^\circ$, $84-86^\circ$, $83-85^\circ$, $65-75^\circ$, respectively. The conductances Λ are approx. α those of the solutions but are much smaller and, like the dielectric consts., are > those of the membrane material in bulk. In general Λ varies with current but the capacity is independent of current. Approx. vals. for the membrane potentials V indicate a linear proportionality with the log of the ratio of the concns. of electrolyte on both sides of the membrane. The amount of rectification produced by the membranes increases with V rather than with the concn. ratio of Λ . By considering the presence of fixed as well as mobile ions, the Planck derivation of liquid junction potential is extended to membranes, and expressions are obtained for V and for the variation of A with current. The calc. vals. show qual. agreement with experiment. J. H. B.

Study of "disjoining action" under conditions of sorption of water vapour. M. V. Tschapek (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **31**, 588-590).—The "disjoining action" is the process by which mutual contact of dispersed particles is prevented by the dispersion medium. The output of avlinders prevented by the dispersion medium. The swelling of cylinders prepared from dispersed quartz sand and kaolin, when exposed to H_2O vapour, was determined. Even in the vapour phase, the dispersed particles come in contact through the sorbed vapour. The disjoining action takes place at v.p. at which capillary condensation is improbable. A. J. M.

Unrolling of fibre molecules in flowing solutions. W. Kuhn and H. Kuhn (*Helv. Chim. Acta*, 1943, 26, 1394-1465).—In flowing liquids fibre-type mols. of high polymerides tend to unroll and become elongated in the direction of flow. The effects of this behaviour on the physical properties of the solution are discussed mathematically and relationships are developed expressing the streaming double refraction and viscosities of such solutions in terms of the degree of polymerisation. 1. W. S.

Charge and stability of colloids. II. Effect of non-electrolytes. H. P. Yadava (J. Indian Chem. Soc., 1943, 20, 110–114).—Addition of MeOH lowers slightly the adsorption of Ba" and SO₄" ions on As_2S_3 and $Fe(OH)_3$ sols, respectively. EtOH in low conc. causes an increased adsorption but this effect decreases at higher [EtOH]. Agar-agar and gelatin in low concns. cause a slight increase in adsorption but higher concns. cause a slight decrease. MeOH causes sensitisation towards pptn., whereas the other materials have a stabilising effect. This is explained as due to complex formation between the MeOH and the sol. J. W. S.

Opacity changes in gel-forming mixtures during setting. II. Thorium phosphate, cerium phosphate, thorium arsenate, and stannic phosphate gels. T. V. Desai and S. Guruswamy (*Proc. Indian Acad. Sci.*, 1943, 18, A, 31-39; cf. Prasad and Gogate, A., 1943, I, 256).—Th and Ce phosphate gels give an exponential by HCl and decreased by non-electrolytes. Final opacity vals. depend on the concn. of the constituents of the gel-forming mixture. L. J.

Structure development in rubber sols under the action of active Billers. P. Rebinder, G. A. Ab, and S. J. Veiler (*Compl. rend. Acad. Sci. U.R.S.S.*, 1941, **31**, 444—447).—In presence of active SiO₂, sols of Na-butadiene rubber (10—11% in PhMe) develop a continuous structure. Even with $[SiO_2] = 0.76\%$ there is an appreciable increase in yield val. and anomalous η . Inactive fillers (ground CaCO₃, marshallite, orthoclase) have no structure-forming properties. It is possible that besides transferring the rubber into the film-like state of solvate films, active filler particles act as centres for continuous structure formation by orienting polymer chains under the action of the adsorption field of the particles. Presence of H₂O in the SiO₂ inhibits structure formation. Structure formation also occurs in sols prepared in light petroleum and CHCl₃. C. R. H.

Fine structure of cellulose fibres. H. Staudinger (Z. Elektrochem., Fine structure of celulose fibres. In Status, 1, 300). 1941, 47, 637-638).—A reply to Meyer (A., 1943, I, 300). F. J. G.

Osmotic pressure and viscosity measurements with cellulose acetate fractions. A. Bartovics and H. Mark (J. Amer. Chem. Soc., 1943, 65, 1901—1905).— $\eta_{sp.}$ (<0.5 vol.-%) and π (<0.8 wt.-%) of cellul-ose acetate fractions in COMe₂ and COMe₂-MeOH have been determined. The equations of Flory (A., 1942, I, 364) and Huggins (A., 1939, I, 318; 1943, I, 58) were applicable to all fractions, with k' = 0.70 and $\mu = 0.43$ in COMe₂, and 0.60 and 0.46 in COMe₂-MeOH.

In the equation $[\eta] = KM^a$ $(M = \text{mol. wt., } [\eta] = \eta_{sp.}$ at zero conc., K and a const.), $K = 1.04 \times 10^{-2}$, a = 0.67. W. R. A.

VI.—KINETIC THEORY. THERMODYNAMICS.

Calculation of chemical equilibria and its recent progress. C. G. Boissonnas (*Helv. Chim. Acta*, 1943, 26, 1383—1393).—The calculation of the equilibrium const. of a reaction at any temp. and of the entropy of a perfect gas is discussed. J. W. S.

Statistical mechanics of dimerisation in perfect solutions, G. S. Rushbrook (*Proc. Camb. Phil. Soc.*, 1943, 39, 202-204).—The Gibbs free energy is calc. statistically for a liquid or solid binary solution in which dimerisation may occur in the solute. H. J. W.

Silver this sulphate complexes in aqueous solution. O. Schmitz-Dumont and E. Schmitz (Z. anorg. Chem., 1941, 247, 35–52). Measurements on concn. cells indicate that solutions of $Ag_2S_2O_3$ in 2_M -Na₂S₂O₃ contain the complex ion $[Ag(S_2O_3)_3]^{5-}$. F. J. G.

Ionisation of strong electrolytes. I. General. Nitric acid. O. Redlich and J. Bigeleisen (J. Amer. Chem. Soc., 1943, 65, 1883—1887).—The intensities of Raman lines of HNO_3 solutions have been determined. Comparison of the data with those for $NaNO_3$ solutions establishes the complete ionisation of HNO_3 ; thermodynamic ionisation const. 21. A characteristic Raman spectrum is considered a sufficient criterion of the existence of undissociated mols. in solution. W. R. A.

Dissociation constants of monobasic acids. II. Extrapolation method. III. Strengths of some cyano-acids. D. J. G. Ives and K. Sames (J.C.S., 1943, 511-513, 513-515).—II. Ives' extrapolation method (A., 1933, 780) applies accurately to conductivity measurements free from systematic errors, and is of val. in the determination of all consts. The use of BzOH as standard electrolyte is recommended.

III. Vals. of $K \times 10^5$ for cyanoacetic, β -cyanopropionic, γ -cyanon-butyric, cyclohexyl- and dimethyl-cyanoacetic, and trans-1cyanocyclohexane-2-carboxylic acids, measured by a conductivity method with the authors' extrapolation equation, are 342, 10-2, 3-66, 430, 380, and 13-65, respectively. The effect of \cdot CN as substituent is \gg that of the halogens, which is shown to be mainly electrostatic. The enhanced effect with \cdot CN is due to its polarisability. K may be related with the dipole moment of the substituent, provided that the effect is purely inductive, and that free rotation of bonds does not interfere. L. J. J.

Ionisation constant of carbonic acid in water and the solubility of carbon dioxide in water and aqueous salt solutions from 0° to 50°. H. S. Harned and R. Davis, jun. (J. Amer. Chem. Soc., 1943, 65, 2030—2037).—The solubility of CO_2 in H_2O and aq. NaCl at $0-50^\circ$ has been determined by analysing the solutions used in cells of the type Pt-H₂, $CO_2|NaHCO_3(m_1)$, NaCl (m_2) , $CO_2(m_3)|AgCl-Ag$. Logarithms of the Henry's law consts., computed from these determinations, are expressed by quadratic equations. K of H_2CO_3 at 5° intervals from 0° to 50° has been calc. from the e.m.f. data, and $\log K$ expressed as a function of T. Vals. of ΔG° , ΔH° , ΔC_p° , and ΔS° have been calc. W. R. A.

Activity coefficients of lead chloride determined from e.m.f. and solubility data at 25° in ethylene glycol-water solutions. A. B. Garrett, R. Bryant, and G. F. Kiefer (*J. Amer. Chem. Soc.*, 1943, 65, 1905–1907).—The solubility of PbCl₂ has been determined in $(CH_2 \cdot OH)_2 - H_2O$ solutions (0, 20, 40, 60, and 80 wt.-% H_2O) containing KCl. The e.m.f. of the cell Pb(Hg)|PbCl₂, AgCl|Ag in these solutions has been determined. Activity coeffs. of PbCl₂ solutions have been calc. W. R. A.

Niobium and hydrogen, niobium and deuterium. A. Sieverts and H. Moritz (Z. anorg. Chem., 1941, 247, 124-130).—Isotherms and isobars for the systems Ni-H and Ni-D are recorded. They agree within the experimental error. F. J. G.

X-Ray studies on the system cadmium bromide-cadmium iodide.— See A., 1943, I, 300.

X-Ray investigation of the systems $CaO-Bi_2O_3$, $SeO-Bi_2O_3$, and $BaO-Bi_2O_3-O$. (Mixed oxides with a defect oxygen lattice.) B. Aurivillius (Arkiv Kemi, Min., Geol., 1943, 16, A, No. 17, 13 pp.). When the Ca (Sr, Ba) fraction (= Ca/Ca + Bi) is gradually increased, the first phase to appear, after α -Bi₂O₃, is rhombohedral. The cell dimensions and metal parameters for each system are given. In the CaO-Bi₂O₃ system, this rhombohedral phase is followed by a phase of const. composition. In SrO-Bi₂O₃ several other phases appear. In BaO-Bi₂O₃, when the Ba fraction is increased, one, or possibly two, tetragonal phases of variable composition are formed.

A. J. M. Active substances. XLVIII. Effect of the physical state of the solid reactants on the equilibrium Fe/Fe_3O_4 with H_2O/H_2 . R. Fricke, K. Walter, and W. Lohrer (Z. Elektrochem., 1941, 47, 487– 500).—The equilibrium $3Fe + 4H_2O \rightleftharpoons Fe_3O_4 + 4H_2$ was studied between 360° and 550° by keeping a const. steam pressure and measuring the partial pressure of H_2 . Two forms of Fe were used : "active" Fe prepared by reduction of hydrated Fe₂O₃ at a temp. just > temp. of measurement, and "inactive" Fe prepared by reduction at 665°. The equilibrium was approached from both sides, but in several cases the two results obtained were not concordant. The heat of reaction (W_p) using active Fe is > that using inactive Fe. X-Ray investigation showed that active Fe had a smaller particle size than inactive Fe. The results were not sufficient to account for the large differences in W_p , but this may be due to the fact that X-ray vals. are always average vals., whereas only the more active particles participate in equilibria. The solubility of H_2 in Fe affects W_p by only a few tenths kg-cal. J. F. H.

Fusion diagram for the system LiF-KF-NaF. A. G. Bergman and E. P. Dergunov (Compt. rend. Acad. Sci. U.R.S.S., 1941, 31, 753— 754).—The equilibrium diagram is given. In the binary system KF-NaF, the eutectic is at 710° and 40 mol.-% NaF. In the system LiF-NaF, the eutectic temp. is 652° (39 mol.-% NaF), and in the system LiF-KF it is 492° (50 mol.-% KF). For the ternary system the eutectic temp. is 454° (11.5 mol.-% NaF, 42 mol.-% KF). The very considerable lowering of m.p. of the individual constituents is noticeable. A. J. M.

Fusion diagram of the system LiF-NaF-MgF₂. A. G. Bergman and E. P. Dergunov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **31**, 755—756).—LiF and MgF₂ form a continuous series of solid solutions with a min. at 742° (33 mol.-% MgF₂). In the binary system NaF-MgF₂, a compound NaF,MgF₂, m.p. 1030°, is formed. It forms a eutectic with NaF (75 mol.-% NaF) at 830°, and with MgF₂ (64 mol.-% MgF₂) at 1000°. There are two ternary eutectic points. In the system LiF-NaF-NaF,MgF₂, the eutectic separates at 630° (10 mol.-% MgF₂, 43 mol.-% NaF, 47 mol.-% LiF). In the system LiF-MgF₂-NaF,MgF₂ the eutectic separates at 684° (29 mol.-% MgF₂, 12 mol.-% NaF, 59 mol.-% LiF). A. J. M.

Merwinite $(3CaO,MgO,2SiO_2)$ and its stability relations within the system $CaO-MgO-SiO_2$ (preliminary report). E. F. Osborn (J. Amer. Ceram. Soc., 1943, 26, 321-332).—Investigations on compositions between $2CaO,SiO_2$ and $2CaO,MgO,2SiO_2$ (I), between $3CaO,MgO,2SiO_2$ (II) and (I), and between (II) and CaO,MgO,SiO_1 indicate that a field of (II) appears on the liquidus surface of $CaO-MgO-SiO_2$ and that (II) melts incongruently at 1575° to $2CaO,SiO_2$, MgO, and liquid. Extensive new and correcting data are recorded for various invariant points and joins. J. A. S.

Thermochemistry of alloys. VIII. Heats of fusion of alloys and entropy change on fusion in relation to the degree of orientation. Heats of mixing of several liquid alloys. O. Kubaschewski (Z. Elektrochem., 1941, 47, 475—484).—From measurements of the heat content between room temp. and temp. > m.p. the heats of fusion (L) of the alloys CdSb, Tl₃Pb₃, Tl₇Pb, Bi₃Tl₂, Bi₂Tl, Cu₂Cd₃, Cu₅Cd₈, and Mg₂Pb were determined. The value of L for Hg₅Tl₂ and Mg₅Sn were obtained by different methods. From the results the entropy changes at fusion (ΔS_{exp}) were determined and compared with the calc. vals. (ΔS_{add}) obtained by compounding additively the ΔS vals. of the pure components. The value ΔS_{exp} . $-\Delta S_{add}$ gives an indication of the degree of orientation of the alloy, being 0 for an unoriented alloy and > 0 for an oriented alloy. It is shown that CdSb, Mg₂Pb, and Mg₂Sn are completely oriented, the last two having a fluorspar type lattice. Cu₂Cd₃, Cu₅Cd₈, and Tl₇Pb are partly oriented; the other alloys are unoriented. The treatment was also applied to some measurements by Roos (A., 1916, ii, 293). The heats of mixing of the following alloys were determined: CdSb 900 g.-cal. per g.-cal. per g.-atom at 400°, Bi₂Tl 850 g.-cal. per g.-atom at 600°. Bi₃Tl₂ 1110 g.-cal. per J. F. H.

J. F. H. • Thermochemistry of alloys. IX. Heats of formation of some alloys and the connexion between heat evolution and contraction on alloy formation. O. Kabaschewski (Z. Elektrochem., 1941, 47, 623— 630).—Heats of formation are recorded as follows: LiTl, 6·4; NaTl, 4·5; Na₂Te, 20; NaTe, 15^c; NaTe₃, 7·5; ZnTe 14·7 kg.-cal. per g.-atom. In general, in any given structure type there is a parallelism between heat of formation and contraction, which is modified when the co-ordination no. of one of the constituents is different in the free state. F. J. G.

Transition temperatures and heats of transition of the alkali hydrosulphides and hydroselenides. W. Teichert (Z. anorg. Chem., 1941, 247, 113—123).—The heat contents of NaSH, KSH, RbSH, NaSeH, KSeH, and RbSeH from room temp. to temp. $\sim 30^{\circ}$ > the transition temp. are recorded. The transition temp. are: NaSH, 85°; KSH, 180°; RbSH, 130°; NaSeH, 86°; KSeH, 175°; RbSeH, 147°; and the heats of transition: NaSH, 0.7; KSH, 0.55; RbSH, 0.4; NaSeH, 0.7; KSeH, 0.45; RbSeH, 0.25 kg.-cal. per g.-mol. F. J. G.

Heat of dissolution of ethane and propane. R. A. Budenholzer, B. H. Sage, and W. N. Lacey (*Ind. Eng. Chem.*, 1943, 35, 1214— 1220).—The enthalpy changes involved in the dissolution of C_2H_g and *n*- C_3H_g in a non-volatile, paraffin-base, H₂O-white oil have been determined with an accuracy of 1.5%. Measurements of the influence of temp. on sp. vol. and pressure at bubble point of mixtures of C_3H_8 and oil have also been made. Smoothed vals. of enthalpy change at even compositions at 37.8° and 71.1° and additionally at 104.4° for C_3H_8 are tabulated. Comparison is made between vals. obtained by calorimetric determinations and those calc. from the vol. behaviour of the system. C. R. H.

Volume of mixing and thermodynamic functions of benzene-carbon tetrachloride mixtures. S. E. Wood and J. P. Brusie (J. Amer. Chem. Soc., 1943, 65, 1891–1895).—The increase in vol. on mixing CCl₄ and C₆H₆ has been measured at 15—75° and at const. pressure. Vals. of ΔG , ΔH , and ΔS of mixing have been calc., and vals. of ΔA and ΔE derived from the data for 25°, 40°, and 70°. Vol. of mixing increases ~9-fold; excess S of mixing at const. vol. decreases by ~50% from 25° to 70°. W. R. A.

Free energy of methyl ether from the methanol-methyl ether equilibrium 2MeOH (v.) = Me_0 + H_2O (v.). P. H. Given (J.C.S., 1943, 589).—Recalculation of $\Delta G^{\circ}_{298:1}$ from recent published thermodynamic data gives -28,500 g.-cal. L. J. J.

VII.—ELECTROCHEMISTRY.

Antimony-cæsium films. P. G. Borziak (Compt. rend. Acad. Sci. U.R.S.S., 1941, 31, 546-549).—Investigation of the sign of the thermo-e.m.f. of Sb-Cs films in different stages of formation indicates that they have predominantly a hole conductivity, which, however, becomes electronic on introduction of excess of Cs into the film. If excess of Cs is added to a formed film, its dark conductivity decreases, but rises again on removal of the excess of Cs. The photo-conductivity of the films is discussed. A. J. M.

Superconductivity of tin-zine eutectics. E. L. Andronikaschvili (Compt. rend. Acad. Sci. U.R.S.S., 1941, **31**, 541-542).—Molten Sn-Zn alloys were solidified at liquid air temp. and were then annealed at a temp. near the eutectic. Up to 1.5° K., the magnetic moment of the alloy is practically independent of [Sn], and is equal to the magnetic moment of Sn of equal vol. The threshold temp. at which superconductivity sets in is the crit. temp. of Sn (3.69° K.). Curves of magnetic moment against magnetic field show the "tails" characteristic of the disperse state. When the superconductivity of the alloys is destroyed, there is an appreciable time lag, in contrast with the effect in pure Sn. The results may be 'explained by supposing that the Sn screens the Zn grains. This effect may possibly be eliminated by suitable heat-treatment. A. J. M.

Conductometric study of the acids H_3RO_3. R. Duckert, P. Kohler, and P. Wenger (*Helv. Chim. Acta*, 1943, 26, 1166–1172).—*A* for mixtures of Al(OH)₃ gel with lactic or pyruvic acid decreases markedly with time, especially with lower concns. of org. acid. This behaviour is attributed to the formation of complex acids.

F. J. G. Influence of sorption on electrical conductivity of pulverised sorbents. N. A. Figurovski and M. M. Feinberg (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 344—346).—The electrical conductivity of pulverised charcoals deposited from suspensions on to pumice, ebonite, porcelain, and other dielectrics was determined after the deposits had adsorbed C_8H_6 , PhMe, aliphatic alcohols, Et_2O , CCl_4 , and other substances from their mixture with air. There is a decrease of resistance with time of sorption up to a limit, which, in the case of the alcohols, is the greater the higher is the mol. wt. of the alcohol. The nature of the sorbed substance influences the rate and final val. of the resistance decrease. The speed with which equilibrium is reached shows that the reversible sorption takes place mainly on the surface and in the macropores of the charcoal. A. J. M.

Cu/Cu^{**} potential in concentrated copper sulphate solutions at different temperatures. I. F. Müller and H. Reuther (Z. Elektrochem., 1941, 47, 640—644).—E.m.f. data for the cells Cu amalgam CuSO₄(c), Hg₂SO₄ (saturated)|Hg are recorded for conc. CuSO₄ solutions (up to saturation) at 11.5—50°. The normal potential Cu(Hg)|Cu^{**} is $E_{23}^{\circ} = 0.3454$ v. F. J. G.

Variations of the potentials of the ozone and oxygen electrodes under the influence of ultra-violet radiation. E. Briner and A. Yalda (*Helv. Chim. Acta*, 1943, **26**, 1368—1370).—Exposure to ultra-violet radiation decreases the potential of an ozonised-O₂ (2% O₃) on Pt electrode in both 38% and $0\cdot 1n\cdot H_2SO_4$; the effects with polished and platinised electrodes are approx. equal. The potential of an O₂-Pt electrode, however, is increased, the effect with polished being > with platinised Pt, but the potential is still < the theoretical val. for a reversible O₂ electrode. These results are in accord with the observations that O₃ is decomposed, and O₂ slightly ozonised, in ultra-violet light and that O₃ is decomposed on platinised Pt. I. W. S.

J. W. S. Cause of the asymmetric potential of glass electrodes. W. Brauer (Z. Elektrochem., 1941, 47, 638-639).—The dependence of the asymmetric potential of glass electrodes on the history of the two surfaces indicates that differences in their alkali content, and not mechanical strains, are the cause of this potential. F. J. G.

Influence of non-electrolytes on the decomposition potential of aqueous silver nitrate. D. N. Solanki (*J. Indian Chem. Soc.*, 1943, 20, 105-109).—The decomp. potential of $0\cdot 1N-AgNO_3$ at 30° is unaltered by the presence of 0-50 vol.-% of EtOH, glycerol, or C_5H_5N , although the sp. resistance of the solution increases with increasing concn. of non-electrolyte. The decomp. potential, however, is raised from 0.75 to 0.85 v. in the presence of 5 vol.-% of COMe₂, but is unaltered at higher concn. This is attributed to the formation of a stable complex of $AgNO_3$ with COMe₂. J. W. S.

Oxidation potentials of methoxyacetophenones. R. H. Baker and J. G. Schafer (*J. Amer. Chem. Soc.*, 1943, **65**, 1675-1676).—By equilibration with fluorenol in NMe₄·OH-Pr^βOH, COPhMe and its o-, m-, and p-OMe-derivatives are shown to have E_0 151, 160, 158, and 129 mv., and $-\Delta F$ 70, 7.4, 7.3, and 6.0 kg.-cal., respectively. The low val. for the p-compound is due to its being a vinologue of an ester; absence of this effect for the o-compound is ascribed to intra-mol. H-bonding of the reduced form. R. S. C.

Revision of the oxidation potentials of the o-phenanthroline and dipyridyl ferrous complex. D. N. Hume and I. M. Kolthoff (J. Amer. Chem. Soc., 1943, 65, 1895—1897).—The oxidation potential of Fe^{III}-o-phenanthroline and -2:2'-dipyridyl in 1M-H₂SO₄ or -HCl is 1.06 v., instead of the reported val. (1.14 v.). W. R. A.

Oxidation potential of the chromocyanide-chromicyanide couple and polarography of the chromium cyanide complexes. D. N. Hume and I. M. Kolthoff (*J. Amer. Chem. Soc.*, 1943, 65, 1897-1901).— The reaction $Cr(CN)_{e'''} \rightleftharpoons Cr(CN)_{e'''} + e$ has been studied polarographically and potentiometrically. It is reversible at the dropping Hg electrode in IM-KCN, with an oxidation potential of -1.14 v. The standard potential is estimated to be -1.28 v. W. R. A.

Electrical activity of acetylcholine, choline, adrenaline, and benzedrine. R. Bentner and T. C. Barnes (*Biodynamica*, 1942, 4, 47– 55).—Acetylcholine (I) (1 part in 3×10^8) in 0.7% NaCl in contact with PhNO₂ generates a negative p.d. of ~1 mv. In contact with triacetin no p.d. develops. To produce the same p.d. a solution of choline in 0.1% NaOBz of 1 part in 10⁷ should be needed. Adrenaline gave a negative p.d. which soon decreased in magnitude. Benzedrine gave a similar but smaller and more stable negative p.d. and also gave a p.d. when in contact with triacetin. The negative p.d. produced by (I) at such low concn. may explain its effect on nerve fibres. L. G. G. W.

Part played by overvoltage and ohmic resistance in the passivity of lead. B. N. Kabanov (Compt. rend. Acad. Sci. U.R.S.S., 1941, 31, 339—343).—The resistance of a Pb electrode rendered passive by a film of PbSO₄ was determined, taking into account the phase displacement of the a.c. used. The ohmic component decreases with frequency and amounts to only 19 ohms in a fully passive electrode. The ohmic resistance plays no part in the potential change on passivation. This change of potential is connected with the c.d. in the pores of the layer. A. J. M.

Crystallisation of lead sulphate and the thickness of the passive layer on lead. B. N. Kabanov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **31**, 581—584).—The quantity of electricity necessary to render passive a previously reduced Pb electrode in dil. H_2SO_4 has been determined, the effect of c.d., temp., and conc. of the H_2SO_4 , and the presence of org. compounds being investigated. The thickness of the layer required to render the Pb passive decreases, and the supersaturation of the PbSO₄ increases, with increasing c.d. The thickness of the layer is 4—6 times as great in aq. H_2SO_4 as in a 40% EtOH- $H_2O-H_2SO_4$ solution containing the same $[H_2SO_4]$.

Chemistry and structure of anodically produced precipitates and films. I. Anodic behaviour of zinc in a bath of sodium hydroxide. K. Huber (*Helv. Chim. Acta*, 1943, 26, 1037—1054).—According to conditions, Zn anodes in NaOH become coated with a loose coating of γ -Zn(OH)₂ together with a little ZnO (active anodes) or a dark coherent coating having a characteristic structure and oxidising properties (passive anodes). F. J. G.

I. M.

VIII.—REACTIONS.

Max Bodenstein and chemical kinetics. H. J. Schumacher (Z. Elektrochem., 1941, 47, 469-475).—An appreciation. J. F. H.

Explosive oxidation of sulphur monoxide. H. Kondrateeva and V. Kondrateev (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **31**, 128).— Measurements, at 3—13 mm. pressure, of the oxidation velocity determined by the rate of disappearance of the absorption spectrum as a function of O_2 pressure in the temp. range 54—144° show that the reaction velocity rises rapidly with O_2 pressure and becomes immeasurable at the crit. pressure. The measured crit. pressures p_1 satisfy the equation $p_1 = 0.5c^{2140/RT}$ mm. Hg. If O_2 is forced in at $p > p_1$ there is a slight blue flash lasting a few sec. Near p_1 an induction period lasting ~2 min. at the lowest temp. was observed. Results show that the oxidation is a chain reaction and that the chains have few branches; p_1 corresponds to the lower ignition limit. N. M. B.

Exchange between ions in solid salts and their radioactive isotopes in solution. E. Gleditsch and R. Rona (5 Nordiske Kemikermode, 1939, 184-186).—The rate of exchange of radioactive Cu⁺ in solution with solid CuSO₄,5H₂O is very rapid and increases with decrease in particle size, with solid CuBr and CuI is slower and decreases as the solid ages, and of radioactive Br' and I' with solid CuBr and CuI very slow. M. H. M. A.

Elimination of chlorine from sodium chloroacetate by salts of weak acids. H. M. Dawson, E. R. Pycock, and G. F. Smith (J.C.S., 1943, 517-520).—The initial velocity coeffs. (k) for the reaction between CH₂Cl·CO₂' and 34 anions, which have been measured at 45°, show that there is a general relation between k and the basic strength of the added anion, k increasing with anionic strength. C. R. H.

C. R. H. Brönsted relation in the hydrolysis of the halogenoacetates and the theory of acids and bases. G. F. Smith (J.C.S., 1943, 521– 523).—Basic catalysis of the hydrolysis of $CH_2X \cdot CO_2'$ (X = halogen) exhibits the characteristics usually associated with general acidbase catalysis, and the data for $CH_2Cl \cdot CO_2'$ (see preceding abstract) and $CH_2Br \cdot CO_2'$ conform to the Brönsted catalysis relation with certain exceptions, notably the anions OH', SO_3'' , and S_2O_3'' . Discussion of the theory of acids and bases leads to the view that, contrary to the Lowry-Brönsted definition, the transfer of a proton is not an essential process in basic or acid catalysis. C. R. H.

Kinetics of oxidation of organic compounds by potassium permanganate. VI. Benzaldehyde. F. C. Tompkins (*Trans. Faraday* Soc., 1943, 39, 280-287).—The reaction in neutral solution is of the second order, with k = 0.34 l./g.-mol./sec. at 30.30° , and an activation energy of 11,800 g.-cal. in the range 26.7— 45.6° . In alkaline solution k decreases with time, but the extrapolated vals. (k_0) for t = 0 increase linearly with [OH'] up to 0.15N., when acceleration occurs owing to formation of MnO₄". In acid solution k increases with time and k_0 is related to [H'] by $\log k_0 = 1.18 \log$ [H'] + 2.26. Mechanisms similar to those proposed for the oxidation of formate (cf. A., 1941, I, 271) are applicable and the previous theory is confirmed. F. L. U.

Kinetics of the decomposition of trinitrobenzoic acid in dioxanwater mixtures. D. Trivich and F. H. Verhoek (J. Amer. Chem. Soc., 1943, 65, 1919—1924).—The kinetics of the decarboxylation of 2: 4: 6: 1-(NO_2)₃C₆H₂·CO₂H have been studied at 10% intervals in 0—90% aq. dioxan, at 60° and 70°, and 0—30%, 80—90% at 80°. The order of reaction varies continuously from 1 at low dioxan concn. to 0.5 at high dioxan concn. The rate has a max. at 60% dioxan. E of activation decreases from 36 kg.-cal. in H₂O to 22 kg.-cal. in 90% dioxan. The variation in order of reaction and the max. in rate are due to the decomp. of the trinitrobenzoate ion; measurements of K give quant. support to this explanation. Variation of E of activation has been related to varying degrees of solvation of the trinitrobenzoate ion. W. R. A.

Kinetics of oxidation of cellulose with periodic acid. G. Goldfinger, H. Mark, and S. Siggia (Ind. Eng. Chem., 1943, 35, 1083— 1086).—Curves relating O_2 consumption and time in the oxidation by NaIO₄ at pH <1 (H₂SO₄) of Hercules Powder cotton linters and cellulose (I) regenerated from Cu(NH₄)₄." can be interpreted as the superposition of a fast and a slow oxidation reaction. The saturation val. for the former corresponds with the total amount of easily accessible (*i.e.*, amorphous) areas of the (I), and can be obtained by extrapolating the linear portion of the curve to the ordinate; it amounts to ~2 wt.~% of the (I). The remainder corresponds with the more difficultly accessible (*i.e.*, cryst.) parts of (I). The method enables the relative amounts of the two phases to be estimated. The ·CHO val. reaches a max. after 16 hr. and falls to ~0 after 24 hr.; the ·CO₂H val. increases most rapidly at the max., and then follows the O₂ curve closely. The oxidation of the individual glucose units is a two-step reaction following approx. a simple kinetic scheme. J. G.

Hydrogen fluoride [as] catalyst. I. Physical and chemical properties. II. Role in organic chemistry. J. H. Simons (Petrol. Refiner, 1943, 22, 155-161, 189-193). R. B. C.

Initiation of polymerisation by free radicals. G. V. Schulz (Z. Elektrochem., 1941, 47, 618-619).—Polymerisation by heat, peroxides, and radicals is a free radical process, whilst there is not enough evidence to decide between free radical and polarisation mechanisms in the case of initiation by inorg. catalysts (cf. A., 1943, I, 280). J. H. BA.

Catalysis of reactions of the mercurous ion. Equilibrium Fe^{...}-Fe^{...}-Hg^{...}-Hg in aqueous perchlorate solutions. P. A. Herrlin (5 Nordiske Kemikermede, 1939, 194—195).—The reaction $2Fe(ClO_4)_2 + Hg_2(ClO_4)_2 \rightarrow 2Fe(ClO_4)_3 + 2Hg$ is very slow in absence of catalysts, but is powerfully catalysed by kieselguhr, graphite, and all types of activated C. k increases with increasing catalyst surface and increasing initial [Fe^{...}], but decreases with increasing initial [Hg₃"]. The catalysis is probably due to the transition Hg₂" \rightarrow 2Hg on the active surface. M. H. M. A.

Induced chlorination of maleic acid. Evidence for chain reaction mechanisms. H. Taube (J. Amer. Chem. Soc., 1943, 65, 1876–1882).—The induced chlorination of maleic acid has been studied kinetically. One-electron reducing agents which react with Cl_2 , and Ce^{\dots} , are equally effective as inductors, whereas one-electron reducing agents which do not react with Cl_2 , and O_2 , are inhibitors. These results, and the kinetic data, are explained by a chain mechanism involving at. Cl and an org. radical. Relative reaction rates of at. Cl in M-Cl' at 25° with inhibitors and with maleic acid have been determined. W. R. A.

Oxidation processes. XVI. Autoxidation of ascorbic acid. A. Weissberger, J. E. LuValle, and D. S. Thomas, jun. (J. Amer. Chem. Soc., 1943, 65, 1934–1939).—The rate of the autoxidation of *l*-ascorbic acid (I) has been determined at pH 4·7–9·2 and at 20°, in presence of Cu⁻⁻ or with CN' and CNS' ions added to suppress catalysis by metal ions. The uncatalysed reaction is first order with respect to (I). The uncatalysed reaction rate depends on pH, showing that both singly and doubly charged ions of (I) are reacting; the rates with O_2 at 760 mm. are 5×10^{-6} and 5 and are independent of and ∞ the partial pressure of O_2 . The rate of the Cu⁻⁻catalysed reaction ∞ [O_2] at pH <7. W. R. A.

Radioactive exchange and adsorption of methyl bromide with several inorganic bromides. G. B. Kistiakowsky and J. R. Van Wazer (*J. Amer. Chem. Soc.*, 1943, 65, 1829—1834).—Exchange of Br between MeBr and inorg. bromides has been studied using Br*. For AlBr_s, which catalyses reactions of MeBr, the activation energy is 4.6 kg.-cal., but for BaBr₂, a less active catalyst, it is 12 kg.-cal. The rate of exchange with KBr is too slow to detect. The differential heat of adsorption of MeBr on BaBr₂ is ~3 kg.-cal., and, as the adsorption is multimol., the rate-determining step in the MeBr-BaBr₂ exchange must be between the BaBr₂ crystals and the adsorbed MeBr. W. R. A.

Rates and temperature coefficients of the hydroxyl-ion-catalysed aldol condensation of benzaldehyde with methyl ethyl ketone and acetone. J. D. Gettler and L. P. Hammett (*J. Amer. Chem. Soc.*, 1943, 65, 1824—1829).—Acid- and base-catalysed aldolisations of PhCHO with COMeEt and COMe₂ have been studied synthetically and kinetically. Selection of experimental conditions can totally eliminate concurrent and consecutive reactions. The OH'-catalysed reaction is first order with respect to [PhCHO] and [COMeEt], and the sp. rate is a linear function of [base]⁴, with pronounced medium effects. Vals. of entropy and energy of activation support the theory of Price and Hammett (A., 1941, I, 474) on the effect of structure on the reactivity of carbonyl compounds. W. R. A.

Some reactions of hydroxylamine and the catalytic oxidation of ammonia. M. Bodenstein (Z. Elektrochem., 1941, 47, 501-518; cf. A., 1943, I, 281).—From a study of the properties of NH₂OH, the following reactions are suggested for the catalytic oxidation of NH₃: (1) primary reaction, NH₃ + O = NH₂OH; (2) formation of NO, NH₂OH + O₂ = HNO₂ + H₂O followed by (2a) HNO₂ + O₂ = HNO₄ and (2b) HNO₄ = NO + O₂ + OH, (3) formation of N₂O, NH₂OH + O = HNO + H₂O followed by 2HNO = H₂O + N₂O. (4) N₂ can be formed in two ways: HNO₂ + NH₃ = 2H₂O + N₄ and HNO + NH₂OH = 2H₂O + N₂. All these reactions have been experimentally confirmed except (2a) and (2b). I. F. H.

Chemistry and structure of anodically produced precipitates and surface films. II. Anodic behaviour of zine in mixed solutions of sodium hydroxide and sodium salts. K. Huber (*Helv. Chim. Acta*, 1923, 26, 1253—1281; cf. A., 1944, I, 40).—In NaOH-Na₂SO₄, NaOH-Na₂CO₃, and Na₂CO₃-NaHCO₃ baths, as in NaOH, active and passive states of a Zn anode can be sharply differentiated. In NaOH-Na₂SO₄ solutions Zn(OH)₂ of previously unknown lattice structure is deposited on an active anode, whereas a passive anode is coated with a dark oxide film more yellowish than that formed in NaOH. At lower [NaOH] active areas appear on the otherwise passive anode and in these areas there is formed a white ppt. intermediate in composition between Zn(OH)₂ and ZnSO₄, 3Zn(OH)₂. An active anode in NaOH-Na₂CO₃ baths yields little and in pure Na₂CO₃ no ppt., a passive anode becoming dark, except with higher bath voltages when the anode in Na₂CO₃ is lighter. In Na₂CO₃-NaHCO₃ solutions a basic Zn carbonate is deposited at active spots on the otherwise passive anode, whilst with high [NaHCO₃] $3Na_2CO_3,8ZnCO_3,8H_2O$ is formed (cubic, a 13.706 A., d 2.726). No K-containing deposit is formed in K₂CO₃-KHCO₃ baths. The characteristics of the deposits are described and discussed in detail.

Passivity of iron and the Ostwald-Lillie concept of nerve conduction. III. Oscillographic investigations of the cathodic behaviour of passive iron and of platinum in nitric acid. H. Beinert and K. F. Bonhoeffer (Z. Elektrochem., 1941, 47, 536–545).—Pt and Fe were cathodically polarised in HNO₃ by means of short current impulses from a 50-v. battery and the change in electrode potential with time was followed on a cathode-ray oscillograph. The experiments with

Pt served for comparison. The activating current does not of itself bring the Fe potential from the passive val. of $\sim 1.0 \text{ v}$. to the activated val. of $\sim 0.3 \text{ v}$. An intermediate potential of $\sim 0.5 \text{ v}$. exists, and it is sufficient for the activating current to produce this val., when 10-4 coulomb has passed through the electrode. After interrupting the current at this passed through the electrode. Infer interrupting the current at this stage, a potential lowering of ~0.15 v. takes place fairly rapidly, the Fe finally assuming the active state at a potential of ~0.3 v. The course of the potential-time curves depends on the kind of Fe used, temp, acid concn. and especially the HNO₂ content. The results can be explained by the assumption that a unimol layer of surface oxide is partly reduced at the interthat a unimol. layer of surface oxide is partly reduced at the intermediate potential and the remainder is spontaneously reduced by local currents. After complete reduction the spontaneous decrease in potential occurs, which leads to activation. Studies of the activation of Fe in H₂SO₄ confirm this view. J. F. H.

Zinc plating from sodium zincate solutions.—See B., 1944, I, 31.

Anode reactions in the electrolysis of ethyl alcohol. E. Linde (5 Nordiske Kemikermade, 1939, 215–216).—Electrolysis of H_2O -free EtOH yields Et_2O_2 (I) and McCHO (II) not by direct anodic oxidation but by : $EtO' \rightarrow EtO + e$; $2EtO \rightarrow (I)$; $EtO \rightarrow (II) + H$. In presence of Na(K)OH or Na(K)OEt (II), OH CHMe CH₂ CHO, CHMe CH CHO, unidentified acids, ketones, and (probably) hydro-carbons, but not (I) or H_2 , are found. M. H. M. A.

Reduction of carbon dioxide during photosynthesis. J. C. McGowan (*Chem. and Ind.*, 1943, 458-459).—Explanations of CO₂ reduction during photosynthesis are discussed. The formation of an intermediate compound such as "methylene dioxide" is most probable, and a mechanism for the initial stages of photosynthesis is proposed. C. R. H.

Photochemical dimerisation of trans-cinnamic acid.-Sce A., 1944, II, 48.

IX.—PREPARATION OF INORGANIC SUBSTANCES.

Separate production of Glauber's salt and epsomite from natural astrakhanite. V. I. Nikolaev and A. I. Katschalov (Compt. rend. Acad. Sci. U.R.S.S., 1941, 31, 572).—If a solution of astrakhanite at 25° is cooled to <0°, almost pure Na₂SO₄,10H₂O (I) is pptd. After pptn. of (I), brine containing MgCl₂ is added to the mother-liquor + MgSO₄ in the right proportions. Slight evaporation and cooling gives pptn. of MgSO₄,7H₂O. A. J. M.

Kurrol's sodium metaphosphate. H. Huber and K. Klumpner (Z. anorg. Chem., 1943, 251, 213—220).—A new method for the prep. of Kurrol's insol. Na metaphosphate is described. Its m.p. is 630—650°, and $\rho 2.6$. Its properties are described; they differ in some respects from those recorded by Pascal (A., 1924, ii, 856).

F. J. G.

F. J. G. systems alkali oxide-CaO-Al₂O₃-SiO₂-CO₂. XI. Reaction pres-sures in the system K_2O -CaO-SiO₂-CO₂. C. Kröger, K. W. Illner, and W. Graeser (Z. anorg. Chem., 1943, 251, 270-284).-M.p. and X-ray diagrams for the system K_2CO_3 -CaCO₃ under 50 atm. of CO₂ are given. A double carbonate K_2CO_3 , 2CaCO₃, m.p. ~835°, exists, and there are two modifications of K_2CO_3 , CaCO₃. The dissociation pressures of these double carbonates are given. Reaction pressures and equilibrium data are given for systems consisting of K and Ca carbonates and double carbonates with SiO₂ and various K and Ca carbonates and double carbonates with SiO₂ and various K and Ca silicates and double silicates. F. J. G.

Effect of changes in lattice defect structure on the reactivity of cuprous sulphide. R. Jagitsch (5 Nordiske Kemikermøde, 1939, 211-212).—Changes in the defect structure of Cu₂S on heating are independent of the history of the sample and are fully reversible. The reactivity of Cu₂S increases greatly around the transition temp., the material reacting explosively with O_2 . M. H. M. A.

Hydrothermal reactions. III. Formation of calcium hydrosilicates from calcium oxide and silica gel at 300° and 350° and high pressures. W. Jander and B. Franke (Z. anorg. Chem., 1941, 247, 161-179).—The formation of Ca hydrosilicates from SiO₂ gel and CaO in presence of excess of liquid H₂O at 300-350° has been studied. The products obtained are 2CaO,SiO₂,H₂O (n = 1.600 and 1.612; cf. Å., 1935, 50). 2CaO,SiO₂,0.5H₂O (n = 1.658 and 1.640), CaO,SiO₂,0.25H₂O (n = 1.586), identical with xonotlite, and 3CaO,2SiO₂,H₂O (n = 1.600; cf. A., 1932, 707). F. J. G. Hydrothermal reactions. III. Formation of calcium hydro-

Chemistry and morphology of the basic salts of bivalent metals. Chemistry and morphology of the basic saits of bivalent metals. X. Highly basic zinc hydroxychloride III. XI. Zinc hydroxy-bromides III and IV. W. Feitknecht and H. Weidmann (*Helv. Chim. Acta*, 1943, **26**, 1560—1563, 1564—1569).—X. Addition of 45—80% of the equiv. amount of NaOH to 0.09M-ZnCl₂ followed by ageing of the ppt. for 5 months yields a product ("hydroxy-chloride III") with hexagonal lattice, $a \ 6.30$, $c \ 7.77 \ A.$, $d \ 3.22$; it corresponds with $4Zn(OH)_{g}$ ZnCl₂, with 34—38% of the Cl replaced by OH

by OH. XI. Interaction of 0.25-0.8 m-ZnBr₂ with active ZnO, produced by the spontaneous dehydration of Zn(OH)₂, yields a product ("hydroxybromide III") crystallising in hexagonal plates with *a* 6.32 and *c* 22.4 A., and *d* 3.64. From its structure it is considered

to have the composition 3Zn(OH)2, 2Zn(OH)Br. Ageing of a-Zn(OH)2 in 0.05-0.18M-ZnBr₂ yields a voluminous ppt. ("hydroxybromide IV ") with a 3.145 and c 24.8 A., which is regarded as comprising ZnBr₂,4Zn(OH)₂ with ~35% of the Br replaced by OH.

. W. S. Boron. I. Preparation and properties of pure crystalline boron. A. W. Laubengayer, D. T. Hurd, A. E. Newkirk, and J. L. Hoard (J. Amer. Chem. Soc., 1943, 65, 1924–1931).—Factors affecting the prep. of B by deposition on a glowing filament are discussed. Single crystals, in the form of needles or hexagonal plates, have been grown and optical evidence indicates that both types of crystals probably belong to the monoclinic system. Cryst. B exhibits great hardness, great opacity, metallic lustre, electrical properties usually associated with semi-metallic substances, and extreme chemical inertness. It is not attacked by boiling HCl or HF, but is slowly attacked by hot conc. HNO_3 , H_2SO_4 , or NaOH; it is slowly oxidised by heating to bright incandescence but oxidation is not sustained when the flame is withdrawn. The temp. coeff. of electrical resistance is \ll recorded vals. X-Ray diffraction patterns of the needle crystals show a spacing of 5.06 A. along the needle axis with two equal and orthogonal axes 8.93 A. in length lying perpendicular to the needle axis. Needle crystals are invariably interpenetration twins, with twinning along (130) and the needle axis in common. The needle crystals show an unusual amount of symmetry and this suggests that these crystals may be tetragonal under ideal conditions of crystal growth. Plate axes is a 17.86, b 8.93, c 10.13 A. The structures of the two crysts. forms are not fundamentally different. The doubling of two of the corresponding translations in the needles cannot be fully explained.

Fluorination of boron trichloride. H. S. Booth and S. G. Frary (J. Amer. Chem. Soc., 1943, 65, 1836–1837).—Only BF₃ is obtained when BCl₃ is fluorinated by SbF₃ in presence of SbCl₅ at 0°, -15° , -40° , and -78° or when BCl₃ and CaF₂ are heated up to 200°. No rearrangement occurs when BF₅ and BCl₂ are heated or when the state of t rearrangement occurs when BF_3 and BCI_3 are heated or subjected to electrical discharge. W. R. A. to electrical discharge.

Addition compounds of trimethylamine with boron fluoride and its methyl derivatives. A. B. Burg and (Miss) A. A. Green (*J. Amer. Chem. Soc.*, 1943, **65**, 1838—1841).—The compounds $\text{NMe}_3, \text{BF}_2\text{Me}$ (m.p. ~35°) and $\text{NMe}_3, \text{BFMe}_2$ (liquid) have been prepared. Their volatility and vapour-phase dissociation have been studied. The vapour of NMe_3, BF_3 is associated and does not dissociate at $<230^\circ$. Substitution of one Me for F in NMe_3, BF_3 leads to a large decrease in the strength of the N \rightarrow B linking but further substitution of Me produces no marked diminution. The free energies of dissociation of the compounds have been estimated. W. R. A.

Volumetric determination of boric acid. IV. Activation of boric acid by polyhydroxy-compounds and processes for the volumetric determination of activated boric acid. H. Schäfer (Z. anorg. Chem., 1941, 247, 96—112).—The effective species in the titration of H_3BO_3 activated by polyhydroxy-compounds is the didiol boric acid,

 $H[R <_{0}^{0} > B <_{0}^{0} > R]$. Other complexes play no significant part. An improved analytical procedure (C., 1944, Part 1) is described

F. J. G. Boric acid and alkali borates. XI. System NaBO₂-H₂O. H. Menzel and H. Schulz (Z. anorg. Chem., 1943, 251, 167-200).-Working details for the prep. of pure NaBO₂.4H₂O (I) and NaBO₂.2H₂O (II) are given. (I) is triclinic, with p^{25} 1.743. Vals. for the f.p. depression down to the cryohydric point (-5.77°) are recorded. From tensimeter curves the heats of hydration are NaBO₂.0⁵H₂O \rightarrow (II), 13.9, and (II) \rightarrow (I), 12.55 kg.-cal. per g.-mol. of H₂O. The constitution of these salts is discussed. There is no justification for a dimeric formula. is no justification for a dimeric formula. F. J. G.

Lower aluminium fluoride. W. Klemm and E. Voss (Z. anorg. Chem., 1943, 251, 233–240).—When Al and AlF₃ are heated together in a vac. at $650-800^{\circ}$ a volatile subfluoride (AlF)_z is formed; ib decomposes on condensation to Al and AlF₃. F. J. G.

Aluminium stearates.-See A., 1944, II, 3.

Rare-earth metal amalgams. IV. Isolation of europium. J. K. Marsh (J.C.S., 1943, 531-535).-If Sm-Eu amalgam is decomposed with a mixture of H_2SO_4 and AcOH, mainly pure $Sm(OAc)_3$ and impure (20%) EuSO₄ are formed. If isolation of Eu is desired the crude rare-earth solution is treated with small amounts of H₂SO₄ and Na amalgam, when a ppt. of mixed EuSO4 and SmSO4 is formed, only a small amount of Sm-Eu amalgam being formed. Cold, dil. HNO₃ selectively oxidises SmSO₄ with formation of sol. Sm(NO₃)₃, leaving EuSO₄ (90%) which can be converted into EuCl₂.2H₂O by way of acetate, amalgam, and treatment with conc. HCl. Several methods of separating Sm from Eu after decomp. of amalgam where Eu/Sm = 1/100 have been tried and are described. C. R. H.

Mechanism of the combustion of carbon. V. Sihvonen (5 Nordiske Kemikermode, 1939, 96-112) .- A review (cf. A., 1939, I, 570) M. H. M. A

Preparation of purified inorganic compounds for use in spectro-graphic standards. R. C. Hughes (J. Opt. Soc. Amer., 1943, 33,

49-60).-Details of methods of purification of a no. of compounds are given. SiCl₄ is purified by repeated fractional distillation, and pure SiO_2 is obtained from it. Ca compounds are obtained by repeated extraction of impurities from $Ca(OH)_2$ by H_2O , in absence of CO_2 , or by repeated recrystallisation of $CaSO_4$. Mg compounds can be obtained by recrystallisation of $MgSO_4$, and Na and K com-pounds by repeated volatilisation of the chlorides. The relative efficiency, convenience, and cost of various methods are compared. A. J. M.

A. J. M. **Preparation of properties of potassium thiogermanate and thio-germanic acid.** H. H. Willard and C. W. Zuchlke (*J. Amer. Chem.* Soc., 1943, 65, 1887–1889).—*K thiogermanate*, $K_2Ge_2S_8$, was pre-pared in solution thus: $2GeO_2$ (hydrated) + $5H_2S$ + 2KOAc == $K_2Ge_3S_5 + 2AcOH + 4H_2O$. Addition of COMe₂ gave two layers with AcOH and KOAc in the COMe₂ layer and a conc. aq. solution of $K_2Ge_2S_5$. Crystals of $K_2Ge_2S_5$ were deposited by abs. EtOH. Solid *thiogermanic acid*, $H_2Ge_2S_5$, was prepared thus: $2GeO_2$ (hydrated) + $5H_2S = H_2Ge_2S_5 + 4H_2O$, but it was very unstable. The ion Ge_2S_5 " in acid solution yields a derivative with 5: 6-benz-quinoline. W. R. A. W. R. A. quinoline.

Reactions of solid substances. CXXXII. The course of sintering in lead powders followed dilatometrically. G. F. Hüttig and W. Hennig (Z. anorg. Chem., 1943, 251, 260-269).—The sintering of Pb powder shows itself as a contraction superimposed on the normal thermal expansion at $>100^\circ$. Foreign gases retard the process. F. I. G

Complex compounds and salts of ethylenediaminetetra-acetic acid. H. Brintzinger, H. Thiele, and U. Müller (Z. anorg. Chem., 1943, 251, 285–294).—The following compounds derived from ethylene-diaminetetra-acetic acid $[CH_2 \cdot N(CH_2 \cdot CO_2 H)_2]_2 (=RH_4)$ are described: $Pb_4R, H_2O; Na[Co^{11}R], 4H_2O; H[Cr^{11}R]; H[Fe^{11}R];$ $NH_4[Fe^{11}R], H_2O; LaHR (I); NdHR; ThR, 2H_2O; ThR, 0.5H_2O;$ $U^{1V}R, 2H_2O.$ (I) is almost insol. in $H_2O.$ F. J. G.

Autoxidation of lead tricyclohexyl and its behaviour towards carbon tetrachloride.-See A., 1944, II, 65.

Fluorination of thiophosphoryl bromide. Thiophosphoryl bromo-Fluorination of thiophosphoryl bromide. Thiophosphoryl bromo-fluorides. H. S. Booth and C. A. Scabright (J. Amer. Chem. Soc., 1943, 65, 1834—1835).—Fluorination of PSBr₃ with anhyd. SbF₃, without a catalyst, yields PSF₃ and two liquids PSF₂Br and PSFBr₂ having the following vals.: b.p., $35 \cdot 5 \pm 0 \cdot 1^{\circ}$; $125 \cdot 3 \pm 0 \cdot 1^{\circ}$; f.p., $-136 \cdot 9 \pm 0 \cdot 5^{\circ}$; $-75 \cdot 2 \pm 0 \cdot 1^{\circ}$; ρ^{0} , $1 \cdot 940$; $2 \cdot 390$; heat of vaporisation, 6775; 8361 g.-cal.; Trouton's const., $22 \cdot 0$; $21 \cdot 0$; $\log p_{0} \rightarrow 760$ nm., $-1484 \cdot 8/T + 7 \cdot 6970$; $-1827 \cdot 3/T + 7 \cdot 4674$. PSFBr₂ is less re-active than PSF₃Br and is unusually resistant to alkaline hydrolysis.

active than PSF₂Br and is unusually resistant to alkaline hydrolysis. W. R. A. Higher chromium fluorides (CrF₄, CrF₅, and CrO₂F₂). H. von Wartenberg (Z. anorg. Chem., 1941, 247, 135—146).—CrF₅, CrF₅, and CrO_2F_3 are described. CrF₄ is a brown amorphous solid, v.p. = 3 mm. at 220°, $\rho = 2.9$. The vapour is blue and has a character-istic absorption spectrum. CrF₆ is red and fairly volatile. Both are instantly hydrolysed by H₂O, affording Cr¹¹¹ and Cr^{V1}. CrF₆ appears not to exist. CrO₂F₂ is formed as a brown gas; this condenses to a brown solid (v.p. = 24 mm. at 0°) which slowly changes to a white solid, not volatile at <200°, apparently a polymeride. The absorption spectrum of the gas resembles that of polymeride. The absorption spectrum of the gas resembles that of CrO₂Cl₂. F. J. G.

Chromous iodide. F. Hein and G. Bähr (Z. anorg. Chem., 1943, 251, 241–250).—The work of Hein and Wintner-Hölder (A., 1932, 133, 229) has been confirmed. CrI_{2} has ρ_{1}^{20} 5.023. Its brown colour is not due to occluded I. F. J. G.

Stability of uranium pentachloride. H. Martin and K. H. Eldau (Z. anorg. Chem., 1943, 251, 295–304).—UCl₅ dissociates appreciably into UCl₄ and Cl₂ at room temp. The dissociation tension is $\leq 10^{-2}$ mm. at room temp. and $\leq 10^{-1}$ mm. at 65°. The action of H₂O on UCl₅ is purely hydrolytic. The v.p. of UCl₅ at room temp. is $\leq 10^{-2}$ F. J. G.

Nitroso-salts of the iron series. (A) L. Cambi. (B) W. Hieber and R. Nast. (c) L. Cambi (Z. anorg. Chem., 1941, 247, 22-30, 31-32, 33-34).-(A) Theoretical. The reactions and structures of Roussin's salts and analogous substances are discussed.

(B) A reply. (c) A rejoinder.

F. J. G.

System NiTe-NiTe. W. Klemm and N. Fratini (Z. anorg. Chem., 1943, 251, 222–232).—Data on lattice consts., ρ , and χ for Ni-Te preps. having compositions from NiTe to NiTe, are recorded. Different lattice consts. are found for the same composition, the vals. falling into two series for which ρ is respectively > and < that calc. from the X-ray data. χ is small, indicating mainly at. binding. Possible interpretations are discussed. F. J. G.

Metallic amides and metallic nitrides. XII. System nickel-nitrogen. R. Juza and W. Sachsze (Z. anorg. Chem., 1943, 251, 201-212).—Ni nitride, Ni₃N, is obtained by heating Ni, NiF₂, or NiBr₂ in NH₃ at 445°. It has a hexagonal close-packed lattice of Ni atoms with a 2.665, c 4.298 A., c/a = 1.613, in the interstices of which the N atoms are accommodated; ρ_4^{26} 7.66. A structure

diagram is given. The solubility of N_2 in Ni is ~0.07%. Ni₃N is stable towards NaOH but is attacked by mineral acids. F. J. G.

Chemistry of bivalent and tervalent rhodium. V. Co-ordination complexes of rhodous halides with dialkylarsines. F. P. Dwyer and R. S. Nyholm (J. Proc. Roy. Soc. New South Wales, 1943, 76, 133— 136; cf. A., 1942, I, 337).—The prep, of the following compounds is described : $[RhX_2(AsMe_2R)_4]$ (I), X = I, R = Ph, m.p. 79—80°; X = I, $R = p-C_6H_4Me$, m.p. 80—82°; X = Br, R = Ph, m.p. 68—69°; X = Br, $R = p-C_6H_4Me$, m.p. 68—70°; X = Cl, R = Cl

Ph and $p-C_6H_4Me$; [Cl(AsMe₂R)₃Rh Cl Rh(AsMe₂R)Cl] (II),

R = Ph, m.p. 88°; p-C₆H₄Me, m.p. 87--88°; [Rh(AsMe₃R)₆][RhI₅AsMe₂R] (III), R = Ph; p-C₆H₄Me, m.p. 207°; [Rh(AsMe₂Ph)₆][RhI₄(AsMe₂Ph)₂] (**IV**), m.p. 210°. (I) is formed by reduction of [RhX₃(AsMe₂R)₃] by H₃PO₂ in presence of AsMe₂R; from its solution in aq. EtOH a compound of type (II) is pptd. under suitable conditions. (III) is formed by similar reduction of (IPh(AsMe_2)) [IPh(AsMe_2)] to under reduction of fording a compound of $[Rh(AsMe_2R)_d][RhX_d]$, further reduction affording a compound of type (IV). (IV) is converted into (I) by dissolution in hot org. solvents; the reverse change occurs (incompletely) on boiling (I)with HX and H_2PO_2 . A. J. E. W.

Constitution of Koefoed's nitroso-platinum complexes. K. A. Jensen (5 Nordiske Kemikermede, 1939, 200).—The compounds obtained from NO or HNO₂ and solutions of various Pt complexes can also be prepared by addition of NOCl to the solids. In the green and blue salts, NO and Cl are separately linked in a 6-covalent complex cation, e.g., $[Pt(NH_3)_4(NO)Cl]^{"}$; the yellow forms have binuclear cations linked by the •ON:NO• group. M. H. M.

XI.—GEOCHEMISTRY.

Characteristics of waters of underground lakes. G. A. Maxi-movitsch and G. G. Kobjak (Compt. rend. Acad. Sci. U.R.S.S., 1941, 31, 26-28) .- Chemical analyses of the waters of the lakes in the grottoes Titanic and Coliseum and of H₂O dripping from the cavern in Ethereal grotto are recorded. They show that the waters of underground lakes in gypsum-anhydrite rocks are to be classified as mineral waters. . L. S. T.

Cobalt in mine waters. I. P. Novochatski and S. K. Kalinin (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **31**, 591-593).—Co is present in mine waters of a no. of deposits, particularly Cu and polymetallic deposits rich in Cu, thus indicating paragenesis of Co with Cu mineralisation. Mine waters serve as a concn. of Co. Owing to the presence of Mn compounds, Co is pptd. from solution at a lower pH than is normally required to ppt. it as hydroxide. A. I. M.

Oxidation-reduction potentials and pH of the lake waters and of lake sediment. R. J. Allgeier, B. C. Hafford, and C. Juday (*Trans. Wisconsin Acad. Sci.*, 1941, 33, 115-133).—Oxidation-reduction potentials and pH of lake H₂O are determined *in situ* (apparatus described). Redox potential is generally lower in the lower waters due not only to lower dissolved O₂ but also to Fe^{**}, H₂S, and possibly org. reducing systems. Redox potentials of lake waters are not org. reducing systems. Redox potentials of lake waters are not L. G. G. W. const.

Beer's law and the proportion of organic matter in lake waters. H. R. James (*Trans. Wisconsin Acad. Sci.*, 1941, 33, 73—82).— For a series of dilutions of lake H_2O , light absorption follows Beer's law so long as the dilution is >5%. Below this irregular results are obtained because at these dilutions physical changes of the colloids in the H.O take place. L. G. G. W.

Isotopic composition of waters in metamorphic rocks and minerals. V. I. Vernadski, A. P. Vinogradov, and R. V. Teis (Compt. rend. Acad. Sci. U.R.S.S., 1941, **31**, 573-576).—Chlorites, talcs, and

Sixteenth list of new mineral names. L. J. Spencer (Min. Mag., 1943, 26, 334-344).—A dictionary list of 94 names collected from the 1941-43 literature. Chemical formulæ are given for each mineral and a systematic chemical classification is appended.

Helium indexes for several minerals and rocks. N. B. Keevil (Amer. J. Sci., 1943, 241, 680-693).—He index data for rocks and minerals from Franklin and Sterling Hill New Line Line and Sterling Hill New Line Line and Sterling Hill New Line and minerals from Franklin and Sterling Hill, New Jersey, and from Buchans, Newfoundland, and for diabases and basic rocks from Yellowstone National Park, Michigan, New Jersey, and Quebec, are recorded and discussed. He indexes for a series of cryst. basic rocks are fairly consistent with the expected geological sequence, probably because of the high He retentivities of the mafic constituents. Results for pre- and post-ore dykes in southern Quebec and Newfoundland indicate contemporaneous mineralisation in these two widely separated deposits. Rocks with a glassy groundmass are useless in geological correlation by the He method. L. S. T.

Sulphur at Rotokaua, Taupo. J. Healy (New Zealand J. Sci. Tech., 1942, 23, B, 84-92).—The S occurs in ores of several different types, the most common being patches of "massive" S, which consist of pure S embedded in a fine matrix of pumice. Lenses of " black S (80% S) are closely associated with the massive deposits. The amount of S estimated to be available is $8-11.6 \times 10^3$ tons. All deposits are connected with thermal vents and are of volcanic origin, the S being deposited at the surface by oxidation of H.S.

Formation of mineral "hair silver." E. Jensen (5 Nordiske Kemikermøde, 1939, 193).—"Hair Ag" (I) is formed whenever Ag is pptd. in presence of Sb" in solution and a solid sulphide. (I) from Kongsberg (Norway) has been formed by migration of Ag' in Ag₂S to a surface where it was pptd. by Sb" or Cu" below 100°; it cannot have been formed by gaseous reduction of Ag₂S at $>2500^{\circ}$. M. H. M. A

Bauxite in Tasmania. H. B. Williams (Bull. Imp. Inst., 1943, 41, 196-200).—Proved and potential resources at Ouse, Campbell Town, Swansea, and St. Leonards indicate a substantial vol. of ferruginous bauxite suitable for the production of Al. The Ouse deposits average Al_2O_3 41.2, SiO₂ 3.2, and TiO₂ 2.17%.

L. S. T.

Nature and origin of Tasmanian bauxite. D. R. Dickinson (Bull. Imp. Inst., 1943, 41, 200-203).—The physical characteristics of Tasmanian bauxites differ widely in the various localities, but the geological associations are similar, and the deposits probably belong to one epoch and were formed by similar processes, viz., decomp. L. S. T. in situ of volcanic tuff accumulations.

Coloration of Ural corundums. B. A. Gavrusevitsch (Compt. rend. Acad. Sci. U.R.S.S., 1941, 31, 686-688).-Coloration depends on genesis. Corundums from the Vishneviye Gory and Kishtym regions are greenish-grey and brown (pegmatites), greyish-blue and blue (desilicified pegmatites), and blue (emery deposits). The main colorants are Fe^{**}, Fe^{*}, Ti, Mn, and, to a smaller extent, Ni and V, and they seem to replace Al isomorphously. Light corundums, except greyish-blue, have high content of Ca and Mg. Cr is absent in most and, when present, occurs to only a very limited extent.

W. R. A.

Composition of uraninites. R. Bakken and E. Gleditsch (5 Nordiske Kemikermode, 1939, 200-201).-UO₂: UO₃ in cleveite varies widely with different samples. UO₃ is formed from UO₂ and O₂ in solid solution from the transition: $2UO_2 \rightarrow 2PbO + O_2$ (PbO₂ is always absent), and UO₂: UO₃ is thus a very rough guide to the age of the mineral. M. H. M. A. of the mineral.

Course of the reactions occurring between serpentine and superphosphate. H. O. Askew (New Zealand J. Sci. Tech., 1942, 24, B, 128-134).—Reaction between ground serpentine (I) and superphosphate (II) leads to large reductions in the amounts of $H_2O-sol.$ SO_4 , CaO, and SO₄, but not to reductions in citric acid-sol. fractions; SiO_2 and Fe appear in a readily-sol. form. Since $Ca_3(PO_4)_2$ is the main Ca phosphate present after reaction is complete, the expected That a present after feaction is complete, the expected scheme $Ca(H_2PO_4)_2 + MgO = CaHPO_4 + MgHPO_4 + H_2O$ does not explain the reaction between (I) and (II). 2% citric acid extracts more Mg^{**} from the mixture than does distilled H₂O. Mixtures of (I) and (II), originally moist, can become apparently dry without loss of total H₂O. This is due to hygroscopic H₂O being fixed as H₂O of crystallisation of the new phosphates formed during the reaction during the reaction. L. S. T.

Forgotten uses of selenite. C. E. N. Bromehead (Min. Mag., 1943, 26, 325-333).-Mention is made of the use in ancient times of cleavage slabs of gypsum in windows. L. J. S.

Genetic types of cobalt deposits in the Urals. A. E. Malachov (Compt. rend. Acad. Sci. U.R.S.S., 1941, 31, 148-149).—The most pronounced concns. of Co ores in the Urals occur in the following penetic varieties. (A) Deposits of the exogenetic group, represented by widely distributed deposits of the Mesozoic weathering crust of the Southern and Middle Urals, with types (i) hydroxide orcs, with Co and Ni (1:5) contained in complex hydrated oxides of Fe, Mn, etc., and (ii) silicate deposits with Co and Ni (1:20) entering the isomerphous Mc silicate readjustice remains the table. (B) Deposite isomorphous Mg silicates, revdiniskite, garnierite, etc. (B) Deposits of the endogenetic group, with types (i) silicate in dunite plutones of the Urals, with Co and Ni (1:10) entering olivines isomorphously, (ii) sulphide types present in classical deposits of the Urals, viz., Cu and Fe ore deposits, Cu pyrites deposits of the Oran, deposits, and altered rocks such as the listvenites of the Pishmin-Kliutschevsk ore field. These sulphide types offer the greatest possibilities of utilisation. S. T.

Occurrence of iron ore in the Catlins District, S. Otago. R. W. Willett (New Zealand J. Sci. Tech., 1942, 23, B, 227-230).—The occurrence of Fe ore, cemented blacksand, in the Jurassic sandstone of this district is described. Two chemical analyses are given. The high TiO_2 content, $\sim 8-9\%$, and the small quantity of ore eliminate economic possibilities. L. S. T.

Tin in lievrite. G. P. Barsanov (Compt. rend. Acad. Sci. U.R.S.S., 1941, 31, 594-597) .- The occurrence of Sn has been confirmed in a large no. of specimens of lievrite, so that its presence is not accidental. The processes by which Sn could be combined in a basic ferrosilicate mol. are discussed. A. J. M.

Occurrence of indium in various metallogenic cycles of the U.S.S.R. N. M. Prokopenko (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, 31, 19-21).—In is an element typical of the metallogenic Variscian cycle. Its occurrence in this and other cycles is discussed. L. S. T.

Distribution of indium in Ural ore deposits. S. A. Borovik and N. M. Prokopenko (Compt. rend. Acad. Sci. U.R.S.S., 1941, 31. 22-23).—The distribution of In, which is frequent but variable in the pyrite and Cu-Zn deposits of the Urals is discussed. LST

Prospecting evidence for indium. N. M. Prokopenko (Compt. rend. Acad. Sci. U.R.S.S., 1941, 31, 16-18).-N. Kirghizia and E. Transbaikal can be regarded as enriched with In, whilst Altai and Salair are impoverished; the Urals occupy an intermediate position. Distribution of In in sphalerites (I) depends in an unknown way on the Fe concn. ; In is more frequently contained in (I) from the lower horizons of a deposit. Black ferruginous (I) are especially rich in In. Prospecting for In should be conducted in polymetallic deposits of hypothermal, hypo-mesothermal, and mesothermal types, particu-L. S. T. larly sulphides.

Content of germanium and other rare elements in topazes and beryls of the U.S.S.R. S. A. Borovik (*Compt. rend. Acad. Sci.* U.R.S.S., 1941, 31, 24—25).—Spectrographic determinations of the Ge content of 28 samples of topaz (I) from different deposits of the U.S.S.R. are recorded. (I) of early origin shows a high Ge content; that of a later generation shows much less (10-20 times). Beryls (II) from the same deposits (Emerald mines) as the topazes Beryls (11) from the same deposits (Emerald mines) as the topazes with high [Ge] contains no Ge, but 0.01% of Sc and much Cr was present in the green (II). Chrysoberyl from this deposit contained 0.1% of Sn and comparatively much Ga. 9 samples of (I) contained no Ga, 1 contained $\sim 10^{-4}$ %, 10 contained 10^{-3} %, and the remainder 0.005%. The distribution of Ga in the topazes is quite different from that of Ge. Some V and much Cr were present in the topazes that gave no Ge lines. L. S. T.

Identity of tanatarite and diaspore. J. D. Gotman (Compt. rend. Acad. Sci. U.R.S.S., 1941, 31, 29-30).—The mineral found near Kairakty, Kazakhstan (Petrushkevitsch, 1926) is a normal rhombic, and not a monoclinic, diaspore. Tanatarite does not exist, there-L. S. T. fore, as a mineral species.

Lazulite in the andalusite-sericite-quartz rocks of the Kongur-Alanghez range. S. A. Movsesjan (Compt. rend. Acad. Sci. U.R.S.S., 1941, 31, 31-32).-The occurrence of lazulite (I) at Kapudshick is described, and a chemical analysis recorded. (1) is attacked by a mixture of any of the acids, HNO_3 , HCl, H_2SO_4 , H_3PO_4 , and HF, only after ignition at 500–700°. It is unattacked by dil. H_2SO_4 (1:3) at high pressure (~32 atm.) or at 235°. L. S. T.

Synthesis of magnesium silicate gels having a two-dimensional regular structure. H. Strese and U. Hofmann (Z. anorg. Chem., 1941, 247, 65-95).—Gels obtained by boiling MgCl₂ and hydrated 1941, 247, 65–95).—Gels obtained by boling higo 2 and hydroden SiO₂ with KOH or Ca(OH)₂ have the composition and properties of Mg montmorillonite, $Mg_3(OH)_2Si_4O_{10}$, mH_2O . Hydrothermal treat-ment with KOH affords montmorillonite or mica according to conditions. Gels resembling antigorite, $Mg_6(OH)_8Si_4O_{10}$, may also be obtained under suitable conditions. F. J. G.

Piedmontite-bearing quartz schists from Black Peak, N.W. Otago. C. O. Hutton (*New Zealand J. Sci. Tech.*, 1942, 23, B, 231-232).— Petrology is described, and optical data on the piedmontite and accessory tourmaline (elbaite) are recorded. L. S. T.

Rare earths in scheelite. J. K. Marsh (J.C.S., 1943, 577-578).---Chemical and spectroscopical analysis of scheelite from Forbes Reef, Swaziland, detects only 5% of the amount of Eu detected by Servigne's micro-method (cf. A., 1940, I, 303). Servigne's estim-ations of the amounts of other rare earths in scheelite are criticised. R. H.

Thermochemical properties of the torbanite of the Glen Davis deposit. R. F. Cane (J. Proc. Roy. Soc. New South Wales, 1943, 76. 190-202).-Experimental investigation of the nature and rate of the thermal decomp. of torbanite (I) shows that there is no direct conversion of the original org. matter into crude oil and gas. org. matter changes at a temp. < that necessary to produce oil into a semi-solid intermediate bitumen phase, which produces oil on decomp. Time and temp, are the two controlling factors in the nature of the oil produced. Data for thermal expansion, η , sp. heat, and heat of combustion of the crude oil obtained from (I) are L. S. T. recorded.

Orepuki oil shale. R. F. Cane (New Zealand J. Sci. Tech., 1942, 23, B. 212-216).—Physical characteristics and microscopic structure are described. Chemical analysis shows that the shale ash is typical, but the nature of the oil is less common. The higher fractions are largely saturated, and contain >10% of phenolic substances. S is high, and the oil contains large amounts of wax. L. S. T.

INDEX OF AUTHORS' NAMES, A I.

FEBRUARY, 1944.

An, G. A., 36. Abbad, M., 30. Alexeevski, N. E., 31. Allgcier, R. J., 46. Andrews, K. W., 33. Andronikaschvili, E. L., 39. Askew, H. O., 47. Aston, J. G., 31. Aurivillius, B., 37.

Aurivillius, B., 37. ВАня, G., 45. Baker, R. H., 40. Barsanov, G. P., 47. Beinert, H., 42. Benrath, A., 35. Bhattacharya, G. N., 20. Bigeleisen, J., 37. Bodenstein, M., 42. Bothatacharya, G. N., 20. Bigeleisen, J., 37. Bodenstein, M., 42. Bothattacharya, G. N., 20. Bigeleisen, J., 37. Bodenstein, M., 42. Booth, H. S., 44, 46. Borovik, S. A., 48. Borniak, P. G., 39. Brauer, W., 30. Briner, E., 36, 39. Briner, E., 36, 39. Bryant, R., 87. Burg, A. B., 44. Burg, A. B., 44. Byström, A., 30. CAMBI, L., 45.

Самві, L., 45. Cane, R. F., 48. Chang, T. S., 30. Cox, M., 31. Craggs, J. D., 25. Crosswhite, H. M., 25.

DAMKÖHLER, G., 32. Danz, W., 34. Davson, H. M., 41. Dergunov, E. P., 38. Desai, T. V., 36. Dickinson, D. R., 47. Dicke, G. H., 25. Duncanson, W. E., 30. Dwyer, F. P., 46.

Rolán, B., 25. Rdsall, J. T., 29. Bhrlich, P., 34. Eldau, K. H., 45. Eliczer, C. J., 27. Evans, L. K., 28.

FEINBERG, M. M., 39. Feitknecht, W., 43. Felsing, W. A., 32. Fischer, E. A., 36. Franke, B., 43. Frary, S. G., 44. Fratui, N., 46. Freeman, I. R., 36. Fricke, R., 37. Fritz, W., 32.

Fritz, W., 32. GAILAY, W., 32. Garrett, A. B., 37. Gavrusevitsch, B. A., 47. Gettler, J. D., 42. Giguère, P. A., 31. Gillam, A. E., 28. Ginzburg, V. L., 27. Given, P. H., 38. Gladitsch, E., 41, 47. Goldfinger, G., 41. Goldfinger, G., 41. Goldfinger, G., 43. Graue, G., 35. Green, A. A., 44. Guruswamy, S., 36. Guyer, A., 32.

Guyer, A., §2. HAFFORD, B. C., 46. Hales, E. B., 26. Hammett, L. P., 52. Hannay, N. B., 29. Hardman, Y., 36. Harned, H. S., 37. Hawkins, G. A., 32. Hazen, W. E., 28. Healy, J., 47. Hein, F., 46. Hennehöfer, J., 32. Hennig, W., 45. Henrlin, P. A, 41. Hibber, H., 28. Hieber, W., 45. Hieber, W., 45. Hibber, K., 40, 42, 43. Huber, K., 40, 42, 43. Huter, C. M., 33. Huter, C. J., 44. Hume, D. N., 40. Hume, Chery, W., 33. Hurd, D. T., 44. Husemann, E., 31. Huton, C. O., 48. ILLYEE K. W. 43.

ILLNER, K. W., 43. Iona, M., jun., 26. JAGITSCH, R., 43. James, H. R., 46. Jander, W., 43. Jensen, E., 47. Jensen, K. A., 46. Jones, R. N., 28. Jones, T. O., 33. Jordan, E. B., 26. Juday, C., 46.

Ives, D. J. G., 37.

Juža, R., 40.
KARANOV, B. N., 40.
Kalitin, N. N., 28.
Kao, S. K., 30.
Katschalov, A. I., 43.
Keevil, N. B., 46.
Kemmer, N., 27.
Kistakowsky, G. B., 42.
Kistler, S. S., 36.
Klemm, W., 44, 45.
Klumpner, K., 43.
Kobjak, G. G., 46.
Koch, H. W., 36.
Kohthoff, I. M., 40.
Kondrateeva, H., 40.
Kondrateeva, M. A., 35.
Kröger, C., 43.
Kubaschewski, O., 38.
Kuhn, W., 38.
Kusaka, S., 26.

LACEY, W. N., 38. Lantzsch, B., 31. Lapp, R. E., 36. Laubengayer, A. W., 44. Lazarev, M. J., 30. Lialdkov, K. S., 33. Linde, E., 43. Lipson, H., 30. Little, A. T., 33. Löwy, E., 35. Lobrer, W., 37. Lu Valle, J. E., 42.

MA, S. T., 27. McBain, J. W., 30, 35. McGaban, J. C., 43. McMabon, H. O., 29. Malachov, A. E., 47. Mark, H., 36, 41. Marsh, J. K., 44, 48. Marshall, M. J., 29. Matin, H., 45. Maximovitsch, G. A., 46. Medkrum, W. B., 33. Menzel, H., 44. Michailov, I. G., 33. Milazzo, G., 20. Miller, J. A., 28. Milne, E. A., 27. Moritz, H., 37. Movsesjan, S. A., 48. Müller, F., 30. Müller, F. H., 20. Müller, U., 46.

NAST, R., 45. Nereson, N., 27. Newkirk, A. E., 44. Nicola, F. H., 31. Nikolaev, V. I., 43. Novochatski, I. P., 46. Nyholm, R. S., 46.

OSBORN, E. F., 38.

PALACIOS, J., 35. Parker, A. M. B., 30. Patterson, R. F., 28. Perlitz, H., 30. Peterhans, E., 32. Plucknett, W. K., 29. Poggio Mesorana, F., 25. Poglio Mesorana, F., 25. Prokopenko, N. M., 48. Puddington, I. E., 32. Pycock, E. R., 41.

RALSTON, A. W., 34. Rao, K. N., 27. Raynor, G. V., 33. Rebinder, P., 36. Redlich, O., 37. Regener, V. H., 26. Reuther, H., 30. Rivoir, L., 30. Rivoir, L., 30. Rona, R., 41. Rossi, S., 30. Rossi, B., 27. Rushbrook, G. S., 37. Rushkrook, G. S., 37.

Sacht, C. J., Jun., 32. Sachsze, W., 45. Sage, B. H., 38. Salcedo, R., 36. Sances, K., 37. Sastry, M. G., 27. Sastry, M. G., 27. Sastry, M. G., 27. Sastry, H., 44. Schäfer, H., 44. Schäfer, J. G., 40. Scheftal, N. N., 30. Scheftal, A., 32. Schmitz, E., 37. Schmitz, E., 33. Schomaker, V., 31. Schuz, G. V., 41. Schulz, H., 44. Schumacher, H. J., 40. Seabright, C. A., 46. Sen, R., 31. Sevastianov, N. G., 30. Sibbitt, W. L., 32. Sieverts, A., 34, 37. Siggia, S., 41. Sinvohnen, V., 44. Sinha, S. P., 26. Smith, G. F., 41. Sinha, S. P., 26. Smith, G. F., 41. Solanki, D. N., 40. Solberg, H. L., 32. Solomin, S. S., 28. Spatz, W. D. B., 26. Spatz, W. D. B., 26. Staudinger, H., 31, 36 Stickley, E. E., 30. Stoll, E. K., 33. Strese, H., 46.

TABIN, J., 26. Taube, H., 42. Teichert, W., 38. Teis, R. V., 46. Thiele, H., 45. Thomas, D. S., jun., 42. Tompkins, F. C., 41. Trivnch, D., 41. Tschapek, M. V., 36.

VAN WAZER, J. R., 42. Veiler, S. J., 30. Verbock, F. H., 41. Vernadski, V. I., 46. Vinogradov, A. P., 46. Voss, E., 44.

Voss, E., 44. WALTER, K., 37. Wartenberg, H., 45. Watagbin, G., 27. Watson, G. M., 32. Wehrli, M., 29. Weidmann, H., 43. Weissberger, A., 42. Weigeren, A., 30. Willard, H. H., 45. Willert, R. W., 47. Williams, F. E., 31. Wood, C. A., 31. Wood, S. E., 39. Worley, R. E., 27.

YADAVA, H. P., 36. Yalda, A., 30.

ZEISE, H., 27. Zuchlke, C. W., 45.

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