BRITISH CHEMICAL AND PHYSIOLOGICAL ABSTRACTS

AUGUST, 1944

A I—GENERAL, PHYSICAL, AND INORGANIC CHEMISTRY

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BRITISH CHEMICAL AND PHYSIOLOGICAL ABSTRACTS

A I-General, Physical, and Inorganic Chemistry.

AUGUST, 1944.

I.—SUB-ATOMICS.

Shell spectrum of HR 8731 in 1940, with an intercomparison of the spectra of several shells. R. B. Baldwin (Astrophys. J., 1943, 97, 388—393).—Analysis of the 1940 shell spectrum of HR 8731, which resembles that of ζ Tauri in 1914, shows lines of H, O I, Mg I, Mg II, Si II, Ca I, Ca II, Ti II, Cr II, Fe I, Fe II, Sr II, Sc II, and Ni II. The shell spectra of γ Cassiopeiae, ζ Tauri, ε Capricorni, β Monocerotis, Pleione, HR 8731, and ψ Persei indicate decreasing excitation conditions in the shell. The cooler shells, in which shell absorption is weak, usually contain less material. E. R. R.

Five spectroscopic binaries. D. M. Popper (Astrophys. J., 1943, 97, 394-411).—Spectroscopic observations on SX Aurigae, V Puppis, ζ Centauris, RY Scuti, and *i* Bootis B are recorded. E. R. R.

Spectra of U Geminorum type variable stars. C. T. Elvey and H. W. Babcock (Astrophys. J., 1943, 97, 412–425),—From new spectrograms of 21 stars, a summary of the characteristics of the spectra of U Geminorum type variables at min, and max. light is obtained and presented. E. R. R.

Spectrum of Pleione. O. Struve and P. Swings (Astrophys. J., 1943, 97, 426-442).—The spectrum of the shell has become stronger (since 1938) and resembles the metallic spectrum of a Cygni. Dilu-tion effects show in the weakness of Mg II and Si II. Lines of ions having metastable lower levels have appeared : Ni II and Fe II in 1940, Ti II in 1941, and Mn II in 1942, which order is inconsistent with the ordinary theory of ionisation. Low central intensities of the cores of H lines are explained by reduced re-emission which is thrown back within the shell into the emerging beam of radiation. The metallic lines on the violet side of the Balmer limit are relatively strong on account of the transparency of the shell and the absence of Stark effect wings in the shell. E. R. R.

HD 15963, a new shell star. W. P. Bidelman (Astrophys. J., 1943, 97, 452).—The spectrum shows the simultaneous presence of an a-Cygni-like spectrum and abnormally broad He I lines, $\lambda\lambda$ 4026 and 4009. The Balmer series is sharp and strong. Si II and Mg II lines are weaker than in a Cygni; the lines $\lambda\lambda$ 4121, 4144, and 4471 are present. New spectrograms confirm these observations and show lines of Fe-II, Ti II, and Mg I. The star is considered to be a shell star. E. R. R.

Investigation of "Bremsstrahlung" by means of excited ¹¹⁵In nuclei. M. I. Korsunski, A. K. Walther, A. V. Ivanov, S. I. Zipkin, and V. E. Ganenko (*J. Physics, U.R.S.S.*, 1943, 7, 129–137).—The excitation of metastable ¹¹⁵In is used as an indicator of the "Bremsexcitation of metastable from in is used as an indicator of the Brems-strahlung "produced by bombarding thin Au leaf and thick Be sheet with electrons of energies 1.04 - 1.5 Me.v. The observed isochromates ($h\nu = 1070$ e.kv.) agree with Bethe and Heitler's theory (A., 1934, 1150), but are at variance with the results of Collins *et al.* (cf. A., 1940, I, 5). The relative probability for the production of an X-ray quantum varies as the square of the at. no.

H. J. W. H. J. W. H. J. W. fluence of different irradiations on the production of the phenomenon under constant electrical conditions. P. G. Deo (*Proc. Indian Acad.* Sci., 1944. A. 19. 117-122) — Conductivity under clothing of the Sci., 1944, A. 19, 117–122).—Conductivity under electrical dis-charge in Cl_2 is instantaneously and reversibly reduced on irradiation with visible light. The effect increases with the ν and intensity of irradiation under const. electrical conditions. L. I. I.

Calculation of the temperature of the electric arc, and problem of stability of the arc column. R. Mannkopff (Z. Physik, 1943, 120, 228-251).—An approximation method is used to calculate the radial variation of temp. in the arc column. The conductivity per cm., the ionisation potential of the gas, the column diameter, gas pressure, and edge temp. are parameters, and the thermal conductivity pressure, and edge temp. are parameters, and the thermat conductivity of the gas and the no. of carriers of charge as a function of temp. must be known. The calculation is applied to the arc in air. The temp. along the axis is $\sim 7000^{\circ}$ K. Results for the outer zone could not be expected to agree with experiment as the effects of chemical reaction between N₂ and O₂ are not taken into account in the calcul-ation. A. J. M.

Secondary electrons from photo-electric semi-conductors. H. Wolff (Ann. Physik, 1941, [v], 39, 591-603).—The emission from 161 K (A. I.)

various modifications of Se, and from Se photo-cells of known relative thickness of covering electrode, is investigated. The emission varies with the modification. Se sputtered from the vitreous state is deposited as the black form. Increase of thickness of the covering electrode gives a steady transition from the Se curve to the Au curve. No connexion between photo-electric properties and emission or velocity distribution is traced. Cd selenide phosphors are also investigated. Although the films varied considerably in properties they behaved in an identical manner on electron bombardment. Experiments with materials, some of which had been heated to redness and the others not, show that the heating has more effect on the emission power than has the addition of Cu. All the Cd selenide films show similar velocity distribution of the secondary electrons. A. J. M.

POLITECHNIK

Spatial periodic distributions of freely falling ions and electrons. W. O. Schumann (Z. Physik, 1943, 121, 629-646).—Mathematical. Field-strength distribution curves for a variety of cases in which ions and electrons enter a vacuous space from opposite sides are computed. Periodic variations in space are possible in specified conditions. L. J. J.

Decay of ion concentration and electron temperature in the extinc-Decay of ion concentration and electron temperature in the extinc-tion of low-pressure discharges. G. Mierdel (Z. Physik, 1943, 121, 574—585).—Measurements of the ion concn. and electron temp, in a Hg plasma immediately following extinction, in a cylindrical tube, show quant. agreement with the diffusion theory of the column at pressures <10 m-torr. At higher pressures vol. recombination takes place. The electron temp, falls very rapidly to ~2000° k. and then much more alowly. The electrons are energised by the remaining metastable Hg atoms at this stage. The yield of collisions of the second kind is $1\cdot8 \times 10^{-3}$. The dynamic component of the probe current expected from the growth of the Langmuir layer is not observed. L. I. I. Langmuir layer is not observed. L. J. J.

Significance of ionic diffusion for the structure of the ionosphere. E. Bagge (*Physikal. Z.*, 1943, 44, 163-166).—A differential equation for the diffusion of ions at great heights in the atm. is derived. It shows that if the diffusion effect is taken into account, the decrease of ionic density at the edge of the atm. is ∞ no. of neutral gas atoms. The ionic density is 10^{-9} — 10^{-6} of the particle density of the corresponding gas. A. I. M.

Activation of a palladium surface by the glow discharge. R. Ulbrich (Z. Physik, 1943, 121, 351–376).—The surface of Pd is considerably activated by the glow discharge in H_2 or A. Both Pd wire and the compact metal become saturated with mol. H_2 at 30–130 torr after treatment with the glow discharge. The in-crease of electrical resistance and the absorption velocity were determined at various times. The curves consist of three parts : (1) a linear portion, (2) a second linear portion, making a smaller angle with the time axis than the first and (3) a curve which approaches with the time axis than the first, and (3) a curve which approaches the saturation val. asymptotically. The two linear portions correspond to the concn. range in which solid compounds of Pd and H_2 correspond to the contraring in which some compounds of Pd and P_2 exist, whilst the asymptotic portion corresponds to the dissolution of the gas in the metal. An electrode system composed of a Pd tube and a Ni cylinder shows a much greater polarity effect after treatment of the Pd cathode with the glow discharge. There appears to be an increased transmission of positive particles under the sessing, of the electric field from a heated Pd tube through which A is passing, A. J. M. to be an increased transmission of positive particles under the action

Negative ions in Braun tubes and their connexion with oxide cathode mechanism. H. Schaefer and W. Walcher (Z. Physik, 1943, 121, 679-701).—Mass-spectroscopic investigation of the negative emission from oxide cathodes shows prevalence of H^- , CH^- , OH^- , O_2^- , and CI^- ions, together with 11 weaker ionic species. All the ions found originate in the cathode except OH^- , which can also originate in the gas space by impact of H_2O on the cathode. The connexion between O_2^- and electron emission from the cathode shows activation of the latter to arise from Ba⁺ ions leaving their regular lattice places and being adsorbed at electron-emitting points of disturbance. L. J. J.

Applications of incandescent anodes to mass-spectroscopic isotope separation. W. Walcher (Z. Physik, 1943, 121, 604-613).—The use of Kunsman-Koch electrodes of alkali chlorides supported on 162 W as ion sources for mass spectroscopy succeeds with the alkali metals, In, Ga, and Tl, but not with, e.g., alkaline-earth metals. The yield of alkali anodes of this type is nearly 100% of the alkali metal adsorbed on the inner W surface, and is independent of the emission current (up to 0.7 ma. for a Rb anode). An In anode gives only ~5% yield of ions. L. J. J.

Nuclear photo-effect in beryllium. F. G. Houtermans and (Frl.) I. Bartz (*Physikal. Z.*, 1943, 44, 167–176).—The neutron efficiency of the (γ, n) process for Be with γ -rays from Ra-(B + C) is compared with the efficiency of a (Ra-a + Be) source by the method of Amaldi and Fermi. The yield of the γ -source per cm. thickness of the Be layer is 5.46 \pm 0.3% of the yield of the comparison a-source of the same γ -equiv. Assuming that the most prolific of the (Rn-a + Be) sources emits 22,000 neutrons per m-curie per sec., and the no. of effective γ -quanta is 0.296 per disintegration, the mean effective cross-section of Be for the nuclear photo-effect with γ -rays from Ra-(B + C) is (8.8 \pm 1.0) \times 10⁻²⁸ sq. cm. These results are compared with those of other workers. A. J. M.

Energies and masses of nuclear fission particles obtained by bombardment of uranium with neutrons. W. Jentschke (Z. Physik, 1943, 120, 165—184).—A U foil was bombarded with (Rn + Be) neutrons, and the masses and energies of the fission products were investigated. Earlier experiments with thermal neutrons have been repeated; there is considerable analogy between the results with thermal and with fast neutrons. In the fission of the $\frac{249}{99}$ U nucleus, the mass of the lighter product is 79—114, and of the heavier 125— 160, with max. frequencies at 97 and 142. The fission products are, therefore, not equally massive when neutrons of ~10 Me.v. are used. The vals. obtained when fast neutrons are used are not so certain. With fast neutrons the mean total energy of the fission particles is 163 Me.v., and with thermal neutrons it is 160 Me.v. Experiments with Th, in the form of a thin layer on a thicker substrate, give 150 Me.v. for the mean total energy, and 141 and 92 for the masses of the most frequently occurring products. A. J. M.

Nuclear disintegration and heavy particles in cosmic rays. I. Heavy particles in cosmic rays as a consequence of nuclear disintegrations. II. Mechanism of collision and vaporisation processes. E. Bagge (Ann. Physik, 1941, [v], 39, 512-534, 535-552).—I. The curve of frequency of occurrence of nuclear disintegration and of heavy particles with height follows almost the same course as that of the large Hoffmann collisions and cascade electrons. It is therefore concluded that the nuclear disintegration particles are released by light quanta or by charged particles of the soft component of cosmic rays. The mean energy of the radiation causing nuclear disintegration is calc. to be >10¹⁰ e.v. A necessary consequence of the nuclear transmutation process is the occurrence of individual protons and neutrons in cosmic rays; the frequency of their occurrence agrees with the extent of nuclear transmutation. The energy spectrum of the proton paths is obtained and compared with experiment.

II. To explain the experimental energy distribution it is necessary to suppose that the primary process in collision consists of the collision of a no. of heavy particles, in many cases at least three. A formula for the velocity distribution of the emitted vaporisation protons and neutrons which takes into account the cooling effect on the nucleus of the emitting process is deduced. Comparison with experiment indicates that larger portions of the nucleus must be broken away in the vaporisation process. A. J. M.

Cosmic rays. W. F. G. Swann (J. Franklin Inst., 1943, 236, 521-540).—A popular-style lecture-survey of the discovery, properties, and theory of cosmic rays. N. M. B.

Separation of electronic and non-electronic components of cosmic radiation. H. J. Bhabha (*Proc. Indian Acad. Sci.*, 1944, A, 19, 23-36).—Results obtained when the soft component of cosmic radiation is removed by absorption in a dense material must be interpreted with caution, as the exclusion of the soft component is \ll has been supposed. The behaviour of the soft component in passing through a slab of dense material is discussed on the basis of the cascade theory, and a formula for the depth of penetration of a cascade as a function of the energy of the primary electrons is obtained by the use of calculations due to Bhabha and Chakrabarty (A., 1942, I, 350; 1943, I, 215). A simple formula for the end of a shower is also given. Fluctuation is important in determining the ability of an electron to operate two counters separated by a given thickness of absorber, and increases the no. of such electrons tenfold for thick absorbers. Formulæ are given for the no. of electrons entering an absorber, and resulting in one or more particles emerging from the other side. A new experimental arrangement is described which makes more effective use of the cascade process for separating electrons from the penetrating radiation. It was devised especially for measuring the penetrating radiation in stratosphere balloon flights, the mass of absorber being kept as low as possible. It is also useful for studying the range spectrum of cosmic ray mesons. (Cf. C., 1944, Part 3.) A. J. M.

Theory of the particle of spin 3/2. V. Ginzburg (J. Physics, U.R.S.S., 1943, 7, 115-128).—A relativistic theory in spinor-vector form. H. J. W.

Quantum theory of radiation damping. E. Gora (Z. Physik, 1943, 120, 121-147). A. J. M.

Stochastic problems in physics and astronomy. S. Chandrasekhar (*Rev. Mod. Physics*, 1943, 15, 1—89).—A comprehensive review in which fundamental probability methods applied to physical and astronomical problems are considered. The problem of random flights is developed from the simple one-dimensional problem. The theory of the Brownian motion of a free particle, and of a free particle in a field of force, is considered. Smoluchowski's conception of probability after-effects is examined, and its application to colloid statistics is dealt with. The reversibility of thermodynamically irreversible processes, and the range of validity of the second law of thermodynamics, are also considered. Probability methods in stellar dynamics are reviewed. A. J. M.

II.—MOLECULAR STRUCTURE.

Shifts in the absorption spectra of mononuclear aromatic compounds. O. Schmidt (Ber., 1941, 74, [B], 987—1001).—Extinction curves in the near ultra-violet are determined for C_6Me_6 and C_6E_6 in cyclohexane. Comparison with other alkyl-substituted benzenes shows an increasing shift of the band towards the red with increasing size of the substituent group. This is explained by the cylindrical electron box model of the C_6H_6 mol., in which decreases in the box radius (by substitution) are shown to alter the electronic levels in such a way as to result in a shift towards the red. The difference between the spectra of C_6H_6 liquid and vapour is accounted for in the same way. Shifts are observed in the spectra of C_6H_6 , PhCl, and C_6E_6 in CHCl₃ solution, by addition of SnCl₄. C_8Me_6 and C_6E_6 give yellow solutions in liquid SO₂, SO₂Cl₂, SnCl₄, SOCl₂, oleum, and ClSO₃H. These observations, and colour formations of hydrocarbons with other compounds of strong electron affinity, arise from an increase in the length of the electron box due to axial addition of the compounds. J. H. BA.

Absorption spectra of nitrophenols in liquid ammonia. N. Dichno and A. Schattenstein (*Acta Physicochim. U.R.S.S.*, 1942, 17, 230– 236).—The absorption spectra of o-, m-, and p-NO₂·C₆H₄·OH, 2:4:1- and 2:6:1-(NO₂)₂C₆H₃·OH, and picric acid in liquid NH₃ were determined in the range 2500—6000 Å. Nitrophenoxide ions are formed in liquid NH₃, and the log ε - λ curves are therefore similar to those obtained in aq. NaOH; the curves for liquid NH₃, however, are shifted towards longer $\lambda\lambda$. Experiments with 3:5:1-C_nH₃(NO₂)₂·C₀H in liquid NH₃ confirm that the effect of salt addition is the larger, the smaller is the radius and the larger is the charge of the ions of the salt. J. F. H.

charge of the ions of the salt. J. F. H. Absorption spectra of 1: 2-benzanthracene and of some methoxyderivatives. E. R. Holiday (*Cancer Res.*, 1943, 3, 689-690).—An absorption curve (2300-4000 A.) is given for 4'-methoxy-1: 2benzanthracene in $n \cdot C_6 H_{14}$, and the $\lambda \lambda$ of absorption max. are compared with those for 1: 2-benzanthracene (I), 9: 10-dimethyl-1: 2-benzanthracene, and a methylated metabolite from mice injected with (I) (cf. A., 1944, III, 489). A. J. E. W.

Effects of environment and aggregation on absorption spectra of dyes. S. E. Sheppard (*Rev. Mod. Physics*, 1942, 14, 410).—Errata (cf. A., 1943, I, 192).

Ultra-violet absorption spectra of protein solutions. R. N. Jones and H. J. Creech (*J. Opt. Soc. Amer.*, 1943, 33, 209–218).—Analyses of conjugated proteins, formed by the interaction of serum-proteins with the carbimides of certain polynuclear aromatic hydrocarbons, are described. The no. of hydrocarbon groups introduced into each protein mol. can be determined provided the hydrocarbon chromophore has absorption max. at $\lambda\lambda > 3250 \text{ A}$. B. S. C.

Fluorescence spectrum of uranyl fluoride. D. D. Pant and N. D. Sakhwalkar (*Proc. Indian Acad. Sci.*, 1944, **A**, **19**, 135–140).—The fluorescence spectrum of solid UO₂F₂ has been investigated at liquid air temp., and the 17 sharp and discrete bands have been classified as five groups and five series. The bands, interpreted using the three $UO_2^{"} \nu \nu$, are due to transitions from the excited (0,0,0)' and (0,1,0)' states to various vibrational levels of the ground state. W. R. A.

Spectrofluorescence, with special reference to sugars. S. J. Lewis (J.S.C.I., 1944, 63, 157-160).—When a fluorescent substance is illuminated by a spectrum, the curve of the intensity of the degraded light at successive $\lambda\lambda$ is an expression of the chemical nature of the substance. It discriminates not only between a spociated substances, *e.g.*, mannitol and glucose, but also between a pure substance and the same substance when embodying a very small proportion of a minor compound, *e.g.*, sucrose alone and when medicated with 1% of raffinose. The method is applicable to both solids and solutions.

Distribution of radiant energy in fluorescent spectra of atabrin and other acridine derivatives. T. C. Butler (*J. Pharm. Exp. Ther.*, 1944, 80, 70–73).—Data of absorption and fluorescent spectra of atabrin dissolved in C_6H_6 , M./15-PO₄^{'''} buffer at pH 8 and 5.9, 150- C_5H_{11} ·OH, or lactic acid, 2 : 5-dichloro-7-methoxyacridine in iso- C_5H_{11} ·OH, 2-chloro-5-amino-7-methoxyacridine hydrochloride

and 2-chloro-7-methoxy-5-acridone in C8H8 are given. in H₂O, For all these compounds, the fluorescent spectra cover a wider band of longer λ than do the absorption spectra. The λ exciting max. fluorescence corresponds with the λ at which the absorption bands fade out. G. P

Nature of spectral diffuse emission of solutions of rare-earth salts. A. A. Schischlovski (*Acta Physicochim. U.R.S.S.*, 1942, **17**, 135– 151),—The absorption spectra of aq. solutions of Ce^{***} salts and of cryst. solutions in transparent La salts have approx. the same structure. The photoluminescence of Ce^{***} salts is generally un-affected by the surrounding medium. No quenching agents were found. The absorption of Ce^{***} solutions is not affected by the presence of alkaline-earth chlorides, bromides, or iodides, or of HCl or HNO_3 . From these results and theoretical considerations it is concluded that the Ce^{***} ion, and not a complex, is the "centre" in the photoluminescence of Ce^{***} salts. The mechanism of absorption and emission of other extreme ions of the rare-earth group is discussed in relation to the structure of their $4f^n$ shell. J. F. H.

Effect of temperature on the intensities of Raman lines. III. Liquids. K. Venkateswarlu (*Proc. Indian Acad. Sci.*, 1944, A. 19, 111-116).—In typical liquids (e.g., CCl_4 , $C_6H_6^*$, Bu^aOH , and PhCl) the Stokes lines (except 215 cm.⁻¹ of CCl_4) decrease in intensity with increase of temp, whereas the anti-Stokes lines increase. The latter effect is < that expected. The Stokes : anti-Stokes ratio agrees with that calc., but Stokes intensity does not agree with calc. vals. (Cf. A., 1942, I, 387.) L. J. J.

Raman effect in relation to crystal structure : sodium nitrate. B. S. R. Rao (Proc. Indian Acad. Sci., 1944, A, 19, 93-99).-To account for the observed Raman and infra-red $\nu\nu$ of cryst. NaNO₂, force consts. 5.42 \times 10⁵, 1.78 \times 10⁵, 0.64 \times 10⁵, and 4.40 \times 10⁵, the same as those calc. for the free ion, and 0.03 \times 10⁵, 0.35 \times 10⁶, and 0.07×10^5 , referring to interionic forces, are adopted. Calc. Raman and infra-red $\nu\nu$ are 87, 190, 766, 1069, 1362, and 60, 71, 157, 292, 439, 716, 843, 1411 cm.⁻¹, respectively. The ν of the total symmetric oscillation 1048 in the free ion increases to 1069 cm.⁻¹ in the crystal. Two "lattice lines" at frequencies 190 and 87 cm.⁻¹ are predicted by the calculation, and five different v shifts in the infra-red spectrum. L. J. J.

Raman effect and hydrogen bonds. IX. Solutions of salicylic acid and aspirin. G. V. L. N. Murty and T. R. Seshadri (*Proc. Indian Acad. Sci.*, 1944, A. 19, 17–20).—The Raman spectrum of salicylic acid in dioxan (I) and in C_6H_6 has been investigated. Results indicate that in (I) unimol. chelate structures with the solvent predominate. In C_6H_6 some unimol. chelate structures with the majority consists of dimers of indefinite structures exist, but the majority consists of dimers of indefinite structure, presumably some kind of open structure. The Raman spectrum of acetylsalicylic acid in (I) indicates the existence of chelate structures. A. J. M.

Rotation of molecules in the crystal lattice and light scattering. Gross and A. Raskin (Acta Physicochim. U.R.S.S., 1942, 17, E. 127-134).-Some crystals exhibit anomalies in sp. heat, dielectric const., etc. in the temp. region immediately below the m.p. This behaviour is generally accompanied by an enantiotropic transition to a higher-temp. form with greater symmetry. Such crystals are intermediate between true crystals and liquids and hence are called "quasi-liquid crystals". The diffusion spectra of some examples of such substances [CBr₄, cyclohexanol, camphor, borneol, examples of such substances [CBr₄, cyclohexanol, camphor, borneol, camphene (I), and C_2Cl_6] were examined around the Rayleigh line at temp. between the transition temp. and the m.p.; the low- ν diffusion spectra of the liquids were also examined. None of the crystals examined showed any low- ν lines of noticeable intensity. (I) and C_2Cl_6 showed a distinct background extending 20—25 cm.⁻¹ away from the Rayleigh line. The results do not enable a choice to be made between the Bauling Facular theory of complete rotation to be made between the Pauling-Fowler theory of complete rotation and the Frenkel theory of "orientation fusion" for such substances. I. F. H

Longitudinal scattering of infra-red rays and the mol. wt. of high-and low-molecular substances. W. W. Lepeschkin (Kolloid-Z., 1943, 105, 205-208).-The rule that the longitudinal scattering of infrared rays (Plotnikov effect) is ∞ cube root of the mol. wt. of the scattering substance is accurate for lower-mol. homologues. For other low-mol. substances the scattering is dependent not only on mol. wt. but also on mol. structure. The presence of OH, and particularly of CO_2H , favours scattering. The ratio of the scattering in a high-mol. substance to that in a low-mol. substance which contains OH and CO_2H is < the ratio of the cube roots of the mol. wts., and the structure factor is >1. For sucrose the factor is 120 for a structure factor is >1. For sucrose the factor is 1.38, for citric acid it is 1.43, and for a degradation product of gelatin, 1.6. As a general rule, in such cases, the ratio is more nearly that of the fourth root of the mol. wts. It is possible to determine the mol. wts. of the lower-mol. degradation products of proteins by applying this rule. A. I. M.

Effect of water vapour, gases, and vacuum on the crystal photo-[electric] effect in semi-conductors. M. Ögder (Rev. Fac. Sci. Istanbul, 1943, 8, A, 23-38).—The influence of H_2O vapour on the photo-electric effect for proustite (two varieties), pyrargyrite

(one variety), and cuprite (three varieties) has been examined; in all cases there is an increase in the photo-electric effect. In a vac. there is a min. in the e.m.f. and current-time graphs for two varieties of cuprite and for the third a sinking to a const. low val. For but no min. Dry, electrolytically produced O_2 and H_2 have no effect on proustite after keeping in a vac. The variation of e.m.f. and current with intensity of illumination for this crystal shows that at high intensities it is possible to measure the current but not the potential. Some other secondary phenomena are described. The general pretreatment of crystals was washing with a brush moistened with EtOH. Dipolar mols. are adsorbed on the crystal surface in the liquid state, forming a double layer, the conductivity of which is < that of the crystal surface, so that the potential and current The min. is caused by the increase in conductivity due to a decrease of adsorbed mole. on evacuation, followed by a decrease in conductivity due to the disappearance of O_2 . These results, taken with those of Brauer and Dubar (A., 1936, 1055), prove the correctness of Dember's model of a photo-cell (A., 1932, 8).

J. O'M.-B. Breakdown and time-lag of dielectric materials. Breakdown of liquid carbon tetrachloride. S. S. Attwood and W. H. Bixby (J. Franklin Inst., 1943, 235, 259-272).—Theories and formulæ are discussed. Experimental data for CCl₄ indicate that modern theories may be applicable to a wide range of dielectrics if their mol. constitution is ionic, and that the technically important time-lag follows a simple rule in its dependence on over-wolf are. follows a simple rule in its dependence on over-voltage. N. M. B.

Interferometry. I. (A) C. V. Raman. (B) L. B. Tuckerman. (c) S. Tolansky (*Phil. Mag.*, 1944, [vii], **35**, 210-213).--(A) A priority claim (cf. Tolansky, *ibid.*, 1943, [vii], **34**, 555).

(B) Attention is directed to work by Pohl (Physikal. Z., 1940, 41, 498). H. J. W.

(c) A reply.

Origin and complications of electric double refraction and of electric dichroism in dilute dispersed systems. W. Heller (Rev. Mod. Physics, 1942, 14, 390-409).—A general survey of the possible causes of double refraction in steady and alternating fields. Complications may be due to orientation by convection or sedimentation, to orientation or deformation in an inhomogeneous field, and to the competition between intrinsic and "form" double refraction for anisometric particles. Four types of electric dichroism are noted two due to absorption and two to scattering or reflexion.

H. J. W Migration double refraction of fibre molecules in an electric field. W. Kuhn and H. Kuhn (*Helv. Chim. Acta*, 1944, 27, 493–499). Methylcellulose degraded to an ~60-fold polymer and oxidised by I to methylcellulosemonocarboxylic acid shows strong double refraction when its aq. solutions are placed in electric fields of 450– 1200 v. per cm. The double refraction const. is $1\cdot1 \times 10^{-8}$, in qual. accord with the val. deduced from consideration of the orientation of the mols. in the electric field. J. W. S.

Hydrogen bond. C. E. Kendall (Chem. and Ind., 1944, 211). The effect of H bonding on η is considered (cf. Friend, A., 1944, I, 149). The variation of η with mol. wt. for compounds in which the intermol. forces are (a) van der Waals forces, (b) dipole attractions intermol. forces are (a) van der waars forces, (b) dipole attractions and van der Waals forces, (c) H bonds, dipole attractions, and van der Waals forces, is shown graphically. Compounds of class (c)have higher η than the others. The aliphatic acids have lower η than the corresponding alcohols, since the latter form transient groups of mols. linked by H bonds, whilst the acids tend to form dimers in which the H bonds are stabilised by resonance. Com-parison of the η of o, m, and p-C₆H₄Cl·OH (4·20, 16·7, and 23·0 centipoises, respectively, at 20°) indicates that H bonding occurs in these compounds, and that it is intramol, in the case of the o-compound, and intermol. in the others. A. J. M.

Systematics of states of aggregation. G. F. Hüttig (Kolloid-Z., 1943, 104, 161-167).—The conceptions of mol. mobility, degree of ordering, and degree of dispersion are used as parameters in the discussion of a state of aggregation. A diagram is given showing how the various states of aggregation differ with regard to these parameters. A. I. M.

A. J. M. Temperature variation of surface tension and the molecular diameters of water and benzene. A. Espurz (Anal. Fis. Quim., 1942, 38, 303—315).—From vals. of γ for H₂O and C₆H₆ it is calc. by the Ramsay–Shields formula that the degrees of association are 3·20 and 1, respectively. The "active surface tension" γ_6 arising from the kinetic energy is related to the surface tension γ_0 at 0° x. by $\gamma_8 = \gamma_0 (V_0/V)^{2/3} - \gamma$ and should replace γ in the formula of Mokrouskin (A., 1924, ii, 820). The calc. val. of the mol. diameter of C₆H₆ is > that given by Sirk's formula. F. R. G.

Measurement of surface tension by means of sessile drops. [Surface tension of water.] H. J. Taylor and J. Alexander (*Proc. Indian Acad. Sci.*, 1944, **A**, 19, 149—157).— γ for H₂O against saturated air is 72.70±0.07 and 71.56±0.07 dynes per cm. at 20° and 27.7°, in good agreement with recorded vals. (Cf. C., 1944, Part 3.)

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Parachors of cis- and trans-decahydronaphthalene. F. H. Lee (J. Chinese Chem. Soc., 1943, 10, 16—18).—The parachors of cisand trans-decahydronaphthalene, calc. from the data of Seyer and Davenport (A., 1941, I, 458), are 366-0 and 370-1, whereas the calc. val. is 368-0 for both isomerides. J. W. S.

III.—CRYSTAL STRUCTURE.

Fundamentals of crystal physics. (Sir) C. V. Raman (Current Sci., 1943, 12, 342-344).—An address.

Low angle X-ray scattering from chrysotiles. I. Fankuchen and M. Schneider (J. Amer. Chem. Soc., 1944, **66**, 500-501).—Both wide- and low-angle X-ray diffraction of four chrysotiles are studied. Wide-angle scattering is similar in each case. Two lines are visible in each low-angle diagram, the ratios of the Bragg spacings being $\sqrt{3}$, suggesting a parallel fibrous structure. Diameters of the fibrils have been calc., and it is suggested that differences in mechanical properties can be correlated with different fibre diameters.

W. R. A.

Influence of crystal size on the absorption factor as applied to Debye–Scherrer diffraction patterns. A. Taylor (*Phil. Mag.*, 1944, [vii], **35**, 215–229).—The absorption factor τ for a spherical crystal is calc. from the tabulated factors for cylindrical crystals due to Bradley (A., 1935, 1306). A table of τ is given for various reflecting angles and crystal sizes. The application of these results to a cylindrical powder specimen is discussed, and the effects of crystallite aggregation, size, and dilution in the embedding matrix are considered. H. J. W.

Geometry of spherical packing. I, II. R. Straubel (Kolloid-Z., 1943, 104, 167-180; 105, 227-241).—I. Mathematical. A no. of cases of spherical packing are considered.

II. The geometry of spherical packing of systems with up to 12 elements is worked out. The stability of each arrangement is discussed. A. J. M.

Various types of disturbances in crystal lattices and their influence on chemical reactions and surface activity. J. A. Hedvall (*Chalmers Tehn. Hogskol. Handl.*, 1942, No. 4, 25 pp.).—Theories of imperfections in crystal lattices are reviewed. Reversible imperfections are considered, and the application of the Schottky-Wagner theory of faulty arrangement to the formation of solid solutions is discussed. In some cases of reactions between solids, e.g., Ag₂HgI₄ from AgI and HgI₂, the process can be followed kinetically. Theory and experiment agree closely in the case of the formation of Cu₂O. The effect of irreversible imperfections is also considered, especially in the case of the reactivity of Fe₂O₃ with CaO. The possibility of changing the surface activity of solids by disturbances less violent than the production of real imperfections, e.g., by magnetic, electrical, and photochemical effects, is discussed. The kinetics of the decomp. of HCO₄H in contact with a Pd-Co catalyst have been investigated, and it is found that there is a marked change of velocity in the neighbourhood of the Curie point. There are 5—10 times as many active centres when the catalyst is in the paramagnetic state compared with the ferromagnetic state. There is a discontinuity in the velocity of dissolution of Rochelle salt at the electric Curie point. The effect of light on surfaces is dealt with. Experiments with CdS and phenolphthalein (I) show that the quantity of (I) adsorbed on CdS is smaller in light than in darkness. The difference of activity of different surfaces of the same crystal is also evident in photochemical processes. The layer-latticed CdI₂, when irradiated with short- λ ultra-violet in the presence of traces of H₂O, was attacked only on the " prism " faces, which were blackened, while the ionic surfaces were unaffected. O₂ inhibited the effect. The effect is also observed with the other modification. A. J. M.

Diffraction of X-rays by liquid elements. N. S. Gingrich (*Rev.* Mod. *Physics*, 1943, 15, 90—110).—The diffraction of X-rays by 23 liquid elements has been investigated by various workers, and the results are here reviewed. The intensity and distribution curves are given for 16 elements. On the basis of assumed models for the liquid state, ideal distribution curves can be constructed. Comparison of these curves with the observed data makes it possible to obtain interat. potentials and certain physical properties of the liquid. The curves also indicate the mol. state of the liquid. A. J. M.

Electron microscope photographs of the lamellar structure of magnesium hydroxide. T. Marx and G. Wehner (Kolloid-Z., 1943, 105, 226—227).—X-Ray experiments (Fricke *et al.*, A., 1937, I, 83) indicate that cryst. Mg(OH)₂ has a layer lattice, the thickness of the lamellæ being ~100 A. This has been confirmed by the investigation of commercial Mg(OH)₂ with the electron microscope; the thickness of the lamellæ is 20—100 A. It is possible that this is not the original form of the Mg(OH)₂ crystal, as change of structure may occur under the conditions of high vac. and temp. used with the electron microscope. The same type of structure was observed with MgO obtained by heating the same Mg(OH)₂. A. J. M.

Investigation by electron diffraction of the structures of halogen derivatives of tin, arsenic, and nitrogen. H. A. Skinner and L. E.

Sutton (*Trans. Faraday Soc.*, 1944, 40, 164–184).—The following are the lengths, in A., of the central atom-halogen links, determined from electron-diffraction patterns of the vapours, in the compounds indicated : $SnMe_3Cl 2.37\pm0.03$, $SnMe_2Cl_2 2.34\pm0.03$, $SnMeCl_3 2.32\pm0.03$, $SnMe_3Br 2.49\pm0.03$, $SnMe_2Br_3 2.48\pm0.02$, $SnMeBr_3 2.45\pm0.02$, $SnMe_3I 2.72\pm0.03$, $SnMe_2Br_3 2.48\pm0.04$, $AsMe_2I 2.52\pm0.03$ (cf. 1.77 ± 0.02 for NMe_2Cl and 1.74 ± 0.02 for NMeCl_2). These and other data indicate that, in general, such links become progressively shorter as the no. of halogen atoms displacing H or Me on the central atom increases. This behaviour is in accordance with the theory that bond contractions are a function of differences of electronegativity, but not with one that ignores the effects of charge redistribution arising from multiple bonding. F. L. U.

Magnetic investigations of organic substances. XXI, XXII.—See A., 1944, II, 189.

Scattering of light by single crystals. Intensity measurements. S. Bhagavantam and K. Venkateswarlu (*Proc. Indian Acad. Sci.*, 1944, A, 19, 108—110).—Relative intensities of Rayleigh and Raman lines in calcite and quartz crystals are determined for different orientations, CCl_4 being used as intermediate standard. The Rayleigh intensity is 2—7 times that of the principal Raman line.

L. J. J. Statistical theory of the brittle strength of real crystals. J. I. Frenkel and T. A. Kontorova (*J. Physics, U.R.S.S.*, 1943, 7, 108— 114).—The strength of a crystal is assumed to be determined by the most "dangerous" inhomogeneity present. The strength of a crystal therefore depends on its vol., just as in the "weak link" theory the strength of a chain depends on its length. A statistical treatment of brittle strength is given. H. J. W.

Correlation of solution potentals with orientations of single crystals of high-purity aluminium.—See A., 1944, I, 178.

Elasticity, creep, and recovery of acetate and viscose rayon yarns.— See B., 1944, II, 133.

Isomorphism and polymorphism of barbituric acid derivatives. (Frl.) M. Brandstätter (Z. physikal. Chem., 1942, A, 191, 227– 240).—The phase behaviour of binary mixtures of some 40 derivatives of barbituric acid was investigated by the contact method of Kofter (C., 1944, Part 3). Examples of Rozzeboom's types I, III, IV, and V, as well as mixed types, are given. J. F. H.

IV.—PHYSICAL PROPERTIES OF SUBSTANCES.

Theory of the intermediate state of superconductors. L. Landau (J. Physics, U.R.S.S., 1943, 7, 99-107).—The intermediate state is assumed to be laminar, alternate laminæ being normal. The laminæ split up into fringes near the surface of the superconductor. This leads to an explanation of the hysteresis in the transition to the intermediate state. The behaviour of a superconductor containing a narrow slit transverse to the magnetic field is investigated.

H. J. W. Higher paraffin hydrocarbons. Correlation of physical properties. A. W. Francis (Ind. Eng. Chem., 1944, 36, 256–260).– d_4^{20} and $n_{\rm P}^{20}$ of *n*-paraffins and of parafins of structures CHRR'R'', CHEtRR', $\Pr^{\beta}\cdot[CH_2]_n\cdot\Pr^{\beta}$, and (CHRR')₂ can be expressed A - B/x, where x is the total no. of C atoms (\leq 11) and A and B are const. for each structural series but vary with the series. For other paraffins these properties can be calc. by adding suitable increments dependent on the mode of building their structures from those of lower paraffins. The b.p. of branched-chain paraffins are correlated similarly but show wider discrepancies. J. W. S.

Specific heat of zirconium dioxide at low temperatures. K. K. Kelley (Ind. Eng. Chem., 1944, 36, 377).—Fused ZrO_2 (purity 99.14%; SiO₂ 0.30, TiO₂ 0.20, CaO 0.07%) has C_n (corr. for impurities) 1.473 at 54.3° K., rising to 13.25 at 295.0° K. (27 vals. determined at intermediate temp.); hence $S = 12.03 \pm 0.08$, and $\Delta G = -244.2$ kg.-cal., at 298.16° K.

Determination of the thermal constants of samples of activated charcoal and silica gel. L. K. Simonova (J. Appl. Chem. Russ., 1943, 16, 87-94).—Measurements were made on air-dired industrial absorbents comprising three samples of activated bone-C and one of SiO₂ gel. Diffusivity vals. (sq. m. per hr. $\times 10^{-4}$) were at 0° 5·41-8·19, at 20° 5·91-9·08, and at 70° 7·87-13·34. Powdering of the samples increased these vals. by ~11%. Thermal conductivity (kg.-cal. per m. per hr. per degree) was in the range (0°) 0·08-0·17, (20°) 0·09-0·21, and (70°) 0·12-0·24. The average increase on powdering was 35·9%. Sp. heat (kg.-cal. per kg. per degree) varied from 0·294 to 0·332; the influence of temp. was negligible but the sp. heat was decreased ~2% by powdering. V. B.

Mechanism of the dependence of the thermal conductivity on pressure in gases. I. Ethyl chloride. K. Schäfer and O. R. Foz (Anal. Fis. Quim., 1942, 38, 316-346).—Vals. of k for EtCl show a variation with p > that required by Maxwell's theory. This is attributed to the formation of double mols. for p >50 mm.; the

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expression for the second virial coeff. is shown to be $B_1 - RT/k_p$, where B_1 is due to double mols. F. R. G. where B_1 is due to double mols.

Some problems involving line sources in conduction of heat. J. E. Jaeger (*Phil. Mag.*, 1944, [vii], 35, 169—179).—The temp. due to an instantaneous line source parallel to the axis of a solid cylinder embedded in a solid medium of different thermal consts. is determined. The problem of a line source of given strength moving with a const. angular velocity around the surface of a solid cylinder is also solved. This solution is applied to the practical problem of the H. J. W. grindstone used in wood-pulping.

Thermodynamic properties of light hydrocarbons. D. E. Holcomb (*Ind. Eng. Chem.*, 1944, 36, 384).—Enthalpy charts given previously (A., 1942, I, 321) are corr. J. W.

Differential equations of wave propagation in gases. K. Bechert (Ann. Physik, 1941, [v], 39, 357-372).—Mathematical. L. J. J.

Variation of the viscosity of gases and vapours with temperature. W. Licht, jun., and D. G. Stechert (*J. Physical Chem.*, 1944, 48, 23-47).—Equations relating η and temp. of gases are reviewed. With the exception of H₂ and He for which Trautz's equation is causely, extendence with the review for the base of the review. equally satisfactory, Sutherland's equation has been shown to be the most reliable. A universal η equation, which is independent of the substance and requires knowledge only of crit. temp. and pressure and mol. wt., has been derived. A nomograph for determining η from this equation is reproduced. C. R. H.

Calculation of most probable concentration in diffusion theory. E. M. Galvez Laguarta (Anal. Fis. Quim., 1942, 38, 102-104).— The most probable val. of the concn. of a diffused phase is expressed The most probable val. of the content of a diffusion phase at super-mathematically in terms of the initial condition of the system and the Brownian effect. The formula can be applied to the calculation of the rate of propagation of matter, heat, light, and electricity. F. R. G.

V.—SOLUTIONS, DISPERSIONS, AND MIXTURES.

Structure of water in aqueous solutions. D. D. Eley (Trans. Faraday Soc., 1944, 40, 184-194) .- The two-stage process, (1) creation of a cavity in the H_2O , (2) insertion of a gas mol. in the cavity, is used in a discussion of the energy and entropy of dissolution of inert gases. Previous work (cf. A., 1938, I, 519; 1939, I, 607) is extended by presenting a mol. theory for the low energy of cavity formation and by showing that the smallness of this energy term is due to a polarisation of the H_2O mols. in the region of the cavity that persists when an inert gas enters the cavity. There is evidence that, whilst an inert gas atom can occupy only a restricted no. of sites in H_2O , ions can exchange with any H_2O mol. in the solution, considered as a quasi-lattice. Existing theories of the partial molal heat capacities of ions in aq. solutions fail to account for the opposite effect on this property of increasing ionic radius shown by inert gases on the one hand and by ions on the other. An explanation based on a long-range polarisation extending far beyond the first F. L. U. hydration shell is offered.

Apparent ionic volume in infinitely dilute solutions. F. H. Lee (J. Chinese Chem. Soc., 1942, 9, 46–53).—In alkali metal halide solutions the apparent vol. V. of the ion pairs at infinite dilution is related to the spherical vol. of the ions in the cryst. state $(v_e \text{ and } v_a)$ by $V = A(v_e + v_a) - B$, where A and B are consts. dependent on temp. with the vals. 1.87 and 20.7 cu. A., respectively, at 25°. The vals. of V for Na halides are low, indicating that the Na ion has an abnormally small vol. in solution. The relation is explained by supposing v_a and v_a to be determined by the effective ionic vol. due to its kinetic effect and by the electrostriction of a unimol. layer of H₂O around the ion. I. W. S.

Osmotic pressures for mixed solvents. F. T. Wall (J. Amer. Chem. Soc., 1944, 66, 446-449).-Mathematical. The osmotic pressure, π , of solutions in mixed solvents has been derived thermodynamically. Measured vals. of π have definite significance only when the solutions on either side of the membrane have different compositions, subject to certain relationships. Van't Hoff's equation holds true for infinitely dil. solutions. With conc. solutions, complications are to be expected in the determination of π , especially with dynamic methods. W. R. A.

Cryoscopy of isanic acid. Y. Doucet and M. Fauve (Compt. rend., 1942, 215, 533-534).—The cryoscopic const. in AcOH is 3.72 and in C_6H_6 5.12. The mol. wt. of the acid is 274, and the structure $CH_2:CH\cdot[CH_2]_4$ -C:C-C:C-[CH_2]_7-CO_2H. N. M. B.

Critical graphical methods for calculating isotonic concentrations and freezing points of aqueous solutions.—See A., 1944, III, 497.

Fine structure of glasses. Change of fine structure in system P_2O_s -ZnO.--See B., 1944, I, 235.

Density, thixotropy, and setting of silver amalgams .--- See B., 1944, I, 243.

Volume relations in alloys in the heterogeneous liquid-solid region. I. F. Sauerwald (*Metallwirts.*, 1941, 20, 405-408; cf. A., 1944, I,

102).-Existing data are reviewed and discussed with particular reference to the systems Fe-C, Cu-Sn, Cu-Zn, and Cu-Al. C. E. H.

Structure of hard metal alloys. W. Dawihl and J. Hinnüber (Kolloid-Z., 1943, 104, 233-236).—The hardness of metal alloys composed of WC and $\sim 6\%$ of a metal of lower m.p. (Co) can be explained as due to the formation of a WC skeleton. The strength of this skeleton is revealed by treating sintered plates of the alloy with HCl, which leaves an almost complete skeleton of WC crystals. If the sintered plate contains >10% Co, it disintegrates when treated with HCl. The variation of mechanical strength of pure WC, and of alloys with 6 and 11% Co, with sintering temp. has been determined, and the results agree with the WC skeleton theory. A. J. M.

Physico-chemical study of phases having the nickel arsenide structure in the systems iron-antimony, cobalt-antimony, and nickel-antimony. N. V. Ageev and E. S. Makarov (Bull. Acad. Sci. U.R.S.S., Cl. Sci. Chim., 1943, 87-98).—Ni-Sb alloys containing 41-56 at.-% of Sb are studied. From micro-sections, the lattice spacings a and c, electrical resistance r, and its temp. coeff. a, it is spanness a and t, electrical resistance r, and rs temp. bein a, r is concluded that the γ phase exists between 46.4 and 54.4 at -% of Sb. At 50 at.-% of Sb r has a min., and a a max., and at 54.4% r has a max. and a a min. The hardness h (Shore) has a min. at bigs a max. and a min. The matches r (shote) has a min. at 50% of Sb. The γ phase of Co-Sb alloys (42-54 at.-% of Sb) lies between 43.4 and 49.6% of Sb. Within the γ phase r and h decrease when the % of Sb increases. This phase is a solid solution of Co in the "apparent" compound CoSb. The ϵ phase of Fe-Sb alloys (35-51 at.-% of Sb) lies between 42 and 48% of Sb. Data on r and a are incomplete because of the brittleness of this phase, and h decreases when the % of Sb increases. In the series Ni–Co–Fe r increases and a decreases. The a spacing increases in the order Co < Ni < Fe, and c in the order Fe < Ni < Co. The strength of the chemical bond increases in the order FeSb < CoSb < NiSb. J. J. B.

Gas solubility and partial pressure. Nomograph for correlation of data. D. F. Othmer and R. F. Benenati (Ind. Eng. Chem., 1944, **36**, 375–377).—Nomograms are given for obtaining the partial pressure at various temp. for CO_2 in H_2O , C_6H_6 , and aq. $Na_2CO_3 + NaHCO_3$; HCl, NH_3 , SO_2 , and Cl_2 in H_2O ; SO_3 in H_2SO_4 . J. W.

Solubility of aluminium bromide in *n*-butane. J. D. Heldman and C. D. Thurmond (*J. Amer. Chem. Soc.*, 1944, 66, 427-431).--Measurement of the solubility of AlBr₃ in n-C₄H₁₀ from 28·3° to 97·5° (m.p. of AlBr₃) reveals no evidence for a phase transformation in AlBr₃ at ~70°. The system is regular in the Hildebrand sense. The solubility of AlBr₃ in 16 other solvents is briefly discussed.

W. R. A.

Mechanism of solvent action. A. K. Doolittle (Ind. Eng. Chem., 1944, 36, 239-248).-The processes operating during the dissolution of macromol. substances are assumed to involve solvation-desolvation equilibria between the solute and solvent and aggregationdisaggregation equilibria between solute mols. For solvent mixtures comprising an active solvent mixed with a diluent liquid the min. mol. concn. of solvent (" threshold concn.") required to initiate dissolution decreases to a const. min. val. on ascending a homologous series of solvents. This val. (" class threshold concn.") is independ-ent of the diluent, provided this is a true non-solvent. In certain cases it is possible to pass out of the solvent region at the low mol. wt. end of a series, and it is always possible to do so at the high mol. wt. end since the mol. concn. of pure compound decreases with increasing mol. wt. For solutions of const. solute concn. log $\eta = A + B/n$ ($\eta =$ viscosity, n = concn. of solvent liquid, A and B are const.), except near the threshold concn., where log η rises rapidly with decreasing n, approaching ∞ as n approaches the threshold concn. The application of the author's theory to the mechanisms of film formation and plasticisation are discussed.

I. W. S Penetration of hydrogen in monocrystalline and polycrystalline iron. A. Portevin, G. Chaudron, and L. Moreau (Compt. rend., 1942, 215, 351-353; cf. A., 1943, I, 59).—The expulsion of adsorbed H, by heating in vac. at different temp., was investigated by micrographic examination and hardness tests after submitting the residual gas to ionic bombardment following each heating. Results are tabulated, and differences in the retention of the H in the lattice and in the intergranular joints and its expulsion for the two cryst. forms of Fe are discussed. N. M. B.

Occlusion of hydrocarbons by chabazite and analcite. R. M. Barrer and D. A. Ibbitson (Trans. Faraday Soc., 1944, 40, 195-206) .- Sorption equilibria between the zeolites and paraffin hydrocarbons up to C_8 have been studied at various temp. Isotherms and some isosteres are given. Sorption of CH₄ and C₂H₆ occurs very rapidly, and that of the higher members fairly rapidly only at or above 100°. Branched chains are not sorbed. Thermodynamic properties (ΔH , ΔA_0 , ΔS_0) of the solid solutions are obtained as functions of charge of gas, chain length, or temp. In both chabazite and active analcite the affinity of solutes for the lattice increases in the order He < H₂ < O₂. A < N₂, CH₄ < C₂H₄ < C₂H₄ < n-C₄H₁₀. the order He < H $_2$ < O $_2,$ A < N $_2,$ CH $_4$ < C $_2$ H $_8$ < C $_3$ H $_8$ < n -C $_4$ H $_{10}.$ F. L. U. F. L. U.

Kinetics of formation of zeolitic solid solutions. R. M. Barrer and D. A. Ibbitson (Trans. Faraday Soc., 1944, 40, 206-216; cf.

preceding abstract) .- Solutes are occluded in chabazite and active analcite at rates depending on their cross-sectional diameter (d). For $d \ge 4.0$ A. (He, H₂, O₂, N₂, CH₄, C₂H₆) mols. are taken up by free diffusion down minute channels; for d = 4.89 (higher *n*-paraffins) the binds on down infinite channels, for a = 4.85 (higher *n*-paralities) the process is one of slow diffusion in which an energy of activation is needed; mols, with $d \not < 5.58$ A. (isoparaffins and aromatic hydrocarbons) are totally excluded. With *n*-paraffins the rate decreases with increase in chain length, and with increase in the concn. of gas initially within the zeolite; it is also modified by the conditions of dehydration of the sorbent. The kinetics of sorption are those of a modified by the conditions of dehydration of the sorbent. a pure diffusion process, without any rate-determining phase boundary processes. The sorption rate increases exponentially with rise of temp., and apparent energies of activation are given for C_3H_8 , $n \cdot C_4H_{10}$, $n \cdot C_5H_{12}$, and $n \cdot C_7H_{18}$.

Effects of salts on the adsorption of erythrosin on silver halides. A. P. Tai and C. L. Chen (J. Chinese Chem. Soc., 1943, 10, 22–29).— The effects of KCl, KBr, KI, and KCNS on the adsorption of ery-throsin on AgBr, AgCNS, and AgCl are irregular and hence the adsorptions of the anions do not follow the Paneth-Fajans rule. The observations made are interpreted on the basis of pptn. of less sol. Ag halides, disruption of the crystal lattice of the ppt. through adsorption of larger anions, and the increased adsorption of K' as compared with the Na' present in the indicator. J. W. S.

Adsorption of thorium on tantalum.-See A., 1944, I, 138.

Adsorption of sodium alkyl sulphate by wool and other fibres.-See B., 1944, II, 160.

Adsorption from non-aqueous solutions. V. Aleixandre (Anal. Fis. Quim., 1942, 38, 378–382).—AcOH adsorbed by kaolin from CS_2 , CCl_4 , C_6H_6 , PhMe, MeOH, and EtOH decreases as the dipole moment increases and is approx. in accordance with Freundlich's equation. F. R. G

Approximate relation between surface tension and concentration for regular solutions. M. Wales (J. Chem. Physics, 1944, 12, 135-142).—An equation for the variation of surface tension (γ) with concn. in regular solutions has been derived using Hildebrand's model and calculating the work per unit interfacial area required to separate a body of liquid reversibly into two infinitely removed parts, spherical symmetry in shape and mol. field of both components spherical symmetry in shape and mol. held of both components being assumed. The general equation is $\gamma = v_1^* \gamma_1 + v_2^2 \gamma_2 + C v_1 v_2$, where v_1 and v_2 are vol. fractions and γ_1 and γ_2 are the respective vals. of γ for the pure components. *C* is a const. depending on other properties of the mixture under consideration, and equations relating *C* with these properties are derived. Its val. is generally $\leq 2\sqrt{(\gamma_1\gamma_2)}$. For ideal solutions $C = \gamma_1 + \gamma_2$ so that $\gamma = v_1\gamma_1 + v_2\gamma_2$. All recorded data for regular solutions quantitatively fit one or other of these equations with the exception of CS₂-C₆H₆; possible reasons for the non-uniformity of this system are discussed possible reasons for the non-uniformity of this sytem are discussed. C. R. H.

Surface activity. IX. Cryoscopy and surface activity in benzene solutions of aliphatic alcohols. X. Cryoscopy and surface activity in benzene solutions of fatty acids. A. Giacalone (Gazzetta, 1942, 72, 378-389, 429-439).—IX. F.p. measurements of $C_{g}H_{g}$ solutions of $n-C_{x}H_{2x+1}$. OH (x = 1-6) are recorded and discussed in relation to the v.p. measurements of Butler *et al.* (*Trans. Faraday Soc.*, 1931, 27, 797). Depression of f.p. diminishes as mol. concn. of solute increases; contrary to experience in $H_{2}O$ (A., 1940, I, 203), the diminution in depression is the greater the lower is the mol. wt of the diminution in depression is the greater the lower is the mol. wt. of the alcohol. From activity coeff. at infinite dilution the variations in mol. free energy for each additional CH₂ are calc. γ of MeOH, EtOH, and BuOH in C₄H₆ at 27° is recorded.

X. F.p. measurements of C_6H_6 solutions of $n-C_2H_{2z+1}$ CO₂H (x = 0-8) (and also of C_7H_{16}) are recorded. Again diminution in depression is the greater the lower is the mol. wt. of the acid. Variation in mol. free energy is greatest between AcOH and PrOH, and small and approx. const. between other adjacent pairs. Mol. free energy of dissolution decreases constantly in successive members. γ of AcOH, EtCO₂H, and PrCO₂H in C₆H₆ at 27° is recorded.

E. W. W. Rates of evaporation of water through compressed monolayers on water. I. Langmuir and V. J. Schaefer (J. Franklin Inst., 1943, 235, 119—162).—A method is described for the determination of the rate of evaporation of H_2O from a clean surface and from one covered by a compressed monolayer. The rate of evaporation is measured by finding the increase in wt. of a vessel containing CaCl₂ placed at a known distance above the surface. Decrease of temp. of the surface due to evaporation and increase of temp. of the temp. of the surface due to evaporation, and increase of temp. of the CaCl, above it, effectively reduce convection. The rate of escape of mols. from the H₂O surface was decreased in the ratio of $\sim 10^4$ to 1 by the presence of a monolayer of cetyl alcohol. By analogy to 1 by the presence of a monolayer of cetyl alcohol. By analogy with Ohm's law, the evaporation resistance is defined by the equation, rate = driving force/resistance. The evaporation resistance (ω_i) of films increases rapidly with their surface pressure, and the in-crease is \gg can be accounted for by an energy barrier. ω_i of monolayers of highly purified fatty acids with 16, 18, 19, 20, 21, and 23 C atoms, and of $C_{20}H_{41}$ OH, have been determined and the effect of pH of the substrate and the presence of Ca and Ba salts has been studied. There is a linear relationship between surface pressure studied, There is a linear relationship between surface pressure,

F, and $\log \omega_f$, represented by $\log_{10} \omega_f = -3.08 + 0.0425F + 0.122n$ (*n* = no. of C atoms in acid). Curves of *F* against *a*, the area per mol., are also given. Collapse pressures for the films are much higher for acids having an odd no. of C atoms. The $F-\omega_j$ curves show a hysteresis effect. Experiments were also carried out with mixtures of cholesterol and the C_{23} acid, the results indicating that minute amounts of impurities can exert a great effect on ω_f . To investigate whether high ω_i depends on a strong localised com-pressive force at a definite level in the monolayer, experiments were carried out with mixtures of the C_{21} acid and θ -dihydroxystearic acid (I). The presence of only 30% of the C_{21} acid causes rapid collapse of a film of (I). The effects of thick layers of oil on rate of evaporation of H₂O have also been investigated. The results are discussed theoretically. A. J. M.

Surface phenomena in non-conducting liquids under the influence of electric discharges in gases. T. Rummel (Kolloid-Z., 1941, 96, 340-347).—A thin layer of oil spread on the surface of a tube in series with a high-potential discharge forms into drops on the surface. Scher layers in vessels form a variety of surface figures, the shapes depending on the viscosity and type of oil used. Mobile liquids, e.g., CCl₄, give foams under the same conditions. When liquid and gas layers are placed in parallel, as between plates partly filled with liquid, the angle of contact of the liquid becomes $>90^\circ$ on application of the field, but falls below normal when discharge occurs. The phenomena are discussed in relation to the energy at the surfaces.

Production of monodisperse substances. A. H. M. Andreasen (Kolloid-Z., 1943, 104, 181-189).—The production of monodisperse BaSO₄ of grain size $3-0.3 \mu$. by condensation has been investigated. The effect of mixing solutions of SO₄" and Ba" in the presence of various substances was studied. It is possible to obtain mono-disperse spherical particles of $\sim 3 \mu$. diameter if a substance which increases the solubility (HCl) is added before mixing the solutions. If a substance which decreases the solubility is added, the particles are smaller. are smaller. Another method, in which the reaction employed took place slowly, and in which pptn. was therefore gradual, was also used. Thus, monodisperse Cu_2O was obtained by adding Fehling's solution in excess to a solution of a reducing sugar. Monodisperse HgI2 and TII were obtained by mixing solutions of the corresponding were obtained in the form of long rounded particles of $BaSO_4$ diameter by mixing solutions of $BaCl_2$ and H_2O_2 with $Na_2S_2O_3$ and adding various quantities of normal Na citrate. A. J. M.

Influence of van der Waals forces on coagulation of aerosols. M. V. Tichomirov, N. N. Tunitzki, and J. B. Petrjanov (Acta Physicochim. U.R.S.S., 1942, 17, 185–196).—An equation is deduced which shows that the rate of coagulation of an aerosol is determined uniquely by the mean vals. of R, 1/R, and $1/R^2$, where R is the radius of the particles. On taking into account the interaction between the particles, *i.e.*, the van der Waals forces, the coagulation const. is increased by a factor γ , which is independent of R but is determined by the const. in the van der Waals forces equation. Experiments with mists of mineral oil, tritolyl phosphate, and H_2SO_4 give γ vals. of 1.25, 1.22, and 1.30, respectively. J. F. H.

Determination of size, shape, and anisotropy of submicroscopic particles (colloids and macromolecules) by means of double refraction and viscosity. H. A. Stuart (*Kolloid-Z.*, 1941, 96, 161--168).—The application of equations for viscosity, and electrical, magnetic, and streaming double refraction, to the determination of particle dimensions is discussed for different ranges of particle size.

Structure of soap solutions. J. Stauff (Kolloid-Z., 1941, 96, 244-251).-The theories of soap solution structure are reviewed and. suggestions made about the micellar structure at various concns., J. H. BA. which are supported by approx. energy calculations.

Powder dispersoids and their derivatives. W. Ostwald (Kolloid-Z., 1943, 104, 137-139).—A review. The characteristic properties of powders, and their importance in technology, are mentioned. The incoherent nature of powders and the methods of converting them into a coherent system are considered. Metal and C powders show a reversible change between coherence and incoherence. It is possible to make "solid" bodies from powders by the application of high pressures, and these substances have almost the same d as the compact material, but they differ considerably from the latter in physico-chemical properties. The hardness of a compressed powder may be > that of the compact form obtained by fusion. A. J. M.

Elementary processes of fritting and sintering metal powders with special reference to the real structure of their surfaces. F. Sauerwald (*Kolloid-Z.*, 1943, **104**, 144—160).—Methods of prep. of metallic powders are summarised. The nature of the free surface of metallic powders is considered, and two types of roughness are recognised, one, produced, e.g., by breaking, and visible under the optical or electron microscope, and the other at., being related to the fine structure of the surface. The vectorial nature of surface energy, and the variation of surface tension of different surfaces of a crystal, are considered. Other factors of importance in connexion with the surface are the velocity of its formation, and the presence of foreign

substances, especially O_2 . The internal surfaces of regular bodies are also considered. Cold pressing, hot pressing, fritting, and sintering are discussed. The effect of fritting and sintering processes on

ing are discussed. The effect of fritting and sintering processes on the properties of metals, particularly mechanical strength, is de-scribed. The strength is dependent on the temp. of sintering. A. J. M. Effect of the gaseous atmosphere on the chemical activity and surface properties of powders during their formation. J. A. Hedvall and A. Lundberg (Kolloid-Z., 1943, 104, 198-203).—The effect of heating powders (SiO₂, Al₂O₃) in O₂, N₂, air, SO₂, and SO₃ to various temp. on their surface properties has been investigated. The activating effect decreases at high temp., and the differences in activity between two different preps. of the same powder are very great, indicating that the effect is due to dissolution of the gas. Experiments with mixtures of CuO and SiO₂ indicate that it is not merely an adsorption layer. The activity varies with the gas pressure, and the variation of reactivity of heated powder mixtures according to the pretreatment they have received with gases is according to the pretreatment they have received with gases is similar to the effect on recrystallisation. A. J. M.

New methods of investigation of colloidal systems. D. Beischer (Kolloid-Z., 1941, 96, 127-135) .- A review of the application of electron microscope and electron diffraction technique to the elucid-J. H. BA. ation of colloidal structure.

Determination of the basic texture of gels by means of double refraction. W. J. Schmidt (Kolloid-Z., 1941, 96, 135-147).-The various ways in which double refraction may occur are discussed in relation to gel structure. I. H. BA.

Systematics of gels. E. Manegold (Kolloid-Z., 1941, 96, 186-210) .- The fine structures which may occur in gels are tabulated under the main headings of corpuscular, laminar, and fibrillar skeletons, and each is discussed in detail. J. H. BA.

Fine structure of solids made up of particles of colloidal size and their physical and chemical properties. R. Fricke (Kolloid-Z., 1941, 96, 211-225).-- A discussion of the surface energy of solids with reference to its dependence on the constitution and size of the crystals concerned, the origin of active spots, and specificity of chemical reactions at surfaces. J. H. BA.

Nature of water film in plastic clay.—See B., 1944, I, 236.

Optical properties of gels. I. Thorium molybdate gels. II. Thorium arsenate gels. III. Silicic acid gels. M. Prasad and S. Guruswamy (*Proc. Indian Acad. Sci.*, 1944, 19, A, 47-65, 66-76, 77-87).-I. The intensity and depolarisation factors of light scattered transversely by Th molybdate gels have been determined. The intensity was measured photoelectrically, and the depolaris-ation factors $(\rho_{ev}, \rho_{h}, \rho_{u})$ by Cornu's method with a double-image prism and a Nicol. Comparison of light scattered at 45° and 135° shows that the size of the particles is ~0.25 λ of the light used. The shows that the size of the particles is ~ 0.25 A of the light used. The density scattering, $I_{\rm A}$, have been calc. separately, and their changes during gelation have been investigated. $I_{\rm D}$ increases during gel formation owing to increase in vol. and decrease in no. of particles. As this is analogous to coagulation it is inferred that gelation is a coagulation and a hydration phenomenon. In the early stages of gel formation $I_{\rm A} \gg I_{\rm D}$, but it decreases rapidly during gelation. There is no great difference in the final wolk of gel particles formed under different conditions. The final vols. of gel particles formed under different conditions. The Krishnan relation between ρ_v , ρ_h , and ρ_u holds for this gel (cf. A., 1935, 821).

II. Similar investigations were made with Th arsenate gels. The particle size is $\sim 0.25 \lambda$ of the light used. The intensity of scattered light, and ρ_e and ρ_u were found in one case to increase greatly even after the gel had set. The particles increase in size by ~ 25 times during gel formation, and this is largely independent of conditions of formation. Krishnan's formula applies reasonably well to this gel.

III. Similar investigations have been made with silicic acid gels. The size of the particles is of the same order as those of the other The she of the particular for the she of th well for this gel. A. J. M.

X-Ray investigation of the structure of soap solutions. H. Kiessig (Kolloid-Z., 1941, 96, 252-255).—X-Ray diagrams of Na oleate in H_2O show a well-defined long spacing (a) which decreases to that found in the solid soap with increase in concn. A more diffuse small spacing (b) of 4.4 A. is independent of soap concn. This indicates soap micelles formed from double mols. which are extended lengthwise by the interposition of a H_2O layer between the polar groups. Addition of C_8H_6 to the aq. soap solution increases a but not b. The C_8H_6 is thus interposed between the non-polar groups of the double mols. in the micelle. Laurylpyridinium chloride gives sharp X-ray rings in aq. solution but not in EtOH. Preliminary experiments on an aq. polyethylene oxide derivative also show micelle formation, but the solutions have a smaller a than the J. H. BA. solid.

Mechanical properties of soap solutions and their relation to struc-ture. W. Philippoff (Kolloid-Z., 1941, 96, 255-259).—The $n_{\rm rel.}$ -concn. curve for aq. K laurate shows a deviation from linearity at ~1% but in EtOH no such deviation occurs. The deviation varies with addition of KOH, being a min. at 0.6N-KOH. These solutions also show a strong temp.-dependence of $\eta_{\text{rel.}}$ structural viscosity, streaming double refraction, and a less sharp X-ray picture. Addition of *m*-cresol to aq. Na oleate gives a max. in the η_{rel} -concn. curve and a decrease in the long spacing in the X-ray picture, and the mixtures show structural viscosity. The micellar structure of soap solutions is discussed and a hexagonal micelle is proposed. J. H. BA

Effect of association and solvation on the structure of cellulose solutions. E. Steurer (*Kolloid-Z.*, 1941, **96**, 333–335).—The osmotic pressure of ethylcellulose (I) in 90% C_8H_8 –10% EtOH (II), CHCl₃, dioxan, C_6H_8 , and PhMe is measured. (II), CHCl₃, and dioxan give the same mol. wt. on extrapolation to zero concn., but C_8H_8 and PhMe give higher vals. tending to decrease with decrease in concn. beyond 1.5 g. per 1. for PhMe. cycloHexane, 95% C₆H₆-5% COMe₂, 70% C₆H₆-30% C₆H₁₄, and *m*-xylene behave as C₆H₈ and PhMe. These increases decrease with increase in temp. and on addition of polar solvents, and are due to association of solute mols. in the non-polar solvents. A comparison of tetramethyl-and 2:3:6-trimethyl-methylglucoside and (I) shows an increase in association with the no. of OH groups in the mol. The temp.-dependence of the viscosity of (I) is greatest in non-polar solvents and is accounted for on the came basis and is accounted for on the same basis. J. H. BA.

Deformation and swelling mechanisms in cellulose gels. P. H. Hermans (Kolloid-Z., 1941, 96, 311-317).—The anisotropic swelling is measured at various degrees of extension for cellulose gels with varying degrees of initial swelling. The anisotropy increases more quickly with extension for the more swollen gels, but if the degree of extension is calc. on the initial and final dry states all samples show the same anisotropy at the same extension. The crystallinity in-creases on drying and extension. The structure of cellulose is dis-cussed on the basis of these results. J. H. BA.

Effect of traces of inorganic salts on the fall in viscosity of cellulose nitrate solution. J. S. Gourlay (J.S.C.I., 1944, 63, 123-124).— The rate of decrease in η of COMe₂ solutions of cellulose nitrate on ageing is increased if the solvent contains NaCl or CaCl₂; the initial η of the solution is also decreased.

Nitration of cellulose. I. Nitration in the vapour of nitric acid. G. L. Wilson and F. D. Miles (Trans. Faraday Soc., 1944, 40, 150-163).-The reaction of cellulose with HNO3 vapour at 20° and 40° has been followed by suspending bundles of ramie from a quartz spring balance in a stream of the vapour at 4-16 mm. pressure, the extent of reaction and of adsorption being calc. from the observed increase in wt. and the chemical analysis of the product. Adsorption reaches a max. in \sim 3 hr., and the rate of nitration, the max. of which coincides with the adsorption max., is approx. ∞ (amount of ad-sorbed HNO₃)². It is inferred that 2 mois. of HNO₃ are concerned in the conversion of each OH, thus: OH + 2HNO₃ \rightarrow O·NO₂ + HNO₃,H₂O. The max. degree of nitration observed (1 week at 40°) was N 13.7%. Raising the temp. does not greatly increase the rate of nitration, since the resulting increase in the velocity coeff. is of nutration, since the resulting increase in the velocity coeff. is largely compensated by the decrease in adsorption. Fractional dissolution of some of the products in aq. $COMc_2$ showed them to be very inhomogeneous (e.g., 10.7 and 13.35% N for the extreme fractions) and to have abnormally low solubility. Adsorption of HNO₃ vapour on a highly nitrated specimen (N 13.7%) was measured at 20° and 40°, and the results could be fitted to the Langmuir equation. The calc. mol. heats of adsorption are 16.4 and 14.0 kg.-cal. at 10 and 20% adsorption. F. L. U.

Association and solvation of cellulose acetate from dielectric measurements. H. Erbring and M. Takei (Kolloid-Z., 1941, 96, 336-340).-The polarisation of cellulose acetate (I) in dioxan shows a decrease with increasing concn. which is attributed to association of the solute. The polarisation decreases with increase of % MeOH in MeOH-COMe₂ mixtures, but is independent of the concn. of (I) in these mixtures. This shows lack of association and a const. solvation which is independent of concn. Using the extrapolated val. at infinite dilution for the polarisation in dioxan, solvation nos. for (I) J. H. BA. in various solvents are calc.

Relationship between viscosity and strength of gel of pectin solu-tions. L. Malsch (*Biochem. Z.*, 1941, 309, 283-296).—Aq. pectin solutions, after treatment with NaCl, behave as homopolar colloids, solutions, after treatment with Nach, behave as homopolar controls, and obey Staudinger's viscosity law. The viscosity-concn. ratio is ∞ strength of gel. The isolation of purified pectin preps. following hydrolysis of the raw material by HCl at pH 0.7 for 48 hr. at 40° is described. The average galacturonic acid content is 65—75%. The OMe content averages 5—7%, but is reduced to 1—3% by prolonged acid hydrolysis (7 days). P. G. M.

Structural changes in gels on freezing. H. Ullrich (Kolloid-Z., 1941, 96, 348—353).—The pH of gelatin solutions in citrate buffers, originally at pH 1.7—7.7, after freezing show a shift towards the isoelectric point, log ApH being a log [gelatin]. The softening

points show an increase after freezing. The increase is a max. at the isoelectric point for solutions of 2-4% and 7-10% gelatin, is a min. for 4-7%, and is independent of pH for 4% and 7% solutions. The frozen gels show double refraction which increases with temp. and concn. [With agar solutions log Δ pH is $\propto 1/\log$ [agar], and no change is evident in citrate buffer at pH 5.8. There is no change in softening point. Addition of salts increases coacervation and double refraction. In mixed agar-gelatin solutions coacervation occurs at 2° . The observations are discussed in relation to the changes occurring in plants on freezing. J. H. BA.

Light scattering experiments with high polymer solutions. P. M. Doty, B. H. Zimm, and H. Mark (*J. Chem. Physics*, 1944, **12**, 144–145).—From an equation for the turbidity of a colourless binary mixture due to fluctuations in *d* and concn., an expression is derived which shows that a plot of $H(g_2/r_2)$ against g_s should give at low concns. a straight line having an intercept of $1/M_a$ [τ_2 = turbidity of solution less turbidity of solvent, $g_2 = g$, of solute per c.c., $M_2 = mol.$ wt. of solute, and *H* is a function of wave-length, *n*, and concn.]. Turbidity data for PhMe and COMEEt solutions of polystyrene fractions show this linear relation. C. R. H.

Longitudinal scattering of infra-red rays, Tyndall effect, and mol. wt. of proteins.—See A., 1944, III, 497.

Theory of molecular size distribution and gel formation in branched polymers. II. General cross linking. W. H. Stockmayer (*J. Chem. Physics*, 1944, 12, 125–131; cf. A., 1943, I, 126).—A statistical calculation of the gel point and of the mol. size distribution is made for cross-linked high polymers of arbitrary initial size distribution. The wt.-average polymerisation degree of the cross-linked polymer depends only on the wt.-average polymerisation degree of the initial polymer and the degree of cross-linking. The treatment is not generally applicable to cases of copolymerisation of a vinyl derivative with sufficient quantity of a divinyl derivative since polymerisation and cross-linking are concomitant rather than consecutive, but restricted applications are possible, and these are discussed.

C. R. H. Electrical double refraction and electrical dichroism in dilute dispersed systems.—See A., 1944, I, 166.

Anomalous viscosity and flow-birefringence of protein solutions. III. Changes in these properties of myosin solutions in relation to adenosine triphosphate and muscular contraction.—Sec A., 1944, III, 498.

Influence of ions on the settling of a suspension of powdered quartz. V. Romanovsky (*Compt. rend.*, 1942, 215, 531-533).---Measurements are tabulated for various cations, and, for a given cation, for various anions. Sediments are characterised by the index $\varepsilon =$ vol. of liquid/vol. of solid. Results show that ε is very small with twice-distilled H₄O but increases sharply with tap water; for a given anion, ε increases with the at. wt. of the metal cation, and also with the valency of the anion; for a given cation, ε is tends to decrease as the size of the particles increases. N. M. B.

VI.—KINETIC THEORY. THERMODYNAMICS.

Calculation of the composition of equilibrium gas mixtures at high pressures. A. B. Brodski (Acta Physicochim. U.R.S.S., 1942, 17, 228-229).—The equation given previously (A., 1944, I, 103) for the activity coeff. of a gas is a mathematical expression of the results of Newton and Dodge (A., 1935, 823). Calc. vals. for the yields of NH₃ from N₂ and H₂ at 300-600 atm. agree well with observed vals. J. F. H.

Alkalinity of concentrated solutions of alkali hydroxides. G. Schwarzenbach and R. Sulzberger (*Helv. Chim. Acta*, 1944, 27, 348—362).— The method of Hammett and Deyrup (A., 1932, 921) has been applied to determine the alkalinity of 0·1—19·5n-NaOH and 0·1—15·2N-KOH at 20°. Nine indicators dissolved in various org. solvents were used and the ratio of the concns. ([S]/[HS]) of their colour forms in the solvent in equilibrium with the alkali solutions was determined by extinction coeff. measurements. From the results the pH vals. of the solutions have been derived by application of the relation (pH)₁ - (pH)₂ = (log [S]/[HS])₁ - (log [S]/[HS])₂. J. W. S.

Acid-base studies in the gaseous phase. I. Precise dissociation measurements. H. C. Brown, M. D. Taylor, and M. Gerstein. II. Anomalous base strength of the methylamines. A new manifestation of steric strain. H. C. Brown, H. Bartholomay, jun., and M. D. Taylor (J. Amer. Chem. Soc., 1944, 66, 431-435, 435-442).— I. An apparatus for determining the degree of dissociation of AB additive compounds in the gas phase has been developed." Samples of A and B are placed in separate tensimeters, with bulbs of equal vol. (within 0.05%), and the amount of substance is adjusted until the pressures, measured by Hg manometers, are identical (within 0.02 mm.). The more volatile substance is then condensed by liquid N₂ into the other tensimeter, and the gas pressure of the additive compound, thus synthesised, measured at ~5° intervals from ~10° above the saturation point, and checked with decreasing temp.

The purity of the additive compound is accurately determined by measuring the v.p. at 0°. The accuracy of the method has been examined, using NMe₃, BMe₃ as additive compound. K_p and ΔH of dissociation can be determined to 2% and 0.1%. Measurements at ~25 and ~10 mm. initial pressure show that deviations from the gas laws do not introduce considerable errors.

II. Highly purified samples of the additive compounds of BMc₃ with NH₃ (I), NH₄Me (II), NHMe₂ (III), and NMe₃ (IV) have been prepared, and their m.p., v.p., and dissociation in the gas phase measured. M.p. are: (I) 73·2-73·7°, (II) 26·9-27·2°, (III) $35\cdot0-35\cdot5^\circ$, and (IV) 128°. V.p., in the temp. ranges indicated, are: (I) $(20\cdot0-59\cdot7^\circ)$, $\log p = -(3095/T) + 11\cdot229$; (II) $(34\cdot7-93\cdot1^\circ)$, $\log p = -(2829/T) + 9\cdot611$; (III) $(45\cdot7-80\cdot0^\circ)$, $\log p = -(2902/T)$ $+ 9\cdot860$; (IV) (29·8-65\cdot1°), $\log p = -(3467/T) + 11\cdot949$. Vals. of $\log K_p$, in the temp. ranges indicated, and ΔH of dissociation (in kg.-cal. per mol.), are: (I) $-(3007/T) + 8\cdot723$ (54·8-130·0°), $13\cdot75\pm0\cdot3$; (II) $-(3856/T) + 8\cdot880$ ($85\cdot4-139\cdot9^\circ$), $17\cdot64\pm0\cdot2$; (III) $-(4211/T) + 9\cdot595$ ($85\cdot1-125\cdot6^\circ$), $19\cdot26\pm0\cdot2$; and (IV) $-(3852/T) + 9\cdot998$ ($65\cdot8-111\cdot3^\circ$), $17\cdot62\pm0\cdot2$. The relative affinity of the methylamines for BMe₃ is identical with their affinity for H', the base strength increasing from (I) to (III), but decreasing considerably in (IV). To account for this, two strain effects are postulated: an "F-strain," depending on the steric requirements of both base and acid, and a "B-strain," depending on the steric properties of base alone. B-strain," depending on the steric properties of base alone. W. R. A.

Effect of metallic ammine salts on pH of phosphate buffer solutions. L. H. Cobb and J. S. Anderson (*Trans. Faraday Soc.*, 1944, 40, 145—150).—Addition of $[Co(NH_3)_3]Cl_3$. $[Co en_3]Cl_3$. $[Pt(NH_3)_3]Cl_2$, and of $[Ir(NH_3)_3]Cl_3$ to phosphate buffers, M./15 with respect to $PO_4^{\prime\prime\prime}$ and varying in pH from 7.17 to 5.29, causes a decrease in pH \gg that calc. from the change in ionic strength. The effect appears to be a sp. property of the added cation. Measurements at 20° are recorded for varying concus. of the ammine salts up to 0.08M. Over a fairly wide range the pH of the solutions is a linear function of log [ammine]. F. L. U.

Peculiarities of H and OH ions. P. Jolibois (Compt. rend., 1942, 215, 344—345).—Electrolysis phenomena of H₂O and of strong acids can be explained by the theory of Arrhenius with the help of the hypothesis of hydration of ions. N. M. B.

Diffusion and dialysis coefficients of positively charged elementary ions. H. Spandau (Z. physikal. Chem., 1943, A, 192, 211-228).— A crit. analysis of measurements of dialysis coeffs. (λ) with Cellophane and Cuprophane membranes shows that no conclusions can be drawn from them about the extent of ionic hydration. Determinations of λ with "Cellafilters" indicate that the ratio of λ to the diffusion coeff. (D) increases slightly with increasing charge on the ion. The product $\lambda \sqrt{M}$ (M = mol. wt.) for different ions is not const., as claimed by von Kiss. From the relation $D\sqrt{M} =$ const. the hydration for various ions is calc. The results agree with other vals. The relation D = ku/n (u = mobility, n = valency, kconst.) is shown to hold with a few exceptions. J. H. BA.

Ionic dissociation frequency of complex binary ions in aqueous solution. R. Daudel (*Compt. rend.*, 1942, 215, 301-303).—Investigations for a no. of ions are reported and discussed. N. M. B.

Chemistry in anhydrous hydrogen cyanide. G. Jander and G. Scholz (Z. physikal. Chem., 1943, A. 192, 163–210).—The cryoscopic const. of HCN is determined and the cryoscopic method used to show that amines, e.g., NEt₃, form cyanides in HCN which ionise in the solvent, but that H_2SO_4 , SO_3 , and CH_2Cl+CO_2H are undissociated. By analogy with H_2O the CN group is basic, and neutralisation reactions, e.g., KCN + H_2SO_4 , are followed by salt pptn. and conductometric and potentiometric measurements, which indicate in some cases the formation of acid salts. The ionic product $[H^+][CN']$ is determined potentiometrically. Solvolysis, e.g., $Ag_2SO_4 + 2HCN \rightarrow 2AgCN + H_2SO_4$, and amphoteric behaviour (with Fe salts) are also observed. The reaction of SO_3 with HCN is of the first order, and the product is a tribasic acid $(OH)_3S(CN)_2$.

J. H. BA.

Electrochemical determination of activity coefficients of the $IO_3^$ ion in aqueous solution. L. Cavallaro (Gazzetta, 1942, 72, 343-350).—From the e.m.f. of Ag|AgIO₃, KIO₃|KCl,Hg₂Cl₂|Hg cells in which KIO₃ varies from 0.2 to 0.02M., $\pi^{\circ}_{10^{\circ}} = 0.3578$ v. (cf. Pearce et al., A., 1933, 1121). Vals. of log $f_{10^{\circ}}$ agree with those calc. from the Debye-Huckel formula only roughly and at low concn., but agree closely with those calc. from the Bonino-Centola formula (A., 1934, 254). E. W. W.

Binary systems of cholesterol with sarcosine anhydride and antipyrine. M. Brandstätter (Z. physikal. Chem., 1943, A, 192, 260— 263).—Contrary to previous reports, the systems cholesterol (I)sarcosine anhydride (II) and (I)-antipyrine do not form mixed crystals but give a mol. compound [2 mols. (I): 1 mol. (II)] and a eutectic [102°, 47% of (I)] respectively. J. H. BA.

Miscibility and molecular compounds in the naphthalene group. A. Kofler and M. Brandstätter (Z. physikal. Chem., 1943, A, 192, 229-259).-M.p.-composition curves for the ten two-component systems which can be made from $C_{10}H_8$, a- and β - $C_{10}H_7$ ·OH, and a- (I) and β - $C_{10}H_7$ ·OH² (II) are determined. All except the (I)-(II) mixture have been examined previously, but more detailed analyses reveal differences from previous results. The system (I)-(II) shows a transition point between two forms of (II), each form giving a cutectic with (I). J. H. B_A .

Isomorphous replacement of chalkogens and ψ -chalkogens in organic compounds. H. Rheinboldt and F. Berti (*Ber.*, 1941, 74, [*B*], 1046-1047).—Thermal analysis by the "thaw-melt" method shows formation of mixed crystals of COPh CH₂Ph (I) with PhSBz [eutectic temp. 40.4°; 53% of (I)] or PhOBz [eutectic temp. 49.2°; 74.5% of (I)]. Mixed crystals are not formed by NHPhBz (II) with (I) [eutectic temp. 51.8°; 4% of (II)], PhOBz [eutectic temp. 66.3°; 5% of (II)], or PhSBz [eutectic temp. 53.7°; 2% of (II)]. R. S. C.

Phase equilibria in hydrocarbon systems. Volumetric behaviour of *n*-butane. R. H. Olds, H. H. Reamer, B. H. Sage, and W. N. Lacey (*Ind. Eng. Chem.*, 1944, 36, 282–284).—P-V curves have been determined for *n*-C₄H₁₀ at 60° intervals between 100° and 460° and at pressures >10,000 lb. per sq. in. The results are in accord with previous observations (A., 1939, I, 135; 1940, I, 202) and expressures > 2000 lb. per sq. in. Che results are in accord with previous observations (A., 1939, I, 135; 1940, I, 202) and at pressures > 3000 lb. per sq. in. also agree fairly well with vals. calc. from the Beattie-Bridgeman equation of state, but larger J. W. S. discrepancies occur at higher pressure.

Phase equilibria in hydrocarbon systems. Compositions of co-existing phases of [the] *n*-butane-water system in the three-phase region. H. H. Reamer, R. H. Olds, B. H. Sage, and W. N. Lacey (*Ind. Eng. Chem.*, 1944, **36**, 381–383).—At temp. >37.8° there exist two liquid phases and one gas phase. The compositions of the gas phase and of the liquid phase of lower d were determined through-out the three-phase region. The liquid phase of lower d has a crit. temp. of 152° and a crit. pressure of 637.5 lb. per in.² J. W.

Iron-nickel-sulphur system. Introduction with new data on crystallisation of pyrrhotite and pentlandite. J. E. Hawley, G. L. Colgrove, and H. F. Zurbrigg (*Econ. Geol.*, 1943, 38, 335-388; *Nickel Bull.*, 1943, 16, 180).—Experiments showed that for low-S melts of Fe and Ni, FeS [pyrrhotite (I]] enters into a peritectic reaction with a Ni-rich liquid, forming a ternary solid solution which on final cooling is equiv. to pentlandite (II). Natural (II) appears to have a const. composition (FeNi)₉S₈ with Fe: Ni = 10:11. Synthetic (II) prepared from melts of varying composition ranged from 45 FeS-55 NiS to 10 FeS-90 NiS. In another series of experiments, using material of lower S content, a compound close of experiments, using material of lower S content, a compound close to the composition 30 FeS-70 NiS, and approximating to the Fe: Ni ratio of $(FeS)_2Ni_3S_2$, was obtained. This compound was indistinguishable from (II). Cooling-curve data suggest that whilst the peritectic type of crystallisation may occur with low S contents, a solid-solution series between Fe sulphide and Ni sulphide may form over a still wider range. Textural relations between natural (I) and (II) are reviewed and new evidence is produced for the existence of a natural nickeliferous (I) solid solution. The mode of crystallisation of non-aq. Fe-Ni sulphide liquids is traced on the basis of studies of natural ores and experimental data. The importance of S content is emphasised. No evidence was found that such sulphide liquids are immiscible. R. B. C.

Volatility of chromium halides and equilibria in the chroming of iron. C. Wagner and V. Stein (Z. physikal. Chem., 1943, A, 192, 129–156).—The v.p. of CrCl₂, CrCl₃, and CrBr₃ in an atm. of N₂, and CrCl₂ pressures in varying HCl-H₂ mixtures, are determined to tracing term. and various temp. These give equilibrium consts. of the reaction 2HCl (g.) + Cr (s.) = H₂ (g.) + CrCl₂ (l.) which agree with previous determinations. These results, with the corresponding ones for the Fe system, are discussed in relation to the chroming of Fe, and vals. of the equilibrium const. for the reaction $CrCl_2(g) + Fe(s.) =$ $FeCl_2$ (g.) + Cr (s.) are calc. I. H. BA.

Crystallisation volumes of the quaternary reciprocal system Na, K||F, Br, I. N. S. Dombrovskaja (*Compt. rend. Acad. Sci. U.R.S.S.*, 1943, 39, 57-60).—The constitution diagram of the Na, K||F, Br, I 1943, 39, 57–60).—The constitution diagram of the Na, $K_{\rm B}$, $F_{\rm B}$, 1 system, in the form of a tetrahedral prism, separates into three crystallisation vols.: (1) NaF, the largest, (2) KF, (3) continuous solid solutions of NaBr, NaI, KBr, and KI. The lowest temp. for coexistence of three solid phases is 520°, and the composition at this temp. is 4.5% NaF, 31% KBr, 31% KI, 33.5% KF. The most stable ternary diagram cross-section is NaF-KBr-KI. A. J. M.

Thermodynamics of the manganese ion. II. Thermodynamics of the manganese ion and the specific heats of ions in solution. III. Apparent volume of the manganese ion in aqueous solution. A. Kapustinski (*Acta Physicochim. U.R.S.S.*, 1942, **17**, 152-166, 167-172; cf. A., 1941, I. 417).—II. The sp. heats of aq. solutions of $MnCl_2$ (0.6% to saturation) were determined at 25°, and partial molal heat capacities for the MnCl₂ and H₂O were calc. The apparent heat capacity is a linear function of the square root of the molal core assuming that the heat capacity at infinite dilution molal concn. Assuming that the heat capacity at infinite dilution (C_p^0) of the H^{*} ion is zero, C_p^0 vals. at 25° were calc. for Li^{*}, Na^{*}, K^{*}, Cl['], Br['], I['], SO₄^{''}, Mg^{**}, Mn^{**}, Ca^{**}, and Ba^{**} in aq. solution. C_p^0 can be divided into two parts; the first has a positive sign and is expended on the increase of the thermal motion of the ions in

the solution; the second has a negative sign, is larger numerically, and represents the change of ionic hydration with temp. C_p^0 for ions of equal valency in aq. solution is a linear function of the reciprocal of the ionic radius.

III. Determinations of d of aq. solutions of MnCl₂ (0.6% to satur-ation) were carried out at 25°. For all solutions except those of the highest conens., the formula $d_2^{25} = 0.9971 + 0.00786p + 1.313 \times 10^{-4}p^2$, where p is the wt.-% of MnCl₂, holds with an accuracy of 0.2%. From the results, the sp. vols. of the solutions and apparent molal vols. (\$\phi\$) of the MnCl₂ in the solutions were calc. ϕ is a linear function of $\sqrt{(\text{molality})}$. ϕ at infinite dilution for Mn^{**} in aq. solu-tion is -48, indicating considerable hydration. The electro-striction curve for the system MnCl.-H.O is similar to the curve of striction curve for the system $MnCl_2-H_2O$ is similar to the curve of thermal expansion coeffs. of aq. solutions of $MnCl_2$ in its dependence J. F. H. on concn.

Heat of hydration of gaseous ions. F. H. Lee and Y. K. Tai J. Chinese Chem. Soc., 1942, 9, 41-45).—The authors' theory (A., 1943, I, 229) has been utilised to calculate the mol. heats of hydration of gaseous ions. The results for alkali and alkaline-earth metal ions are in approx. accord with the empirically deduced vals. J. W. S.

Variation of the heat of dissolution of sodium thiosulphate pentahydrate with the temperature. M. Colomina Barberá (Anal. Fis. M_{a_2} M_{a of dissolution is positive. F. R. G.

Heats of acetylation of a- and β -d-glucose from the heats of com-bustion of the penta-acetates. T. H. Clarke and G. Stegeman (J. Amer. Chem. Soc., 1944, 66, 457-459).- ΔH of combustion at 25° and 1 atm. of a- and β -d-glucose penta-acetates have been determined and 1 atm. of a and β -d-glucose penta-acetates nave been determined calorimetrically, and are a 537.36, β -533.25 kg.-cal. per g.-mol. C_p at 25° are a-0.301, β -0.305 g.-cal. per degree per g. ΔH of formation and of the reactions d-glucose (s) + 5AcOH (1) \rightarrow d-glucose penta-acetate (s) + 5H₄O (1) and d-glucose (s) + 2.5Ac₅O (1) \rightarrow d-glucose penta-acetate (s) + 2.5H₄O (1) are : a-, -304.28, 6.32, and -30.88; β -, -302.76, 8.92, and -28.29 kg.-cal. per g.-mol. W. R. A.

P Maxwell's demons and the second law of thermodynamics. Demers (Canad. J. Res., 1944, 22, A. 27-51).—It cannot be regarded as possible to open a shutter between two compartments by the expenditure of an infinitesimal amount of energy, but only that of an amount $\sim kT$. The second law may be formulated "A system at a single temp, cannot produce useful work." This formulation is shown to be supported by quantum emission laws. L. J. J.

VII.—ELECTROCHEMISTRY.

Elementary mechanism of aqueous electrolysis. P. Jolibois (*Compt. rend.*, 1942, 215, 319—321).—Starting from the theory of Arrhenius, the min. potential for electrolysis and other phenomena can be explained with the help of the postulate of ions surrounded with the help of the postulate of ions surrounded by the present of the postulate of ions surrounded by the present of the postulate of ions surrounded by the present of the postulate of ions surrounded by the postulate of ions surrounded with an electrostatically charged H₂O layer. N. M. B.

Electrolytic solution pressure of copper wires under strain. L. R. Gautam and J. B. Jha (Proc. Indian Acad. Sci., 1943, 18, A, 350-354).—P.d. between longitudinally strained and unstrained Cu wires, of various diam., in 0.04 and 0.004 \times . aq. CuSO, have been measured. The potential of the wires becomes more positive as the strain increases. It is suggested that work is necessary to detach ions from the metal surface, and that this work is greater at strained W. R. A. than at unstrained surfaces.

Correlation of solution potentials with orientations of single crystals of high-purity aluminium. C. J. Walton (*Trans. Electrochem. Soc.*, 1944, 85, *Preprint* 7, 71-84).—Large crystals of Al were prepared 1944, 85. Preprint 7, 71-84).—Large crystals of Al were prepared and the solution potentials of polished faces and the resistance of the faces to attack by conc. HCl were measured. The differences in solution potentials among faces of widely different orientations were <2 mv., faces with orientations approaching that of an {001} plane tending to have a lower potential than faces with orient-ations approaching a {111} plane. The {111} plane is more readily attacked by HCl than the {001} plane. C. R. H.

Theory of the discharge of hydrogen ions. II. Mercury. Con-centrated solution of acids. S. Jofa and A. Frumkin (Acta Physico-chim. U.R.S.S., 1943, 18, 183-193; cf. A., 1939, I, 614).—The decrease in overvoltage (η) in conc. acid solutions is determined by the charge in the boundary layer structure of the intermediate by the change in the boundary layer structure and the increase in [H']. The change in activity coeff. is relatively ineffective. Changes in η in HCl-KCl and HCl-LiCl solutions at equal concess are approx. equal. A linear relation is found between the adsorption potential equal. A linear relation is found between the distribution point point of $H^*(\psi_1)$ and log (mean *a* val. for positive and negative ions) in the acid. The change in ψ_1 is < the val. calc. from the change in ψ_1 . L. J. J.

VIII.—REACTIONS.

Rupture of chains in chain reactions at the surface of solid bodies. N. N. Semenov (Acta Physicochim. U.R.S.S., 1943, 18, 93-147). The author's mathematical theory of chain reactions is applied to the precise formulation of kinetic equations for reactions involving chain rupture at the walls in plane, cylindrical, and spherical vessels, and in cylindrical and spherical vessels of quartz or glass enclosing metallic rods or spheres. Limits of inflammation in such vessels, and in a dusty gas, and the effect of addition of inert gas, are considered. The theory of the operation of anti-detonators is quantitatively formulated. L. J. J.

Self-diffusion and chemical reaction in solids using emanation as indicator. R. Jagitsch (*Chalmers Tekn. Högskol. Handl.*, 1942, No. 11, 47 pp.).—The use of emanation as an indicator is recommended in a rapid method of investigating self-diffusion and chemical reactions occurring between solids. The method can also be used for the investigation of the connexion between ionic migration and conductivity of electronic conductors, and for investigation of recrystallisation processes and reaction kinetics. A. J. M.

Exchange reactions between solid and liquid phases. R. Daudel (*Compt. rend.*, 1943, **217**, 239—240).—In the case of a pptd. salt in a solution of a salt with the same anion, or the same cation, there is rapid exchange at first, but this soon becomes very slow. The rate of exchange during this latter stage is dependent on coron. according as there is a tendency for the ions in the solution to form complexes with the solid. Thus, with AgCl and KCl, where there is such a tendency, the rate depends considerably on [KCl], whereas with MnSO₄ and MnS the rate is almost independent of [MnSO₄]. A. J. M.

Chemical reactions in shock waves. J. Zeldovitsch and O. Leipunski (*Acta Physicochim. U.R.S.S.*, 1943, **18**, 167–171).—A gas mixture $2H_2 + O_2 + 5A$ can be ignited by firing a round-nosed Al bullet through it (impact with solid bodies being excluded) at ~2000 m. per sec., corresponding with a max. temp. in the gas compressed in front of the nose of the bullet of 2640° K. L. J. J.

Hydroxyl in flames. L. I. Avramenko (*Acta Physicochim. U.R.S.S.*, 1942, 17, 197-210).—The [OH] in rarefied H₂ flames, with the pressure of the H₂-O₃ mixture ~40 mm., are >10⁴ times the equilibrium vals. Hence the chemical reaction and not equilibrium dissociation is the source of OH in the flame. The dependence of [OH] on the rate of reaction confirms this result. Measurements of the distribution of OH in a rarefied cone of H₂ flame show the presence of an OH cloud around the visible cone. In non-rarefied H₂ flames the [OH] becomes comparable with the equilibrium conc.

Thermal reactions of acetylene. I. Kinetics and mechanism of thermal polymerisation of acetylene and its reaction with nitrie oxide. D. A. Frank-Kamenetzki (Acta Physicochim. U.R.S.S., 1943, 18, 148-156).—The thermal polymerisation of C_2H_2 at 400—700° and 50—760 mm. occurs in three stages: (i) an induction period without change of pressure, (ii) a homogeneous bimol. dimerisation, (iii) a heterogeneous reaction with formation of high polymers, H_2 , and C. NO prolongs (i), and polymerisation is delayed until the NO is consumed. The temp-dependence of (i) and (ii) corresponds with the same activation energy. The kinetics agree with a scheme involving primary combination of $2C_2H_2$ or two radicals, the latter at a slow rate. L. J. J.

Oxidation of beryllium. H. Terem (Rev. Fac. Sci. Istanbul, 1943, 8, A, 9-22).—The kinetics of the oxidation of Be have been studied to examine the validity of Valensi's law. Four samples of Be were used, containing $\Rightarrow 4.2\%$ Si and 0.6% Fe. For oxidation at const. temp. there is an initial induction period for all samples, that for the purest sample (0.61% Si and 0.2% Fe) being the least. In this case the amount oxidised tended to be related parabolically to the temp. and thus to react as expected from Pilling and Bedworth's generalisation (B., 1923, 359). The activation energies are different for the various samples owing to the differing degree of impurity. H₂O acts as a powerful catalyst. Oxidation in O₂ shows that nitride formation is not the cause of the inapplicability of Valensi's law as the induction period is again observed. The oxide skin formed gradually on Be at normal temp. does not greatly affect the kinetics. The mode of prep. of the powdered metal, especially the sifting, has a marked effect on the course of oxidation and rests of a few days between experiments cause an increase in the velocity owing to the absorption of H₂O by the oven. For oxidation with linearly increasing temp. the rate of oxidation increases parabolically with temp. and the general course of the reaction is independent of the rate of increase of temp. For the purest sample, oxidation is $>500^{\circ}$ and decreases with particle size. Results obtained with varying amounts of Be are compared and the optimum amount is shown to be 0.2 g. J. O'M-B.

Differential equation for the kinetics of contact unimolecular reactions investigated by the flow method. A. A. Balandin (*Acta Physicochim. U.R.S.S.*, 1942, 17, 218-223).—Theoretical. The results are applied to the dehydrogenation of alcohols and to contact isomerisation. I. F. H.

Steady-state approximation in polymerisation kinetics. W. H. Stockmayer (J. Chem. Physics, 1944, 12, 143-144).—The application of the Bodenstein steady-state method to the calculation of

the conen. of the free radical intermediates in vinyl polymerisations is discussed. C. R. H.

Disturbances in crystal lattices and their influence on chemical reactions and surface activity.—See A., 1944, I, 167.

History of earbonyl metals. A. Mittasch (Kolloid-Z., 1943, 104, 139-141).—A review dealing chiefly with the work of the author on the kinetics of formation of $Ni(CO)_4$, the prep. of Fe carbonyls and of "carbonyl" Fe from the latter by thermal decomp. The uses of "carbonyl" Fe and Ni (*i.e.*, finely-divided Fe and Ni) are mentioned. A. J. M.

Sodium chloride as catalyst in silicate-forming reactions in the solid phase. L. M. Bliumen (*J. Appl. Chem. Russ.*, 1943, 16, 81–86),—NaCl catalyses the interaction of CaO with clays, resulting in the formation of silicates and aluminates at relatively low temp. (~1000°). Trials on a large scale showed that the addition of 0.7–1% of NaCl greatly improved the resistance of bricks to weather and to disintegration by H_3O . V. B.

Reactions of the type (A) solid + B (solid) \rightarrow AB (solid). IV. Review of mechanism of chemical reactions between solids. II. G. F. Hüttig (Kolloid-Z., 1943, 104, 189–198; cf. A., 1943, I, 22). The changes undergone by powdered Cu and Sn in the course of gradual heating to high temp. have been investigated. Pure Cu and Sn powders, and mixtures of 3 Cu-1 Sn and 1 Cu-1 Sn, were heated in H₂. The solubility of the heated Cu in $0.02n-HNO_3$ and of Sn in 0.1n-HCl was determined. The addition of Sn reduces the reactivity of the Cu, but addition of Cu to Sn tends to increase the reactivity of the latter. Allotropic changes may explain the considerable increase in reactivity of pure Sn with acids after heating to 180°. This increase in reactivity is carried over to the Cu in mixtures of Cu and Sn, independent of composition. Pure Cu shows no increase of reactivity after having been heated to this temp. The adsorption isotherms for MeOH vapour were determined. Mixtures of Cu and Sn powders at room temp. show smaller adsorption than the individual components. This must be due to a decrease in the area of adsorbing surface. The size of the capillary pores in the mixture is between those of the components. Pure Sn adsorbs better than Cu. In the case of pure Sn there is a sudden decrease in adsorption on heating to $\sim 160^\circ$, but it rises to a max. again at 170°, after which there is a decrease to the m.p. In the again at 10, after which there is a decrease to the prime in the mixtures, the max was not so well defined. Vol. changes on heating were also investigated by the pyknometer method. The catalytic effect on the decomp. of H_2O_2 was studied. Catalytic activity increases if the Sn is heated to 170°, and then decreases, at first slowly, then rapidly. The catalytic activity in the case of (3 Cu-1 Solv was the same as, or with (1 Cu-1 Sn) >, that of the components. The results are discussed on the supposition of the occurrence of a diffusion process, and the existence of an adsorption layer. The effects taking place when the substances are heated over the range 150-200° are specially considered. A. J. M.

Kinetic study on the dehydrogenation of cyclohexane. A. A. Balandin and F. L. Kostin (Acta Physicochim. U.R.S.S., 1942, 17, 211-217).—The catalytic dehydrogenation of cyclohexane was investigated at $380-530^{\circ}$ with Cu on Cr_2O_3 (I), Cu on Cr_2O_3 with BaO (II), and Cr_2O_3 from $Cr_2(CrO_3)_3$ (III) as catalysts. C_8H_6 is the main product, the yields at 530° being 100% with (I), 13% with (II), and 51% with (III). Contrary to usual results, catalyst (III) did not lose its activity after 80 hr. in use. With increasing temp. the yield of unsaturated hydrocarbons obtained with (III) decreased. Determination of the activation energy and the pre-exponential factor for the reaction show that the sextet mechanism proposed previously (A., 1937, I, 90) is operative for reaction on catalyst (I); in the other cases the duplet mechanism occurs. J. F. H.

Polymerisation of isobutene on hydrated silicate catalysts. III. B. A. Kazanski and M. I. Rozengart (J. Gen. Chem. Russ., 1943, 13, 304-308).—Products, similar in composition and yield, are obtained when iso-C₄H₈ (I) is polymerised in the presence of Gayer (hydrated Al₂O₂-SiO₂) catalyst or of "solid phosphoric acid" (H₄P₂O₂ on kieselguhr); a similarity in their mode of action is indicated. Catalysts prepared by Gayer's method (B., 1933, 997), in which Al is replaced by Zn or TI⁴, are incapable of polymerising (I). A similar Th catalyst was active but rapidly became poisoned by deposition of non-volatile products; this catalyst showed a very mild action, since the liquid product contained almost 50% of dissobutene and practically no isomeric dimerides. It is suggested that these catalysts we their activity to the acidic properties of the hydrated metallic silicates dispersed over the surface; the neutral silicates (of Zn and TI⁴) are inactive. R. C. P.

Catalytic behaviour of thermally-pretreated copper powder with respect to the decomposition of formic acid vapour. K. Sedlatschek (Kolloid-Z., 1943, 104, 203-208).—Cu powder was heated to various temp. in HCO₂H or H₂ and the activity as regards catalytic decomp. of HCO₂H vapour was determined. The activity was considerably affected by this pretreatment, the activation energy showing two max. (250-280° and 540°). These are explained by consideration of the processes taking place during the preheating, some affecting the surface, others the lattice. Preheating in HCO₂H vapour brings

the max. closer together, and makes it more difficult to distinguish between surface and lattice processes. The decomp. of $HCO_{2}H$ vapour by the same catalyst is reproducible, but it is difficult to prepare Cu catalysts of the same activity. Reproducibility of activation energy can be more easily attained than activity and no. of active centres. The activation energy of Cu powders depends on how long they are kept between periods of use, and in what atm. A. I. M.

Catalytic vapour-phase oxidation of fatty oils.—See B., 1944, II, 172.

Electrolysis of fused sodium sulphate. I. H. vom Hove and F. Müller (Z. anorg. Chem., 1943, 250, 377–388).—Metals, C. and electrically-conducting metallic sulphides are attacked by fused Na_2SO_4 , but Fc_3O_4 is unchanged. In the electrolysis of fused Na_2SO_4 between Fc_3O_4 clectrodes, SO_2 or SO_3 and O_2 are evolved at the anode and Na_2O is formed at the cathode. At the same time the cathode is converted into $NaFeO_2$, and Na_2SO_3 , Na_2S , and FeS are formed by cathodic reduction. F. J. G.

Chemiluminescence of lucigenin. B. J. Sveschnikov and P. P. Dikun (*Acta Physicochim. U.R.S.S.*, 1942, 17, 173–184).—The kinetics of chemiluminescence of lucigenin (I) in aq. H_2O_2 -NaOH solution were studied at 18° and 50°. The behaviour is similar to that observed with 3-acetamidophthalhydrazide (II) (A. 1938, I, 600), the main difference being that the curve connecting intensity of luminescence with time for (I) shows no max. This is in part contradictory to Drew's hypothesis (A. 1939, I, 125), but it appears that the first stage of the luminescence process is the same for (I) and (II), viz., the formation of a peroxide. J. F. H.

Mercury-photosensitised polymerisation of acetylene. D. J. Le Roy and E. W. R. Steacie (*J. Chem. Physics*, 1944, **12**, 117-124).— The rate of the $Hg({}^{3}P_{1})$ -photosensitised polymerisation of $C_{2}H_{2}$ at 25° increases rapidly with pressure up to ~5 mm, but at higher pressures the increase is less marked. The rate increases with temp. up to ~250° and then decreases, the temp. coeff. being small. The quantum yield is $4 \cdot 5 \pm 1 \cdot 2$ at 25° and 40 mm. Polymerisation is inhibited by NO, indicating that free radicals rather than excited mols. are involved, and a probable mechanism for such a reaction is suggested, the primary step being $Hg({}^{3}P_{1}) + C_{2}H_{2} \rightarrow C_{2}H +$ $H + Hg({}^{1}S_{0}) \rightarrow C_{2}H + HgH \text{ or } \rightarrow HgC_{2}H + H. Inhibition by$ $NO also occurs when the reaction is photosensitised by Cd({}^{3}P_{1})$ $or Cd({}^{1}P_{1}).$ C. R. H.

Action of X-rays on hydrogen sulphide. J. Loiseleur (Compt. rend., 1942, 215, 536-537).—Under the action of Mo K_a radiation, an aq. solution of H_2 S undergoes "electrolysis" with liberation of S. Measurements show that the amount of S increases with the concn. of the solution, and, for very small concns., the S is suspended in colloidal form, but appears as a rapidly settling ppt. at higher concns. N. M. B.

Spectral study of a luminescent reaction.—See A., 1944, I, 116.

Piccardi phenomenon. Measurement of activation and character of crystalline deposits from activated [natural] water. A. Manfredi (Gazzetta, 1942, 72, 529-537).—The temp, at which microcrystals of CaCO₃ appear on the surface of hard natural H_2O is reduced by "T" activation (cf. Piccardi, A., 1940, I, 112), and increased by "R" activation by a high-frequency discharge between a stainless steel electrode and a Ciccotti element (a Ne tube with single central electrode; cf. C., 1944, Part 3). Increase in temp. is const. for const. activation, and increases smoothly with time of activation. The greater is the increase in temp., the smaller are the microcrystals formed. E. W. W.

IX.—PREPARATION OF INORGANIC SUBSTANCES.

Cyclotron targets. Preparation and radiochemical separation. II. Krypton. S. C. Brown, J. W. Irvine, jun., and M. S. Livingston (J. Chem. Physics, 1944, 12, 132-134).—If NaBr is bombarded with neutrons and the crystals, which contain radioactive Na, Br, and Kr, are melted in a monel metal tube, the released gas contains radioactive Kr free from measurable amounts of radioactive Br. Another method is to bombard fused and powdered NaBr and to dissolve the powder in 0.01M-NaOH under reduced pressure. The radioactive Kr is removed by sweeping CO, through the solution. C. R. H.

Preparation of sodium nitrite. W. T. Cooke (J. Proc. Austral. Chem. Inst., 1944, **11**, 49–51).—A charge of NaNO₃ is melted with Pb in an Fe ladle at 400–450°. The reaction $Pb + NaNO_3 =$ PbO + NaNO₂ proceeds rapidly on the surface but lengthy heating and stirring are necessary to produce a good yield. After cooling, the melt is treated with H₂O, any sol. Pb removed by a current of CO₂, and nitrous fumes are aspirated through the liquor to neutralise excess of alkali. Fractional crystallisation yields first crops containing 85–90% of NaNO₂. Further low-grade crops are best fused again with Pb. J. C. C.

Preparation of cupric sulphate by aërial oxidation. K. K. Jeu and C. T. Hsu (J. Chinese Chem. Soc., 1943, 10, 40–47).—The rate of dissolution of Cu in H_2SO_4 (0.5–6N.) in presence of air has been

studied by repeatedly pouring the acid over scrap Cu and also by intermittent immersion of Cu plates in the acid. The rate of dissolution during intermittent immersion in H_2SO_4 saturated with CuSO₄ has also been studied. From the results it is inferred that 2x- H_2SO_4 causes most rapid dissolution and also dissolves the largest total amount of Cu. J. W. S.

Ammine of basic copper chromate. W. H. Hartford (J. Amer. Chem. Soc., 1944, 66, 312).—Basic Cu carbonate (14-3) and $(NH_4)_2Cr_2O_7$ (4-4 g.) in H_2O (40 ml.) with conc. aq. NH_3 (50 ml.) at room temp. (not colder) give the compound, $2CuO_4NH_3$, CrO_3 , H_2O .

K. S. C. Complex compounds of cupric azide. VI. Azidocuprates of the elements of the first and second groups of the periodic system. M. Straumanis and A. Cirulis (Z. anorg. Chem., 1943, 252, 121– 125).—The following azidocuprates are described: $K[Cu(N_3)_3], H_2O;$ $K[Cu(N_3)_3]; Rb[Cu_2(N_3)_8]$ (I); $Cs[Cu_2(N_3)_5]$ (II); $Sr[Cu(N_3)_4], 3H_2O$ (III). (I) explodes at 230–233°, (II) at 210°; both are sensitive to shock. (III) explodes on dehydration. F. J. G.

Preparation of calcium and sodium formates. N. N. Zabolotskaja, E. I. Lukianova, and D. N. Schoichet (J. Appl. Chem. Russ., 1943,16, 118—128).—The production of $(HCO_2)_2Ca$ by the direct action of CO or of producer gas on $Ca(OH)_2$ is catalysed by alkali metal salts. Optimum conditions are a temp. of $180-200^\circ$ and CO pressure of 20-25 atm. The presence of H_2O (0.5 atm.) is desirable. HCO_2Na can be simultaneously obtained by the action of CO on equimol. mixtures of $Ca(OH)_2$ with Na_2CO_3 or Na_2SO_4 . The max. yield of HCO_2' (89.7%) was obtained with the former at 6 atm. CO at 200° for $7\frac{1}{2}$ hr. With 8 atm. producer gas at 200° for 24 hr. the conversion into HCO_2' was 88.7%. V. B.

Gallium trimethyl. E. Wiberg, T. Johannsen, and O. Stecher (Z. anorg. Chem., 1943, **251**, 114—124).—GaMe₂ is formed quantitatively from Ga and HgMe₂ at 130°. It has m.p. $-15\cdot8^{\circ}$ and v.p. at $0^{\circ} = 64\cdot5$ mm. With H₂ in the glow discharge it affords $Ga_2H_2Me_4$, with I at 60° GaI₃ and MeI, and with HI, GaI₃ and CH₄. With NMe₃ it forms $GaMe_3,NMe_3$, m.p. $96\cdot2^{\circ}$, and with NEt₃, $GaMe_3,NEl_3$, m.p. $96\cdot2^{\circ}$, and with NEt₃. GaMe₃,NEl₃, m.p. $96\cdot2^{\circ}$, and with net₄. F. J. G.

Phenol-*p*-sulphonates of lanthanum [and other metals]. G. Mannelli (*Gazzetta*, 1943, **73**, 105–108).–(*p*-OH·C₈H₄·SO₃)₂Ba and $M_2(SO_4)_3$ give La, Pr, Nd, and Sm phenol-p-sulphonates, (*p*-OH·C₈H₄·SO₃)₃M,6H₂O. These are too sol. in H₂O to be useful for fractionation. E. W. W.

Diamond problem. P. L. Günther, P. Geselle, and W. Rebentisch (Z. anorg. Chem., 1943, 250, 357-372).—Attempts to synthesise diamond (I) by modifications of Moissan's method, and by subjecting C for a short time to pressures of 120,000 atm. at $3000-3200^{\circ}$, all failed. (I) is unchanged in contact with Fe melts rich in C at $\geq 2000^{\circ}$, but rapidly changes to graphite at higher temp. F. J. G.

Effect of transformation temperature of supercooled austenite on composition of separated carbides. N. N. Sirota (Compt. rend. Acad. Sci. U.R.S.S., 1943, 39, 111—114).—Mathematical. The composition of the carbides separating from a supercooled austenitic steel approximates the more nearly to pure Fe₃C the smaller is the particle size, *i.e.*, the lower is the transformation temp.

М. Н. М. А.

Germanium. XIX. Polymorphism of germanium dioxide. R. Schwarz and E. Haschke (Z. anorg. Chem., 1943, 252, 170–172).— The transformation of pure specimens of the sol. hexagonal modification (I) of GeO₂ into the insol. modification (of rutile type) is often strongly inhibited, but occurs easily at $\leq 380^{\circ}$ in presence of small announts of NH₄F, provided that (I) is initially in thin flakes as obtained by slow evaporation. F. J. G.

Preparation and stability relations of black phosphorus. P. L. Günther, P. Geselle, and W. Rebentisch (Z. anorg. Chem., 1943, 250, 373–376).—Ordinary white P (I) is converted into Bridgman's black P (II) at room temp. by a pressure of 100,000 atm. If not completely freed from traces of (I), (II) changes spontaneously into (I) under ordinary conditions. F. J. G.

Chemistry in liquid sulphur dioxide. XII. Preparation of some anhydrous tetramethylammonium compounds and their behaviour in liquid sulphur dioxide. G. Jander and H. Hecht (Z. anorg. Chem., 1943, 250, 304–311).—The following NMe_4 compounds are described : $(NMe_4)_2S_2O_5$; $(NMe_4)_2S_2O_3$; NMe_4SbCl_4 . Their behaviour in liquid SO₂ is described. F. J. G.

Chemistry in liquid sulphur dioxide. XI. Amphoteric behaviour of some sulphites or oxides in liquid sulphur dioxide. G. Jander and H. Hecht (Z. anorg. Chem., 1943, 250, 287-303).—When $(Me_4)_2SO_3$, which is the analogue of a strong base in the SO₂ system, is added to solutions of SnCl₃, SiCl₄, SbCl₃, SbCl₅, and GaCl₃ in liquid SO₂, ppts. are obtained which redissolve in excess. Conductometric titration curves are in accord with reactions analogous to the pptn. and redissolution of an amphoteric hydroxide in the H_2O system. Sn dissolves in a solution of $(NMe_4)_2SO_3$ in liquid SO₂, and the reaction products contain Sn^{IV} and S₂O₃". This reaction is interpreted on the same analogy. F. J. G. Salts of phenolsulphonic acids. G. Manelli (Gazzetta, 1943, 73, 109-113).—The solution derived from aq. $(p-OH \cdot C_6H_4 \cdot SO_3)_2$ Ba (I) and CuSO₄ when treated with an aq. Ca(OH)₂ gives the basic salt $C_6H_{10}O_{10}SCu_4$. The solution from (I) and ZnSO₄ gives only Zn(OH)₂. E. W. W.

Reactions in liquid ammonia. I. Ammonolysis of sexavalent chromium derivatives. H. H. Sisler (*Trans. Kansas Acad. Sci.*, 1943, 46, 136—141).—KCrO₂Cl (I) is prepared by adding CrO₂Cl₂ dropwise to aq. K₂CrO₄ at 100°, cooling, and separating (I). CrO₃ or (I) and excess of liquid NH₃ (-80° to 0°) give Cr₂O₃ (~25% of the total Cr) and an insol. yellow product (II); at 0° in a sealed tube the reaction miture often inflowed. It is more total the total Cr) and an insol. the reaction mixture often inflames. It is suggested that (II) is an ammiono-chromate. M. H. M. A.

Tungsten oxides. O. Glemser and H. Sauer (Z. anorg. Chem., 1943, 252, 144-159).-W oxide preps. were synthesised from W 1943, 252, 144—159).—W oxide preps. were synthesised from W and WO₂, and their X-ray diagrams, ρ , and conductivity determined. The following phases exist: a, WO₃ to WO_{2.95}, in which the least deficiency of O below WO₂ produces a blue colour; β , WO_{2.92} to WO_{2.85}; γ , WO_{4.76} to WO_{2.45}, which gives an X-ray diagram identical with that of the oxide W₄O₁₁ described by Ebert and Flasch (A., 1934, 378) although their interpretation is not confirmed; δ , WO_{2.05} to WO₂. There is no oxide lower than WO₂. Products obtained by reduction of WO₃ with H₂-H₂O mixtures were identical with these phases, but reduction of H₂WO₄ afforded instead of β two new phases which contain H. Both of these on further eduction afford γ . One of them has the ReO₃ structure with a = 3.746 A. It is the H-analogue of the W bronzes, and may be 3.746 A. It is the H-analogue of the W bronzes, and may be formulated WO_3, nH_2 where n < 1, and in which the H atoms are irregularly placed in the lattice. The other new phase is closely related to this, and so are the so-called hydroxides of Ebert and Flasch (A., 1936, 174). F. J. G.

Composition of tungsten-blue. O. Glemser and H. Sauer (Z. anorg. Chem., 1943, 252, 160-163).—The composition of W-blue depends on the conditions of its formation. Specimens which are oxidisable in air contain the α phase of the W-O system (cf. preceding abstract), with an O content somewhat < that of WO₃, whereas those stable in air contain WO_3, nH_2 . F. J. G.

Partial separation of uranium light isotope by thermodiffusion. A. E. Brodski (Acta Physicochim. U.R.S.S., 1942, 17, 224-227).-Calculations are made of the necessary equipment and efficiency for the separation of 235 U by thermal diffusion using UF₈. The energy expended in separation is 40–80% of that yielded by fission of the 236 U nuclei. J. F. H. J. F. H.

Enrichment of ³⁷Cl in carbon tetrachloride by thermal diffusion. A. Fournier (Compl. rend., 1942, 215, 529-530).-Experiments by the Clusius-Dickel method are reported. The enriched CCl, is subjected to the transformation steps $CCl_4 \rightarrow CHCl_3 + ZnCl_2 \rightarrow$ AgCl, and the enrichment is detected by measurements of ρ and n. N. M. B.

Decomposition of hypochlorites in solution. P. Pierron (Compt. rend., 1942, 215, 354-355) .- Investigations on the salts of Na, K, and Li, under similar sets of conditions of temp., concn., alkalinity, and acidity, indicate the transitional formation of peroxides which effect decomp. of one part of the hypochlorite into chloride and O2 and oxidation of the other part to chlorate. N. M. B.

Cyanic acid. V. Carbamato-cobaltic complexes. M. Linhard and H. Flygare (Z. anorg. Chem., 1943, 251, 25-44).—Attempts to prepare cyanato-complexes by the action of KOCN or AgOCN on aquo-cobaltamine salts results in the formation of carbamato-complexes. aquo-cooattaminine saits results in the formation of carbamato-complexes. The reaction is rapid and notably exothermic $(q \sim 15 \text{ kg.-cal. per g.-mol.})$ and involves direct addition of the OCN' ion to the complex-bound H₂O mol. The following compounds are described : $X(NO_3)_2$ (I); XSO_4 , H₂O (II); $X(HSO_4)_2$; XBr_2 (III); XI_2 (IV); XS_2O_8 (V; $XCrO_4, xH_2O$ [$X = Co(NH_3)_5CO_2\cdot NH_2$]; $Y(NO_3)_2$; YS_2O_8 [$Y = Co(NH_3)_4(H_2O)CO_2\cdot NH_2$]. Solubilities are recorded as follows: (I), 0.0778; (II), 0.220; (III), 0.629; (IV), 0.188; (V), 0.0005 g.-mol. per l. at 20°. F. J. G.

Composition and mechanism of formation of nickel hydrides I. Composition. A. A. Balandin, B. V. Jerofeev, K. A. Pecher-skaja, and M. S. Stachanova (*Acta Physicochim. U.R.S.S.*, 1943, **18**, 157–166).—Ni hydride is formed in the reduction of NiCl₂ with organo-Mg halide solutions in an atm. of H₂, and has the composition NiH₄, whilst NiH₂ is absent in these conditions. NiH₄ has been isolated and analysed by decomp at 100° Excess over has been isolated and analysed by decomp. at 100°. Excess over the theoretical amount of H_2 is absorbed during the prep. of NiH₄, owing to catalysis of hydrogenation of the C₈H₅ nucleus of the MgPhCl used. NiH₂ is formed by the partial decomp. of NiH₄.

L. J. J Metallic carbonyls. XLV. Rhodium in the system of the metallic carbonyls. W. Hieber and H. Lagally (Z. amorg. Chem., 1943, 251, 96–113).—The compound prepared by Manchot and König (A., 1925, ii, 1193) by the action of CO on hydrated RhCl₃ at >100°, and formulated Rh₂OCl₃, 3CO, is *Rh dicarbonyl monochloride*, [Rh(CO)₂Cl]₂, m.p. 123°. The corresponding bromide, [Rh(CO)2Br]2, m.p. 118°, is

formed under analogous conditions, and these and the *iodide*, $[Rh(CO)_2I]_x$, m.p. 114°, may be obtained by high-pressure synthesis from the anhyd, halides and CO. High-pressure synthesis with CO and either metallic Rh or RhCl₃ in presence of Cu or Ag under various conditions affords the following *Rh* carbonyls: $[Rh(CO)_4]_r$, m.p. 76°; $[Rh(CO)_3]_r$, decomp. 150°; and $[Rh_4(CO)_{11}]_r$, decomp. 220°, and *Rh* carbonyl hydride, $Rh(CO)_4H$, m.p. -10° to -12° .

F. I. G.

Hydroxylamine and hydrazine complex compounds of platinum and palladium. I. Hydroxylamine compoints of platinum and palladium. I. Hydroxylamine compounds of platinum. V. I. Goremikin and K. A. Gladischevskaja (*Bull. Acad. Sci. U.R.S.S., Cl. Sci. Chim.*, 1943, 108—116).—Pt^{II} in *cis*-platotetrammines can be oxidised by NH₂OH to Pt^{IV} with formation of "inorganic quin-hydrones." *cis*-[Pt(NH₃)₂(NH₂OH)₂]Cl₂ with 48% HBr at 100° yields the *compound* [Pt(NH₃)(NH₂OH)Br₂][Pt(NH₃)(NH₂OH)Br₄] (I), brown crystals stable at 110° which are decomposed by COMe₂ to [Pt(NH₄)(NH₄OH)Br₄] (II) isolated after being transformed into

(I), brown crystals stable at 110° which are decomposed by COMe₂ to $[Pt(NH_3)(NH_2OH)Br_3]$ (II), isolated after being transformed into $\{Pt(NH_3)(NH_2OH)[CS(NH_2)_2]\}Br_2$, and the compound $[Pt(NH_3)(NH_2OH)Br_4]$ (III), orange crystals. (I) is obtained also by moistening a powdered mixture of (II) and (III) with dil. HBr. In a small yield are obtained the compounds: trans-trans- $[Pt(NH_2OH)_2Br_2][Pt(NH_2OH)_2Br_4]$, brown crystals, by heating $[Pt(NH_3OH)_4]Cl_2$ or $[Pt(NH_2OH)_2](OH)_3$ with 30% HBr, and trans-trans- $[Pt(NH_2OH)_4]Cl_2$ or $[Pt(NH_2OH)_2](OH)_3$ with 30% HBr, and trans-trans- $[Pt(NH_2OH)(C_5H_5N)Br_2][Pt(NH_2OH)(C_5H_5N)Br_4]$, brown crystals, from cis- $[Pt(NH_2OH)_2(C_3H_5N)_2]Cl_2$ and 20—30% HBr. I. J. B.

J. J. B.

XI.—GEOCHEMISTRY.

Chemistry of sea-water : elements present in traces. H. Wattenberg (Z. anorg. Chem., 1943, 251, 86-91; cf. A., 1938, I, 280). F. J. G.

Chemistry of sea-water: dissolved gases. H. Wattenberg (Z. anorg. Chem., 1943, 251, 71-85).—A review. Methods of analysis and equilibrium relationships and distribution of A, N_2 , O_2 , and CO_3 (CO_3 '', HCO_3) at various depths are discussed (see also C 1011) (CO_3'', HCO_3') at various depths are discussed (see also C., 1944, Part 3). F. J. G. F. J. G.

Carboniferous brines of the Polasna-Krasnokamsk anticline. A. M. Kuznetzov and S. N. Novikov (Compt. rend. Acad. Sci. U.R.S.S., 1943, 39, 61-64). Brines containing H₂S were found during oildrilling in the Middle and Lower Carboniferous rocks of the Kama triang in the windthe and Lower Carbonierous focks of the Kama region. They are saturated with $CaSO_4$. The pH does not vary greatly (4·11—4·63); [Ca]/[Mg] = 1·86—2·85; [NH₄]/[Br + I] = 0·87 - 1·30. [H₂S]•in H₂O from the top portion of the Car-boniferous rocks is 0·45 g. per 1000 g. In sub-oil H₂O it is 0·16 g. per 1000 g. In the edge H₂O, [H₂S] is very small, and no H₂S was found in the H₂O of the coal-bearing series, or at the bottom of the Carboniferous. This may be due to the physiological equilibrium of the continue being disturbed but the course public of Co^{**} and the solution being disturbed by the accummulation of Ca" ar Mg". A. J. M. and

Composition of colloid dispersion minerals and the metathetic capacity of glauconites from Saratov [Russia]. I. N. Antipov-Karataev and I. D. Sedletzki (Compt. rend. Acad. Sci. U.R.S.S., 1943, 39, 115-117).---- Glauconites "from Lyssaya Gora (Saratov) 1943, 39, 113-117). Glatconnes from Lyssaya cora (Saratov) contain glauconite \sim 50, montmorillonite \sim 40, and sericite \sim 10%. The X-ray picture remains unchanged on substitution of H, Li, Mg, Na, or Ba for the replaceable cations. The metathetic ability (B.E.V.) for M-BaCl₂ at pH 9 is 31·1 m-equiv. per 100 g. M. H. M. A.

Action of hydrofluoric acid on muscovite. R. Delavault (Compt. rend., 1942, 215, 582-584).-Two different forms of corrosion due to the boiling acid are discussed; one is related to the crystal lattice structure, and the other to physical irregularities or the presence of impurities. N. M. B.

X-Ray scattering from chrysotiles.—See A., 1944, I, 119.

The Panjal traps : acid and basic volcanic rocks. P. N. Ganju (Proc. Indian Acad. Sci., 1943, 18, B, 125-131).—Chemical analyses are recorded and discussed. L. S. T.

Sulphur in the Buguruslan [Russia] oil region. G. I. Theodoro-vitsch (*Compt. rend. Acad. Sci. U.R.S.S.*, 1943, 39, 118—120).—The Buguruslan oilfield is covered in the west by anhydrite (20—30 m.), which splits towards the east into two seams separated by halite. No free S occurs in or above the oilfield itself, but, except on the eastern side, free S occurs around the edges of the field in the zone eastern side, here S occurs around the edges of the field in the zone of oil-H₂O contact. Formation of S probably proceeds by SO₄" \rightarrow H₂S (bacterial?), followed by oxidation of H₂S by O₂ dissolved in mobile stratum H₂O, which originates to the N.N.W. of the oilfield. In the eastern boundary the stratum H₂O is not mobile and thus does not carry O₂; H₂S formed from SO₄" appears in this region as FeS₂. It is concluded that inclusions of free S under anhydrite are wide so for the stratum of evidence of the near presence of oil-bearing strata. M. H. M. A.

Statistical study of bioclimatic influence on the chemico-mineralogical characteristics of the soil of the Ivory Coast (silica-alumina relation). L. Galangeaud (Compt. rend., 1942, 215, 360-362). Curves are given and discussed. N. M. B.

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