# BRITISH CHEMICAL ABSTRACTS

## A., I.—General, Physical, and Inorganic Chemistry

SEPTEMBER, 1937.

**Structure of $H_\alpha$ of hydrogen.** N. A. KENT, R. M. FRYE, and W. H. ROBINSON (Physical Rev., 1937, [ii], **51**, 990; cf. A., 1927, 997).—Using two Lummer plates dispersing in the same plane, the microphotometer curves of the resultant pattern showed four distinct components of $H_\alpha$ with intensities and positions approx. as given by theory. N. M. B.

**Interferometer measurements of wave-lengths in $H_2$ bands.** H. LANDAHL and G. S. MONK (Physical Rev., 1937, [ii], **51**, 993).—Intensities and λλ accurate to 0·002—0·005 A. for 56 lines in the range 6285—8546 A. are tabulated. N. M. B.

**Band systems ending on the $1s\sigma 2s\sigma\,^1\Sigma_g$ ($^1X_g$) state of $H_2$. I.** O. W. RICHARDSON (Proc. Roy. Soc., 1937, **A**, **160**, 487—507).—An analysis of the band system. Rotational structures are tabulated. G. D. P.

**Cessation of axiality of the hydrogen atom and the helium atom ion by the electric field and radiation collision.** J. STARK (Physikal. Z., 1937, **38**, 572—574).—An explanation of the effect of an electric field and of collisions on the emission spectrum of H and He, based on the theory of the axiality of the atom and electron, is given. A. J. M.

**Nuclear spins and magnetic moments in the Hartree model.** M. E. ROSE and H. A. BETHE (Physical Rev., 1937, [ii], **51**, 993; cf. this vol., 163).—A correction. The ground states of $^{12}B$, $^{11}B$, and $^{11}C$ are $^3P_0$, $^2P_{\frac{1}{2}}$, and $^2P_{\frac{1}{2}}$, respectively, and the magnetic moments of $^{11}B$ and $^{11}C$ are −0·52 and 1·57, respectively. N. M. B.

**Absorption spectrum of solid oxygen in the far red.** A. PRICHOTKO (Physikal. Z. Sovietunion, 1937, **11**, 465—477).—Crystals of $O_2$ of sufficient transparency for absorption experiments were obtained by slow cooling. Layers of the α-modification of 0·5—5 mm. thickness were examined, but owing to the low absorption of the γ-form large homogeneous crystals of the latter were necessary. The absorption spectra of the liquid and of the α- and γ-solid forms consisted of four intense bands. The spectra of the liquid and γ-form differ only in the sharpness of the edges. The absorption of the α-form differs in structure from that of the others. The absorption bands of solid $O_2$ are similar to those of the gas, and are due to the same transitions, but they possess a complicated structure characteristic of the crystal. A. J. M.

**Internuclear distance in oxygen molecules.** H. D. BABCOCK (Proc. Nat. Acad. Sci., 1937, **23**, 301—304).—Twelve absorption bands of atm. $O_2$ have been measured, eight associated with $^{16}O^{16}O$, two with $^{16}O^{17}O$, and two with $^{16}O^{18}O$, and the 575 lines have been assigned. Internuclear distances for the various electronic and vibrational states of each type of $O_2$ are calc. $^{16}O^{16}O$ increases in size with change in electronic state and with increased vibrational energy in a particular electronic state. W. R. A.

**Action of ultra-violet sunlight on the upper atmosphere.** M. N. SAHA (Proc. Roy. Soc., 1937, **A**, **160**, 155—173).—Existing information concerning the action of sunlight (λ <3000 A.) on mol. $O_2$ and $N_2$ is summarised and it is shown that the ultra-violet radiation of the sun differs from that of a black body. The necessity for carrying out laboratory experiments on the absorption spectra of $O_2$ and $N_2$ is emphasised. G. D. P.

**Spectrum of Na I with high resolution and the structure of the $^2D$ terms.** K. W. MEISSNER and K. F. LUFT (Ann. Physik, 1937, [v], **29**, 698—712).—Light from a beam of Na atoms excited by electronic impact giving a spectrum of great intensity and sharpness was examined by the Fabry–Perot method. Members of the second subordinate series gave a vibration difference $\Delta\nu = 3^2P_{\frac{1}{2}} - 3^2P_{\frac{3}{2}} = 17{\cdot}1963$ cm.$^{-1}$; two members of the first subordinate series were resolved into doublets. Separation of the $^2D$ terms was determined. H. C. G.

**Sodium spectrum.** K. W. MEISSNER and E. EBBINGHAUS (Ann. Physik, 1937, [v], **29**, 713—714).—λλ of lines in the subordinate series of the Na spectrum from a specially prepared Geissler tube were compared with those from the at. beam source. No λ shift was detected. H. C. G.

**New absorption spectrum of diatomic sulphur.** P. W. SCHENK (Z. Physik, 1937, **106**, 271—272).—A criticism of Cordes (this vol., 271). L. G. G.

**Magnetic nuclear moment of $^{39}K$.** K. W. MEISSNER and K. F. LUFT (Z. Physik, 1937, **106**, 362—364).—From hyperfine structure ($\Delta 2S_{\frac{1}{2}}$ and $\Delta 2P_{\frac{1}{2}}$) of the K resonance lines 7665 and 7699 A., $\mu = 0{\cdot}40$ and 0·30 nuclear magnetons respectively. L. G. G.

**Extinction of fluorescence of iodine vapour by magnetic fields.** E. SCHOLZ (Z. Physik, 1937, **106**, 230—235).—Apparatus is described for photography of the resonance series excited by 5462 A. radiation in I vapour subjected to magnetic fields of 0—20,000 gauss. The validity of Van Vleck's law

($Q = fH$, where $Q$ = extinction and $H$ = field strength) is confirmed over the range of $H$ employed. L. G. G.

**Bergmann series of cæsium.** K. W. MEISSNER and W. WEINMANN (Ann. Physik, 1937, [v], **29**, 758—760).—The ground terms of the Bergmann series of Cs at 1 μ have been examined with a Fabry–Perot etalon and their structure is determined. The line at 10,123·5 A. is a doublet; $\Delta\nu = 0{\cdot}177$ cm.$^{-1}$ H. C. G.

**Arc spectrum of mercury in the infra-red.** G. WIEDMANN and W. SCHMIDT (Z. Physik, 1937, **106**, 273—278).—A new infra-red prism spectrograph is described, and lines have been measured from 7097 to 12,156 A. L. G. G.

**Photo-electric measurement of the diurnal variations in daylight in temperate and tropical regions.** W. R. G. ATKINS, N. G. BALL, and H. H. POOLE (Proc. Roy. Soc., 1937, **A**, **160**, 526—539).—An investigation of the vertical and total illumination from sun and sky in England and in Ceylon. G. D. P.

**Physical processes in gaseous nebulæ. I. Absorption and emission of radiation.** D. H. MENZEL (Astrophys. J., 1937, **85**, 330—339).—Various fundamental formulæ are derived. The total emission and absorption of radiation by at. H are evaluated, together with the no. of transitions to and from any quantum level. General equations that determine the statistical equilibrium of the assembly and the partition of atoms into various at. states are developed. L. S. T.

**Widths and shapes of *X*-ray lines reflected from flat powder layers.** G. W. BRINDLEY (Proc. Leeds Phil. Soc., 1937, **3**, 353—368; cf. A., 1935, 16).—The widths of *X*-ray reflexions from flat powder layers are calc. and discussed. A distinction can be drawn between the type of line obtained inside and outside a region of sharp focussing. An analysis of the distribution of intensity in the line recorded on a cylindrical film surrounding the powder is given. N. M. B.

**Effect of temperature on the reflexion of *X*-rays.** M. BLACKMAN (Proc. Camb. Phil. Soc., 1937, **33**, 380—384).—Theoretical. An exact expression for the temp. factor for a cubic crystal is determined, and its relation to the properties of the vibrational spectrum is investigated. F. J. L.

**Shape of the Compton lines. I.** A. SOMMERFELD. **II.** W. FRANZ (Ann. Physik, 1937, [v], **29**, 715—720, 721—740).—I. Theoretical (cf. A., 1936, 1041).

II. The discontinuity of the Compton band on the short-wave side is discussed mathematically for a series of atoms. It is concluded that the Raman lines beyond the limit of the Compton band could probably not be observed, but that the existence of the discontinuity itself might be established by direct observation in spite of the overlapping of the primary line and the presence of the continuous underground, through careful selection of the angle of observation. H. C. G.

**Lattice constant of quartz and measurement of the *K*α wave-length of 45Rh, 46Pd, and 47Ag.** S. ELG (Z. Physik, 1937, **106**, 315—321).—The lattice const. of quartz (0001 plane) using Mo $K\alpha_1$ radiation is 1797·872. Vals. are recorded for λ (*K*α radiation) of Rh, Pd, and Ag and $n$ for quartz is calc. L. G. G.

**(A) Spectra of K III, Ca IV, and Sc V, and their relation to the spectra of other ions in the isoelectronic sequence Cl I to Mn IX.** P. G. KRUGER and L. W. PHILLIPS. **(B) Spectra of Sc IV, Ti V, Mn VIII, and Fe IX in the isoelectronic sequence A I to Fe IX.** P. G. KRUGER, S. G. WEISSBERG, and L. W. PHILLIPS (Physical Rev., 1937, [ii], **51**, 1087—1089, 1090—1091; cf. A., 1935, 1437).—(A) From spectrograms of Sc and Ca taken with a 21-ft. vac. spectrograph, multiplets are identified and classified.

(B) Data in the sequence A I—Fe IX are completed. Radiation connecting the higher terms with the ground state in all the ions has been identified. N. M. B.

**Geiger–Müller counter measurements of reflected Mo *K*α *X*-rays from powdered zinc.** R. D. MILLER (Physical Rev., 1937, [ii], **51**, 959—963).—The formula due to Volz (Z. Physik, 1935, **93**, 540) for counting rate is verified. $F$ vals. for various reflexions were measured and results are in agreement with those of Brindley (cf. A., 1936, 3) corr. for dispersion. N. M. B.

***L*α lines of some nickel alloys.** F. C. CHALKLIN and S. P. HILLSON (Phil. Mag., 1937, [vii], **24**, 190—195).—Measurements on four Ni alloys show no λ shift due to alloying of the metal, indicating no change in the $M_{IV, V}$ level of the atom. Approx. measurements on two Cu alloys show no evidence of shift of the *L*α line. A. J. E. W.

**Radiation probabilities, Auger effect, and energy level widths for Au (79).** E. G. RAMBERG and F. K. RICHTMYER (Physical Rev., 1937, [ii], **51**, 913—925; cf. A., 1935, 138).—Full tabular data for energy level widths, calc. on the Weisskopf–Wigner theory, and non-relativistic corrections for radiation transitions and Auger effects are given. N. M. B.

**Satellite structure of *L*α and $L\beta_2$ of Au(79).** F. K. RICHTMYER and E. G. RAMBERG (Physical Rev., 1937, [ii], **51**, 925—929; cf. preceding abstract).—On the basis of the Coster–Kronig hypothesis of satellite origin, separations and relative intensities are calc. by the theory of complex spectra. Using data on the mean life of the states involved in the transitions and on the probability of the Auger effect producing the initial state for the satellite emission, contours of the satellite structure agree satisfactorily with experimental patterns and confirm the Coster–Kronig theory. N. M. B.

**Thermionic approximations to the gas-covered fraction of an adsorbing surface, applied to the temperature dependence of oxygenation and oxidation of a tungsten filament.** M. C. JOHNSON and F. A. VICK (Proc. Physical Soc., 1937, **49**, 409—418).—Theoretical. A set of thermionic currents from W, measured in presence of small and approx. const. traces of $O_2$, can be analysed in two ways to obtain information on the fraction of the

surface covered. A new method of obtaining work functions of a partly oxygenated surface has been devised. C. R. H.

**Thermionic emission into dielectric liquids.** E. B. Baker and H. A. Boltz (Physical Rev., 1937, [ii], **51**, 989).—A crit. discussion of the results of Reiss (cf. this vol., 337), and a comparison of the "potential dissociation effect" and thermionic emission theories. N. M. B.

**Field emission from film-covered cathodes. Aluminium–aluminium oxide–cæsium oxide.** H. Mahl (Naturwiss., 1937, **25**, 459; cf. Malter, Physical Rev., 1936, [ii], **50**, 48).—The anomalous electron emission from an oxidised Al cathode coated with $Cs_2O$ has been photographed by means of an electron microscope, and is described. O. D. S.

**Thin film field emission.** E. R. Piore (Physical Rev., 1937, [ii], **51**, 1111—1112).—Measurements and curves for $BaO-B_2O_3$ films evaporated on a metal plate and treated with Cs and $O_2$ show the existence of anomalous secondary electron emission similar to that reported by Malter (cf. *ibid.*, 1936, **50**, 48) for $Al_2O_3$. N. M. B.

**Secondary-electron emission from complex surfaces.** L. R. G. Treloar (Proc. Physical Soc., 1937, **49**, 392—408).—Data for secondary emission from W and Mo on which Ba or Th has been deposited indicate that for a given base metal, and provided the thickness of the deposit is $<1$ at. layer, the log of the secondary emission coeff. varies linearly with the work function, in agreement with the author's theory. From data obtained with thicker deposits it is calc. that the average depth at which secondary electrons originate is 1·4 at. layer. C. R. H.

**Excitation of the *C* state of hydrogen by electron impact.** R. Roscoe (Proc. Leeds Phil. Soc., 1937, **3**, 369—372).—An investigation of the energy losses undergone by electrons in inelastic collision with $H_2$ mols., for electron energies 30—130 volts, confirms the results of Jones (cf. A., 1929, 115). The calc. and experimental relative probabilities of transitions to the vibrational levels of the *C* state show max. corresponding with energy losses of 12·87 and 12·53 volts, respectively, giving an unexplained divergence of 0·34 volt. N. M. B.

**Variation of the primary specific ionisation of hydrogen as a function of incident electron energy.** M. G. E. Cosyns (Bull. Acad. roy. Belg., 1937, [v], **23**, 498—513).—In order to verify available calc. results on the interaction of H atoms and electrons of $10^6$ e.v. (min. ionisation) to high energies, the primary sp. ionisation was measured by a Geiger–Müller counter method. For lower energy radiation the hard β-rays of U-$X_2$, and for high energies cosmic radiation, were used. Results contrary to theory are obtained, the ionisation decreasing continuously for higher energies. N. M. B.

**Automatic plotting of electron trajectories.** D. B. Langmuir (Nature, 1937, **139**, 1066—1067).—An apparatus for this purpose is described. L. S. T.

**Behaviour of electrons in bromine.** J. E. Bailey, R. E. B. Makinson, and J. M. Somerville (Phil. Mag., 1937, [vii], **24**, 177—190).—The diffusion of photo-electrons in Br vapour has been studied by a method previously applied to $Cl_2$ (A., 1935, 677). Certain kinetic properties of the electrons are deduced. A. J. E. W.

**Production of positive and negative electron pairs in a cloud chamber.** L. Simons and K. Zuber (Proc. Roy. Soc., 1937, **A**, **159**, 383—394).—Positron and electron pairs produced in A and in MeI vapour by γ-rays have energies of $2·62 \times 10^6$ e.v. In A the average energy of positrons is about equal to that of electrons, but in MeI there is a difference. The distribution in direction of ejection, relative to the incident γ-ray, agrees with theory. A new instrument for measuring the curvature of tracks in gases of high at. no. is described. G. D. P.

**Recombination of ions over an extended pressure range.** L. B. Loeb (Physical Rev., 1937, [ii], **51**, 1110—1111).—Theoretical. A reconciliation of the Thomson and Langevin theories is discussed. N. M. B.

**Low-voltage proton sources.** E. S. Lamar W. W. Buechner, and K. T. Compton (Physical Rev., 1937, [ii], **51**, 936—941; cf. A., 1934, 1052; 1935, 1185; 1936, 130).—Attempts to increase the proton yield from capillary arc sources are described. A quartz capillary showed evidence of gradual disintegration by low-speed electrons in the discharge. A Pyrex capillary source gave proton yields up to 20%. The introduction of $H_2O$ vapour into the tube in an attempt to increase the at. H present gave a fourfold % increase in proton yield. The source has greater ion current efficiency, requires no cooling, is easily constructed, and is free from impurities. N. M. B.

**At. wt. and its importance for the characteristics of chemical elements.** S. A. Schukarev (Trav. Congr. Jubil. Mendeléev, 1937, **2**, 363—370).—The significance of the mass term which occurs in most mathematical expressions dealing with physical properties is discussed. C. R. H.

**Radioactive isotope of rubidium.** A. Hemmendinger and W. R. Smythe (Physical Rev., 1937, [ii], **51**, 1052—1053; cf. Hahn, this vol., 210).—The isotopes of Rb have been separated by means of a high-intensity mass spectrometer. Measurements of radioactivity of samples collected at masses 84, 86, 87, 88, and 90 show that $^{87}Rb$ is radioactive and no other isotope shows appreciable activity. N. M. B.

**Modern methods of predicting elements.** (Frau) I. Noddack (Trav. Congr. Jubil. Mendeléev, 1937, **2**, 371—377).—A brief account of the methods used in discovering some of the newer elements. C. R. H.

**Present state of Mendeléev's periodic law.** S. A. Schukarev (Trav. Congr. Jubil. Mendeléev, 1937, **2**, 37—49).—A lecture. The law is discussed in the light of modern knowledge of the electronic structure of the elements. C. R. H.

**Development of the periodic system.** W. Noddack (Trav. Congr. Jubil. Mendeléev, 1937, **2**, 53—59).—A lecture. C. R. H.

**Scattering of alpha-particles in helium, hydrogen, and deuterium.** C. B. O. MOHR and G. E. PRINGLE (Proc. Roy. Soc., 1937, **A**, **160**, 190—206).—The experiments show that the Coulomb law of force fails at distances exceeding $10^{-12}$ cm. The ratio of observed to "classical" scattering is large for $H_2$ and $D_2$, but for He is < previous estimates. Nuclear potentials are discussed and a calculation of wave functions for motion in a Coulomb field is given. G. D. P.

**Continuous β-ray spectrum.** F. L. ARNOT (Nature, 1937, **139**, 1065).—Theoretical. This spectrum can be explained without assuming the existence of undetectable neutrinos. L. S. T.

**Nuclear β-rays of radium-*D*.** H. O. W. RICHARDSON and A. LEIGH-SMITH (Proc. Roy. Soc., 1937, **A**, **160**, 454—463).—Study of 107 β-ray tracks of Ra-*D* produced in a cloud chamber shows that 57±8% of the electrons have energies < 4 kv., and that <3% have energies exceeding 13 kv. No evidence for the presence of a long-range β-transition between the ground states of Ra-*D* and -*E* is found. G. D. P.

**Law of Sargent.** G. E. UHLENBECK and H. KUIPER (Physica, 1937, **4**, 601—605).—Mathematical. The dependence of the decay const. of β-radioactivity on the max. energy and on the nuclear charge has been calc. The ratio of electron to positron emission in the branch reaction of $^{64}_{29}$Cu is calc. to be 7·2 (cf. van Voorhis, this vol., 59). O. D. S.

**Comparison of the γ-ray intensities from radium preparations.** J. A. C. TEEGAN (Sci. Proc. Roy. Dublin Soc., 1937, **21**, 449—452).—A steady deflexion, or null, method of high accuracy, eliminating the disadvantages of the electroscope method, is described. The ionisation produced by the γ-rays emitted from Ra needles placed outside a special ionisation chamber is amplified by means of an electrometer valve unit. N. M. B.

**Hard γ-rays from Ra-*C* + *C*′ + *C*″ + *D*.** S. NISHIDA (Physical Rev., 1937, [ii], **51**, 996; cf. Devons, this vol., 210).—Examination with a Wilson chamber showed rays of approx. energies 3·1, 4, and 4·9 m.e.v., indicating that hard γ-rays, but not such β-rays as abnormal decay electrons, are emitted. An explanatory scheme of levels is suggested. N. M. B.

**Coherent scattering of γ-rays at nuclei.** A. ACHIESER and I. POMERANTSCHUK (Physikal. Z. Sovietunion, 1937, **11**, 478—497).—Theoretical. Formulæ are derived for the effective cross-section of the scattering. A. J. M.

**Neutron scattering by magnetic substances.** O. HALPERN and M. H. JOHNSON, jun. (Physical Rev., 1937, [ii], **51**, 992).—Using the theory of Bloch (cf. A., 1936, 1173), results of a complete quantum mechanical treatment are given for unmagnetised paramagnetic and for ferromagnetic bodies. Expressions for magnetic cross-section are compared. N. M. B.

**Magnetic scattering of neutrons. II.** F. BLOCH (Physical Rev., 1937, [ii], **51**, 994; cf. A., 1936, 1173).—The comparative results of treating the neutron as a true magnetic dipole, a sphere, or a cylinder are examined. N. M. B.

**Scattering of fast neutrons.** C. H. FAY (Physical Rev., 1937, [ii], **51**, 995).—Using Bethe's larger nuclear radius, the elastic cross-sections of heavy nuclei for Be–Rn neutrons are recalc. and plotted, and results are compared with previous vals. (cf. A., 1936, 1314). N. M. B.

**Neutron yields from artificial sources.** E. AMALDI, L. R. HAFSTAD, and M. A. TUVE (Physical Rev., 1937, [ii], **51**, 896—912).—Using the technique of reduction to thermal energies (cf. this vol., 58), measurements of the total yields of neutrons from deuteron bombardment of $D_2O$, Li, Be, and C for the range 300—1000 kv., and from Rn + Be were made. Graphs for the "activability" of the detector relative to the source–target distance are given and abs. yields approx. to 20% are calc. N. M. B.

**Atomic transformation by means of γ-rays.** W. BOTHE and W. GENTNER (Z. Physik, 1937, **106**, 236—248).—A continuation of previous work (this vol., 212). L. G. G.

**Elementary consideration of some nuclear phenomena.** A. H. CROUP and L. A. GOLDBLATT (J. Chem. Educ., 1937, **14**, 210—215).—A non-mathematical review of the nuclear transformations and artificial radioactivity of the lighter elements. L. S. T.

**Conservation of energy in the disintegration of $^8$Li.** L. H. RUMBAUGH, R. B. ROBERTS, and L. R. HAFSTAD (Physical Rev., 1937, [ii], **51**, 1106—1107; cf. this vol., 5).—Detailed deductions from an investigation of the reaction $^7Li + {}^2D = {}^8Li + {}^1H + Q$ are reported, and excitation curves for the delayed α- and β-particles, and an energy diagram for $^8$Li disintegration, are given. Considerations of conservation of energy and electric charge require the application of the neutrino hypothesis giving $^8_3Li \rightarrow {}^4_2He + {}^4_2He + {}_{-1}\varepsilon + {}_0\nu + Q_2$. N. M. B.

**Radioactive α-particles from $^7$Li + $^2$H.** W. A. FOWLER and C. C. LAURITSEN (Physical Rev., 1937, [ii], **51**, 1103).—α-Particle radioactivity when Li is bombarded by deuterons has been found by cloud-chamber investigation. A range–distribution curve is given and discussed. The suggested reactions and energy relation are: $^7Li + {}^2H \rightarrow {}^8Li + {}^1H + Q$; $^8Li \rightarrow {}^8Be + e^- + E_0$; $^8Be \rightarrow {}^4He + {}^4He + T$; $Q + E_0 + T = 15{\cdot}6 \pm 0{\cdot}2$ m.e.v. (cf. Lewis, this vol., 108). N. M. B.

**Proton-induced radioactivity in oxygen.** L. A. DU BRIDGE, S. W. BARNES, and J. H. BUCK (Physical Rev., 1937, [ii], **51**, 995; cf. this vol., 340).—Targets of quartz, solid oxides, or Pt foil in $O_2$ under bombardment by protons of energy 1·4—3·8 m.e.v. give rise to periods of 1·28±0·10 and 107±4 min. The former is identified with $^{17}$F formed by the capture of a proton by $^{16}$O, and the latter to the reaction $^{18}O + {}^1H \rightarrow {}^{18}F + {}^1n$; $^{18}F \rightarrow {}^{18}O + e^+$. The reaction sets in sharply at 2·6 and rises rapidly to 3·8 m.e.v.; the approx. cross-section is $4 \times 10^{-25}$ sq. cm. N. M. B.

**Separation of unweighably small amounts of artificially radioactive phosphorus from the**

**stable isotope.** O. ERBACHER and K. PHILIPP (Z. physikal. Chem., 1937, **179**, 263—274; cf. A., 1936, 773).—$Ph_3PO_4$ in $C_6H_6$ solution is bombarded with neutrons, and the $^{32}_{15}P$ produced, which is in the ionised form, extracted with $H_2O$ or C. The amount of ordinary stable P in the extract is < the $1{\cdot}2 \times 10^7$th part of the amount bombarded. R. C.

**Induced radioactivity of potassium.** D. G. HURST and H. WALKE (Physical Rev., 1937, [ii], **51**, 1033—1037; cf. this vol., 213).—In addition to formation by deuteron or slow neutron bombardment of K salts, $^{42}K$ is formed by the reactions $^{45}Sc + {}^1n \rightarrow {}^{42}K + {}^4He$ and $^{42}Ca + {}^1n \rightarrow {}^{42}K + {}^1H$, the relative probability in the last case being small. The half-life is $12{\cdot}4 \pm 0{\cdot}2$ hr. Fast neutron irradiation of K yields active Cl and $^{41}A$ thus: $^{39 \text{ or } 41}K + {}^1n \rightarrow {}^{36 \text{ or } 38}Cl + {}^4He$; $^{41}K + {}^1n \rightarrow {}^{41}A + {}^1H$. α-Particle bombardment of Cl yields $^{38}K$ (half-life $7{\cdot}7_5 \pm 0{\cdot}1_5$ min.) thus: $^{35}Cl + {}^4He \rightarrow {}^{38}K + {}^1n$, and deuteron bombardment of Ca gives: $^{40}Ca + {}^2H \rightarrow {}^{38}K + {}^4He$. N. M. B.

**Radioactivity of $^{38}K$.** W. J. HENDERSON, L. N. RIDENOUR, M. G. WHITE, and M. C. HENDERSON (Physical Rev., 1937, [ii], **51**, 1107).—Rock-salt and also $NiCl_2$, but not $Na_2CO_3$, bombarded with 0·05 microamp. of 7 m.e.v. α-particles give a strong activity of $7{\cdot}5 \pm 0{\cdot}1$ min. half-life. The emitted particles are positrons, and evidence indicates that the radioelement is $^{38}K$ formed from $^{35}Cl$. Hence Walke's $^{38}K$ (10·5 hr.) (cf. this vol., 213) is probably $^{42}K$ (12·2 hr.). N. M. B.

**Radioactivity produced in nickel by deuteron bombardment.** R. L. THORNTON (Physical Rev., 1937, [ii], **51**, 893—896).—Ni bombarded with 5-mv. deuterons exhibits an intense positron activity of half-life $3{\cdot}4 \pm 0{\cdot}1$ hr., shown chemically to be isotopic with Cu. The energy excitation curve for 3—5 mv. for this reaction (proton capture) differs markedly from that for Cu (neutron capture). The variation with energy of the disintegration cross-section agrees with theoretical formulæ for the penetration of a deuteron into a nucleus of radius $4{\cdot}5 \times 10^{-13}$ cm. N. M. B.

**Artificial radioactivity produced by α-particles.** L. N. RIDENOUR and W. J. HENDERSON (Physical Rev., 1937, [ii], **51**, 1102).—Co, Cu, and Ni become strongly radioactive when bombarded with about 0·05 microamp. of 7-m.e.v. α-particles. The relative initial intensities of the activities are Co : Cu : Ni = 100 : 15 : 22. In each case decay is accompanied by emission of positrons. The respective half-lives and suggested identifications are: $9{\cdot}65 \pm 0{\cdot}07$ min., $59 \pm 1$ min., $3{\cdot}25 \pm 0{\cdot}05$ hr., and $^{62}Cu$, $^{68}Ga$, $^{61}Cu$. N. M. B.

**Artificial radioactivity produced by fast neutrons and their inelastic collisions.** J. ROTBLAT (Nature, 1937, **139**, 1110—1111).—The formation of a radio-element of 11 min. half-period from Cu irradiated by fast neutrons from a Be + Rn source has been confirmed (cf. this vol., 5). The product is $^{62}Cu$ derived from $^{63}Cu$ by the loss of a neutron. The 60 min. half-period product from Zn is also confirmed, but it is an isotope of Ni and not of Zn (cf. *loc. cit.*). In Ag, a product of $25 \pm 3$ min. half-period but not of 50 sec. activity (cf. *ibid.*, 107) has been obtained, probably from the reaction $^{107}Ag + {}^1n = {}^{106}Ag + 2{}^1n$. The efficiency of this reaction is approx. 0·03 of the total efficiency of fast neutrons in producing radioactivity in Ag. Activations of this type lead to the appearance of two neutrons that are more efficient than fast neutrons in producing activation of the "capture" type. This may account for the increase of artificial activity observed when fast neutrons pass through relatively small thicknesses of certain absorbing substances, and attributed hitherto to inelastic collisions. L. S. T.

**Radioactive isotopes of copper.** E. A. OESER and J. L. TUCK (Nature, 1937, **139**, 1110).—Irradiation of CuO with fast neutrons from a Ra–Be source gives a radioelement of $160 \pm 10$ min. half-period. This ppts. with NiS and must be due to $^{63}_{28}Ni$ or $^{65}_{28}Ni$; it may be produced from either $^{63}_{29}Cu$ or $^{65}_{29}Cu$ by capture of a neutron and expulsion of a proton. The same half-period has been found in Ni irradiated by slow neutrons. Cu irradiated by slow in the absence of fast neutrons shows an activity of $13 \pm 0{\cdot}5$ hr. half-period, and the same activity was obtained by separating radioactive Cu from Zn bombarded by fast neutrons. No indication of a 6, 10, or 17 hr. period was obtained. L. S. T.

**Production of a silver isotope of 24 minutes half-period by beryllium neutrons.** H. REDDEMANN and F. STRASSMANN (Naturwiss., 1937, **25**, 458—459).—The 24 min. half-period activity produced in $AgNO_3$ by neutrons from a Ra–Be source remains in the ppt. after pptn. as AgCl. It is probably due to the process $^{107}_{47}Ag\ (n;\ 2n)\ ^{106}_{47}Ag \rightarrow 24$ min. as suggested by Bothe and Gentner (this vol., 162) and Heyn *ibid.*, 340). O. D. S.

**Long-period activity in cadmium irradiated with neutrons.** A. C. G. MITCHELL (Physical Rev., 1937, [ii], **51**, 995—996).—Cd foil under neutron bombardment for a week gave rise to a decay curve showing periods $52 \pm 5$ and 5 hr. (cf. Cork, this vol., 277). The activity was too weak to allow identification. N. M. B.

**Sidereal time periodicity of cosmic rays and its phase shift.** J. BARNÓTHY and M. FORRÓ (Nature, 1937, **139**, 1064—1065). L. S. T.

**Mechanism of the production of cosmic showers.** P. AUGER, P. EHRENFEST, jun., A. FREON, and (MME.) T. GRIVET (Compt. rend., 1937, **204**, 1797—1799).—The production of secondary cosmic particles in Pb screens of varying thicknesses has been investigated. The results are in accord with the theory of Bhabha and Heitler (this vol., 213). A. J. E. W.

**Absolute intensity of the ionisation in argon by cosmic radiation at sea level.** J. CLAY and K. OOSTHUIZEN (Physica, 1937, **4**, 527—530; cf. Clay and Jongen, this vol., 213).—The ionisation has been determined in A at pressures from 38 to 1 atm. The intensities of ionisation at 1 atm. under 12 cm. and under 56 cm. of Fe are $1{\cdot}58I$ and $1{\cdot}46I$, respectively. The max. energies of electrons ejected from the Fe walls under 56 cm. of Fe are < under 12 cm. of Fe. O. D. S.

**Decrease of hard primary cosmic rays in matter.** J. Clay, J. T. Wiersma, and E. M. Bruins (Physica, 1937, **4**, 521—526; cf. A., 1936, 773).—The decrease has been determined in Hg, Pb, Fe, Sn, S, and $H_2O$ under layers up to 1300 g. per sq. cm., and is shown to depend on mass and not on electron density or the size of the nucleus. The coeff. of decrease decreases with increasing thickness of the layers. It is suggested that the decrease is due partly to replacement of protons by neutrons and partly to energy loss in ionisation, showers, and radiation. O. D. S.

**Passage of fast electrons and theory of cosmic showers.** H. J. Bhabha and W. Heitler (Proc. Roy. Soc., 1937, **A**, **159**, 432—458).—A theoretical investigation of the production of secondary positive and negative electrons by a fast primary electron. Showers are explained by the ordinary quantum theory. Comparison with experiment shows that Rossi's transition curve and Regener's absorption curve are in agreement with theoretical predictions. G. D. P.

**Measurements of the nuclear absorption of electrons by the atmosphere up to about $10^{10}$ electron volts.** I. S. Bowen, R. A. Millikan, and H. V. Neher (Nature, 1937, **140**, 23).—Cosmic ray intensities at different atm. heights at Madras, India, and San Antonio, Texas, indicate that these rays produce their max. ionisation before they have penetrated through the first tenth of the atm. The latitude-sensitive part of the cosmic ray ionisation found in the lower atm. is practically all due to the secondary effects of varied nature resulting from the incoming electrons in the upper tenth of the atm. The absorption coeffs. suggest that the particles producing the latitude and the east–west effect are predominantly positive electrons and not protons. L. S. T.

**Longitude effect and the asymmetry of cosmic radiation.** G. Lemaître (Nature, 1937, **140**, 23—24). L. S. T.

**Energy loss of cosmic ray particles in metal plates.** P. M. S. Blackett and J. G. Wilson (Proc. Roy. Soc., 1937, **A**, **160**, 304—323).—The energy loss associated wtih the passage of cosmic ray particles through screens of Pb 1 cm. and 0·33 cm. and of Al 1 cm. thick has been measured. For energies of $< 2 \times 10^8$ e.v. the observed energy losses agree with the predictions of theory, but at higher energies a discrepancy appears. The necessary modifications of the radiation formula are discussed and a formula is derived fitting experimental facts as well as can be expected. G. D. P.

**Disintegration of high-energy protons.** G. Nordheim, L. W. Nordheim, J. R. Oppenheimer, and R. Serber (Physical Rev., 1937, [ii], **51**, 1037—1045).—Mathematical. Application of the Fermi theory of β-decay to energy transfers by high-energy protons to electrons and neutrinos in passing through matter is examined. N. M. B.

**Transformation series from neutron irradiation of uranium.** L. Meitner, O. Hahn, and F. Strassmann (Z. Physik, 1937, **106**, 249—270).—A physical discussion of the relationship between the three transformation series, and elements of at. no. 93 to 96. L. G. G.

**Determination of the number of free electrons in metals from their mean free paths.** L. Riedel (Metallwirts., 1937, **16**, 634—640).—Recent investigations are reviewed. C. E. H.

**Heavy particle interactions from β-decay theory.** G. D. Camp (Physical Rev., 1937, [ii], **51**, 1046—1048).—Mathematical. Heavy particle and β-decay interactions could not be reconciled by replacing the small const. $g$ of a Fermi type coupling by a function of the momenta of the light particles. N. M. B.

**Matrix element in Fermi's theory of β-decay.** L. W. Nordheim and F. L. Yost (Physical Rev., 1937, [ii], **51**, 942—947).—Mathematical. The formulation of Fermi's theory of β-decay for a complex nucleus containing many particles is investigated. N. M. B.

(A) **Mutual potential energy between two deuterons.** K. Umeda, S. Tomonaga, and Y. Ono. (B) **Exchange integral.** S. Tomonaga and K. Umeda (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, **32**, 87—96, 97—102).—(A) Mathematical. The exchange energy is calc. on the basis of neutron–proton force.

(B) The conditions of disappearance of the exchange integral are determined. F. J. L.

**[Suggested] experimental test of the proton–neutron exchange interaction.** H. J. Bhabha (Nature, 1937, **139**, 1021—1022). L. S. T.

**Statistical calculation of the density of the energy levels of the nuclei.** C. van Lier and G. E. Uhlenbeck (Physica, 1937, **4**, 531—542).—The calculation of Bethe (cf. A., 1936, 1175) is extended. O. D. S.

**Statistical theory of the nucleus.** L. Landau (Physikal. Z. Sovietunion, 1937, **11**, 556—565).—Formulæ for the energy distribution of nuclear levels can be obtained without assuming the nucleus to be an ideal gas (cf. A., 1936, 1175). A formula for the determination of the width of resonance levels for neutrons is given. The inelastic scattering of neutrons is also discussed. A. J. M.

**Dynamic liquid model of atomic nuclei.** K. Umeda and Y. Ono (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, **32**, 120—128).—Theoretical. The Thomas–Fermi liquid model of at. nuclei is treated dynamically by the method of Bloch (A., 1933, 443). F. J. L.

**Structure of nuclei beyond oxygen.** E. Wigner (Physical Rev., 1937, [ii], **51**, 947—958; cf. this vol., 109).—Mathematical. An attempt is made to correlate the inflexions in the mass defect curve with the energy differences between isobars as obtained by direct measurements and from the shift of the isotopic no. to higher vals. with increasing no. of particles. N. M. B.

**Magnetic moments of atomic nuclei.** T. Schmidt (Z. Physik, 1937, **106**, 358—361).—A regular relationship exists between nuclear magnetic and mechanical moments. H. C. G.

**Signs of the nuclear magnetic moments of $^{7}$Li, $^{85}$Rb, $^{87}$Rb, and $^{133}$Cs.** S. MILLMAN and J. R. ZACHARIAS (Physical Rev., 1937, [ii], **51**, 1049—1052).—Application of the at. beam method of non-adiabatic transitions shows that the sign is in each case positive, in agreement with results from hyperfine structure determinations. N. M. B.

**Magnetic moment of the neutron.** P. N. POWERS, H. CARROLL, and J. R. DUNNING (Physical Rev., 1937, [ii], **51**, 1112—1113).—Investigations previously reported (cf. this vol., 211) on the transmission of neutrons through Fe plates are repeated with two and three plates, using neutrons emitted from a "howitzer" cooled to liquid air temp. Curves are given showing that the effect (% increase in transmission with the plates magnetised) increases for slower neutrons and for greater thicknesses of Fe. Theory is discussed. N. M. B.

**Sign of the magnetic moment of free neutrons.** O. R. FRISCH, H. VON HALBAN, jun., and J. KOCH (Nature, 1937, **139**, 1021).—Using the method previously proposed (this vol., 340), the magnetic moment of the free neutron is found to be negative, *i.e.*, the relative direction of spin and magnetic moment is the same as in the electron. This is in agreement with expectations based on the magnetic moments of the proton and deuteron. L. S. T.

**Origin of quadrupolar moments of atomic nuclei.** J. SOLOMON (Compt. rend., 1937, **204**, 1935—1938).—Mathematical. J. G. A. G.

**Additional interaction of protons with an electromagnetic field, due to the presence of the electron-neutrino field.** H. PRIMAKOFF (Physical Rev., 1937, [ii], **51**, 990—991; cf. this vol., 278).—Mathematical. N. M. B.

**Generalisation of the equations of the self-consistent field for two-electron configurations.** A. F. STEVENSON (Proc. Roy. Soc., 1937, **A**, **160**, 588—604).—Mathematical.

**Calculation of transition probabilities in helium.** E. A. HYLLERAAS (Z. Physik, 1937, **106**, 395—404).—Theoretical. H. C. G.

**Neutrino theory of light.** A. SOKOLOV (Nature, 1937, **139**, 1071).—Theoretical. L. S. T.

**Bose amplitudes in the neutrino theory of light.** V. FOCK (Compt. rend. Acad. Sci. U.R.S.S., 1937, **15**, 241—244).—Mathematical. A. J. E. W.

**Values of fundamental atomic constants.** S. VON FRIESEN (Proc. Roy. Soc., 1937, **A**, **160**, 424—440).—A crit. survey of the at. consts. from a no. of sources leads to the following vals.: velocity of light $(2{\cdot}9978\pm0{\cdot}0002)\times10^{10}$ cm. per sec., sp. charge of electron $(1{\cdot}7585\pm0{\cdot}002)\times10^{7}$ e.m.u. per g., electronic charge $(4{\cdot}800\pm0{\cdot}005)\times10^{-10}$ e.s.u., Planck's const. $(6{\cdot}610\pm0{\cdot}015)\times10^{-27}$ erg sec., Avogadro's no. $(6{\cdot}028\pm0{\cdot}008)\times10^{23}$, mass of H atom $(1{\cdot}673\pm0{\cdot}003)\times10^{-24}$. The reciprocal of Sommerfeld's fine structure const. is thus 136·9, which agrees within the limits of error with Eddington's hypothetical val. 137. G. D. P.

**Redetermination of the elementary charge by the oil drop method.** Y. ISHIDA, I. FUKUSHIMA, and T. SUETSUGU (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, **32**, 57—77, and Nature, 1937, **140**, 29).—In view of discordant available vals. of *e* an investigation was made, using an improved Millikan apparatus, with special reference to the effect of the convection current on the speed of the oil drop, evaporation and oxidation (or adsorption) of the drop, the shape of the drop, and the effect of the arc on the drop. Full data are tabulated. The val. obtained for *e* is $(4{\cdot}806\pm0{\cdot}003)\times10^{-10}$ e.s.u. using Harrington's val. for $\eta$. N. M. B.

**Collision of two oil drops and the stability of a non-spherical oil drop.** Y. ISHIDA (Nature, 1937, **140**, 70—71).—In experiments on the fall of electrified oil drops for the determination of *e* (cf. preceding abstract) four types of drops, varying in shape and time of fall, have been identified. L. S. T.

**Mechanism of the formation of atomic and colloidal centres of silver in alkali halide phosphors.** A. TOPOREC (Compt. rend. Acad. Sci. U.R.S.S., 1937, **15**, 245—248; cf. A., 1936, 427).—The formation of at. Ag and K centres by penetration of electrons into KCl and KBr crystals has been studied by observing their ultra-violet absorption coeffs. The formation of colloidal Ag particles instead of at. centres is discussed. A. J. E. W.

**Aluminium oxide bands.** (MISS) E. BODSON and (MISS) F. DEHALU (Bull. Acad. roy. Belg., 1937, [v], **23**, 408—415).—Using the method of explosion of fine Al wires as a source of excitation, several new bands of the system $^{2}\Sigma$—$^{2}\Sigma$ of AlO have been observed, and the sequences $\Delta v = 2$ and $\Delta v = 3$ have been traced beyond their convergence. The extrapolated normal heat of dissociation is 4·105 e.v. N. M. B.

**Analysis of molecular $^{3}\Pi$ states with application to AlH, $OH^{+}$, and BH.** C. N. CHALLACOMBE and G. M. ALMY (Physical Rev., 1937, [ii], **51**, 930—936).—The mol. consts. $\lambda$, $B$, and $D$ are calc. by Gilbert's method (cf. A., 1936, 661) with a more accurate consideration of the rotational $D$ terms. A graphical method of obtaining $\lambda$ is developed. Graphs show, for $K = 2, 3, 4, 5$, the variation in multiplet splitting as the coupling const. $\lambda$ varies from $-8$ to 10. New data for AlH lines with $K < 6$ are given. A comparison of corresponding electronic *ls* coupling coeffs. in mol. and atom is made. N. M. B.

**Structure of the $\alpha$ and $\beta$ band systems of SiF.** E. H. EYSTER (Physical Rev., 1937, [ii], **51**, 1078—1086).—A new vibrational analysis of the $\alpha$ system is given, and a detailed rotational structure analysis of the (0, 0) band of the $\alpha$ and of the $\beta$ system is tabulated. Consts. are evaluated and spin doubling is discussed. N. M. B.

**Band spectra of ionised halogen hydrides. III. Fine structure and isotope effects in hydrogen chloride and deuterium chloride spectra. Term schemes.** F. NORLING (Z. Physik, 1937, **106**, 177—204).—A theoretical discussion. L. G. G.

**Spectrum of thallium fluoride.** H. G. HOWELL (Proc. Roy. Soc., 1937, **A**, **160**, 242—253).—Absorption and emission spectra of TlF have been photographed and analysed. A doublet and singlet band system and three continua are found in the region 2000—3100 A. No sign of $^{203}$Tl is detected.
G. D. P.

**Molecular emission spectra of metallic salts.** P. MESNAGE (Compt. rend., 1937, **204**, 1929—1931).—Under the conditions employed (cf. A., 1935, 1051), $CrBr_3$, $NiI_2$, and $MnI_2$ did not afford mol. emission spectra. With $NiBr_2$, band spectra were emitted at 3900—5100 A. and there was a max. of continuous emission at 5700 A. With $CoBr_2$, band spectra were emitted at 4340—4900 and 5400—5750 A.
J. G. A. G.

**Absorption spectrum of solid anhydrous cobalt chloride.** O. R. HOWELL and A. JACKSON (J.C.S., 1937, 973—979).—An investigation and comparison of the bands of the solid deposited on filter-paper and of solutions in aq. HCl confirms the view that the blue colour is typical of association of the Co ion with four Cl ions, and the red colour of association with six groups. The transition red—blue in the range liquid air temp.—350° does not accord with the visual appearance owing to the variation of intensity of the relative amounts of Co in the respective forms. The conversion with rise of temp. is comparable with that of the salt in aq. HCl or aq. $MgCl_2$ and is attributed to increasing association of Co with four Cl ions. Crystal structure determination by the powder method shows no indication of such change. The absorption spectrum of the solid salt deposited on various supports shows that different bands are enhanced by different surfaces.
N. M. B.

**Available surface of cellulose.** O. R. HOWELL and A. JACKSON (J.C.S., 1937, 979—982).—With a view of determining the available or real surface of cellulose fibre, the absorption spectrum of solid $CoCl_2$ deposited in different amounts on filter-paper was measured. Absorption max.–deposit curves show discontinuity corresponding with the formation of a primary covering, and evidence that this is unimol. is given. The calc. available surface is 85 times as great as the total apparent surface obtained by measurements of the constituent fibres under a microscope. Results are discussed in relation to the granular theory of cellulose.
N. M. B.

**Absorption spectra of solutions of some halides and oxyhalides of sulphur, selenium, and tellurium.** R. SAMUEL and M. USMAN (Proc. Indian Acad. Sci., 1937, **5**, **A**, 425—432).—The absorption spectra $\lambda > 2400$ A. of $SOBr_2$, $SeOCl_2$, $SeBr_4$, $TeBr_2$, $TeI_2$, and $Se_2Br_2$ dissolved in neutral solvents are similar to those found in the vapour state (A., 1936, 775). The Te–I bond energy is 36 kg.-cal. per mol.
F. J. L.

**Absorption spectrum of phosphorus pentaselenide vapour.** M. I. HAQ and R. SAMUEL (Proc. Indian Acad. Sci., 1937, **5**, **A**, 423—424). The two long-wave limits are $\lambda\lambda$ 3420 and 2534 A., $\lambda_{max.}$ 2780 A.; the energy difference is 1·3 e.v. ($^1D - {}^2P$ of Se = 1·18 e.v.). The two regions of selective absorption probably correspond with the dissociation processes $0{\cdot}5P_2Se_5 \rightarrow 0{\cdot}5P_2Se_3 + Se\ (^2P)$; $0{\cdot}5P_2Se_5 \rightarrow 0{\cdot}5P_2Se_3 + Se\ (^1D)$.
F. J. L.

**Energy of dissociation of carbon monoxide.** R. SCHMID and L. GERÖ (Z. physikal. Chem., 1937, **B**, **36**, 105—128; cf. this vol., 279).—Consideration of the absorption spectrum leads to the dissociation scheme $CO + 11{\cdot}06$ volts $\rightarrow C\ (^5S) + O\ (^3P)$. This scheme also agrees with the results of electron collision experiments in CO and $CO_2$. The val. 170·2 kg.-cal. is calc. for the at. heat of vaporisation of solid C. This leads to $CN\ (X^2\Sigma) \rightarrow C\ (^5S) + N\ (^4S) - 182{\cdot}6 \pm 5$ kg.-cal., a result which seems to be supported by the distribution of perturbations in the $B^2\Sigma$ state. The above dissociation scheme also permits an interpretation of the ultra-violet absorption spectra of CO and $CO_2$.
R. C.

**Completion of the term schemes of carbon monoxide. II.** R. SCHMID and L. GERÖ (Z. Physik, 1937, **106**, 205—211).—A continuation of earlier theoretical work (this vol., 279).
L. G. G.

**Absorption spectra and photochemistry of polyatomic molecules containing alkyl radicals. V. Vibration frequencies and structure.** H. W. THOMPSON and J. W. LINNETT (Proc. Roy. Soc., 1937, **A**, **160**, 539—562; cf. A., 1936, 1443).—The vibration frequencies of metallic alkyl compounds are considered. It is shown that with $ZnMe_2$ and $HgMe_2$ a valency force field is more satisfactory than a central force, and that the experimental data are consistent with a linear structure. The bearing of the results on certain chemical problems is discussed.
G. D. P.

**Optical absorption of porphyrins. XI.** A. STERN and M. DEŽELIĆ (Z. physikal. Chem., 1937, **179**, 275—294; cf. this vol., 165).—Introduction of two OH into the 5 : 6 position of the chlorin system shifts the band max. towards the red, but otherwise has little effect on the band spectrum, which remains of the "chlorin" type. Dihydroxychlorin $p_6$ and dihydroxy-$\psi$-chlorin $p_6$ have different absorption spectra which suggest that the steric relations between these isomerides are similar to those between the corresponding unoxidised compounds. The absorption curves of the dihydroxyporphyrins (I) are of the "porphin" type, indicating oxidation, not at the β-positions of the nuclei of the porphin system (II), but at the methine bridges. From the similarity between the effects on the absorption spectrum of introduction of Me and OH into the methine bridges of (II) and the effects accompanying similar substitutions in $C_6H_6$ it is inferred that the OH in (I) are attached to the γ- and δ-C atoms. The absorption spectra of solutions of mono- and di-hydroxyporphyrins vary little with the solvent. The changes occurring in porphyrin solutions in light apparently consist in photo-oxidation proceeding by way of (I). In acid solutions the absorption spectra of (I) differ considerably from those of the corresponding porphyrins, presumably owing to modification of the basic character of the porphyrin complex by the OH. The absorption spectrum of mesorhodin Me ester (III) (fluorescent) is of the "porphyrin" type. In solution equilibrium seems to be established between

(III) and the corresponding mesoverdin (non-fluorescent). R. C.

**Near infra-red absorption spectrum of heavy water.** L. KELLNER (Proc. Roy. Soc., 1937, **A**, **159**, 410—415).—The absorption of liquid $D_2O$ in the range 0·9 to 2·1 μ has been measured. Four absorption bands are observed and ascribed to overtones and combination tones of three fundamental frequencies. G. D. P.

**Rotation of water molecules in carbon disulphide solution.** E. L. KINSEY and J. W. ELLIS (Physical Rev., 1937, [ii], **51**, 1074—1078).—The absorption spectrum of $H_2O$ dissolved in $CS_2$ (1 m. length) was investigated for four combination bands corresponding with those found in the vapour state. A correlation is made between the solution and vapour bands with and without the assumption of vapour–solution shift. Results in each case indicate that the mol. in the solution is freely rotating. The existence of line structure in the solution spectrum is undecided. In the 3 μ region a doublet in the solution of components at 2·80 and 2·65 μ is found. N. M. B.

**Infra-red absorption of mixtures of water and organic liquids.** D. WILLIAMS, T. GATICA, and W. GORDY (J. Physical Chem., 1937, **41**, 645—649).—The infra-red absorption spectra of MeOH–$H_2O$, PrOH–$H_2O$, and glycerol–$H_2O$ mixtures have been measured. It is concluded that the intense bands at 2·8 μ and the weaker bands at 6·1 μ are due to $H_2O$ mols. which have been distorted by the solvent mols. Even in mixtures containing only 5% of $H_2O$ a considerable no. of these distorted mols. are associated in a manner similar to that in the liquid $H_2O$ state, as is shown by the existence of the 4·7 μ absorption. No evidence of the distortion of alcohol mols. was found. O. J. W.

**Effect of hydrogen bonding on the infra-red absorption of the hydroxyl group.** A. M. BUSWELL, V. DEITZ, and W. H. RODEBUSH (J. Chem. Physics, 1937, **5**, 501—504; cf. this vol., 110).—Aq. solutions of *o*-$NO_2$·$C_6H_4$·OH (I), 2 : 4-dinitroresorcinol, 2 : 4- and 2 : 6-$(NO_2)_2C_6H_3$·OH, 2 : 4 : 6-$(NO_2)_3C_6H_2$·OH, Me salicylate (II), salicylaldehyde, and *o*-nitroanisole, and solutions of (I) in $CS_2$ and $C_2Cl_4$ all show a strong absorption max. at about 3350 cm.$^{-1}$ After keeping in contact with $D_2O$, (I) and (II) show a decrease in the intensity of this band and formation of a new max. at 2440 cm.$^{-1}$, attributable to replacement of OH by OD. The absorption spectra of aq. MeOH, EtOH, Bu$^{\alpha}$OH, and $CH_2Ph$·OH show a decrease in the intensity of the 3700 cm.$^{-1}$ band with increasing alcohol concn. whilst a band appears at 3400 cm.$^{-1}$ of intensity ≫ that of the 3700 cm.$^{-1}$ band. This is interpreted as indicating intermol. H bonds. J. W. S.

**Assignment of the $\delta_{\pi s}$, $\nu_{2\pi s}$ frequencies in the ethylene molecule.** T. Y. WU (J. Chem. Physics, 1937, **5**, 600—601).—Theoretical considerations support the view of Sutherland and Dennison that of the fundamental frequencies of $C_2H_4$, $\delta_{\pi s}$ = 1623 and $\nu_{2\pi s}$ = 1342 cm.$^{-1}$, respectively (cf. A., 1935, 569). This causes certain changes in the vals. of the frequencies for $C_2H_2D_2$ and $C_2D_4$ (this vol., 397). J. W. S.

**Infra-red spectrum and internuclear distances of methylacetylene.** R. M. BADGER and S. H. BAUER (J. Chem. Physics, 1937, **5**, 599).—The spectrum of CMe:CH has been measured over the range 7500—11,500 A., and the 10,304 A. band re-investigated in detail. The results confirm previous data (this vol., 166), and it is concluded that the short C—C distance, 1·463 A., indicated for this compound is real. This is in accord with the observation that the bond force const. in these compounds is > the val. expected for a C—C distance of 1·54 A. (*ibid.*, 219). J. W. S.

**Infra-red and Raman spectra of chlorobromomethanes.** J. LECOMTE, H. VOLKRINGER, and A. TCHAKIRIAN (Compt. rend., 1937, **204**, 1927—1929).—The Raman frequencies are: $CCl_3Br$ 187, 243, 289, 418, 710, 765, $CCl_2Br_2$ 141, 164, 230, 252, 318, 370, 672, 720, 759, and $CClBr_3$ 139, 210, 266, 326, 674, 734 cm.$^{-1}$ The infra-red frequencies between 500 and 1400 cm.$^{-1}$ are: $CCl_3Br$ 717, 764, $CCl_2Br_2$ 680, 727, 764, and $CClBr_3$ 667, 740 cm.$^{-1}$ J. G. A. G.

**Werner complexes. Dissimulation of the N–H vibration in ammine complexes.** (MME.) M. FREYMANN and J. P. MATHIEU (Bull. Soc. chim., 1937, [v], **4**, 1297—1300).—Aq. solutions of $[Pt(NH_3)_3C_5H_5N]Cl_2$ and *cis*-$[Pt(NH_3)_2(C_5H_5N)_2]Cl_2$ do not show the absorption band at 1·04 μ and the Raman frequencies characteristic of $NH_3$ (cf. A., 1935, 563; this vol., 219). An anomaly is explained (A., 1931, 1353; this vol., 168.) J. G. A. G.

**Raman spectra of crystal powders. V. I. Inorganic nitrates. II. Water of crystallisation.** R. ANANTHAKRISHNAN (Proc. Indian Acad. Sci., 1937, **5**, **A**, 447—462).—I. The Raman spectra of $NaNO_3$, $KNO_3$, $NH_4NO_3$, $Pb(NO_3)_2$, $Sr(NO_3)_2,4H_2O$, $Ca(NO_3)_2,4H_2O$, $Cd(NO_3)_2,4H_2O$, $Mg(NO_3)_2,6H_2O$, $Cu(NO_3)_2,3H_2O$, $Ce(NO_3)_3,6H_2O$, and $Bi(NO_3)_3,5H_2O$ have been photographed using the technique of complementary filters. The main nitrate frequency is 1050 cm.$^{-1}$, intense and sharp in all nitrates, and a less intense line 710—755 cm.$^{-1}$ The interval 1100—1600 cm.$^{-1}$ is complex, and depends on nature of cation, no. of $H_2O$ of crystallisation, and crystal structure.

II. The spectra of Mg, Ca, Cd, Cu, Ce, and Bi nitrates, Sr, Mg, and Mn chlorides, $CuSO_4,5H_2O$, $NaVO_4,12H_2O$, $Na_3PO_4,12H_2O$, $Na_2CO_3,10H_2O$, and $Na_2B_4O_7,10H_2O$ all differ widely from one another. The $H_2O$ of crystallisation gives rise to Raman frequencies between 3150 and 3650 cm.$^{-1}$ F. J. L.

**Relation between Raman frequencies and interatomic distances.** P. DONZELOT and J. BARRIOL (Compt. rend., 1937, **204**, 1867—1868).—The plot of "reduced" frequency against internuclear distance is a straight line. Methods of obtaining the "reduced" frequencies are outlined. W. R. A.

**Raman spectrum of monodeuteroethylene.** J. M. DELFOSSE, J. C. JUNGERS, G. LEMAITRE, Y. L. TCHANG, and G. MANNEBACK (Nature, 1937, **139**, 1111—1112).—Calc. data for $C_2H_4$, $C_2H_3D$, $C_2D_4$ and observed data for $C_2H_3D$ are tabulated and discussed. Calc. and observed frequencies for $C_2H_3D$ agree to within 1·5%. L. S. T.

**Raman spectra of amino-acids and related compounds. IV. Ionisation of di- and tri-carboxylic acids.** J. T. EDSALL (J. Chem. Physics, 1937, **5**, 508—517; cf. A., 1936, 269; this vol., 168, 282).—Raman frequencies are recorded for aq. solutions of $H_2C_2O_4$, $K_2C_2O_4$, $CH_2(CO_2H)_2$, $CH_2(CO_2H)(CO_2Na)$, $CH_2(CO_2Na)_2$, $CD_2(CO_2D)_2$, $CD_2(CO_2Na)_2$, crotonic acid, Na crotonate, $Na_2$ maleate, $Na_2$ fumarate, *d*- and *meso*-tartaric acids, $Na_2$ *d*-tartrate, *l*-aspartic acid hydrochloride, Na *l*-aspartate, *d*-glutamic acid hydrochloride, Na *d*-glutamate, tricarballylic acid, $Na_3$ tricarballylate, citric acid, and $Na_3$ citrate, together with preliminary data for $NH_2$-acids. The strong $CO_2H$ frequency at about 1700 cm.$^{-1}$ vanishes on ionisation, and the ions show one or more intense polarised lines near 1400 cm.$^{-1}$, which are almost unaffected by D substitution and probably correspond with a symmetrical valency oscillation of the $CO_2'$ group. Deformation frequencies in the same region and due to $CH_2$ and Me groups are changed by D substitution. Most of the substances show strong polarised lines at 700—950 cm.$^{-1}$, which are increased in frequency by 30—50 cm.$^{-1}$ on ionisation and depressed by D substitution. Frequencies below 600 cm.$^{-1}$, which are almost unaffected by ionisation or D substitution, are attributed to bending or twisting vibrations. J. W. S.

**Light scattering, Raman spectra, and allied physical properties of some essential and vegetable oils.** C. DAKSHINAMURTI (Proc. Indian Acad. Sci., 1937, **5**, **A**, 385—406).—The adiabatic and isothermal compressibility, sp. vol. for various temp., sp. heat at const. pressure, *n*, rotation of plane of polarisation, depolarisation factor, intensity of scattered light, and Raman spectra of eucalyptus, cajeput, coriander, anise, citronella, sandal, coconut, groundnut, and castor oils are recorded. The intensity of the scattered light indicates that its origin is mol., and the Raman spectra show that the accepted chemical constitutions of the oils are correct. F. J. L.

**Formation and mode of action of light-sensitive zinc sulphide and other luminophores.** N. RIEHL (Ann. Physik, 1937, [v], **29**, 636—664).—A survey of recent work. H. C. G.

**Ionisation potentials of free radicals methyl and ethyl.** R. G. J. FRASER and T. N. JEWITT (Proc. Roy. Soc., 1937, **A**, **160**, 563—574).—A beam of free radicals, formed by thermal decomp. of Pb tetra-alkyl, is admitted to an ionisation gauge. From the ion current the ionisation potentials are deduced (Me 11·2, Et 10·6 volts ± 0·8). G. D. P.

**Photo-electric measurements with metallic antimony.** R. SUHRMANN and W. BERNDT (Z. Physik, 1937, **106**, 354—357; cf. Middel, this vol., 395).—Middel's films of Sb must have contained some non-metallic Sb. The internal photo-electric effect in metallic conductors is vanishingly small. H. C. G.

**New kind of permanent polarisation of dielectrics.** G. NADJAKOFF (Compt. rend., 1937, **204**, 1865—1866).—By subjecting a dielectric to the simultaneous action of illumination and an electric field a new type of polarisation (permanent photo-polarisation) is induced. This is maintained indefinitely if the dielectric is kept in the dark after removal of the electric field. Its magnitude can be measured from the current produced in an ionised gas under standard conditions of illumination of the photo-cell. W. R. A.

**Effect of heat on the uni-polar electrical conductivity of carborundum.** M. K. CHAKRAVARTY and S. R. KHASTGIR (Phil. Mag., 1937, [vii], **24**, 127—141; cf. A., 1935, 148, 682).—The effect of change of temp., between 300° and 800° abs., on the conductivity of a carborundum crystal in two opposite directions has been studied. $\kappa$ increases exponentially with temp. The ratio of the two vals. of $\kappa$ rises or falls with temp., or shows a max. val. The results are interpreted on the basis of the Wilson–Fowler electron theory of semi-conductors. A. J. E. W.

**Dependence of dielectric loss on constitution and size of molecule of ketones.** W. HOLZMÜLLER (Physikal. Z., 1937, **38**, 574—587).—The dielectric loss of a no. of aliphatic and cyclic ketones in non-polar solvents was determined by finding the heat produced when the solutions were placed in a high-frequency field. The calc. relaxation time increases with increasing size of the ketone mol., and is different for two ketones of the same moment but different structure. The effects of solvent and dipole association are considered. The results can be explained by the dipole theory. The agreement with theory is better for the larger mols. A. J. M.

**Theory of electrical breakdown in ionic crystals.** H. FRÖHLICH (Proc. Roy. Soc., 1937, **A**, **160**, 230—241).—From the time of relaxation of an electron in an ionic lattice the crit. field, *F*, for electrical breakdown is calc. Agreement with experiment is obtained. *F* increases with rising temp. and if foreign atoms are introduced into the lattice. The theory also indicates an increase in *F* for layers about $10^{-6}$ cm. thick. G. D. P.

**Dielectric constant of mixed crystals of sodium ammonium and sodium potassium tartrates.** R. C. EVANS (Phil. Mag., 1937, [vii], **24**, 70—79).—Vals. of $\varepsilon$ for a complete series of mixed crystals, obtained in the frequency range 50—2000 kc., are recorded. For the Na $NH_4$ salt, $\varepsilon = 8·2$. No variation of $\varepsilon$ with frequency occurs in the above range. A. J. E. W.

**Dielectric constants of solutions of some alcohols in benzene.** V. I. ROMANOV and I. A. ELTZIN (Physikal. Z. Sovietunion, 1937, **11**, 526—538).—The dielectric consts. of MeOH, $Bu^{\beta}OH$, *n*- and *iso*-$C_5H_{11}$·OH in $C_6H_6$ have been determined for $\lambda$ 57·75 cm., and the mol. polarisations have been calc. The electric moments are obtained and compared with those for a static field. The deviation is considerable, except in the case of MeOH, the vals. agreeing more closely with those calc. for the absorption max. A. J. M.

**Dipole moments of hydrazides.** P. R. FREY and E. C. GILBERT (J. Amer. Chem. Soc., 1937, **59**, 1344—1347).—Vals. of $\mu$ for benzoyl-, $\alpha\beta$-dibenzoyl-, $\alpha$-benzoyl-$\beta$-*p*-toluoyl-, $\alpha$-benzoyl-$\beta$-*p*-chlorobenzoyl-, and $\alpha$-benzoyl-$\beta$-*p*-nitrobenzoyl-hydrazide, azodi-

benzoyl, and 2 : 5-diphenylfurazan are 2·70, 2·63, 3·38, 3·82, 5·57, 2·85, and 3·45, respectively.
E. S. H.

**Raman effect and dipole moment in relation to free rotation. VIII. Molecular structure of carbonic esters.** M. Kubo, Y. Morino, and S. Mizushima (Sci. Papers Inst. Phys. Chem. Tokyo, 1937, **32**, 129—137).—The dipole moment of $Et_2CO_3$ is 1·07 (79—204°) and of $Me_2CO_3$ 0·86—1·00 (55—206°). These is no significant single bond–double bond resonance, the normal state approximates to the classical formula, and the temp. effect in $Me_2CO_3$ is due to oscillation of Me groups; this is not possible in $Et_2CO_3$ because of mutual interaction of Et groups.
F. J. L.

**Dielectric constant of cetyl alcohol near its m.p.** K. Higasi and M. Kubo (Bull. Chem. Soc. Japan, 1937, **12**, 326—327).—Data for the range −13·5° to 64° show that cetyl alcohol has a max. dielectric const. at slightly < m.p. J. G. A. G.

**Double refraction effect in certain fatty materials.** L. Bellingham (Nature, 1937, **140**, 70).—When tested by the projection refractometer vaseline, lanoline, rubber lubricant, ordinary yellow soap, and green soft soap show two refractive indices.
L. S. T.

**Origin of optical activity in nature.** C. W. F. Spiers (Naturwiss., 1937, **25**, 457).—The theory of Kuhn is preferred to that of Langenbeck and Triem (cf. A., 1937, III, 29). O. D. S.

**Relative and absolute spatial configurations of optically active tri-diamine complexes of chromium, cobalt, and rhodium.** F. M. Jaeger (Bull. Soc. chim., 1937, [v], **4**, 1201—1220; cf. this vol., 170).—Earlier work by the author and others is discussed (cf. A., 1928, 1172). The application of Werner's solubility rule to the halogeno-*d*-tartrates shows that *D*-$[Co(en)_3]$, *D*-$[Cr(en)_3]$, *L*-$[Rh(en)_3]$ (I), *L*-$[X(d\text{-cpn})_3]$, and *L*-$[X(d\text{-cxn})_3]$ have the same spatial configuration, where *D* and *L* denote rotation of resolved complex in red light, X = Co, Cr, Rh, en = $(CH_2{\cdot}NH_2)_2$, cpn = *cyclo*pentanediamine, and cxn = *cyclo*hexanediamine. Only in (I) does substitution of Co or Cr by Rh lead to inversion of rotation in the red, the configuration remaining the same. Application of Delépine's "active racemate" method (A., 1935, 65) confirms the above conclusions. The rotatory dispersions and circular dichroism of the chlorides of the above ions and of *L*-$[Co(d\text{-cxn})_2(en)]Cl_3$ and *L*-$[Co(d\text{-cxn})(en)_2]Cl_3$ have been determined (cf. A., 1936, 410) and when interpreted by the method of Kuhn and Bein (A., 1934, 476) lead to identical spatial configurations for all of the ions except in the case of *L*-$[Co(d\text{-cpn})_3]Cl_3$, which gives anomalous results, and this suggests that the method may not have the range of application hitherto supposed. J. G. A. G.

**Measurement of circular dichroism in the ultra-violet regions. I.** R. Tsuchida (Bull. Chem. Soc. Japan, 1937, **12**, 276—285).—Mathematical. A general equation (i) for use in measurements of circular dichroism (A., 1930, 1096) has been developed and the equation formerly used (*loc. cit.*) is shown to be a very special case of (i). The optical absorption, rotatory dispersion, and circular dichroism of $NH_4$ α-bromocamphor-π-sulphonate in the visible and ultra-violet have been determined.
J. G. A. G.

**Magneto-optical properties of compressed gases: magnetic birefringence of nitric oxide. Magnetic rotatory power of helium.** H. Bizette and B. Tsaï (Compt. rend., 1937, **204**, 1870—1871).—A calc. Cotton–Mouton const. for NO agrees well with the observed val. and indicates that the birefringence is max. at −57°. The Verdet const. for He at 89 kg. per sq. cm. has been measured.
W. R. A.

**Anomalies in the magnetic rotatory dispersion of sulphuric acid solutions of tellurium.** H. Bizette and M. Schérer (Compt. rend., 1937, **204**, 1931—1933).—The rotations due to Te were positive on both sides of the Te absorption band. J. G. A. G.

**Structure and electronic interpretation of some optically active sulphoxides.**—See A., II, 373.

**Polarity of chemical bonds.** M. L. Huggins (J. Chem. Physics, 1937, **5**, 527—529).—It is as valid to consider polar bonds to resonate between two covalent states as between a covalent and an ionic state. It is suggested that a H atom may be bonded simultaneously to two other atoms if they are sufficiently electronegative (*e.g.*, F), and that C or N atoms suitably surrounded by electronegative atoms can hold >4 bonding electron pairs in the valency shell. Pauling's magnetic criterion of bond type may distinguish between covalent bonds and ionic bonds.
J. W. S.

**Determination of intermolecular forces in gases from their viscosities.** D. Burnett (Proc. Camb. Phil. Soc., 1937, **33**, 363—370).—Theoretical.
F. J. L.

**Force constants and molecular structures.** C. R. Bailey and J. B. Hale (Nature, 1937, **139**, 1112).—For $COCl_2$, $CH_2O$, and $CO(NH_2)_2$ the carbonyl force consts. are of the order 12·3, 11·5, and 10·2, respectively; the carbonyl frequency, $\omega_1$, for $CH_2O$ (1744 cm.$^{-1}$) can be regarded as the normal val., and arises from a pure double linking. $CO(NH_2)_2$ ($\omega_1$ = 1655 cm.$^{-1}$) has a considerable single linking contribution, but $COCl_2$ ($\omega_1$ = 1827 cm.$^{-1}$) has a marked triple linking effect. L. S. T.

**Rotation and vibration of linear triatomic molecules.** A. Weinberg and C. Eckart (J. Chem. Physics, 1937, **5**, 517—522; cf. A., 1935, 685).—Mathematical. The wave equation of the triat. mol. is derived and its approx. solution is discussed.
J. W. S.

**Determination of the constants of harmonic vibrations.** O. Redlich and H. Tompa (J. Chem. Physics, 1937, **5**, 529—538; cf. A., 1935, 685).—Mathematical. The method of relating the consts. of potential energy and frequency of potential systems for harmonic vibrations is developed.
J. W. S.

**Re-determination of the carbon–oxygen distance in calcite and the nitrogen–oxygen distance in sodium nitrate.** N. Elliott (J. Amer. Chem. Soc., 1937, **59**, 1380—1382).—*X*-Ray investigation gives 1·313 A. for the C—O distance and 1·210 A. for

the N—O distance. The latter val. is discussed in relation to the effect of resultant charge of an atom on its covalent radius. E. S. H.

**Valency angle and radius of action of bound atoms.** H. A. STUART (Z. physikal. Chem., 1937, **B**, **36**, 155—162).—Existing data for internuclear distances and valency angles for mols. of the types $AX_2$ and $AX_3$ indicate that valency angles > the 90° required by wave mechanical theory for O, S, and N, *e.g.*, 110° for O, are due to repulsive forces between the X atoms. Interat. repulsive forces appear inadequate to effect any appreciable deformation of electron envelopes. R. C.

**Quantum theory of atomic polarisation. I. Polarisation by a uniform field. II. Van der Waals energy of two atoms.** R. A. BUCKINGHAM (Proc. Roy. Soc., 1937, **A**, **160**, 94—113, 113—126). —I. The at. polarisability of several atoms containing closed electron groups is calc. from their self-consistent fields. An antisymmetrical wave function gives better results than a symmetrical function.

II. The method developed above is used to calc. the mutual energy of an atom polarised by another distant atom. The dipole–dipole const. is related to the at. polarisability, and is calc. for rare gas atoms and for alkali ions in crystals. G. D. P.

**Rôle of dipole–dipole coupling in dielectric media.** J. H. VAN VLECK (J. Chem. Physics, 1937, **5**, 556—568; cf. this vol., 353).—Mathematical. It is shown that the Lorentz expression for the local field ($E + 4\pi P/3$) and the Clausius–Mossotti formula are only first approximations, valid at low density. A Gaussian approximation or a formula based on Onsager's theory does not allow the electric analogue of ferromagnetism in polar liquids, demanded by the Clausius–Mossotti law. Hence the hypothesis of hindered rotation may not be necessary to explain the absence of spontaneous polarisation and great saturation curvature in strong fields. Kirkwood's calculations (A., 1936, 1321) of the translational fluctuation effect are extended to include polar mols. and accord with measurements on $NH_3$ (A., 1931, 147; 1934, 11). J. W. S.

**Surface tension of deuterium oxide and of its mixtures with water.** G. JONES and W. A. RAY (J. Chem. Physics, 1937, **5**, 505—508).—The surface tension ($\gamma$) of $D_2O$–$H_2O$ mixtures (22—97% $D_2O$) $\propto 1-0{\cdot}00501\Delta s$ ($\Delta s$ = change in $d$ from that of pure $H_2O$). By extrapolation $\gamma$ for pure $D_2O$ is calc. to be 0·99946 that of $H_2O$. J. W. S.

**Surface tension of water and heavy water.** J. TIMMERMANS and H. BODSON (Compt. rend., 1937, **204**, 1804—1807; cf. A., 1936, 557).—Vals. of $\gamma$ for $H_2O$, obtained by capillary-ascent, bubble-pressure, and drop-wt. methods, and vals. for $D_2O$ obtained by a capillary-ascent method, are given for temp. $\not>40°$. The $\gamma/T$ curves show an anomalous flattening at 13° for $H_2O$ and at 17° for $D_2O$. A. J. E. W.

**Polyhalides. V. Structure of polyhalides.** S. K. RAY and D. MAJUMDAR (J. Indian Chem. Soc., 1937, **14**, 197—207).—Parachor measurements indicate that the bonds between the halogens in $NEt_4I_3$, $NEt_4I,Br_2$, $C_6H_4Br{\cdot}NMe_3I,Cl_2$, $C_6H_4Br{\cdot}NMe_3I,Cl_4$, $C_6H_4Br{\cdot}NMe_3,Br_3$, and $NEt_4IBr,Cl_3$ are electron-pair and not singlet links. Structures are suggested. F. J. L.

**Parachors of polycyclic compounds. II.** D. N. KURSANOV and V. S. GORIATSCHEV (J. Gen. Chem. Russ., 1937, **7**, 1096—1101; cf. A., 1935, 15).—The parachors of monocyclic compounds with a double linking are in agreement with theory, whilst those of similar dicyclic compounds are consistently < theoretical. R. T.

**"Detour-excitation," a hitherto unnoticed retroaction phenomenon in grating interference.** M. RENNIGER (Z. Physik, 1937, **106**, 141—176).—A discussion of the reinforcing effect of secondary internal reflexion, due to the primary radiation, on the diffracted *X*-radiation from diamond. The lattice const. of diamond obtained from a consideration of this effect is 3·55948±0·00010 A. L. G. G.

**Theory of fine structure in the *X*-ray absorption spectra of triatomic molecules.** B. V. BOGDANOVITSCH (Physikal. Z. Sovietunion, 1937, **11**, 513—525).—An exact formula for the fine structure in *X*-ray absorption spectra of triat. mols. is derived on the basis of Petersen's generalisation (A., 1932, 892; 1933, 332; 1936, 399) of Kronig's theory (A., 1932, 553). The scattering of the electron wave by a system of two atoms is considered. Axial symmetry of mols. has little effect on the fine structure function. A. J. M.

**Uses and limitations of *X*-ray diffraction methods.** J. T. NORTON (J. Appl. Physics, 1937, **8**, 307—312).—A discussion. H. J. E.

**The liquid state.** K. F. HERZFELD (J. Appl. Physics, 1937, **8**, 319—327).—A review. H. J. E.

**Cathode sputtering of copper in light and heavy hydrogen.** A. GÜNTHER-SCHULZE (Z. Physik, 1937, **106**, 371—372).—At 2000 volts cathode sputtering of Cu in $D_2$ is the same as in $H_2$. H. C. G.

**Nature of the boundary surface of selenium film cells.** P. GÖRLICH (Z. Physik, 1937, **106**, 373—378).—Cathode sputtering of the Se surface with Pt or Ag gives greater sensitivity than evaporation in vac. The Se surface appears to be covered with a thin layer of Se oxides and adsorbed gas atoms. H. C. G.

**Comparison of cathode sputtering of pure and oxide-coated magnesium surfaces.** A. GÜNTHER-SCHULZE and H. BETZ (Z. Physik, 1937, **106**, 365—370).—Sputtering from an oxide-coated Mg cathode is only 0·4% of that from pure Mg. Equally small is that from Mg in $H_2$, whilst in He no sputtering occurs. The reduction when impurities are present on the surface is due to the expulsion of Mg ions, which return to the cathode, instead of Mg atoms. L. G. G.

**Effect of temperature on the intensity of reflexion of *X*-rays from zinc crystals.** E. O. WOLLAN and G. G. HARVEY (Physical Rev., 1937, [ii], **51**, 1054—1061).—Measurements of intensity at room and liquid-air temp. show that the at. structure factors of Zn at these temp. depend on the orientation of the plane from which reflexion takes place. The temp. factor for the various planes has been deter-

mined, and hence the structure factor for the atom at rest is calc. There is evidence that the Zn atoms in the crystal do not possess spherical symmetry but are drawn out in the direction of the *c* axis. The amplitude of thermal vibration of the atoms along various directions in the crystal has been determined, and general deductions agree with those from sp. heat data. N. M. B.

**Atomic structure and vibrations in zinc crystals. IV. Diffuse scattering of *X*-rays at different temperatures.** G. E. M. JAUNCEY and W. A. BRUCE. **V. Diffuse scattering of *X*-rays at various scattering angles.** W. A. BRUCE and E. M. MCNATT. **VI. Determination of electron asymmetry and the two principal characteristic temperatures.** G. E. M. JAUNCEY and W. A. BRUCE (Physical Rev., 1937, [ii], **51**, 1062—1065, 1065—1067, 1067—1073; cf. A., 1936, 1325).—IV. Crystal surfaces must be plane to $10^{-5}$ cm. for reliable results, and methods of annealing and polishing to attain this are described. Measurements for orientations of 3° and 90° at a scattering angle of 30° were made in the temp. range 100—550° abs. A method of obtaining the ratio of the mean square displacement parallel to that perpendicular to the principal axis is described.

V. Former measurements at room temp. are repeated with higher accuracy in order to obtain evidence on electron asymmetry.

VI. A detailed analysis and discussion of the above and an examination of at. structure factor vals. N. M. B.

**Influence of alternating stresses on the crystal structure of metals.** F. WEVER and H. MÖLLER (Naturwiss., 1937, **25**, 449—453).—The change during alternating bending in the structure of a single crystallite at the breaking point of a rod of mild steel (0·02% C) has been followed by *X*-ray diffraction. No alteration was observed with strains $\ll$ the static tensile strength. Above the static strength small disturbances appear. Large disturbances are first observed at the breaking point just before fracture. Results agree with those of Gough and Wood (B., 1936, 841) but disagree with those of Barrett (*ibid.*, 890). O. D. S.

**Non-metallic and random structure of metal films.** R. SUHRMANN and W. BERNDT (Naturwiss., 1937, **25**, 457—458; cf. this vol., 19).—The change of structure of thin condensed films of Fe, $<10$ mμ thick, from a half-conducting non-metallic state to a random, and finally to an ordered, metallic structure has been observed. Previous work is summarised and discussed. O. D. S.

**Dependence of the shift-rate of the planes of a growing crystal on the surroundings.** E. ERNST (Z. Krist., 1937, **96**, 38—77).—Artificially-ground spherical crystals of rock-salt are hung in a slightly supersaturated aq. solution under controlled conditions of temp., evaporation, and stirring, and the formation and shift-rate of the different planes observed by direct measurement. Growth curves are given in detail, and relationships sought between area of face, edge length, and shift-rate. B. W. R.

**Recent knowledge on crystal growth and seed crystal formation.** I. N. STRANSKI (Trav. Congr. Jubil. Mendeléev, 1937, **2**, 185—196).—A brief description of the author's mathematical theory (cf. A., 1934, 946, 1058, 1059; 1935, 816, 1059). C. R. H.

**Quasi-crystalline structure of liquids and solutions. Debye rotational hindrance, van Arkel association, and the "state" of liquids.** F. H. MÜLLER (Physikal. Z., 1937, **38**, 498—510).—Theoretical. The Debye rotational coupling energy is considered. A. J. M.

**Surface layer of polished silica and glass: optical contact.** (LORD) RAYLEIGH (Proc. Roy. Soc., 1937, **A**, **160**, 507—526).—The reflecting power of a surface of $SiO_2$ examined in a liquid of the same *n* as the body of the material depends on its method of prep. Surfaces prepared by a process which removes material rapidly or by washing in dil. HF do not reflect appreciably. If the polishing process does not remove material quickly the surface reflects as much as 0·28% of the incident light. *n* of the surface film may rise to 1·6. Similar, though less marked, effects are observed in glass and crystal quartz. The thickness of the layer is 341 A. The variable reflecting power at the interface of $SiO_2$ or glass surfaces in optical contact can thus be controlled. Surfaces of crystal quartz in optical contact are separated by a distance about 7 times the crystal spacing. G. D. P.

**Physical properties of surfaces. IV. Polishing, surface flow, and the formation of the Beilby layer.** F. P. BOWDEN and T. P. HUGHES (Proc. Roy. Soc., 1937, **A**, **160**, 575—587; cf. B., 1936, 842).—The relative m.p. of polisher and solid are more important than their hardnesses in the process of polishing. Surface flow is produced by intense local heating causing fusion of surface irregularities, which are then smeared over the surface to form the Beilby layer. G. D. P.

**Gold–sodium compound $Au_2Na$.** H. PERLITZ and E. ARUJA (Naturwiss., 1937, **25**, 461; cf. Haucke, this vol., 127).—The side of the unit cube of $Au_2Na$ is 7·7874±0·0002 A. at 20°. The unit cell contains 24 atoms and is of $Cu_2Mg$ type with 16 Au atoms in the Wyckoff layer 16(*b*) and 8 Na atoms in the layer 8(*g*). For the alloy Au 85·7, Na 14·3 at.-% the side of the unit cube is 7·770 A. for $Au_2Na$ and 4·046 A. for Au. O. D. S.

**Polymorphism of antimony trioxide and the structure of the orthorhombic form.** M. J. BUERGER and S. B. HENDRICKS (J. Chem. Physics, 1937, **5**, 600).—The high-temp. orthorhombic form of $Sb_2O_3$, obtainable as a metastable phase at room temp., has a space-group *Pccn*—$D_{2h}^{10}$, with *a* 4·92, *b* 12·46, and *c* 5·42 A., and contains 4 $Sb_2O_3$ mols. per unit cell. The structure can be considered as made up of double chains of alternate O and Sb, with O linking the Sb of the two chains. These Sb–O–Sb angles are 115° and 129°, respectively. J. W. S.

**Crystal structures of $Cr_2Al$ and $Cr_5Al_8$.** A. J. BRADLEY and S. S. LU (Z. Krist., 1937, **96**, 20—37).—$Cr_2Al$ is tetragonal, $a_0$ 2·9984, $c_0$ 8·6303 A., space-

group 14/*mmm*. $Cr_5Al_8$ is rhombohedral, pseudo-body-centred cubic, $a_0$ 9·0327 A., $\alpha$ 89° 16·4′, space-group *R*3*m*. Parameters are accurately determined from intensity measurements, and the structure of $Cr_5Al_8$ is compared in detail with that of $\gamma$-brass ($Cu_5Zn_8$).
B. W. R.

**Change of lattice orientation due to allotropic transformation in boracite, leucite, and anhydrous sodium sulphate crystals.** H. SHÔJI (Sci. Rep. Tôhoku, 1937, **26**, 86—91).—In boracite and leucite crystals one of the (110) planes in the pseudo-cubic lattice becomes parallel to one of the (110) planes in the cubic form during the changes at 265° and 620°, respectively. Other corresponding planes in both lattices are also nearly parallel. In anhyd. $Na_2SO_4$ crystals the (0001) plane in the pseudo-hexagonal lattice at room temp. becomes parallel to the (0001) plane in the hexagonal (or another pseudo-hexagonal) lattice formed at 280°.
J. W. S.

**[Crystal structures of] alkali ferrihexafluorides.** W. MINDER (Z. Krist., 1937, **96**, 15—19).—The elementary cells of compounds $R_3FeF_6$, where R is $NH_4$, Li, Na, K, Rb, and Cs, are measured and results are summarised. The space-group of the $NH_4$ compound was $T^2$ or $T^2_h$; that of the others could not be determined.
B. W. R.

***X*-Ray investigation of diphenylene disulphide and diphenyl disulphide.** M. PRASAD, J. SHANKER, B. H. PEERMOHAMED (J. Indian Chem. Soc., 1937, **14**, 177—187).—Diphenylene disulphide is monoclinic prismatic, space-group $C^5_{2h}$, with 8 mols per unit cell, polymerised in pairs forming 4 asymmetric units. $Ph_2S_2$ is orthorhombic bisphenoidal, space-group $Q_4$, with 4 mols. per unit cell; the possibility of a centre of symmetry in the mol. is not excluded.
F. J. L.

**Crystal behaviour of hydrocarbons.** R. T. LESLIE and W. W. HEUER (J. Res. Nat. Bur. Stand., 1937, **18**, 639—644).—The construction and operation of a microscope for observing crystal growth at low temp. are described. The crystal forms of 9 aromatic, 6 *cyclo*-paraffin, 8 *n*-paraffin, and 5 branched-chain paraffin hydrocarbons have been observed. Condensed mols. tend to crystallise in polyhedra of about equal size, whereas long-chain mols. form long prisms. Successive members of the *n*-paraffin series cannot be distinguished by crystal form, whilst hydrocarbons of different types, *e.g.*, methyl*cyclo*hexane and $\beta\beta\delta$-trimethylpentane, may crystallise in very similar forms. *n*-Paraffin and aromatic hydrocarbon crystals grow more readily than those of the other types.
J. W. S.

**Crystalline structure of the sugars. IV. Pentaerythritol and the hydroxyl bond.** F. J. LLEWELLYN, E. G. COX, and T. H. GOODWIN (J.C.S., 1937, 883—894).—The structure of the tetragonal crystals of pentaerythritol is determined by *X*-ray measurements. The interat. distances within the mol. are C—C 1·50, C—O 1·46 A., and the deviations of the bond angles from the tetrahedral angle are negligible. The structure of the lattice is of a layer type, the mols. being linked in the plane by "hydroxyl bonds," the separation of the layers being >3·5 A., accounting for the perfect cleavage parallel to {001}.
J. D. R.

**Pattern of proteins.**—See A., II, 394.

**Significance of electronic diffraction in scientific and technical questions.** H. MARK (Trav. Congr. Jubil. Mendeléev, 1937, **2**, 69—77).—A lecture. Recent applications of electron and *X*-ray diffraction methods to the determination of at. and mol. structure are described.
C. R. H.

**Carbon–carbon linking distances. Electron-diffraction investigation of ethane, propane, *iso*butane, neopentane, *cyclo*propane, *cyclo*pentane, *cyclo*hexane, allene, ethylene, *iso*butene, tetramethylethylene, mesitylene, and hexamethylbenzene. Revised values of covalent radii.** L. PAULING and L. O. BROCKWAY (J. Amer. Chem. Soc., 1937, **59**, 1223—1236).—The C—C distance has the const. val. 1·54±0·02 A. and is not affected by the presence of an adjacent double linking or $C_6H_6$ nucleus (if it does not form part of a conjugated system). The C=C distance is 1·34±0·02 A., which has led to a revision of the table of covalent radii. The effect of this revision on the linking distance–resonance curve is discussed.
E. S. H.

**Electron diffraction investigation of the fluorochloromethanes.** L. O. BROCKWAY (J. Physical Chem., 1937, **41**, 747—762; cf. this vol., 222).—An amplification of previously published work. The angle Cl–C–Cl (112°) is > Cl–C–F (110°) or F–C–F (110°).
F. R. G.

**Molecular structures of the $\beta\gamma$-epoxybutanes. Correction.** L. O. BROCKWAY and P. C. CROSS (J. Amer. Chem. Soc., 1937, **59**, 1147—1148; cf. this vol., 119).—The previously reported electron diffractions of *cis*- and *trans*-$\beta\gamma$-epoxybutane are confirmed and shown to be in accord with the chemical assignment of configurations if the valency strain of the three-membered ring is distributed over the other linkings. This is held to be proof of such distribution of strain.
R. S. C.

**Electron diffraction investigation of some inorganic halides.** A. H. GREGG, G. C. HAMPSON, G. I. JENKINS, P. L. F. JONES, and L. E. SUTTON (Trans. Faraday Soc., 1937, **33**, 852—874).—From electron diffraction data for $PBr_3$, $PI_3$, $AsBr_3$, $AsI_3$, $SbCl_3$, $SbBr_3$, $SbI_3$, $HgCl_2$, $HgBr_2$, $HgI_2$, $HgMe_2$, and $BCl_3$ the distances between the central and attached atoms have been obtained. The covalency angles for the halides of P, As, and Sb are approx. 100° and for $HgI_2$ $\nless$160°. The data, together with those of other workers, show that the observed interat. distances of $PI_3$, $AsI_3$, and $SbI_3$ are $\nless$ the vals. calc. by summing the Pauling–Huggins covalent radii, whilst for the other halides the observed vals. are < those calc., the difference increasing in the order bromide < chloride < fluoride. For Hg halides the differences between observed and calc. vals. increase in the reverse order. The possible causes of the differences are discussed.
C. R. H.

**Crystal structure of sputtered nickel films.** S. OGAWA (Sci. Rep. Tôhoku, 1937, **26**, 93—105).—Electron diffraction measurements indicate that Ni

films sputtered in $H_2$ are of non-magnetic hexagonal close-packed I (cf. A., 1933, 1234; 1934, 353) which is converted into face-centred cubic I on annealing in a vac. at 320°. Films formed by cooled sputtering in $H_2$ or $N_2$ show diffuse patterns, but yield hexagonal close-packed I and II, respectively, on annealing at 200—250°. On annealing at higher temp. the amount of adsorbed gas decreases, and hexagonal I yields cubic I and hexagonal II yields successively cubic II and cubic I. The magnetic susceptibility of films produced by cooled sputtering in $H_2$ increases with increasing film thickness, this being accompanied by superposition of the cubic on the hexagonal lattice. Films of hexagonal I obtained by non-cooled sputtering are non-ferromagnetic up to thicknesses of $5 \times 10^{-5}$ cm. owing to gas absorption. J. W. S.

**Electron theory of metals.** K. Ariyama (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, **32**, 103—119).—A theoretical discussion of the ferromagnetic properties of metals. F. J. L.

**Piezodielectric effect and electrostriction in anisotropic or isotropic media.** H. Osterberg and J. W. Cookson (Physical Rev., 1937, [ii], **51**, 1096—1101).—Mathematical. N. M. B.

**Pyroelectric behaviour of picric acid crystals.** G. Greenwood (Z. Krist., 1937, **96**, 81—84).—Large crystals of picric acid were obtained by very slow crystallisation from EtOH, and were tested for pyroelectricity by a variety of methods. A negative result was obtained, agreeing with the fact that this substance has so far not been found to be piezoelectric. B. W. R.

**Magneto-resistance effect in cadmium at low temperatures.** C. J. Milner (Proc. Roy. Soc., 1937, **A**, **160**, 207—229; cf. this vol., 227).—The increase of electrical resistance of polycryst. Cd specimens of differing degrees of purity has been measured in fields up to 26 kilogauss. Above 20° abs. the linear variation of resistance with field was confirmed. A new effect was observed at 4·2° abs., where in addition to the linear effect a square law increase was observed, the increase of resistance with field being represented by $aH^2 + bH$. The const. $a$ falls rapidly as the temp. rises above 4° abs. and is dependent on the purity of the specimen. $b$ is approx. const. The results are compared with those of other workers. G. D. P.

**Properties of the surface magnetisation in ferromagnetic crystals.** W. C. Elmore (Physical Rev., 1937, [ii], **51**, 982—988).—The magnetic powder patterns on polished Fe crystals have been studied with the help of a macroscopic model and by investigating the forces on the powder particles. Evidence is given that the structures originate during polishing, but that causes other than magnetic must be responsible for the regularity of the patterns. N. M. B.

**Hysteresis of magnetostriction of iron, nickel, cobalt, and single crystals of iron.** Y. Masiyama (Sci. Rep. Tôhoku, 1937, **26**, 1—39).—The hysteresis of magnetostriction of Fe, Ni, and Co polycrystals and of Fe single crystals has been investigated by varying the field ($H$) gradually or suddenly. After sudden withdrawal of $H$ the residual elongation is $\gg$, and the residual magnetisation $<$, after reducing $H$ slowly to zero. The anomaly can be explained by the rotational inertia of elementary complexes. The effects with polycrystals are the resultant of those of the constituent microcrystals. J. W. S.

**Hysteresis of magnetostriction for alloys of the systems iron–nickel, nickel–cobalt, and iron–cobalt.** Y. Masiyama (Sci. Rep. Tôhoku, 1937, **26**, 65—85; cf. preceding abstract).—Hysteresis of magnetostriction and magnetisation in Fe–Ni, Ni–Co, and Fe–Co alloys occur over a wide range of field strength ($H$), when this is varied slowly. For all the alloys investigated the descending and ascending branches of the magnetostriction–$H$ curves show max. in weak fields, but in alloys containing 20, 50, and 70% of Fe they show min. near where $H = 0$. J. W. S.

**Effect of temperature on the discontinuous process of magnetisation in nickel and nickel-iron alloy (40% Ni).** M. Takagi (Sci. Rep. Tôhoku, 1937, **26**, 55—64; cf. this vol., 173).—With rising temp., the magnetisation in these metals due to the discontinuous process decreases almost linearly, the effect being greatest in strong fields, whilst the prominent discontinuous jumps in strained wires are displaced, generally, but not always, towards weaker fields. This is attributed to the splitting of the coherent magnetisable groups into smaller groups as a result of thermal motion. J. W. S.

**Optical constants of sodium.** H. E. Ives and H. B. Briggs (J. Opt. Soc. Amer., 1937, **27**, 181—185).—Using the method recently reported for K (cf. this vol., 285), vals. of $n$ and extinction coeffs. were obtained for the range 5780—2536 A. Results, with reflecting power, principal incidence angle, and principal azimuth, are plotted as a function of $\lambda$ and are compared with available data and calc. vals. N. M. B.

**Tetragonal enantiomorphous nickel sulphate hexahydrate.** L. Borghijs (Natuurwetensch. Tijds., 1937, **19**, 115—148).—Tetragonal $NiSO_4,6H_2O$ crystals grown at 38—40° have mean $[\alpha]_D$ 1·55°/mm.; 40% are lævo- and 60% dextro-rotatory but only dextro-crystals are formed when grown in lævo-polarised light filtered through Wood's glass. The dispersion curve has been measured between 3342 and 6442·5 A.; an inversion occurs at $\lambda$ 5060 A. $X$-Ray examination by the powder method gave $a$ 6·776±0·003, $c$ 18·249±0·009 A., and $d$ 2·074. A rapid method for the identification of the enantiomorphs based on etching the crystal with MeOH is described. $NiSeO_4,6H_2O$ has mean $[\alpha]_D$ 2·35°/mm. The results of the investigation support the germ theory of crystallisation. S. C.

**Strain double refraction due to small crystal deformations.** Y. Kidani and A. Smekal (Physica, 1937, **4**, 606—608).—The production of double refraction in NaCl crystals by small applied strains is described. O. D. S.

**Artificial slip formation in crystals.** A. W. Stepanow (Nature, 1937, **140**, 64).—Photographs, taken in polarised light, of slip-formation in crystals of rock-salt the surfaces of which had been scratched

and then stretched show that the scratches are the source of the slips; these, in turn, increase the surface defect, which ends in fracture. L. S. T.

**Compressibility of fused-quartz glass at atmospheric pressure.** W. B. EMERSON (J. Res. Nat. Bur. Stand., 1937, **18**, 683—711).—The coeffs. of linear compressibility at atm. pressure and temp for fused $SiO_2$ and stainless steel (14% Cr) are $9{\cdot}9 \times 10^{-7} \pm 5 \times 10^{-8}$ and $3{\cdot}1 \times 10^{-7}$ per atm., respectively. J. W. S.

**Flow phenomena in heavily stressed metals.** P. W. BRIDGMAN (J. Appl. Physics, 1937, **8**, 328—336; cf. A., 1936, 146).—A review. H. J. E.

**Precision extensometer measurements on tin.** B. CHALMERS (J. Inst. Met., 1937, **61**, Advance copy, 293—308).—Creep experiments have been made on Sn specimens consisting of (*a*) single crystals, (*b*) a few crystals with longitudinal crystal boundaries, and (*c*) small crystals, using an extensometer measuring by means of optical interference fringes to strains of $10^{-7}$ cm. per cm. The results show that the change of orientation across a crystal boundary affects the mechanical properties of the boundary and the relation between recovery and creep. The shapes of the various creep curves obtained are discussed theoretically. A. R. P.

**Visual demonstration of the transformations of condensed hydrogen sulphide, $H_2S$ and $D_2S$.** A. KRUIS and K. CLUSIUS (Physikal. Z., 1937, **38**, 510—514).—The transformations of solid $H_2S$ may satisfactorily be explained by the existence of hindered rotation of mols. in the lattice. At least one of the two transition points should be due to a transition of the first kind. This has been verified by observing the transition from the optically anisotropic to the isotropic form by polarised light. At low temp. $H_2S$ exists in the optically anisotropic phase III. It changes by a transformation of the first kind into optically isotropic phase II at $103{\cdot}5_7°$ abs. This is confirmed by the large amount of energy (362·1 g.-cal. for $H_2S$) required for the change, which is used partly to increase the potential energy of the lattice, and partly to overcome the potential barrier for the hindered rotation. At $126{\cdot}2_4°$ abs. phase II changes to phase I, in which the lattice is more widely spaced. No optical evidence of a change in the form of the lattice could be obtained for this transition. A. J. M.

**Visual determination of the transformations of condensed hydrogen sulphide, $H_2S$ and $D_2S$.** E. JUSTI and H. NITKA (Physikal. Z., 1937, **38**, 514).—The crystal structure of the three phases of $H_2S$ is considered. Debye–Scherrer diagrams have shown that all three are cubic, although in the transformation phase III → phase II there may be a slight deformation of the cubic lattice (see preceding abstract). A. J. M.

**Transformation of heavy ammonium chloride.** J. WEIGLE and H. SAÏNI (Arch. Sci. phys. nat., 1937, [v], **19**, Suppl., 28—29).—The change in lattice dimension of $ND_4Cl$, corresponding with that of $NH_4Cl$ at −30°, takes place at −22·5°, and was investigated by *X*-rays. At temp. < −30° the $ND_4Cl$ lattice is 0·004 A. > that of $NH_4Cl$. The lattice symmetry is unaffected. The change of sp. heat with the transformation is discussed. N. M. B.

**Transformation of solid ammonium iodide between −58° and −40°.** A. SMITS and G. J. MULLER (Z. physikal. Chem., 1937, **B**, **36**, 140—145).—The transformation from the tetragonal form stable at lower temp. to the regular form is continuous and free from hysteresis. From −49° the vol. falls with rising temp. and passes through a min. at −40°. R. C.

**Polymorphism of chalkone.** R. J. W. LE FÈVRE (J.C.S., 1937, 1037).—A sample with m.p. 30° was obtained by seeding a melt with a minute crystal of $CH_2Bz_2$, and its polarisation in $C_6H_6$ solutions compared at 25° with that of the normal form, m.p. 58°. Results indicate that the two forms are polymorphs and not geometrical isomerides. N. M. B.

**Theory of phase transformations. II.** L. LANDAU (Physikal. Z. Sovietunion, 1937, **11**, 545—555; cf. this vol., 363).—It is shown that the density function, ρ, of a crystal must always involve three co-ordinates. The transition from liquid to crystal is considered. The nature of liquid crystals is discussed from the viewpoint of the density function. A. J. M.

**Decrease in the electrical resistance of gold with a magnetic field at low temperatures.** W. F. GIAUQUE, J. W. STOUT, and C. W. CLARK (Physical Rev., 1937, [ii], **51**, 1108).—The resistance of a Au wire containing 0·1% of Ag at liquid He temp. was measured in a magnetic field of 1600—8500 gauss. At 4·23° abs. the resistance increased with field; at 1·63° abs. it decreased by >1% under 8000 gauss. N. M. B.

**Second-order electrical effects in metals.** A. H. WILSON (Proc. Camb. Phil. Soc., 1937, **33**, 371—379).—Theoretical. Expressions for thermal conductivity and thermoelectric forces at high and low temp. are derived. F. J. L.

**Anomalous change by heat-treatment of the electrical conductivity of thin films of potassium chloride and sulphur.** H. SAEGUSA and T. MATSUMOTO (Sci. Rep. Tôhoku, 1937, **26**, 159—166; cf. this vol., 395).—The variation of conductivity (κ) with temp. for freshly evaporated films of KCl about 1 μ thick follows approx. the law $\log \kappa = B + A/T$. After heating κ satisfies this equation very well, but its magnitude decreases with increasing temp. of heating, treatment at 180° reducing the val. of κ to 0·01 of the val. for the fresh film. This change is attributed to recrystallisation. The films obey Ohm's law over the range 0—50 volts. Thin S films show no great change in κ after heating. This is in accord with *X*-ray data which show that the S film comprises grains of a large single crystal and does not recrystallise on heating, whilst KCl shows Debye–Scherrer rings. J. W. S.

**Anisotropy of heat-conductivity and thermoelectric force in metals (tungsten) in transverse magnetic fields at 20° abs.** E. GRÜNEISEN and H. ADENSTEDT (Ann. Physik, 1937, [v], **29**, 597—604).—The thermal conductivity of crystals of W in a transverse magnetic field of 6100 œrsted at 21·8°

abs. falls to 0·25 of its val. in the absence of a field. Extrapolation of results indicates that the thermal conductivity approaches a limiting val. in stronger fields. Rotation of the field vector of 6100 oersted in a plane perpendicular to a rod of W causes variations of 25% in the thermal conductivity although W crystallises regularly. Results are analogous to those for electrical conductivity. The thermo-electric contact potential of W is independent of the direction of the field and varies from 1·01 to 2·2 μv. per degree in fields of 6100 oersted. H. C. G.

**Equilibrium curve and entropy difference between the superconductive and the normal state in lead, mercury, tin, tantalum, and niobium.** J. G. DAUNT and K. MENDELSSOHN (Proc. Roy. Soc., 1937, **A**, **160**, 127—136).—The magnetic threshold curve showing equilibrium between superconductive and normal states has been determined between 1·5° and 4·5° abs. The entropy difference between the two states is calc. It is concluded that (1) the electronic entropies of non-superconductive Pb and Hg are > those calc. from Sommerfeld's formula; (2) in Ta and Nb not only valency but also electrons in the partly filled lower shell take part in the formation of the superconducting state. The difference in sp. heat is calc. for Hg and Ta. G. D. P.

**Superconductors of small dimensions.** R. B. PONTIUS (Nature, 1937, **139**, 1065—1066).—The dependence of the threshold val. of superconductivity on diameter is represented graphically for Pb wires (99·999% Pb) at 4·21° abs. A change in threshold val. first appears at a diameter of 14·2 μ. These vals. then increase with decreasing diameter of the wire, and at 5·6 μ diameter the threshold val. is > the normal by 4·08%, indicating a depth of penetration of $10^{-5}$ to $10^{-6}$ cm. for the magnetic field. L. S. T.

**Gradual penetration of a magnetic field into a superconductive sphere.** W. J. DE HAAS, (MISS) A. D. ENGELKES, and O. A. GUINAU (Physica, 1937, **4**, 595—600; cf. A., 1936, 929; Mendelssohn and Pontius, *ibid.*, 1056). O. D. S.

**Thermomagnetic study of the complexes. $[Ag_xCd_y,4C_5H_5N]S_2O_8$.** N. PERRAKIS and L. CAPATOS (Compt. rend., 1937, **204**, 1799—1802; cf. A., 1936, 786).—The Curie points, Curie consts., and magnetic moments of the $Ag^{II}$ ion ($p_w$) are tabulated for vals of $x$ between 0 and 1. As $x$ increases, $p_w$ decreases from a high val., and becomes approx. const. at $x = 0·24$—0·27. A. J. E. W.

**Gerlach's thermomagnetic electromotive force in nickel, iron, and nickel-iron alloys.** N. YAMANAKA (Sci. Rep. Tôhoku, 1937, **26**, 40—47; cf. A., 1936, 1328).—The effects of variations in composition, applied magnetic field ($H$), temp. gradient, and pre-treatment of the metal on the Gerlach e.m.f. in Ni, Fe, and Ni–Fe alloys have been investigated. For annealed wires the e.m.f. is a max. for Ni and min. for alloy containing 35% of Ni. In cold-drawn wires the max. e.m.f. is > for annealed wires when the [Ni] is >87·5%, and < for annealed wires when the [Ni] is <87·5%. The val. of $H$ for saturation e.m.f. is also > for annealed wires. J. W. S.

**Effects of stress on Gerlach's electromotive force in nickel, iron, and nickel-iron alloys.** N. YAMANAKA (Sci. Rep. Tôhoku, 1937, **26**, 48—54; cf. preceding abstract).—For Ni and Ni–Fe alloy (87·5% Ni) the saturation val. of the e.m.f. and the $H$ at which this is attained increase with increasing tension. For alloys containing <87·5% of Ni the e.m.f. generated decreases with increasing tension. For Fe the application of tension decreases both the positive max. val. of the e.m.f. and the val. of $H$ at which it is attained. Torsion decreases the e.m.f. for Fe and Ni. J. W. S.

**Rankine magnetic balance and the magnetic susceptibility of $H_2O$, HDO, and $D_2O$.** H. P. ISKENDERIAN (Physical Rev., 1937, [ii], **51**, 1092—1096; cf. Rankine, A., 1934, 719).—The construction of an instrument of full theoretical sensitivity is described. Vol. magnetic susceptibilities for mixtures were measured, and, assuming the mass susceptibility of $H_2O$ to be $-0·7200 \times 10^{-6}$, the vals. deduced for HDO and $D_2O$ are $-0·6807 \times 10^{-6}$ and $-0·6466 \times 10^{-6}$, respectively. N. M. B.

**Diamagnetic susceptibilities of salts forming ions with inert gas configurations. III. Alkaline-earth halides and general discussion.** F. E. HOARE and G. W. BRINDLEY (Proc. Roy. Soc., 1937, **A**, **159**, 395—409; cf. A., 1936, 278).—The susceptibilities of the halides of Mg, Ca, Sr, and Ba (excepting $MgBr_2$ and $MgI_2$) are determined. An attempt is made to estimate the ionic susceptibility by considering the salts in two classes with co-ordination nos. (i) 6 and 3 and (ii) 8 and 4. It is concluded that for most ions the susceptibility is less in the cryst. than in the free state, but that this is more marked for negative than for positive ions. For the former the susceptibility decreases as the co-ordination no. increases, and as the charge of the surrounding ions increases. G. D. P.

**Diamagnetism of organic sulphur compounds.** A. CLOW and J. M. C. THOMPSON (Trans. Faraday Soc., 1937, **33**, 894—904).—The diamagnetic susceptibilities of 19 thio-compounds have been measured, and the bond depressions calc. for the linkings H·S, C·S, C→S, S→S, C:S, and C≡S. Problems bearing on the structure of several types of thio-compounds are discussed. C. R. H.

**Temperature variation of magnetic anisotropy of organic crystals.** P. NILAKANTAN (Nature, 1937, **140**, 29—30).—A curve showing the variation of the magnetic anisotropy of a crystal of resorcinol from 26° to the m.p. is given. The vals. given for $\chi_a$, $\chi_b$, and $\chi_c$ at room temp. are −66·2, −74·3, and −61·0 ($\times 10^{-6}$), respectively, with α 55·9°, β 47·0°, and γ 62·1°. L. S. T.

**Magnetism and polymerisation. II. Oxymethylene diacetates and polyoxymethylenes.** J. FARQUHARSON (Trans. Faraday Soc., 1937, **33**, 824—827; cf. A., 1936, 277).—Data for the magnetic susceptibilities of polyhydric alcohols and oxymethylene diacetates have been obtained with a view of determining the vals. for the ·CH(OH)· and ·$CH_2$·O· groups, which, according to Pascal's rule, should be identical. The val. for the former group agrees with

Pascal's val., but the val. for the latter is ≪ Pascal's val. The data also lead to the conclusion the α- and β-polyoxymethylenes are dihydrates with 32 and 44 $\cdot CH_2 \cdot O \cdot$ groups and mol. wts. 978 and 1338, respectively; γ- and δ-polyoxymethylenes do not appear to be composed of $\cdot CH_2 \cdot O \cdot$ groups. C. R. H.

**Magnetic inhibition of susceptibilities at radio frequencies.** C. J. GORTER and F. BRONS (Physica, 1937, 4, 579—584).—The paramagnetic susceptibility of $Fe(NH_4)_2(SO_4)_2$ and of $KCr(SO_4)_2$ at frequencies between $1 \cdot 48 \times 10^6$ and $2 \cdot 32 \times 10^6$ is decreased by the application of a const. magnetic field in the direction of the alternating field. At liquid $N_2$ temp., saturation is reached at high fields (3000 oersted). At higher temp. the effect decreases and is negligible at 150° abs. No effect of const. field is observed with liquid $O_2$ or with V $NH_4$ alum. O. D. S.

**Paramagnetic rotatory power of hydrated praesodymium ethyl sulphate in the direction of the optic axis.** J. BECQUEREL, W. J. DE HAAS, and J. VAN DEN HANDEL (Physica, 1937, 4, 543—558; cf. this vol., 351).—The rotatory power of $Pr(SO_4Et)_3,9H_2O$ has been measured at temp. from 1·4° to 291° abs. From 1·4° to 4·2° abs. the variation of rotatory power with temp. and with magnetic field follows a similar law to that observed for the Et sulphates of Dy and Er (*loc. cit.*). A large part of the paramagnetism of $Pr^{+++}$ is independent of temp. Results indicate that the fundamental level of $Pr^{+++}$ in the Et sulphate is doubly degenerate. The magnetic moment in the direction of the optic axis is calc. The effective moment increases with temp., giving evidence of successive occupation of several energy levels. From the variation with temp. at very low temp., it is calc. that the separation of the two lowest energy levels of $Pr^{+++}$ is between 20 and 30 cm.$^{-1}$ The results of Gorter, de Haas, and van den Handel for the thermomagnetic properties of $Pr_2(SO_4)_3$ and $Pr_2(SO_4)_3,8H_2O$ (Comm. Onnes Lab., No. 218*b*, 218*c*) are discussed. O. D. S.

**Ferromagnetic properties of some paramagnetic salts.** L. V. SCHUBNIKOV and S. S. SCHALIT (Physikal. Z. Sovietunion, 1937, 11, 566—570).—The variation of the susceptibility of $FeCl_2$, $CoCl_2$, $NiCl_2$, and $CrCl_3$ has been investigated over the range 14—80° abs. The paramagnetic Curie point of $CoCl_2$ and $CrCl_3$ found by extrapolation has no special physical significance. Ferromagnetic properties occur at temp. agreeing well with the onset of anomalies in sp. heat. A. J. M.

**Anomalous specific heat of deutero-ammonium chloride, $ND_4Cl$, in the crystalline state.** I. NITTA and K. SUENAGA (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 32, 83—86).—Measurements with an improved Nernst type vac. calorimeter in the range −170° to 50° give a curve showing a transition temp. at approx. −24°, supporting the results of Smits (cf. this vol., 352). The temp. range of excessive sp. heat is somewhat wider than in the case of $NH_4Cl$. Explanations are briefly discussed. N. M. B.

**Electron activation in crystals: heat capacities of $Sm_2(SO_4)_3,8H_2O$ and $Nd_2(SO_4)_3,8H_2O$ from 3° to 40° abs.** J. E. AHLBERG, E. R. BLANCHARD, and W. O. LUNDBERG (J. Chem. Physics, 1937, 5, 552—556; cf. A., 1935, 574).—Data are recorded and the electronic heat capacity of $Nd^{\cdot\cdot\cdot}$ is calc. The separation of the levels of the ground states of the salts is <1 cm.$^{-1}$ An electronic energy level exists in $Nd_2(SO_4)_3,8H_2O$ at 77 cm.$^{-1}$ > and of double the statistical wt. of that of the ground state. J. W. S.

**Ethylene. Heat capacity from 15° abs. to the b.p. Heats of fusion and vaporisation. Vapour pressure of the liquid. Entropy from thermal measurements compared with the entropy from spectroscopic data.** C. J. EGAN and J. D. KEMP (J. Amer. Chem. Soc., 1937, 59, 1264—1268).—Heat capacities have been determined from 15° abs. to the b.p.; the sharp rise in the curve just below the m.p. is not due to pre-melting. $C_2H_4$ has m.p. 103·95±0·05° abs., b.p. 169·40±0·05° abs., heat of fusion 800·8±0·8 g.-cal. per mol., heat of vaporisation 3237±3 g.-cal. per mol., v.p. of liquid (123—170° abs.) $\log_{10} P(\text{int. cm.}) = -(962 \cdot 794/T) + 9 \cdot 80431 - 0 \cdot 0184522T + 0 \cdot 000030870T^2$, calc. entropy at 1 atm. and b.p. 47·36 g.-cal. per degree per mol. The agreement of entropy vals. calc. from calorimetric and spectroscopic data, respectively, is discussed. E. S. H.

**Heat capacities of benzene, methyl alcohol, and glycerol at very low temperatures.** J. E. AHLBERG, E. R. BLANCHARD, and W. O. LUNDBERG (J. Chem. Physics, 1937, 5, 539—551).—A low-temp. vac. calorimeter is described; it is cooled internally from 13° to 2° abs. by adiabatically expanding cooled He gas from a pressure cylinder in the calorimeter. The heat capacities of cryst. $C_6H_6$ and MeOH and of cryst. and glassy glycerol have been measured at 3—90° abs., and the entropies at various temp. calc. Below 9° abs. the heat capacity of glassy glycerol is double that of the cryst. form. The glassy form appears to have 4·64 units of entropy at 0° abs. J. W. S.

**Properties of paraffins. II.** A. H. W. ATEN, jun. (J. Chem. Physics, 1937, 5, 598; cf. this vol., 294).—Corrections. J. W. S.

**Vibrational spectrum of a three-dimensional lattice.** M. BLACKMAN (Proc. Roy. Soc., 1937, A, 159, 416—431).—The vibrational spectrum of a simple cubic lattice is calc. and the results are applied to a discussion of the type of sp. heat curve to be expected. The applicability of the conclusions to actual crystals is considered. G. D. P.

**Liquid state.** W. ALTAR (J. Chem. Physics, 1937, 5, 577—586).—A theory of holes in liquids is developed to explain their thermal and mechanical properties. It is assumed that the thermal motion of the liquid is determined by the motion of its "surface," the latter including internal boundaries of which the liquid forms as many as its no. of degrees of freedom permit. An equation of state is derived which accords with experimental data for A. J. W. S.

**Partition function for liquid mercury.** J. F. KINCAID and H. EYRING (J. Chem. Physics, 1937, 5, 587—596; cf. this vol., 125, 224).—Assuming that

the nuclei move independently of their valency electrons, a partition function is derived from which the v.p., equation of state, entropy of melting, and sp. heat of Hg can be calc. between the m.p. and b.p. The results accord well with experiment. J. W. S.

**Second virial coefficient of the different modifications of light and heavy hydrogen. I. Experimental determination.** K. SCHÄFER (Z. physikal. Chem., 1937, **B**, **36**, 85—104; cf. A., 1936, 1185).—Normal and $p$-$H_2$ have the same second virial coeff. and the same is true of normal and $p$-$D_2$. The coeffs. of $CO_2$ and $C_2H_2$ have been determined at 204—273° and 226—273° abs., respectively. R. C.

**Connexion between the second virial coefficient and the phases of collision theory.** L. GROPPER (Physical Rev., 1937, [ii], **51**, 1108; cf. this vol., 71).—Mathematical. An expression for the low-temp. region is proposed. N. M. B.

(A) **Series evaluation of isotherm data of carbon dioxide between 0° and 150° and up to 3000 atm.** A. MICHELS and C. MICHELS. (B) **Isotherms of carbon dioxide in the neighbourhood of the critical point and round the coexistence line.** A. MICHELS, B. BLAISSE, and C. MICHELS. (C) **Thermodynamic properties of carbon dioxide up to 3000 atmospheres between 25° and 150°.** A. MICHELS, A. BIJL, and C. MICHELS (Proc. Roy. Soc., 1937, **A**, **160**, 348—357, 358—375, 376—384).—(A) Isotherm data cannot be represented by a series of powers of the density ($d$) of the type $pv = A + Bd + Cd^2 + \ldots$ Series representation can, however, be used for interpolation and vals. of the coeffs., $A$, $B$, etc., are tabulated for different temperatures.

(B) A new method of measuring isotherms is described. V.p. curve, crit. data, and latent heat are given. The results confirm the real existence of a crit. point.

(C) Vals. of the sp. heat at const. vol., free energy, total energy, and entropy are tabulated. G. D. P.

**Expansion and pressure coefficients of nitrogen, hydrogen, helium, and neon, and the absolute temperature of 0° C.** M. KINOSHITA and J. OISHI (Phil. Mag., 1937, [vii], **24**, 52—62).—Measurements made with a gas thermometer, which is described, are recorded. $N_2$, $H_2$, and He give $0° = 273{\cdot}167 \pm 0{\cdot}005°$ abs. Ne gives inconsistent vals. A. J. E. W.

**Vapour pressures of saturated gaseous hydrocarbons at low temperatures in presence of silica gel.** R. DELAPLACE (Compt. rend., 1937, **204**, 1940—1941; cf. this vol., 231).—V.p. of $CH_4$, $C_2H_6$, $C_3H_8$, $n$- and *iso*-$C_4H_{10}$ in presence of $SiO_2$ gel at −171° to −25° are tabulated. A method of quant. separation of $CH_4$ from $C_2H_6$, $C_2H_6$ from $C_3H_8$, and $C_3H_8$ from $C_4H_{10}$ is indicated. J. G. A. G.

**Vapour pressure of copper and iron.** A. L. MARSHALL, R. W. DORNTE, and F. J. NORTON (J. Amer. Chem. Soc., 1937, **59**, 1161—1166).—The v.p. of Fe at 1317—1579° abs. and Cu at 1268—1466° abs. have been determined from the rates of vaporisation. The emissivities have been determined directly; for Fe and Cu the vals. of $\Delta E_0^\circ$ are 96,033 and 81,240 g.-cal. per g.-atom, respectively. E. S. H.

**Nature of calomel vapour.** F. T. GUCKER, jun., and R. H. MUNCH (J. Amer. Chem. Soc., 1937, **59**, 1275—1279).—Study of the absorption of the resonance line at 2537 A. shows the presence of Hg in HgCl vapour (undried) at 100—450°. The partial pressures indicate that decomp. $2HgCl = Hg + HgCl_2$ is complete. In the vapour of dried HgCl, Hg is observed at 250—400°, but not at <250°; the dried vapour also exhibits general absorption in the ultraviolet, which is not shown by the undried vapour. The v.d. of the dried vapour at 375—425° corresponds with HgCl mols.; no evidence of $Hg_2Cl_2$ mols. was obtained. E. S. H.

**Variations in the mechanochemical constants of benzene hydrocarbons along the vaporisation curve from the origin to 74·5 cm. of Hg.** G. DUCH (Compt. rend., 1937, **204**, 1807—1809).—The mechanochemical consts. $n$ and $K^{-3}$ (cf. A., 1936, 1052) are linear functions of the v.p. A method of calculating the mol. wt. from $d$ and $\gamma$ is deduced. A. J. E. W.

**Experimental verification of Thomson's formula.** K. S. LJALIKOV (Compt. rend. Acad. Sci. U.R.S.S., 1937, **15**, 327—330).—Thomson's equation, connecting curvature of a surface and the v.p., has been verified by determining the variation of the velocity of evaporation of small drops of Hg with their radius. A. J. M.

**Vapour pressure and size of particles.** D. BALAREV [with N. KOLAROV] (Monatsh., 1937, **70**, 318—323).—The effect of grinding on the v.p. of NaCl and KBr has been investigated. The curve of v.p. against average size of particles has a min. at 3—4 μ. F. J. G.

**Heat conduction in liquid helium.** J. F. ALLEN, R. PEIERLS, and M. Z. UDDIN (Nature, 1937, **140**, 62—63).—The heat-conductivity of liquid He II, measured at 1·34 and 2·06° abs. by a new method, depends on the temp. gradient, an unusual effect that appears to be a property of the liquid He II. L. S. T.

**Physical identity of enantiomers. III. Viscosities, densities, and refractivities of *d*-, *l*-, and *dl*-forms of oximinocamphor (stable and unstable), camphor, camphoric acid, camphoric anhydride, camphorquinone, and sodium camphorate.** B. K. SINGH, K. NARAYAN, P. SINHA, H. PRASAD, and N. CHATTERJI (Proc. Indian Acad. Sci., 1937, **5**, **A**, 484—498).—The $d$ and refractivities of $d$-, $l$-, and $r$-forms are identical in every case. The viscosity–concn. curves of $d$- and $l$-forms are identical with that of the racemate below a certain concn., indicating that the racemate is dissociated into $d$- and $l$-forms; above this concn. the racemate exists in solution and its viscosity is > that of $d$- and $l$-forms. F. J. L.

**Viscosity–temperature relations.** M. SOUDERS, jun. (J. Amer. Chem. Soc., 1937, **59**, 1252—1254).—The relation $\log_{10}(\eta/d) = A/T - B$ agrees with the data for 47 org. liquids with errors generally < 1%. The consts. $A$ and $B$ and the errors at various temp. for each liquid are reported. The error increases with rise in mol. wt. rather than with increase of $\eta$.

The equation cannot be applied satisfactorily to substances of high mol. wt., such as petroleum oils, except over short ranges of temp. E. S. H.

**Temperature, pressure, and volume coefficients of the viscosity of fluids.** R. H. EWELL (J. Chem. Physics, 1937, **5**, 571—576).—$(\delta\eta/\delta T)_p$ and $(\delta\eta/\delta T)_v$, both positive for dilute gases and negative for ordinary liquids, become zero at intermediate states, but for the former at lower densities than for the latter. The signs of the $\eta$–$p$ and $\eta$–$V$ coeffs. are deduced for various states of the $\eta$–$T$ coeffs. It is shown that for changes in $V \not> 10\%$, $(\delta\varphi/\delta V)_T$ is const. ($\varphi$ = fluidity), a relation analogous to that of Batchinski, $(\delta\varphi/\delta V)_p$ = const. J. W. S.

**Viscosity (or fluidity) of liquid or plastic unimolecular films.** R. J. MYERS and W. D. HARKINS (J. Chem. Physics, 1937, **5**, 601—603).—The viscosities ($\eta$) of unimol. films of fatty acids have been determined by measuring the quantity ($Q$) of film flowing through a slit (of diameter $d$ and length $l$) in a metal barrier across a trough, under its own pressure ($f$). $C_{18}H_{37}\cdot CO_2H$ films show a non-linear relation between $Q$ and $f$, indicating that the film is a plastic solid, but for the other acids $Q \propto f$ and $\eta$ is given by $fd^3/12lQ$. There is some evidence of an increase of $\eta$ with rise of temp. J. W. S.

**Measurement of the diffusion of metal atoms in gases at room temperature by an optical method.** E. F. M. VAN DER HELD and M. MIESOWICZ (Physica, 1937, **4**, 559—578).—The distribution of Na atoms diffusing against a stream of $N_2$ at room temp. and about 1 mm. pressure has been determined from measurements of the intensity distribution of Na light emitted on excitation of the vapour by a condensed discharge. The diffusion coeff. at 15° and 1 mm. pressure is 20·4 sq. cm. per sec. Results are compared with those of Ginsel (A., 1933, 991) at flame temp. The const. $\theta$ in the factor of Reinganum, exp. $\theta/\tau$, is found to be 600 and the collision radius of Na 1·84 A. When excitation was produced by an induction discharge a homogeneous bimol. reaction, $Na + N + (N_2) = NaN + (N_2)^*$, was observed. O. D. S.

**Viscosity of binary mixtures.** J. S. GOURLAY (Nature, 1937, **140**, 157).—A crit. discussion of Lederer's equation (this vol., 126). L. S. T.

**Metallic state and intermetallic compounds.** J. S. ANDERSON (Chem. and Ind., 1937, 677—681).—A review. J. S. A.

**Alloys of magnesium. VI. Constitution of magnesium-rich alloys of magnesium and calcium.** J. L. HAUGHTON (J. Inst. Met., 1937, **61**, Advance copy, 325—331).—Alloys of Mg with $\not>26\cdot7\%$ Ca form a simple eutectiferous series, the $Mg$–$Mg_4Ca_3$ eutectic occurring at 16·2% Ca, 517°±1°. Mg dissolves 1·8% Ca at 517° and about 0·5% at 250°. A. R. P.

**New intermediate phase in the aluminium-copper system.** A. G. DOWSON (J. Inst. Met., 1937, **61**, Advance copy, 317—324).—In Cu alloys with 14—17% Al a stable phase exists above 963°; at this temp. it decomposes into $\beta + \gamma$ eutectoid, the eutectoid composition being 15·4% Al. An alloy of 15·9% Al corresponds with $Cu_9Al_4$ which should have a $\gamma$-structure with 52 atoms per unit cell; this could not be confirmed since the phase cannot be retained by quenching, but its range of existence has been delineated by thermal and dilatometric analysis. A. R. P.

**Constitution of the nickel–aluminium system.** W. O. ALEXANDER and N. B. VAUGHAN (J. Inst. Met., 1937, **61**, Advance copy, 333—346).—The system has been examined by thermal analysis and micrography. The solubility of Al in Ni decreases from 11% at 1385° to 6% at 980° and 5% at 700°. There is a eutectic at 86·7% Ni, 1385° between $\alpha$ and $\delta$; the liquidus then rises steeply to 1638° at 68·5% Ni (NiAl) and then with more Al the solidus falls steeply to 1133°, 61% Ni where NiAl solid solution reacts with liquid containing 44·4% Ni to produce a new phase with 59·5% Ni ($Ni_2Al_3$). A second peritectic reaction occurs at 854° in which $Ni_2Al_3$ solid solution containing 55% Ni reacts with liquid containing 28·4% Ni to give $NiAl_3$. Finally the Al–$NiAl_3$ eutectic occurs at 539°, 5·7% Ni. The $\delta$-phase has a face-centred cubic structure with superlattice; it forms a limited series of solid solutions, the boundary line on the Al side sloping uniformly from 86% Ni at 1395° to 84·5% Ni at 980° and thereafter becoming vertical, and on the Ni side being vertical at 86·7% Ni below 1360°. The boundary of the NiAl solid solution on the Ni side is at 83, 80·6, and 79·2% Ni at 1395°, 1150°, and 900°, respectively, and on the Al side at 61 and 64·2% Ni at 1133° and 850°, respectively. The $Ni_2Al_3$ phase extends from 56 to 60% Ni from 1133° on the Ni side and from 854° on the Al side down to room temp. $NiAl_3$ does not appear to dissolve either Ni or Al. A. R. P.

**X-Ray study of the chromium–aluminium equilibrium diagram.** A. J. BRADLEY (J. Inst. Met., 1937, **60**, Advance copy, 197—215).—From $X$-ray examination of powdered Al–Cr alloys slowly cooled from 800° the existence of 9 phases has been established; two other phases occur in alloys quenched from >1000°. The $\alpha$ solid solution of Al in Cr (body-centred cubic) extends to 28% Al at 900°, 18% Al at 830°, and somewhat less at 20°. At 850° alloys with 25—19% Al are converted into a tetragonal (ordered) $\beta$-phase formed of three body-centred cubes stacked one above the other. There are four phases with a $\gamma$-brass structure: $\gamma_1$ decomp. at 1000° into $\alpha + \delta$ (40% Al), $\gamma_2$ ($Cr_5Al_8$) formed from $\alpha + \delta$ at 890°, $\gamma_3$ (51% Al) also formed from $\alpha + \delta$ at about 870°, and $\gamma_4$ (52—65% Al) formed at about 700° from $\gamma_3 + \varepsilon$. It is suggested the $\gamma_3$ and $\gamma_4$ are modifications of $Cr_4Al_9$. The $\delta$-phase ($CrAl_3$) is stable only above 860° and is always associated, in quenched alloys, with the products of its decomp. The $\varepsilon$-, $\eta$-, and $\theta$-phases have only small ranges of homogeneity at <600° and appear to be the compounds $CrAl_4$, $Cr_2Al_{11}$, and $CrAl_7$, respectively; their structures are very complicated although single crystals of $\theta$ have been isolated having an orthorhombic (pseudo-hexagonal) structure, $a$ 19·99, $b$ 34·51, $c$ 12·47 A. A. R. P.

**Decomposition of gold–nickel single crystals.** W. KÖSTER and A. SCHNEIDER (Z. Metallk., 1937, **29**,

103—104).—The decomp. of Au–Ni single crystals into Au-rich and Ni-rich solid solutions takes place in a similar way to that of polycryst. aggregates, the lattice const. changing only slightly, but measurably. A. R. P.

**Accurate determination of the f.p. of alloys and a study of valency effects in certain alloys of silver.** W. HUME-ROTHERY and P. W. REYNOLDS (Proc. Roy. Soc., 1937, A, **160**, 282—303).—A method for determining the f.p. of alloys which is stated to have an accuracy of $\pm 0{\cdot}1°$ to $\pm 0{\cdot}3°$ is described. Ag-rich alloys of Ag–Cd, Ag–In, Ag–Sn, and Ag–Sb have been investigated. The initial depressions of f.p. of Ag produced by 1 at.-% of the solutes are not $\propto$ the nos. 2, 3, 4, and 5 but to factors $2a$, $3a$, $4b$, and $5b$ where $b$ is slightly $< a$. G. D. P.

**Solidification diagram and thermal conductivity of rubidium–cæsium alloys.** É. RINCK (Compt. rend., 1937, **205**, 135—137; cf. A., 1936, 1193).—Rb and Cs form a complete series of solid solutions; the solidus and liquidus have minima at 9°, with Rb : Cs = 1. The conductivity affords no evidence of compound formation. A. J. E. W.

**Optical constants of alloys of the copper–zinc system.** H. LOWERY, H. WILKINSON, and D. L. SMARE (Proc. Physical Soc., 1937, **49**, 345—353).—Measurements over the range 4358—6000 A. have been made of $n$, absorption and reflexion coeffs. with polished specimens of a series of Cu–Zn alloys covering the $\alpha$, $\beta$, and $\gamma$ modifications of brass. The data are discussed in reference to the degree of polish of the metal surface. C. R. H.

**Theoretical interpretation of the optical constants of copper–zinc alloys.** N. F. MOTT (Proc. Physical Soc., 1937, **49**, 354—356).—The data of Lowery *et al.* (cf. preceding abstract) are discussed in relation to the electron theory of metals. Explanations are offered for the increase of absorption on the long-$\lambda$ side of the absorption edge, and for the shift of the absorption edge, which becomes less sharp, towards the shorter $\lambda\lambda$ when Zn is added to Cu. Theoretical vals. for the shift of the absorption edge are calc. for certain alloys. C. R. H.

**Heat of formation of intermetallic compounds.** W. BILTZ (Z. Metallk., 1937, **29**, 73—79).—A review of recent work and a discussion of the relation between intermetallic compounds based on the theory of chemical affinity. A. R. P.

**Heat of formation of some metallic systems calculated from A. Ölander's electrochemical data.** F. WEIBKE (Z. Metallk., 1937, **29**, 79—84).—The vals. for the various phases in the Cd–Sb, Bi–Tl, Ag–Cd, Au–Cd, and Cu–Zn systems have been calc. and are shown in tables and graphs. A. R. P.

**Thermochemistry of alloys. I. Direct determination of heats of formation of the alloy series cobalt–silicon, iron–aluminium, cobalt–aluminium, nickel–aluminium, copper–aluminium, and antimony–zinc in the cast condition.** W. OELSEN and W. MIDDEL (Mitt. Kaiser-Wilh. Inst. Eisenforsch., 1937, **19**, 1—26).—Data for complete series of the alloys are recorded and compared with the corresponding equilibrium diagrams. The use of thermochemical data in the determination of such diagrams is discussed. Heats of formation have been determined for $Co_2Si$ 27·6, CoSi 24·0, $CoSi_2$ 24·6, $CoSi_3$ 25·6, $Fe_3Al$ 14·8, FeAl 12·2, $FeAl_2$ 19·5, $FeAl_3$ 26·8, $Cu_2Al$ 16·0, CuAl 9·5, $CuAl_2$ 9·5, CoAl 26·4, $CoAl_2$ 31·8, $Co_2Al_5$ 70, $CoAl_4$ 38·5, $Ni_3Al$ 37·6, NiAl 34·0, $NiAl_2$ 37·8, $NiAl_3$ 38, and ZnSb 3·6 kg.-cal. per g.-mol. E. S. H.

**Ordered distribution in metallic solid solutions.** R. BECKER (Metallwirts., 1937, **16**, 573—578).—A review. C. E. H.

**Time of formation of martensite needles.** F. FÖRSTER and E. SCHEIL (Naturwiss., 1937, **25**, 439—440).—The transformation of the face-centred $\gamma$-lattice of Fe into the space-centred $\alpha$-lattice (formation of martensite) takes place in an Fe–Ni alloy with 29% Fe at room temp. in a series of steps which succeed each other sufficiently rapidly to give an audible note. By an electrical method making use of this fact, the time of formation of a single martensite needle is found to be 0·02 sec. A. J. M.

**The system copper–lead–nickel.** W. CLAUS (Metallwirts., 1937, **16**, 578—579).—Alloys of varying composition were melted and allowed to solidify slowly, in order to establish the ranges of immiscibility in the liquid state. These ranges are somewhat more extended than in the diagram of Guertler and Menzel (B., 1923, 982A). C. E. H.

**Constitution of the alloys of silver, tin, and mercury.** M. L. V. GAYLER (J. Inst. Met., 1937, **60**, Advance copy, 151—172).—Except for Sn-rich alloys with <6% Hg the entire liquidus of the system has been determined by thermal and $X$-ray analysis. Ternary diagrams are also plotted for the equilibria at 70°, 84°, and 100° and pseudo-binary diagrams for const. Hg contents of 4·5, 40, 50, 60, 65, 70, and 80% Hg and for 20% Sn. Addition of Sn to Ag–Hg alloys lowers the liquidus temp. progressively, raises steeply the $\alpha_1$ + liquid $\rightarrow \beta_1$ reaction, and causes below 150° the separation of $\gamma_1$ or $\gamma_2$ from the $\beta_1$ + liquid phase until at 84° the invariant reaction $\beta_1$ + liquid $\rightarrow \gamma_1 + \gamma_2$ occurs. The $\gamma_2$ phase is unstable in the presence of liquid and a further invariant reaction occurs at 80°: $\gamma_1 + \gamma_2$ + liquid $\rightarrow \gamma_1 + \delta_2$. At −36° a third invariant reaction occurs: $\gamma_1 + \delta_2$ + liquid $\rightarrow \gamma_1 + \varepsilon_2$, and at −38·8° any excess of Hg freezes without affecting the $\gamma_1 + \varepsilon_2$ phases. Furthermore, since the $\beta$ phases of the Ag–Sn and Ag–Hg phases are isomorphous each will hold a large proportion of the other in solid solution; this fact and the first two of the above invariant reactions account for the setting of dental amalgams. Analysis of the complex reactions occurring between $Ag_3Sn$ and Hg affords evidence for the existence of three further invariant reactions: $\gamma$ ($Ag_3Sn$) + $\alpha_2$ + liquid $\rightarrow \gamma + \beta_2$ (>217°, <221°), $\gamma + \beta_2$ + liquid $\rightarrow \gamma + \gamma_2$ (217°), and $\gamma$ + liquid $\rightarrow \beta_1 + \gamma_2$ (>210°, <216°). [Greek letters without subscript refer to Ag–Sn phases, with subscript$_1$ to Ag–Hg phases, and with subscript$_2$ to Sn–Hg phases.] A. R. P.

**Ternary iron alloys.** R. VOGEL (Metallwirts., 1937, **16**, 630—632).—Recent work on the constitution of Fe–C–P, Fe–C–Co, and Fe–S–Mn alloys is reviewed. C. E. H.

**New ternary compounds with a β-brass superstructure.** P. RAHLFS (Metallwirts., 1937, **16**, 640—643).—Four new phases having the lattice of β-brass with a superstructure ($a' = 2a$) have been examined. Compositions and lattice consts. at approx. the centre of their ranges of existence are: β-$(Cu,Ni)_3Sn$, $a' = 5{\cdot}946$ A.; β-$(Cu,Ni)_3Sb$, $a' = 5{\cdot}857$ A.; $Ni_2MgSn$, $a' = 6{\cdot}097$ A.; $Ni_2MgSb$, $a' = 6{\cdot}050$ A. The Sn alloys obey the Hume-Rothery rule if Ni is considered univalent, but the relations exhibited by the Sb alloys are rather doubtful. C. E. H.

**Eutectic and peritectic solidification processes with one degree of freedom in ternary alloys.** J. SCHRAMM and H. J. LUCKERT (Z. physikal. Chem., 1937, **179**, 73—118).—Binary eutectic and peritectic reactions and the conditions determining the passage of one into the other have been examined mathematically. Applications are discussed. R. C.

**Use of the centrifuge for investigating alloys.** G. KOMOVSKI (Physikal. Z. Sovietunion, 1936, **10**, 840—842).—The use of a centrifuge for separating intermetallic phases from the rest of the melt is described. *X*-Ray photographs can be taken during rotation, and indicate, in many cases, the complete separation of phases. A. J. M.

**Derivation of formulæ for the absorption coefficient of readily soluble gases.** I. L. PEJSACHOV (J. Chem. Ind. Russ., 1937, **14**, 361—365).—Mathematical. R. T.

**Solubility of hydrogen, carbon monoxide, and their mixtures in methyl alcohol under pressure.** I. R. KRITSCHEVSKI, N. M. SHAVORONKOV, and D. S. TZIKLIS (J. Chem. Ind. Russ., 1937, **14**, 170—173).—The solubility of $H_2$ and of CO in MeOH rises with increasing temp. (30—140°) and pressure (50—300 atm.). Data are recorded for the composition of the liquid and vapour phases of the system $H_2$–CO–MeOH, at 140° between 50 and 300 atm. R. T.

**Vapour pressure of ammonia, carbon dioxide, water, and formic acid over ammoniacal copper sulphate solution.** E. P. LEVITZKAJA (J. Chem. Ind. Russ., 1937, **14**, 342—346).—The v.p. of $NH_3$, $CO_2$, and $H_2O$ over solutions containing $NH_3$, $CO_3''$, $Cu^{I}$, $Cu^{II}$, and $HCO_2H$ has been determined at 0—82°. $HCO_2H$ is absent from the vapour phase at all temp. Evidence is presented that the reaction $HCO_2H \rightarrow CO + H_2$ takes place at 70—80°. R. T.

**Theoretical formula for solubility of hydrogen in metals.** R. H. FOWLER and C. J. SMITHELLS (Proc. Roy. Soc., 1937, **A**, **160**, 37—47).—A formula for the influence of temp. when dissolution takes place without formation of hydride is derived. Agreement with experiment for Cu, Fe, Co, and Ni is obtained. An approx. theory for the cases of Ti, V, Zr, and Th, which form hydrides, yields an expression which accords with experimental data. G. D. P.

**Solubility of barium nitrate in concentrated nitric acid.** C. H. GREENE (J. Amer. Chem. Soc., 1937, **59**, 1186—1188).—Data are recorded for concns. of $HNO_3$ up to 92% at 0° and 24·88°. In the range 55—80% $HNO_3$ the logarithms of the solubilities are a quadratic function of the acid concn. E. S. H.

**Rate of dissolution of benzoic acid in dilute aqueous alkali.** C. V. KING and S. S. BRODIE (J. Amer. Chem. Soc., 1937, **59**, 1375—1379).—The rate of dissolution from rotating cylinders has been measured in $H_2O$, aq. NaOH and KOH, with and without dissolved NaOAc, at 25°. The results are in agreement with a rate equation derived on the assumption that neutralisation occurs slowly within a diffusion layer. E. S. H.

**Solubility of sodium hyposulphite ($Na_2S_2O_4$) in presence of sodium chloride or hydroxide, and ethyl alcohol.** N. S. ARTAMONOV and S. I. SCHADRINA (J. Chem. Ind. Russ., 1937, **14**, 35—37).—The solubility of $Na_2S_2O_4$ is depressed by NaCl, NaOH, or EtOH; a saturated solution in 20% NaCl contains 102, in 20% EtOH 98·8, and in 20% NaOH 31·1 g. of $Na_2S_2O_4$ per 100 ml. R. T.

**Solubility of copper ions in cadmium mercuric thiocyanate.** M. STRAUMANIS [with E. MANKOVIČS] (Z. anorg. Chem., 1937, **233**, 201—208).—$Cd[Hg(CNS)_4]$ is tetragonal, $a$ 11·4406±0·0005, $c$ 4·200±0·001 A. The coloured ppts. containing Cu are true mixed crystals in which Cd ions are replaced by Cu ions up to a limiting ratio Cu : Cd = 1 : 65. The ratios Cu : Cd in solution and solid are approx. equal. There is no compound formation in the solution. The replacement of Cd by Cu in the crystals causes a slight contraction of the lattice. Cu cannot be replaced by Cd in $Cu[Hg(CNS)_4]$. F. J. G.

**Determination of concentration of solutions by the two-solvent method. I. Concentration of water-insoluble substances.** S. I. SPIRIDONOVA (J. Gen. Chem. Russ., 1937, **7**, 1071—1081).—The concn. of EtOH or $COMe_2$ solutions of $H_2O$-insol. substances (camphor, borneol, $C_{10}H_8$) is derived from the vol. of $H_2O$ which must be added to achieve permanent turbidity. R. T.

**Solubility equation of a pure substance which forms a solid complex with the solvent.** J. PERREU (Compt. rend., 1937, **205**, 43—45).—The author's expression for the equilibrium of a solid hydrate and its saturated aq. solution (A., 1934, 249) has been extended generally. Solubility, v.p., and thermal data for mixtures of $COMe_2$ and NaI or $NaI,3COMe_2$ at various temp. have been successfully applied to its verification. C. R. H.

**Aluminium iodide as a solvent.** V. IZBEKOV and A. NISHNIK (J. Gen. Chem. Russ., 1937, **7**, 1268—1279).—$SnI_4$, $SbI_3$, $AsI_3$, and I are miscible in all proportions with $AlI_3$ at 200°. Saturated solutions of $HgI_2$ contain 75, of NaI, KI, or $NH_4I$ 50, and of $PbI_2$, $NiI_2$, or $BiI_3$ 20 mol.-%. The solubility of salts with a mol. space lattice is > that of salts with an ionic lattice. Solutions of $SnI_4$ are non-conducting, whilst those of $AsI_3$ or I are feeble, and of the remaining salts good, conductors. R. T.

**Internal constitution of non-ideal solutions; demixing and complex formation.** J. TIMMERMANS (Trav. Congr. Jubil. Mendeléev, 1937, 2, 447—452).—Various types of mixtures and complexes are described and illustrated by examples. C. R. H.

**Coefficients of fractionation of salts possessing several hydrates.** B. GOLDSCHMIDT (Compt. rend., 1937, **205**, 41—42).—When radioactive solutions of $Ba(OAc)_2$ were crystallised at various temp., the activity of the crystals was always < that of the liquors, the ratio crystal activity : liquor activity decreasing abruptly with the formation of a higher hydrate on lowering the crystallising temp. C. R. H.

**Adsorption of gases and the equation of the liquid state.** E. C. C. BALY (Proc. Roy. Soc., 1937, **A**, **160**, 465—487).—Adsorption is supposed to take place by the formation of layers. Expressions are derived for the fractions of the total surface area covered by successive unimol. layers. The Freundlich isotherm is said to have no physical significance, its form being a mathematical property of the sum of the particular type of series governing multi-layer adsorption. From the adsorption formula the equation of the liquid state is deduced, and the v.p. and latent heat of liquid $CO_2$ between −56·6° and −26° are accurately expressed. The heat of desorption is discussed and the fact that experimental vals. increase with decrease of pressure is taken as proof that the adsorbed state corresponds with the formation of layers of gas. The val. of the heat of desorption governs the phenomena of preferential adsorption, poisoning, and chemi-sorption. G. D. P.

**Adsorption of neon and helium.** V. G. FASTOVSKI and L. A. GIRSKAJA (J. Chem. Ind. Russ., 1937, **14**, 358—361).—The adsorption of Ne and He by active C has been studied between −195·7° and 0° at 20—880 mm. R. T.

**New mode of transformation.** A. DEBIERNE (Compt. rend., 1937, **205**, 141—143).—Very large quantities of heat (of the order of $10^8$ g.-cal. per g.-mol. with $H_2$ or He) are evolved during the initial absorption of small quantities of $H_2$, He, or Ne on previously desorbed charcoal at −195°. The phenomenon is attributed to a nuclear reaction. A. J. E. W.

**Properties of activated sugar charcoal coated with various organic substances. II. Adsorption of acids.** H. K. ACHARYA (J. Indian Chem. Soc., 1937, **14**, 188—196; cf. this vol., 234). The adsorption of acids by activated sugar charcoal coated with $\alpha$-$C_{10}H_7{\cdot}NH_2$ or $NHPh_2$ is > by the original charcoal, reaching a max. val. at 0·005—0·010 g. of amine per g. of charcoal. Assuming the amine layer to be unimol., the surface area per g. of charcoal is 288 sq. m. Acid coverings decrease the adsorption of acids. F. J. L.

**Dissociative adsorption of hydrogen by copper and its kinetic consequences.** L. CLARKE (J. Amer. Chem. Soc., 1937, **59**, 1389—1391).—The assumption of dissociative adsorption at a uniform surface leads to kinetic consequences which explain the observed equilibria in the primary activated adsorption of $H_2$ by Cu. E. S. H.

**Adsorption on measured surfaces of vitreous silica. II.** W. G. PALMER (Proc. Roy. Soc., 1937, **A**, **160**, 254—267; cf. A., 1935, 818).—Previous work at low pressures has been extended at 25° up to saturation for $C_6H_6$, $COMe_2$, and MeOH. The films are 4 mols. thick at saturation and the linear relation between log adsorption potential and amount adsorbed holds over almost the whole pressure range. The spreading force is calc. from the observations by means of an equation of state for the films. The behaviour of films of small mols. on the solid is compared with that of films of long-chain mols. on $H_2O$. G. D. P.

**Adsorption of gaseous silicon tetrafluoride and of aqueous silicofluoric acid.** I. VEICHHERTZ, A. ISAKOVA, O. DRUSHININA, and P. MANUILOV (J. Chem. Ind. Russ., 1937, **14**, 122—126).—$H_2SiF_6$ is feebly absorbed by $SiO_2$ gel; adsorption proceeds according to Freundlich's equation. The adsorption isotherms of $SiF_4$ on $SiO_2$ gel (10—30°) exhibit certain anomalies, ascribed to reaction of $SiF_4$ with $H_2O$ in the gel. Adsorption by active C is anomalously high, due to formation of a multimol. adsorption layer. R. T.

**Exchange adsorptions on the surface of barium sulphate.** I. M. KOLTHOFF and G. E. NOPONEN (J. Amer. Chem. Soc., 1937, **59**, 1237—1239).—The following exchange adsorption processes have been demonstrated: $BaSO_4 + Pb^{\cdot\cdot} \rightarrow PbSO_4 + Ba^{\cdot\cdot}$, $BaSO_4 + CrO_4'' \rightarrow BaCrO_4 + SO_4''$, $BaSO_4 + 2IO_3' \rightarrow Ba(IO_3)_2 + SO_4''$. A method for determining the sp. surface of $BaSO_4$, based on the exchange of $CrO_4''$ and $SO_4''$, is described. E. S. H.

**Replacement of small adsorbed molecules by larger [molecules].** H. MARK (Österr. Chem.-Ztg., 1937, **40**, 343—344).—The energy relations of the exchange process are discussed. E. S. H.

**Base exchange in soluble Prussian-blues.** F. C. GUTHRIE and J. T. NANCE (J.S.C.I., 1937, **56**, 209—210T).—Base exchange is found to occur between the alkali metals and $NH_4$ and sol. Prussian-blue ppts. obtained by adding aq. $FeCl_3$ to an excess of aq. $K_4Fe(CN)_6$. When the mol. ratio of the salts is 0·2, Na, $NH_4$, and Rb almost completely displace the alkali already present, but displacement by Li and Cs occurs to a much smaller extent. In a ppt. formed by a 7 : 6 mol. ratio of $FeCl_3$ to $K_4Fe(CN)_6$ the displacement of K by $NH_4$ takes place by equivs.

**Salt formation and base exchange of graphitic acid.** H. THIELE (Kolloid-Z., 1937, **80**, 1—20).—The prep. and purification of graphitic acid (I) are described; the conductivity of the sols. has been determined. The amount of Fe, Ag, Na, Li, K, $NH_4$, Ba, or Ca taken up by (I) in aq. salt or hydroxide solutions has been determined; salts of (I), analogous to the zeolites, are formed. Base exchange has been observed. E. S. H.

**Coprecipitation and ageing. XI. Adsorption of ammonio-copper ion on and coprecipitation with hydrous ferric oxide. Ageing of the precipitate.** I. M. KOLTHOFF and B. MOSKOVITZ

(J. Physical Chem., 1937, **41**, 629—644; cf. A., 1936, 791).—The effect of the concn. of $NH_3$ and of $NH_4$ and alkali salts in the adsorption on and copptn. with $Fe_2O_3,xH_2O$ has been studied. O. J. W.

**Flow of gaseous mixtures through capillaries. II. Molecular flow of gaseous mixtures. III. Flow at medium pressures.** H. ADZUMI (Bull. Chem. Soc. Japan, 1937, **12**, 285—291, 292—303; cf. this vol., 405).—II. Rates of flow at very low pressures at which the mean free path is large compared with the capillary diameter have been investigated. Rates of mol. flow of $H_2$, $C_2H_2$, and $C_3H_6$ conform to Knudsen's equation. The rates of mol. flow of $H_2$–$C_2H_2$ and $H_2$–$C_3H_6$ mixtures are additive in character, and the changes in composition due to passage through capillaries conform to the additive law.

III. Data for $H_2$, $C_2H_2$, $C_3H_6$, $C_6H_6$, $CCl_4$, $CHCl_3$, and $Et_2O$, and the mixtures $H_2$–$C_2H_2$, $H_2$–$C_3H_6$, $C_6H_6$–$CCl_4$, $CCl_4$–$CHCl_3$, and $Et_2O$–$CHCl_3$ at 0·01—4 mm., at which the flow is partly viscous and partly mol., show that the rate of flow of mixtures agrees with a velocity–pressure relation similar to that for single gases, although the minima observed with the single gases are < for mixtures and occur at lower pressures. J. G. A. G.

**Flow of gases through a porous wall.** H. ADZUMI (Bull. Chem. Soc. Japan, 1937, **12**, 304—312).—The rate of flow of a gas through a porous plate is deduced on the assumption that the plate consists of an assemblage of parallel capillaries each of which consists of series of short capillaries of various diameters. Observed rates of flow agree with the equation, and the no. and mean radius of the pores in porous plates are evaluated. J. G. A. G.

**Permeability of palladium to hydrogen. VII. Influence of the state of purity of palladium on the changes produced in diffusive power by heating above 500°. Further consideration of the effect of temperature.** V. LOMBARD, C. EICHNER, and M. ALBERT (Bull. Soc. chim., 1937, [v], **4**, 1276—1285; cf. A., 1936, 790).—Commercial Pd containing Au, Ag, Pt, Pb, Sn, and Cu does not lose diffusive power when maintained at 500—670° in $H_2$ for long periods, and the sp. rate of diffusion of $H_2$ increases with rise of temp. Loss of diffusive power develops with increased purity of the Pd. J. G. A. G.

**Discontinuous step-like change of vapour pressure of substances adsorbed in capillaries, and measurement of molecular diameter.** D. RĂDULESCU and S. ŢILENSCHI (Z. physikal. Chem., 1937, **179**, 210—226).—It is shown theoretically that the radius of curvature of a liquid meniscus in a capillary is an integral multiple of the radius ($\rho$) of the liquid mol., so that the Helmholtz–Kelvin equation for the variation of v.p. ($p$) with radius of curvature becomes $\log_e p_r = \log_e p - 2\sigma M/(RT\delta n\rho)$, where $n$ is an integer. Adsorption and desorption isotherms must, therefore, be stepped curves, but this discontinuous character will be experimentally detectable only for small vals. of $n$. The mean height of the steps will give the approx. mol. radius. Such curves have been obtained for the desorption of $C_6H_6$ and $CH_2PhCl$ from activated C. R. C.

**Movement of fluid parallel to the axis of a solid cylinder, and the Liesegang phenomenon.** T. OKAYA (Japan. J. Physics, 1937, **12**, 9—25).—Mathematical. E. S. H.

**Dielectric properties of water. Dielectric interphases.** H. FRICKE and H. J. CURTIS (J. Physical Chem., 1937, **41**, 729—745).—The dielectric properties of an aq. suspension are derived from the conductivity and capacity at the interphase. Variation with frequency over the range 0·25 to 2000 kc. per sec. has been studied. F. R. G.

**Theory of surface tension of aqueous solutions of dipolar ions.** K. ARIYAMA (J. Chem. Physics, 1937, **5**, 467—469).—A theory of surface tension of aq. solutions of $NH_2$-acids, based on the idea of an "image force" at the air–$H_2O$ boundary, is discussed and applied to experimental data on seven acids. W. R. A.

**Liquid film in gas absorption.** M. H. HUTCHINSON and T. K. SHERWOOD (Ind. Eng. Chem., 1937, **29**, 836—840).—The coeff. $k_L$ of the rate of transfer of a solute across the liquid film has been studied by measurements of the rate of dissolution of eight relatively insol. pure gases in $H_2O$. When the $H_2O$ is effectively stirred $k_L$ is approx. $\propto$ the 0·6 power of the speed of the stirrer. At a const. stirring speed $k_L$ depends on the mol. wt. of the gas, since He and $H_2$ give figures some 30—35% > most of the other gases, but, on the other hand, for gases of mol. wt. from 28 to 71 $k_L$ shows a remarkable constancy. F. J. B.

**Effect of evaporation on the stability of liquid films.** H. A. NEVILLE and T. H. HAZLEHURST (J. Physical Chem., 1937, **41**, 545—551).—The effect of evaporation on the stability of films of pure liquids ($H_2O$, EtOH, aliphatic and aromatic hydrocarbons) has been studied. Liquid films become thinner by drainage and by suction where curvature exists, and can persist only so long as flow of liquid into the thin portion counteracts drainage. This flow of liquid results from thermal effects due to evaporation of the liquid. The film becomes unstable when evaporation from it is prevented. O. J. W.

**Built-up films of barium stearate and their optical properties.** (MISS) K. B. BLODGETT and I. LANGMUIR (Physical Rev., 1937, [ii], **51**, 964—982).—The technique of depositing successive single layers of mols. of various stearates on a solid surface is described. Films showing a series of steps of two mol. layers are photographed. From measurements of the angles at which films containing known nos. of layers reflect with min. intensity, the thickness per layer and val. of $n$ is calc. with high accuracy. The thickness per layer of Ba stearate is 24·40 A. Traces of foreign substances in the $H_2O$ affect the spacing by 1—3%. Equations are given for $n$ (extraordinary ray), the intensity of the rays reflected from the upper surface and from the film solid boundary, the phase change at the boundaries, Brewster's angle, and other properties of birefringent films. Films formed at $p_H$ <7·0 consist of a mixture of stearic acid and neutral stearate; the former can be dissolved by $C_6H_6$ leaving a birefringent stearate skeleton

having $n <$ for the normal film. Measurements of $n$ for various skeletons are given. N. M. B.

**Electrokinetics. XVIII. Interfacial energy and the molecular structure of organic compounds. IV. Electrokinetic behaviour of charcoals in aqueous solutions of organic acids.** V. L. FRAMPTON and R. A. GORTNER (J. Physical. Chem., 1937, **41**, 567—582).—Electrokinetic measurements with suspensions of C in aq. solutions of various aliphatic acids show that the adsorption of weak electrolytes on C is apolar. The adsorption of HCl, however, is polar. Activation does not appear to affect the electrokinetic properties of C, since the migration velocity of various charcoals suspended in $H_2O$ is const. Graphite and diamond dust show speeds of the same order of magnitude as the more highly activated C samples. No electrokinetic evidence for positively charged C was obtained. O. J. W.

**Electrokinetics. XIX. Interfacial energy and the molecular structure of organic compounds. V. Electric moment of $Al_2O_3$ : benzene–nitrobenzene interface.** R. A. GORTNER and H. B. BULL (Proc. Nat. Acad. Sci., 1937, **23**, 256—258; cf. A., 1933, 122).—Streaming potentials, calc. $\zeta$-potentials, and electric moments of the double layer for the interface $Al_2O_3$ : 0—100% $C_6H_6$–$PhNO_2$ and 10—50% $PhOH$–$C_6H_6$ mixtures have been determined. The results suggest the formation of bimol. compounds, although these are not indicated by the f.-p. curves, which show eutectics at respectively 51·3% $PhNO_2$ and 34·8% PhOH. It seems possible that electrokinetic measurements may be used for detecting mol. species which cannot be directly isolated. N. M. B.

**Influence of sodium ions on the ability of thin silver films to amalgamate.** H. KEHLER (Z. Physik, 1937, **106**, 296—310).—Apparatus is described for the prep. of thin Ag films on glass, mica, and collodion and their treatment with Na ions and Hg vapour. Bombardment with 100-e.v. ions renders the film partly passive to attack by Hg vapour. The resultant passivity $\propto$ no. of ions but is independent of the time of bombardment. Of the three matrices used, glass alone gave non-reproducible results L. G. G.

**Determination of the molecular size of dissolved substances on the basis of rate of dialysis according to H. Brintzinger.** W. RATHJE, K. HESS, and M. ULMANN (Ber., 1937, **70**, [B], 1403—1410).—Measurements of the rates of dialysis of $\alpha$-methylglucoside and sucrose give almost const. dialysis coeffs. when the process occurs with small $\Delta c$ against the solvent; the factor $\lambda\sqrt{m}$ is not const. for the two types of sugar. As $\Delta c$ increases the discrepancies in the dialysis const. tend towards higher vals. An explanation for the dependence of the dialysis const. on $\Delta c$ cannot at present be given but it is not restricted to the sugars. The dependence of the dialysis const. on the concn. at practically const. and sufficiently small $\Delta c$ is explained by the assumption of complex formation and mol. association. On account of the sp. influence of chemical constitution the dialysis method cannot be applied with any considerable degree of exactitude to org. substances. The diffusion const. and osmotic pressure are similar in their dependence on concn. and in this respect the osmotic and diffusion methods are qualitatively complete and confirm one another. H. W.

**Theory of osmotic pressure, and Ulmann's method of measurement. Use of this method at higher temperatures.** K. WOHL (Z. physikal. Chem., 1937, **179**, 195—209).—Partly polemical against Thiel (this vol., 302). Mathematical examination of the effect of external pressure and gravity on the osmotic pressure of a solution shows that osmotic pressure may be regarded equally well as either a pressure or a suction. Ulmann's isothermal distillation method of measuring osmotic pressure ("Molekülgrössenbestimmung hochpolymerer Naturstoffe," 1936) is equiv. to establishing equilibrium between solvent and solution separated by a semipermeable membrane by exerting a pull on the solvent, and here the membrane acts like a series of capillary tubes. Preliminary experiments indicate that by this method the osmotic pressure of a given solution can be measured in the same apparatus at any temp. between room temp. and 80°. R. C.

**Diamagnetism of iodine solutions and the purity of alcohol.** C. COURTY (Compt. rend., 1937, **205**, 140—141; cf. this vol., 302).—The purity of EtOH may be tested by comparing $\chi$ for a solution of I in the specimen with the calc. val. A. J. E. W.

**Flow dichroism of fluorescein solutions.** S. NIKITINE (Compt. rend., 1937, **205**, 124—126).—Dichroism due to flow has been observed in solutions of fluorescein in glycerol, in accord with theory. A. J. E. W.

**Slit photometer for the analysis of thin sections of coloured solutions: experimental confirmation of the diffusion equation.** W. G. EVERSOLE and E. W. DOUGHTY (J. Physical Chem., 1937, **41**, 663—671; cf. A., 1936, 288).—The diffusion coeff. of methylene-blue in 5% gelatin gels at 25° is $1·635 \times 10^{-6}$ (cm.$^2$, sec.). A more accurate photometric apparatus for the analysis of coloured solutions is described. F. R. G.

**Apparent and partial molal volumes of ammonium chloride and of cupric sulphate in aqueous solution at 25°.** J. N. PEARCE and G. G. PUMPLIN (J. Amer. Chem. Soc., 1937, **95**, 1221—1222).—Mol. vols. have been calc. from measurements of $d$. The data are discussed in relation to Masson's law (A., 1930, 31). E. S. H.

**Diffusion constant of an electrolyte, and its relation to concentration.** A. R. GORDON (J. Chem. Physics, 1937, **5**, 522—526).—A semi-empirical equation is developed which gives vals. for the differential diffusion consts. ($k$) of KCl, NaCl, and $KNO_3$ in agreement with experiment. Cole and Gordon's rule (A., 1936, 1197) that the effective diffusion const. measured in a Northrup–McBain diaphragm cell has the same val. as $k$ for the mean concn. is shown to be valid even when $k$ does not vary linearly with concn., provided the total concn. range is $\not>0·1N$. J. W. S.

**Colloids in glacial acetic acid. I. Elements, chlorides, sulphides, and sulphates.** A. L. ELDER and P. N. BURKARD (J. Physical Chem., 1937, **41**, 621—624).—Colloidal As, Se, S, P, Au, Pt, Ag, Cu, sulphides, chlorides, and sulphates in glacial AcOH have been prepared. O. J. W.

**Purification of colloids by electrodialysis.** L. KRATZ (Kolloid-Z., 1937, **80**, 33—43).—The results of a crit. examination of the effectiveness of two existing electrodialysers in the purification of gum-arabic and serum-albumin sols are reported. The change of $p_H$ with time during electrodialysis has been investigated and the influence of the apparatus and experimental conditions on this change discussed. The theory of electrodialysis is discussed. E. S. H.

**Disperse gases. II.** R. AUERBACH (Kolloid-Z., 1937, **80**, 27—31; cf. A., 1936, 425).—The general conditions of formation and properties of gaseous dispersions are discussed, with special reference to stability and solubility, the influence of stabilisers, and particle size. Methods for the prep. of gaseous hydrosols by condensation and by dispersion are described. E. S. H.

**Diffusion of heterodisperse substances. I.** SAKURADA and M. TANIGUCHI (Z. physikal. Chem., 1937, **179**, 227—234).—From Fick's law a diffusion equation for heterodisperse substances has been derived and the Stefan–Kawalki table shown to be approx. valid when the diffusion coeff., $D$, of the heterodisperse substance is defined by $D = 100^2/(\Sigma c_i/\sqrt{D_i})^2$, where $c_i$ and $D_i$ are the % and diffusion coeff., respectively, of the component $i$. The applicability of the equation has been demonstrated by experiments with artificially prepared mixtures. R. C.

**Individuality of cellulose micelles.** O. KRATKY and H. MARK (Z. physikal. Chem., 1937, **B**, **36**, 129—139).—By $X$-ray examination alone it is impossible to decide whether the cellulose fibre consists of discrete micelles or whether the principal valency chains extend through several regions of crystallinity, but the general experimental evidence favours the latter alternative. Nevertheless, the increase in orientation caused by mechanical action seems to be explained most satisfactorily by postulating the presence of box-like cryst. regions, by rotation of which the increase in orientation is effected. R. C.

**Internal solubility in soap micelles.** A. S. C. LAWRENCE (Trans. Faraday Soc., 1937, **33**, 815—820).—Experiments on the solubility of Nujol in soap solutions support the theory that $H_2O$-insol., hydrocarbon-sol. substances are dissolved in the interior of soap micelles by the hydrocarbon portion of the soap mol. The amounts of oil dissolved appear to be independent of the mol. wt. of the oil, but for Na, K, and Cs soaps they increase with increasing mol. wt. of the soap cation. C. R. H.

**Asymmetry and orientation of clay micelles.** S. HENIN (Compt. rend., 1937, **204**, 1498—1499).—Reference is made to various methods by which birefringence and other properties indicative of micellar asymmetry and orientation may be demonstrated. R. M. M. O.

**Dispersion of depolarisation of light-scattering colloids. III.** R. S. KRISHNAN (Proc. Indian Acad. Sci., 1937, **5**, **A**, 407—418; cf. this vol., 409).—Extinction coeffs. and depolarisation factors for Pt, Cu, Se, and Te sols have been measured between λλ 2500 and 7000 A. The particles are spherical, but the optical anisotropy increases somewhat in the ultra-violet. F. J. L.

**Viscosity of sols made from $X$-irradiated agar.** H. KERSTEN and C. H. DWIGHT (J. Physical Chem., 1937, **41**, 687—689).—Irradiation of dry agar decreases the $\eta$ and $p_H$ of the resulting sol. F. R. G.

**Coagulation of colloidal ferric hydroxide by mercury salts.** K. JABŁCZYŃSKI and S. CIOŁEK (Rocz. Chem., 1937, **17**, 196—200).—Positively charged $Fe(OH)_3$ sols are not coagulated by $HgCl_2$ or $Hg(CN)_2$, but if KCl is added coagulation follows. The effect is ascribed to formation of complex anions, of the type $[HgCl_4]''$. R. T.

**Directed coagulation of aërosols. II (I). Determination of the size of elementary magnets of nickel and iron.** D. BEISCHER and A. WINKEL (Naturwiss., 1937, **25**, 420—423; cf. A., 1936, 679).—Ferromagnetic properties are not associated with atoms of ferromagnetic elements, but with an aggregation of atoms with a definite orientation. The type of aggregate formed in aërosols of Ni and Fe, obtained by thermal decomp. of Ni and Fe carbonyls, has been examined by the ultra-microscope. Below the Curie point the aggregates are chain-like in contrast to the usual type of aggregation, which is spherical. The aggregation is practically instantaneous, whereas with other substances it may take a considerable time. It is considered that the directed aggregation is due to magnetic forces. If the aërosol is made above the Curie point, Fe and Ni aërosols aggregate to spherical particles. Determination of the size of the directed crystallites by observing the widening of the Debye–Scherrer pattern shows that the primary crystallites have the magnitude and form of the elementary particles assumed to be responsible for ferromagnetism by the Weiss–Heisenberg theory. A. J. M.

**Ageing of fresh precipitates. XIII. Ageing of freshly precipitated silver chloride as indicated by the adsorption of wool-violet.** I. M. KOLTHOFF and H. C. YUTZY (J. Amer. Chem. Soc., 1937, **59**, 1215—1219; cf. A., 1936, 561, 791).—The ppt., when kept in the mother-liquor, undergoes a rapid decrease of surface as measured by the adsorption of wool-violet. Ageing is most pronounced in 0·001$M$-NaCl or EtOH, least in 0·001$M$-$AgNO_3$, and is promoted by $NH_3$. AgCl pptd. in presence of excess of $Ag^{\cdot}$ adsorbs more wool-violet than that pptd. from a solution containing excess of $Cl'$. E. S. H.

**Potential and transport measurements on ferric hydroxide hydrosols.** A. LOTTERMOSER and H. FRITZSCHE (Kolloid-Z., 1937, **80**, 44—56).—Methods of determining the $Cl'$ activity of $Fe(OH)_3$ sols (prepared from $FeCl_3$), using Ag, AgCl, and $Hg_2Cl_2$ electrodes, are described. The results obtained by different methods are in agreement for the ultrafiltrate, but considerable differences are observed

when measurements are made on the sol. The causes of the disagreement are discussed. E. S. H.

**Behaviour of inulin in liquid ammonia.** F. W. BERGSTROM and A. E. GILMORE (J. Amer. Chem. Soc., 1937, **59**, 1356—1358).—Inulin ppts. slowly when the solution is kept, forming a gel; it shows the Tyndall effect, and does not diffuse through a Cellophane membrane. E. S. H.

**Influence of tervalent metal salts on solutions of gum arabic.** R. HALLER and B. FRANKFURT (Kolloid-Z., 1937, **80**, 68—72).—With increasing concn. of added $Fe^{III}$ salts the $\eta$ of gum arabic solutions falls slightly at first, then rises to a max., and subsequently falls again. The changes are more marked with increasing concn. of gum solution and are not influenced by temp. rise between 20° and 50°. Similar phenomena are observed on adding $AlCl_3$ or $CrCl_3$ to gum arabic solutions. Under certain conditions gels are formed. E. S. H.

**Action of light on the Liesegang phenomenon.** M. F. TABOURY and M. BELLOT (Compt. rend., 1937, **205**, 45—47).—From experiments on the pptn. of $Ag_2CrO_4$ in agar, it is shown that light of $\lambda$ 4000—4960 A. favours and light of longer $\lambda$ prevents rhythmic pptn. C. R. H.

**Silicic acid gels. VII. Effect of the soda-silica ratio on the time of set.** C. B. HURD, W. FIEDLER, and C. L. RAYMOND (J. Physical Chem., 1937, **41**, 553—561; cf. A., 1936, 288).—No difference in time of set is found in gels obtained by mixing aq. Na silicate and aq. AcOH with varying $NaOH : SiO_2$ ratio (1 : 2 to 1 : 3·25) at 25°. The theory of the setting of these gels is discussed. O. J. W.

**Ionic exchange in relation to hydrogen-ion concentration and rigidity of silicic acid jellies.** J. H. HANKS and R. L. WEINTRAUB (J. Physical Chem., 1937, **41**, 583—592).—A method for preparing $SiO_2$ gels at any $p_H$ is described. The influence of time, temp., dialysis, and autoclaving on the [H·] and rigidity of $SiO_2$ gels has been studied. O. J. W.

**Spinning properties of liquids. IV. Liquefying effect of calcium salts on gelatin.** H. ERBRING (Kolloid-Z., 1937, **80**, 20—27; cf. A., 1936, 1200).—When $Ca(SCN)_2$, $Ca(NO_3)_2$, or $CaCl_2$ is added to conc. gelatin solution, $\eta$ decreases strongly to a min. at 1·4*M*, afterwards increasing with increasing concn. of Ca salt. This effect is ascribed to an initial dispersing, followed by a coagulating, influence. The abs. val. of $\eta$ is influenced by the anion. With low and high salt concns. sol thixotropy is marked, although less strongly with intermediate concns. Optimum spinning properties are observed in the concn. regions corresponding with the beginning of liquefaction and of coagulation. During spinning, double refraction due to stretching is observed. E. S. H.

**Action of monohydric alcohols on gelatin gels.** J. A. SAUNDERS (Biochem. J., 1937, **31**, 1093—1096).—The action of MeOH, EtOH, $Pr^{\alpha}OH$, $Bu^{\alpha}OH$, and $Bu^{\beta}OH$ on gelatin gels is studied. On immersion in the alcohols the gels are dehydrated with absorption of the alcohol. On re-swelling in $H_2O$ the gels increase in wt. rapidly for 3 days and thereafter at a rate similar to that of the swelling of untreated gels in $H_2O$. In dil. solutions of EtOH the gel first decreases and then increases in wt. whilst in solutions containing >20% of EtOH the wt. steadily decreases. Swelling in $H_2O$ involves a readjustment of the gel structure with imbibition but small amounts of EtOH prevent this readjustment. E. A. H. R.

**Effect of *X*-radiation on the $\zeta$-potential of colloidal graphite.** J. A. CROWTHER and H. LIEBMANN (Nature, 1937, **140**, 28—29).—When irradiated by increasing doses of *X*-rays the $\zeta$-potential of a colloidal dispersion of graphite alternately increases and decreases. L. S. T.

**Ratio of electro-osmotic mobility along a flat surface to electrophoretic mobility of particles of ultramicroscopic size.** A. R. WILLEY and F. HAZEL (J. Physical Chem., 1937, **41**, 699—710).—According to observations made with $Fe_2O_3$ and gelatin in a Mattson electrophoresis cell, the ratio of electro-osmotic to electrophoretic mobility is unity and the validity of the Smoluchowski equation thus appears to be independent of the particle size. F. R. G.

**Mobility data in determining the composition of colloidal micelles.** B. COHEN (J. Physical Chem., 1937, **41**, 711—713).—The bound and unbound portions of the constituents of a colloidal solution are considered in relation to their mobilities. F. R. G.

**Electrophoresis of lamellæ at the interface of liquid phases.** L. I. BELAEV (Compt. rend. Acad. Sci. U.R.S.S., 1937, **15**, 249—253).—The motion of lamellar films, formed at the interfaces between immiscible liquid phases, under the influence of an electric field applied in the plane of the films has been investigated. Movement towards one or both electrodes may occur. The mechanism of the process is discussed. A. J. E. W.

**Physico-chemical properties of electro-dialysed gels of silica, alumina, and ferric oxide and their mixtures. III. Cataphoretic velocity and $p_H$.** P. B. BHATTACHARYYA (J. Indian Chem. Soc., 1937, **14**, 225—230; cf. this vol., 81).—The cataphoretic velocity and $p_H$ of unmixed and mixed gels of $SiO_2$, $Al_2O_3$, and $Fe_2O_3$ saturated with various cations are recorded. For $SiO_2$, $Al_2O_3 + SiO_2$, and $Fe_2O_3 + SiO_2$ gels the cataphoretic velocity is in the order Na > K > Mg > Ca > unsaturated H gel; and for $Al_2O_3 + Fe_2O_3$ the reverse. The $p_H$ of all the gels is 5—7. F. J. L.

**Present state of the theory of electrolytes.** A. E. BRODSKI (Trav. Congr. Jubil. Mendeléev, 1937, 2, 426—445).—A discussion. C. R. H.

**Interionic attraction theory of electrolysis.** D. A. MACINNES (Science, 1937, **86**, 23—29). L. S. T.

**Recent advances in the electrochemistry of non-aqueous solutions.** A. W. DAVIDSON (J. Chem. Educ., 1937, **14**, 218—227). L. S. T.

**Second dissociation constant of carbonic acid.** Y. KAUKO and A. AIROLA (Z. physikal. Chem., 1937,

179, 307—313).—From the dissociation const. (this vol., 241) the heat of dissociation has been calc. to be 3820 at 0—25° and 3550 g.-cal. at 25—38°. R. C.

**Dissociation constants of *d*-glucoascorbic acid and of its product of oxidation by iodine. Ultraviolet absorption spectra of *d*-glucoascorbic acid.** G. CARPÈNI (Compt. rend., 1937, **205**, 273—275).—For *d*-glucoascorbic acid the electrometric vals. are $5{\cdot}5 \times 10^{-5}$ and $2{\cdot}63 \times 10^{-12}$, whilst the spectroscopic vals. are $7{\cdot}1 \times 10^{-5}$ and $0{\cdot}56 \times 10^{-12}$. On titration of oxyglucoascorbic acid, time being allowed for attainment of equilibrium, the consts. obtained were $2{\cdot}2 \times 10^{-4}$ and $7{\cdot}1 \times 10^{-9}$. Back-titration with HCl gave $1{\cdot}6 \times 10^{-3}$, $6{\cdot}3 \times 10^{-5}$, and $1{\cdot}6 \times 10^{-9}$, whilst rapid titration gave approx. $2{\cdot}8 \times 10^{-9}$. F. J. G.

**Ionisation of acetic acid in aqueous sodium chloride solutions from 0° to 40°.** H. S. HARNED and F. C. HICKEY (J. Amer. Chem. Soc., 1937, **59**, 1284—1288).—E.m.f. data for the cells $H_2$|AcOH(*M*),NaCl(*m*)|AgCl,Ag with 0·2—0·5*M*-AcOH and 0·05—3*M*-NaCl are recorded at 5° intervals from 5° to 40°. The ionisation const. and activity coeff. of AcOH have been calc. The total heat of ionisation of AcOH and the relative partial mol. heat content of its ions in NaCl solutions have been derived. E. S. H.

**Hydrolysis of acetate ion in sodium chloride solutions.** H. S. HARNED and F. C. HICKEY (J. Amer. Chem. Soc., 1937, **59**, 1289—1290).—The reaction has been studied by measurement of e.m.f. of the cells $H_2$|NaOH($m_0$),NaCl(*m*)|AgCl,Ag and $H_2$|AcOH(*M*),NaCl(*m*)|AgCl,Ag at 0—40° and 0—3*M*-NaCl. At 25—40° the total deviation from the mass action law is $\not>4\%$. E. S. H.

**Constitution of water in solutions of strong electrolytes. II.** C. S. RAO (Indian J. Physics, 1937, **11**, 143—163).—Extension of earlier work (A., 1935, 295) shows that the Raman $H_2O$ band is sharper in solutions of strong electrolytes than in the pure solvent, and is shifted towards higher frequency. The position of the intensity max. is determined by the anion and is independent of the cation. Changes in the structure of the band are, however, mainly attributable to changes in the hydration of the cation. F. J. L.

**Interpretation of f.-p. lowering data in terms of polymerisation.** E. N. LASSETTRE (J. Amer. Chem. Soc., 1937, **59**, 1383—1387).—The method of calculating equilibrium consts. of polymerisation reactions from f.-p., b.-p., and distribution data is described. The method has been applied to various compounds and an empirical equation derived. The same type of equation also holds for the distribution of PhOH between $CHCl_3$ and $H_2O$. E. S. H.

**Influence of solvents on the course of chemical reactions. XV.**—See A., II, 339.

**Tautomeric equilibria of nitrosonaphthol–naphthaquinoneoxime systems.** H. S. FRENCH and D. J. PERKINS (J. Amer. Chem. Soc., 1937, **59**, 1182—1186).—The solvent effects (EtOH, $Et_2O$, and *cyclo*hexane) on the absorption spectra of PhNO, 1-$C_{10}H_7$·NO, 1 : 2-naphthaquinonedioxime, and 1 : 2-, 2 : 1-, and 4 : 1-nitrosonaphthols have been determined. The results afford evidence that the quinonoid modification predominates in the quinonoid–benzenoid equilibria of the nitrosonaphthols. E. S. H.

**Binary systems in which one component exhibits a heterogeneous transformation with heterogeneous hysteresis.** A. SMITS and G. J. MULLER (Z. physikal. Chem., 1937, **B**, **36**, 146—154).—Assuming that the second component facilitates transition from oscillation to rotation by removal of inhibitions and that the hysteresis region diminishes and ultimately disappears with increase in the concn. of this component, the *T*–*X* diagram would be expected to show the effect of this component on the hysteresis of the transformation in the mixed crystals. Owing to the difficulty of the experimental determination of this diagram, *V*–*T* lines statically determined for mixtures of various compositions are used instead. Sp. heat measurements throw no light on the effect of the second component on the hysteresis (cf. this vol., 74). R. C.

**Thermodynamics of ionised water in lithium bromide solutions.** H. S. HARNED and J. G. DONELSON (J. Amer. Chem. Soc., 1937, **59**, 1280—1284).—E.m.f. vals. for the cells $H_2$|LiOH(0·01), LiBr(*m*)|AgBr,Ag and $H_2$|HBr(0·01), LiBr(*m*)|AgBr,Ag have been determined at 5° intervals from 0° to 50°. The ionisation const. of $H_2O$, the standard e.m.f. of the AgBr,Ag electrode, the activity coeff., the relative partial mol. heat content of HBr in aq. LiBr, and the ionic activity coeff. product and heat of ionisation of $H_2O$ in aq. LiBr have been calc. E. S. H.

**Thermodynamics of aqueous potassium chloride solutions from electromotive force measurements.** H. S. HARNED and M. A. COOK (J. Amer. Chem. Soc., 1937, **59**, 1290—1292).—E.m.f. data for the cells Ag,AgCl|KCl(*m*)|$K_x$Hg|KCl(0·05)|AgCl,Ag with 0·1—4*M*-KCl are recorded at 5° intervals from 0° to 40°. The activity coeff., relative partial mol. heat content, and relative partial mol. heat capacity of KCl have been calc. E. S. H.

**Equilibrium between hydrogen sulphide and heavy water.** P. A. SMALL (Trans. Faraday Soc., 1937, **33**, 820—823).—The mean val. for the const. for the reaction $H_2S_{gas} + HDO_{liq.} \rightleftharpoons HDS_{gas} + H_2O_{liq.}$ is $0{\cdot}422 \pm 0{\cdot}019$, and for the reaction $H_2S_{gas} + HDO_{gas} \rightleftharpoons HDS_{gas} + H_2O_{gas}$ is $0{\cdot}453 \pm 0{\cdot}020$ at 15°. The latter val. is compared with vals., 0·436 and 0·448, derived respectively from considerations of zero-point energy and from spectroscopic data. C. R. H.

**Calculation of equilibrium constants and activation energies for some reactions involving various isotopic species of hydrogen, water, and hydrogen sulphide.** T. JONES and A. SHERMAN (J. Chem. Physics, 1937, **5**, 375—381).—By the methods of statistical mechanics the partition function ratios for pairs of the different isotopic species of $H_2$, $H_2O$, and $H_2S$ have been calc. and from these the equilibrium consts. for isotopic exchange reactions are derived. Where possible, comparison is made between the vals. obtained and those pre-

viously determined theoretically or experimentally. The calculations cover the temp. range 273° to 1000° abs. and the temp. variation of the equilibrium consts. is shown. Activation energies are calc. The various isotopic exchange reactions in the gas phase and in the absence of catalysts fall into three groups: (*a*) isotopic exchange will occur between $H_2$ and $H_2O$ and between $H_2$ and $H_2S$ at high temp. (500°) by chain mechanisms; (*b*) exchange between isotopic species of $H_2O$ and $H_2S$ will occur at approx. 400° by a bimol. and chain mechanism; and (*c*) at 200° to 300° exchange between $H_2O$ and $H_2S$ will occur by a bimol. mechanism. W. R. A.

**Vapour pressures and activity coefficients of aqueous solutions of ammonium chloride at 25°.** J. N. PEARCE and G. G. PUMPLIN (J. Amer. Chem. Soc., 1937, **59**, 1219—1220).—V.-p. data for the whole range of concn. are recorded. The activities of the solvent, the geometric mean activities of the solute, and the free energies of dilution have been calc. E. S. H.

**Vapour pressures of aqueous solutions of sodium nitrate and potassium thiocyanate.** J. N. PEARCE and H. HOPSON (J. Physical Chem., 1937, **41**, 535—538; cf. A., 1935, 302).—V.p. of aq. solutions of $NaNO_3$ and of KCNS at 25° have been measured, and the apparent and partial mol. vols. calc. O. J. W.

**Vapour pressures and some thermodynamic properties of aqueous solutions of nickel chloride at 25°.** J. N. PEARCE and H. C. ECKSTROM (J. Physical Chem., 1937, **41**, 563—565).—V.p. and *d* of aq. $NiCl_2$ at 25° have been measured, and the activity of the solvent and partial and apparent mol. vol. of the dissolved salt calc. The solubility of $NiCl_2$ in $H_2O$ at 25° is 4·91 mols. per 1000 g. of $H_2O$. O. J. W.

**Vapour pressures of saturated solutions.** W. W. EWING (J. Amer. Chem. Soc., 1937, **59**, 1293—1294).—The conclusions of Roehl (A., 1936, 1069) are inapplicable to many salt solutions. E. S. H.

**Vapour pressures of saturated aqueous solutions.** W. A. WEST and A. W. C. MENZIES (J. Amer. Chem. Soc., 1937, **59**, 1294—1297).—The curves obtained by plotting the logarithm of the v.p. of saturated aq. solutions against reciprocal temp. may show many types of slope or curvature. The slopes of these curves are interpreted by means of Roozeboom's equation $d \log P/dT = [q + Q_c^x/(x - c)]/2T^2$, where $q$ is the mol. heat of vaporisation of $H_2O$, $Q_c^x$ the integral heat of dissolution for 1 formula-wt. of the solid phase in forming its saturated solution from $H_2O$, $x$ the total mols. of $H_2O$ containing 1 mol. of anhyd. solute, and $c$ the mols. of $H_2O$ of crystallisation in 1 formula-wt. of the solid phase. E. S. H.

**Thermodynamic properties of saturated aqueous solutions of salt systems. I. Specific heat and vapour pressure of the system $BaCl_2$–$CaCl_2$–$H_2O$ at 25°.** E. N. VARASOVA, K. P. MISCHTSCHENKO, and O. I. FROST (J. Gen. Chem. Russ., 1937, **7**, 1284—1291).—The solubility of $BaCl_2$ falls practically to zero in 25% $CaCl_2$. Sp. heat and v.p. data are given for saturated solutions at 25°. R. T.

**Continuity of the metastable state.** A. VAN HOOK (J. Physical Chem., 1937, **41**, 593—596).—The temp.-dilatation curves for supersaturated aq. solutions of $KNO_3$, $(NH_4)_2C_2O_4$, $H_2C_2O_4$, $Ca(NO_3)_2$, $NH_2Ac$, and $CO(NH_2)_2$ are found to be quite continuous at the saturation point. The principle of the continuity of properties into the metastable state is generally valid. O. J. W.

**Dissociation of natural zinc carbonate, a reaction in which a mixed condensed phase intervenes.** M. DODÉ (Compt. rend., 1937, **204**, 1938—1939; cf. this vol., 81).—The calc. composition of the condensed phase accords with the observed vals. at a series of temp. J. G. A. G.

**Thermal dissociation of bismuth sulphide.** J. I. GERASIMOV (J. Gen. Chem. Russ., 1937, **7**, 1333—1338).—The equilibrium coeffs. for the reaction $Bi_2S_3 + 3H_2 \rightleftharpoons 2Bi + 3H_2S$ have been determined at 370—590°; the results of earlier workers are on the whole confirmed. The dissociation pressure and heat of formation of $Bi_2S_3$ are calc. R. T.

**Physico-chemical analysis in relation to the sulphuric acid treatment of phosphates. I. Ternary system $CaO$–$P_2O_5$–$H_2O$, at 80°.** A. P. BELOPOLSKI, A. A. TAPEROVA, M. T. SEREBRENNIKOVA, and M. N. SCHULGINA (J. Chem. Ind. Russ., 1937, **14**, 504—507).—Equilibrium data are given for the system $CaO$–$P_2O_5$–$H_2O$, at 80°, for the range 0·13—48·9% $P_2O_5$. R. T.

**Phase-rule studies of the calcium arsenates.** G. W. PEARCE and A. W. AVENS (J. Amer. Chem. Soc., 1937, **59**, 1258—1261).—The system $CaO$–$As_2O_5$–$H_2O$ has been studied at 35°. The existence of $CaHAsO_4$, $Ca_5H_2(AsO_4)_4$, and $Ca_3(AsO_4)_2$ has been confirmed. No basic Ca arsenate was found. E. S. H.

**Soda alum system.** J. T. DOBBINS and L. C. THOMAS (J. Physical Chem., 1937, **41**, 655—661).—Isotherms for the system $Na_2SO_4$–$Al_2(SO_4)_3$–10% $H_2SO_4$ at 50°, 42°, and 30°, and dilatometer measurements at 41—46°, show that $Na_2SO_4,Al_2(SO_4)_3,14H_2O$ is stable below, and the *hexahydrate* above, 42·9—43·4°. F. R. G.

**Ternary system $FeO$–$Al_2O_3$–$SiO_2$.** R. HAY, J. WHITE, and T. H. CAULFIELD (J. Soc. Glass Tech., 1937, **21**, 270—280).—A diagram has been constructed from thermal and microscopic data. Four ternary combinations occur: (1) FeO, spinel, fayalite, (2) fayalite, spinel, mullite, (3) fayalite, $SiO_2$, mullite, (4) $Al_2O_3$, spinel, mullite. Three ternary eutectic points occur; all these approximate to the composition of fayalite. C. L. M.

**Certain physical constants of mixtures of hydrocarbons.** A. V. LOZOVOI, M. K. DJAKOVA, and T. G. STEPANTZEVA (J. Gen. Chem. Russ., 1937, **7**, 1119—1132).—$n_D^{20}$, $d_4^{20}$, and $NH_2Ph$ point data are recorded for binary mixtures of $C_6H_6$, PhMe, *o*-, *m*-, and *p*-xylene, *s*-$C_6H_3Me_3$, 1 : 2 : 4 : 5-$C_6H_2Me_4$, $C_6HMe_5$, $C_6Me_6$, PhEt, $PhPr^{\alpha}$, and *p*-$C_6H_4MePr^{\beta}$ with the corresponding $H_6$-derivatives. R. T.

**The system acetylene–liquid oxygen, and explosions in rectification plants.** I. P. ISCHKIN, P. Z. BURBO, and A. G. PASCHKOVSKAJA (J. Chem. Ind. Russ., 1937, **14**, 560—566).—The solubility of $C_2H_2$ in liquid $O_2$ is determined at −183°, by the $Ag_2C_2$ pptd. on passing the gas through ammoniacal $AgNO_3$ in 80% $COMe_2$. Cryst. $C_2H_2$ separates from supersaturated solutions, and may be removed by filtration; the $[C_2H_2]$ of the filtrate is high enough to render explosion possible, but the pressure developed during the explosion is not great enough to destroy the condenser. R. T.

**Binary systems of fatty acids.** M. KULKA and R. B. SANDIN (J. Amer. Chem. Soc., 1937, **59**, 1347—1349).—F.p.–composition curves have been determined for the systems myristic–palmitic, decoic–lauric, and undecoic–lauric acids. E. S. H.

**Binary systems containing carbamide.** A. S. VETROV (J. Gen. Chem. Russ., 1937, **7**, 1093—1095).—Hydrate formation is not observed in the system $CO(NH_2)_2$–$H_2O$. Formation of a 1 : 2 compound is confirmed for the system $CO(NH_2)_2$–AcOH. R. T.

**Activity coefficients of nitrobenzene in binary systems with certain benzene derivatives.** K. HRYNAKOWSKI, H. STASZEWSKI, and M. SZMYTÓWNA (Rocz. Chem., 1937, **17**, 189—195).—The eutectic mixture of $PhNO_2$ and $C_6H_6$ contains 59·1 mol.-% of $PhNO_2$, and melts at −21·2°; the corresponding vals. for the system $PhNO_2$–PhOH are 58·3 and −16·4°, and for $PhNO_2$–BzOH 95·6 and 3·9°. The fusion diagram of the system $PhNO_2$–PhCHO could not be realised, owing to formation of glassy resins. The activity coeff. of $PhNO_2$ has approx. the same val. in all the above systems. R. T.

**The system α-naphthol–salicylic acid.** A. CASTIGLIONI (Gazzetta, 1937, **67**, 244—247).—The van der Waals equation is applied on the assumption that the heat of mixing is zero, and heats of fusion are calc. in agreement with recorded vals. The eutectic is at 21·3% salicylic acid. E. W. W.

**Existence and nature of acid soaps.** P. EKWALL (Kolloid-Z., 1937, **80**, 77—100).—A summary of published work. E. S. H.

**Thermal decomposition of mixed ammonium–calcium permutites, bentonites, and clays.** O. BOTTINI (Kolloid-Z., 1937, **80**, 56—59).—The % dissociation ($NH_3$ loss) of the mixed substances has been determined at different temp. between 50° and 550°. The different results obtained for the same substance according to the method of prep. show that the intermicellar bound $NH_4^{\cdot}$ is more resistant to thermal decomp. than is the extramicellar $NH_4^{\cdot}$. E. S. H.

**Heat capacity and entropy of silver nitrate from 15° to 300° abs. Heat and free energy of dissolution in water and dilute aqueous ammonia. Entropy of silver ammonia complex ion.** W. V. SMITH, O. L. I. BROWN, and K. S. PITZER (J. Amer. Chem. Soc., 1937, **59**, 1213—1215).—Heat capacities have been determined. The entropy of $AgNO_3$ at 298·1° abs. is 33·68 e.u., the heat of dissolution in $H_2O$ 5360±50 g.-cal. per mol., free energy of dissolution in $H_2O$ −510 g.-cal. per mol., and free energy of formation of solid $AgNO_3$ from its elements −7350 g.-cal. per mol. The heat of dissolution of $AgNO_3$ in dil. aq. $NH_3$ has been determined. The entropy of $Ag(NH_3)_2^{\cdot}$ is 58·7 e.u. at 298·1° abs. E. S. H.

**Calculation of the change in free energy in the formation of tricalcium silicate from calcium oxide and β-dicalcium silicate.** H. A. SHADDUCK (J. Physical Chem., 1937, **41**, 625—628).—The calc. change of free energy for the reaction is small and becomes negative at about 900°. O. J. W.

**Homology and isomerism in long-chain compounds. I. Thermochemical study of the *n*-alkyl esters derived from the monoethylenic monocarboxylic acids in $C_{18}$.** L. J. P. KEFFLER (J. Physical Chem., 1937, **41**, 715—721).—Isothermal heats of combustion are recorded for Me, Et, $Pr^a$, and $Bu^a$ oleates and Me, Et, $Pr^a$, $Bu^a$, and amyl elaidates. The val. for Et oleate is exceptionally < that of Et elaidate. The $CH_2$ increment for the elaidates is equal to that for the alcohols, but for the oleates it is irregular. F. R. G.

**Application of thermal analysis to determination of thermal effects in binary and ternary systems.** K. HRYNAKOWSKI and A. SMOCZKIEWICZOWA (Rocz. Chem., 1937, **17**, 181—185).—The heats of fusion of the eutectic mixtures correspond with calc. vals. in absence of compound formation [systems α- −β-$C_{10}H_7$·OH, $NH_2Ac$–$CO(NH_2)_2$, phenacetin–antipyrine–sulphonal], but not when compounds are formed [α-$C_{10}H_7$·OH–$CO(NH_2)_2$, $NH_2Ac$–β-$C_{10}H_7$·OH]. R. T.

**Energy and volume changes on chemical reaction.** G. BECK (Z. anorg. Chem., 1937, **233**, 151—154).—Vol. change (at 0° abs.) on compound formation is compared with the energy of formation $Q$ by reference to the equation $V_a/V_e = e^{a+b}$, in which $V_a$ and $V_e$ are the initial and final vols. and $a = Q/hcR$. For fluorides $a$ and $b$ are nearly equal but for other halides $b < a$. On the other hand for metallic oxides and anhydrides of strong acids $b \gg a$, so that the energy change is abnormally low and further combination to form salts is possible. Since nitrides resemble oxides in having $b \gg a$ these should be able to combine with acid anhydrides. F. J. G.

**Thermodynamics of the electric field with special reference to chemical equilibrium.** F. O. KOENIG (J. Physical Chem., 1937, **41**, 597—620).—The general thermodynamic equations for dielectrics permeated by electric fields are extended to include the case of variable composition. The chief laws of equilibrium in a non-uniform field are derived. O. J. W.

**Behaviour of organic nitrogen and sulphur compounds in anhydrous hydrogen fluoride.** W. KLATT (Z. anorg. Chem., 1937, **232**, 393—409; cf. A., 1935, 582).—B.p. and conductivity measurements have been made for solutions of nitro-, amino-, azo-, and diazo-compounds, aromatic ethers, and S compounds. Additive cations are formed in most cases and the original compounds are recoverable; those containing negative groups are least sol. and

their additive compounds show the smallest conductivity. $X{\cdot}NO_2$ (X = alkyl or aryl) is, however, more sol. and X·Hal less sol. than HX.
F. R. G.

**Effect of betaine on the conductivity of sodium hydroxide solutions.** R. F. NIELSEN (J. Physical Chem., 1937, **41**, 723—727).—The effect of betaine on the equiv. conductivity of 0·5*N*- to 1*N*-NaOH is about half that of an equimol. quantity of NaOH.
F. R. G.

**Influence of time on the normal Wien effect.** H. FALKENHAGEN, F. FRÖLICH, and H. FLEISCHER (Naturwiss., 1937, **25**, 446—447).—The theoretical explanation of the results of Wien for electrolytes, previously limited to the stationary case (A., 1931, 686), has been extended to cover the dependence of the normal Wien effect on frequency, and the influence of time and potential. A. J. M.

**Transport numbers of ions in solutions of silver dodecyl sulphate.** O. R. HOWELL and H. WARNE (Proc. Roy. Soc., 1937, **A**, **160**, 440—454).—Transport nos. have been determined by the Hittorf method at 40°. The change in transport no. with increasing concn. occurs in three ranges. In the first range, where the conductivity falls, the transport no. of the anion falls rapidly; the mobility of the anion falls rapidly whilst that of the cation increases slightly. This is consistent with the view that the salt is present as a simple completely dissociated electrolyte. In the second range where the electrical conductivity falls rapidly, the transport no. of the anion rises and the mobility of anion increases whilst that of cation falls rapidly. These facts are in agreement with the view that the long-chain ions are unable to pass one another and move as a complete network through which cations cannot pass. The formation of micelles in this range will not account for all the facts. In the third range where the conductivity is const., the transport no. of the anion decreases slightly, the mobility of cation increases whilst that of anion diminishes. The observations are compatible with the existence of micelles in this range. G. D. P.

**Normal potential of the mercury–mercurous iodide electrode at 25°.** R. G. BATES and W. C. VOSBURGH (J. Amer. Chem. Soc., 1937, **59**, 1188—1190).—E.m.f. measurements with the cell $Hg|Hg_2I_2,HI|HI|H_2(Pt)$ at 25° give $E^0_{25} = 0{\cdot}0405$ volt. The normal potentials of the $Pb(Hg)|PbI_2$ and I electrodes have been calc. E. S. H.

**Standard state of copper. Copper–cupric electrode.** L. M. ADAMS and D. J. BROWN (J. Amer. Chem. Soc., 1937, **59**, 1387—1388).—Cu in the standard state has been prepared by the action of org. reducing agents on $CuSO_4$ in $SiO_2$ gel. The normal electrode potential is 0·3472 volt. E. S. H.

**Saturated standard cells with small temperature coefficients. II.** W. C. VOSBURGH, M. GUAGENTY, and W. J. CLAYTON (J. Amer. Chem. Soc., 1937, **59**, 1256—1258; cf. A., 1925, ii, 1164).—A cell with e.m.f. 1·0184 volt at 25° and temp. coeff. 0·000013 volt per degree is obtained by substitution of Cd–Bi amalgam for Cd amalgam in the Weston cell and saturation of the electrolyte with $CdSO_4,Na_2SO_4,2H_2O$ as well as $3CdSO_4,8H_2O$.
E. S. H.

**Electrode potentials of platinum, gold, and silver in various solutions of electrolytes.** I. M. KOLTHOFF and C. WANG (J. Physical Chem., 1937, **41**, 539—544).—Au and Pt electrodes in $CuSO_4$ and $Cu(NO_3)_2$ solutions behave as air electrodes, and the potential is not affected by $[Cu^{\cdot\cdot}]$. After removal of air by $N_2$, the electrodes no longer behave as air electrodes and apparently the oxidation potential of the Cu solutions is measured. In $AgNO_3$ solutions (>0·01*M*) Au and Pt electrodes indicate the oxidation potential of the process $Ag^+ + e \rightleftharpoons Ag$. The potentials are only very slightly affected by a change of $[H^+]$ or by the removal of $O_2$ by means of $N_2$. In all cases the noble metals are easily polarised, and the systems are not suitable for exact measurements.
O. J. W.

**Electrode potentials and adsorbed ionic films.** H. HUNT, J. F. CHITTUM, H. V. TARTAR, and H. K. McCLAIN (J. Amer. Chem. Soc., 1937, **59**, 1400).—The effect observed by Tartar and McClain (A., 1931, 1237) does not appear to be due to the rearrangement of an adsorbed ionic film. E. S. H.

**Argentic salts in solution. V. Oxidation potentials, equilibria with higher silver oxides, and formation of nitrate complexes.** A. A. NOYES, D. DEVAULT, C. D. CORYELL, and T. J. DEAHL (J. Amer. Chem. Soc., 1937, **59**, 1326—1337; cf. this vol., 465).—The formal oxidation potential of Ag in 4·0*f*-$HNO_3$ and 4·0*f*-$HClO_4$ at 0° and 25° has been measured. Vals. of $\Delta F_{298}$ and $\Delta H$ are given. Evidence that $Ag^{II}$ in $HNO_3$ exists mainly in the form of nitrate complexes is adduced. On the average, 1·6 $NO_3$ is bound per atom of $Ag^{II}$. The prep. and properties of pure AgO are described; treatment with $HNO_3$ converts it into $Ag^{II}$ oxynitrate, having the empirical composition $AgO_{1{\cdot}148}(NO_3)_{0{\cdot}153}$. An unstable oxide or basic salt of $Ag^{III}$ is pptd. by electrolysing $AgClO_4$–$HClO_4$ solutions; it is also formed on the surface of AgO when treated with $AgClO_4$. E. S. H.

**Strong oxidising agents in nitric acid solution. III. Oxidation potential of cobaltous–cobaltic salts: kinetics of the reduction of cobaltic salts by water.** A. A. NOYES and T. J. DEAHL (J. Amer. Chem. Soc., 1937, **59**, 1337—1344; cf. A., 1936, 1072).—From e.m.f. measurements the formal oxidation potential for $Co^{III} \rightarrow Co^{II}$ is calc. to range from 1·800 volts in 1*f*-$HNO_3$ to 1·816 volts in 4*f*-$HNO_3$ at 0°, and from 1·842 volts in 3*f*-$HNO_3$ to 1·850 volts in 4*f*-$HNO_3$ at 25°. The decrease in free energy and heat content have also been calc.
E. S. H.

**Oxidation–reduction potentials of a series of nitrosobenzene–phenylhydroxylamine systems.** R. E. LUTZ and M. R. LYTTON (J. Org. Chem., 1937, **2**, 68—75).—The oxidation–reduction potential of the system, Ar·NO ⇌ Ar·NH·OH, is determined by titration with $TiCl_2$ in 50% aq. $COMe_2$ containing 0·1*N*-HCl, Ar being Ph or Ph substituted by Me, Et, F, Cl, Br, I, OMe, OEt, $CO_2Me$, $CO_2Et$, $CO_2Pr$, or $NO_2$. *m*- and *o*-*p*-Directing groups in the *o*-

position raise the potential, $CO_2R$ and $NO_2$ being most effective. In the *p*-position *o*-*p*-directing groups lower and *m*-directing groups raise the potential. In the *m*-position the effect is always small. These results are compared with corresponding data for the quinone series. The following are new: *5-nitroso-m-xylene*, m.p. 59°; o-, m.p. 61°, and m-*nitrosoethylbenzene*, m.p. 22°; *Pr*$^{\beta}$ p-*nitrosobenzoate*, m.p. 61—62°; o-, m.p. 117°, and m-*iodonitrosobenzene*, m.p. 77°; m- and p-*nitrosoethoxybenzene* were obtained, but not pure. Prep. by $FeCl_3$ is usually most satisfactory. R. S. C.

**Theory of overpotential of hydrogen and its catalytic lowering at the dropping mercury cathode.** J. HEYROVSKÝ (Trav. Congr. Jubil. Mendeléev, 1937, **2**, 299—303).—The lowering of $H_2$ overpotential is attributed to increased adsorption of $H^{\cdot}$ in the surface layer, and to a catalytic effect in the metallic phase which brings about union of H atoms and $H^{\cdot}$. This may be a "metallic catalysis" brought about by metals of the Pt group, or a "solution catalysis" brought about by alkaloids of the quinoline group or by certain compounds containing the SH group. C. R. H.

**Kinetics of thermal polycondensation reactions.** H. DOSTAL (Monatsh., 1937, **70**, 324—328).—Theoretical; a reply to Flory (this vol., 249). F. J. G.

**Pyrolysis of ethane.** H. H. STORCH and L. S. KASSEL (J. Amer. Chem. Soc., 1937, **59**, 1240—1246).—The production of $CH_4$ has been traced to the reactions $C_2H_6 = CH_4 + 0{\cdot}5C_2H_4$ and $C_2H_6 + C_2H_4 = CH_4 + C_3H_6$, the rates of which have been determined. The initial rate of dehydrogenation of $C_2H_6$ is of first order from 200 to 1500 mm. and can be expressed by $d[H_2]/dt = k[C_2H_6] - k'[H_2][C_2H_4]$. Side reactions also occur. A free radical chain mechanism does not apply to the whole reaction, but may be concerned in a small part. A low val. for the equilibrium const. of the dehydrogenation reaction has been obtained. E. S. H.

**Influence of pressure on the spontaneous ignition of inflammable gas-air mixtures. The simpler olefines.** G. P. KANE and D. T. A. TOWNEND (Proc. Roy. Soc., 1937, A, **160**, 174—187).—Previous work on ignition-point–pressure curves of paraffin hydrocarbons (cf. A., 1936, 801; this vol., 247) is extended to the olefines ethylene, propylene, $\Delta^{\alpha}$-butene, and $\Delta^{\alpha}$-amylene. For mols. of $> C_3$ the results are similar to those obtained with the corresponding paraffins. The effect of small amounts of $NO_2$ (0·1 and 1%) and $Et_2O$ (0·1 and 0·5%) is investigated. G. D. P.

**Thermal decomposition of ethylene dibromide.** T. IREDALE and A. MACCOLL (Nature, 1937, **140**, 24—25).—$C_2H_4Br_2$ decomposes at 340—370° in Pyrex into vinyl bromide and HBr. The decomp. is heterogeneous; the introduction of Pyrex glass tubing markedly increases the reaction velocity. The reverse reaction is inappreciable at these temp., and there is no decomp. into $C_2H_4$ and $Br_2$. L. S. T.

**Thermal decomposition of ethylene oxide.** M. W. TRAVERS and C. G. SILCOCKS (Nature, 1937, **139**, 1018).—When heated together at 400°, $(CH_2)_2O$ and MeCHO yield approx. ten times as much CO + $CH_4$ as when heated separately. This supports the view that in the thermal decomp. of $(CH_2)_2O$, although only small amounts of MeCHO can be detected, it is the change $(CH_2)_2O \rightarrow$ MeCHO that forms the background reaction preceding the final decomp. The main reaction would be initiated by the collision of mols. of $(CH)_2O$ and MeCHO: $(CH_2)_2O$ + MeCHO = $[(CH_2)_2O,$ MeCHO$] = 2CH_4 + 2CO$. The theory of a background reaction followed by a main reaction dispenses with the conception of a unimol. reaction and also with that of free radicals to account for the thermal decomp. of simple org. compounds; only simple bimol. processes are involved. L. S. T.

**Influence of inert gases on the inflammation of diethyl ether.** J. BARON and P. LAFFITTE (Bull. Soc. chim., 1937, [v], **4**, 1271—1276).—The temp. of spontaneous inflammation of 14—175 mm. of $Et_2O$–$O_2$ mixtures, in which $P_{O_2}/P_{Et_2O}$ was 0·5—6·0, were depressed similarly by adding $N_2$ and $CO_2$ (cf. this vol., 247). J. G. A. G.

**Influence of pressure on the velocity and direction of decomposition of ethane.**—See A., II, 361.

**Measurement of a reaction rate at equilibrium by means of a radioactive indicator. Reaction between arsenic acid and iodine.** J. N. WILSON and R. G. DICKINSON (J. Amer. Chem. Soc., 1937, **59**, 1358—1361).—Radioactive $As^{III}$ does not exchange with non-radioactive $As^{V}$ in dil. acid or alkaline solutions in absence of other easily oxidisable or reducible substances. Exchange occurs at a measurable rate in acid solution in presence of I. Assuming that exchange occurs through oxidation and reduction of I, the rates of oxidation and reduction at equilibrium have been calc. from measurements of rates of exchange in systems containing I′ and small amounts of I. The rates agree with kinetic expressions shown to hold for the same reactions remote from equilibrium. E. S. H.

**Argentic salts in acid solution. IV. Kinetics of the reduction by water and the formation by ozone of argentic silver in nitric acid solution.** A. A. NOYES, C. D. CORYELL, F. STITT, and A. KOSSIAKOFF (J. Amer. Chem. Soc., 1937, **59**, 1316—1325; cf. A., 1935, 1088, 1079).—The rate of reduction at 25° is given by $-d[Ag^{II}]/dt = k_2[Ag^{II}]^2/[Ag^+] + k_4[Ag^{II}]/[Ag^+]$, where $k_2$ and $k_4$ decrease greatly as $[HNO_3]$ increases. The equation is explained by assuming the occurrence of two independent reduction reactions involving $Ag^{III}$ in equilibrium with $Ag^+$ and $Ag^{II}$. The oxidation of aq. $AgNO_3$ by $O_3$ has been studied kinetically. The $Ag(NO_3)_2$ solutions may be titrated directly with certain reducing agents, using the disappearance of the brown-black colour as the end-point. E. S. H.

**Velocity of exchange of solvate molecules as determined by experiments with radioactive halogens.** N. E. BRESHNEVA, S. Z. ROGINSKI, and A. I. SCHILINSKI (J. Phys. Chem. Russ., 1937, **9**, 296—299).—Fractional pptn. by $AgNO_3$ of a

mixture of a solution of NaBr in EtOH with a solution of radioactive NaBr in $H_2O$ shows that active Br is pptd. first. From a mixture of NaBr in $H_2O$ and active NaBr in EtOH inactive Br is pptd. first. This shows that Br solvated by $H_2O$ reacts more quickly with Ag than Br solvated by EtOH, and that the exchange of $H_2O$ and EtOH in the solvates of Br is a slow process (requiring several hr.). E. R.

**Kinetics of thermal decomposition of sodium hydrogen sulphide in aqueous solutions.** E. A. SOKOLOVA and L. M. LITVINOVA (Ukrain. Chem. J., 1937, 12, 197—211).—The slowness of the reaction of conversion of NaSH into $Na_2S$ is due to hydrolysis of the latter. The reaction is accelerated by adding $NaHCO_3$ or S, to an extent $\propto$ their concns., but not by starch. R. T.

**Rate of reaction between ions in solution.** J. W. BELTON (Proc. Leeds Phil. Soc., 1937, 3, 376—379).—A relation between the reaction velocity between oppositely charged ions, their heats of hydration, and their ionisation potentials is deduced and some supporting evidence is given. N. M. B.

**Kinetics of the component reactions in the idealised hydrolysis of sodium bromoacetate.** H. M. DAWSON (Proc. Leeds Phil. Soc., 1937, 3, 373—375).—The rates of liberation of Br in four of the six component reactions pass through max. vals. at certain stages. Two have max. at 50%, and the other two at 25%, hydrolysis, and the incidence of these max. is independent of the original concn. and temp. N. M. B.

**Mechanism of elimination reactions. Unimolecular olefine formation from: I. Alkyl halides in sulphur dioxide and formic acid.** E. D. HUGHES, C. K. INGOLD, and A. D. SCOTT. **II. *sec.*-Octyl halides in aqueous alcohol. A new criterion of mechanism.** E. D. HUGHES, C. K. INGOLD, and U. G. SHAPIRO. **III. *tert.*-Butyl halides in acid and alkaline aqueous solutions.** K. A. COOPER, E. D. HUGHES, and C. K. INGOLD. **IV. *tert.*-Amyl halides in acid and alkaline aqueous solutions, and scope of unimolecular mechanism.** E. D. HUGHES and B. J. MACNULTY (J.C.S., 1937, 1271—1277, 1277—1280, 1280—1283, 1283—1291).—I. Both CHPhMeCl (I) and $Bu^{\gamma}Cl$, when dissolved in $SO_2$ or anhyd. $HCO_2H$, yield mixtures of the original substance in equilibrium with HCl and the corresponding olefine. The reaction is complete in presence of excess of Br. The rate of production of Cl′ from (I) in $HCO_2H$ is substantially the same as the rate of racemisation, indicating the identity of the rate-determining process in both changes. There is strong probability that this process is ionisation of the halide giving rise to a radical with a labile proton.

II. Hydrolysis of β-*n*-octyl bromide in aq. EtOH (neutral to acid) is unimol., and is accompanied by 10% olefine formation, also unimol. In 0·8*N*-alkali the reaction is chiefly of second order and consists of substitution and elimination in approx. equal amounts. Rate consts. for the unimol. reactions at 100° have been determined for both the bromide and the chloride. The ratio (rate of substitution)/(rate of elimination) is approx. the same in both cases, although the total reaction velocity for the bromide is 33 times that for the chloride.

III. Similar results are obtained for $Bu^{\gamma}$ halides. From chloride to iodide the individual rates increase by 100-fold, whilst their ratios remain const. to a factor of 1·3.

IV. Similar results are obtained for *tert.*-amyl halides, the rate consts. for which are > for the corresponding $Bu^{\gamma}$ halides. Increasing alkylation leads to a preference for the elimination reaction. The substantial constancy of the ratio of the individual rate const. for a given alkyl group, observed in all these experiments, supports the hypothesis that the division of the reaction between substitution and elimination occurs after separation of the alkyl group from the halogen atom. Further cases of unimol. elimination are cited. F. L. U.

**Mechanism of substitution at a saturated carbon atom. VII. Hydrolysis of *iso*propyl halides.** E. D. HUGHES and U. G. SHAPIRO. **VIII. Hydrolysis of *tert.*-butyl halides.** K. A. COOPER and E. D. HUGHES. **IX. Rôle of the solvent in the first-order hydrolysis of alkyl halides.** L. C. BATEMAN and E. D. HUGHES. **X. Hydrolysis of β-*n*-octyl bromide.** E. D. HUGHES and U. G. SHAPIRO (J.C.S., 1937, 1177—1183, 1183—1187, 1187—1192, 1192—1196; cf. A., 1936, 433).—VII. The velocity of hydrolysis ($v$) of $Pr^{\beta}Cl$ and $Pr^{\beta}I$ by OH′ has been determined in 60 and 80 vol.-% EtOH. In each case simultaneous $S_N2$, $S_N1$, and $E2$ reactions occur. For all reactions the difference in $v$ between $Pr^{\beta}Cl$ and $Pr^{\beta}Br$ is $\gg$ that between $Pr^{\beta}Br$ and $Pr^{\beta}I$. This is attributed to joint dependence of $v$ on the C–halogen bond strength and halogen polarisability, and is reflected by the difference in the parameter $E$ in the Arrhenius equation. The difference in $v$ between the $S_N2$ reaction for $Pr^{\beta}$ halides and the total reaction (largely $S_N2$) for Et halides (A., 1933, 470) appears mainly as a difference in the factor $B$.

VIII. The hydrolysis of $Bu^{\gamma}$ halides in aq. EtOH is of the type $S_N1$. $v$ is about $10^4$ times the val. for $Pr^{\beta}$ halides, due mainly to variation in the factor $B$ of the Arrhenius equation, the magnitude of which indicates "normal" and "slow" unimol. reactions, respectively. Hydrolysis of $Bu^{\gamma}$ halides becomes "slow" in 95% $COMe_2$. The spacing of the rates of reaction in this series of halides is similar to that for $Pr^{\beta}$ halides. The results are discussed in relation to recent theories of reaction kinetics in solution.

IX. In the hydrolysis of alkyl halides in aq. media, mechanisms $S_N1$ and $S_N2$, both of which follow equations of a first-order reaction, can be distinguished by using as solvent which has an ionising power towards the alkyl halide $\nless$ that of $H_2O$, under which conditions the ionising effect of small additions of $H_2O$ is eliminated. Measurements of the hydrolysis of $Bu^{\gamma}Cl$ at 15° in $HCO_2H$ containing varying quantities of $H_2O$ indicate that the mechanism is $S_N1$, in accord with other data.

X. The alkaline hydrolysis of β-*n*-$C_8H_{17}Br$ comprises the same series of reactions as that of $Pr^{\beta}$ halides, but $v$ for $S_N1$ and $E2$ are >, and $v$ for $S_N2$

about the same as, for $Pr^{\beta}Br$. This effect may be due to steric hindrance or to a tautomeric displacement of the electrons of CH groups, which diminishes as the H atoms are replaced. J. W. S.

**Chemical kinetics of the interaction of the alkyl iodides with sodium eugenoxide in ethyl alcohol.** S. S. Woolf (J.C.S., 1937, 1172—1177).—The reaction of Na eugenoxide (I) with MeI, EtI, $Pr^{\alpha}I$, $Pr^{\beta}I$, $Bu^{\alpha}I$, $Bu^{\beta}I$, *n*- and *iso*-$C_5H_{11}I$ in abs. EtOH is bimol., but the coeffs. for any temp. increase with increasing dilution. The apparent degree of ionisation of (I) in EtOH has been determined from conductivity measurements at 20°, 35°, and 50°. Application of the theory of dual catalysis to the observed velocity coeffs. shows that the reaction is due almost entirely to interaction of eugenoxide ions. The velocity coeffs. for the ionic reactions are independent of initial concn. in equiv. reactions. The temp. coeff. and the Arrhenius crit. increment of the reactions are calc. From the aspect of the collision theory the reactions are "normal" in type, the factor $P$ in the equation $k = PZe^{-E/RT}$ being of the order of unity. J. W. S.

**Application of affinity to coupled biochemical reactions.** P. van Rysselberghe (Bull Acad. roy. Belg., 1937, [v], **23**, 416—428; cf. this vol., 246).—Mathematical. De Donder's theory of affinity is adapted and illustrated by calculations for the following coupled reactions under various biological conditions: synthesis of carbohydrates by the combustion of $H_2$, reduction of $NO_3'$ to $NH_4^+$ by combustion of glucose, and synthesis of $CO(NH_2)_2$ by combustion of glucose and other substances in fatty tissues. Mechanism and heats of reaction are discussed. N. M. B.

**Velocity of dissolution of sodium silicates in water under pressure.** S. K. Tschirkov, A. I. Kiniak, and N. S. Fedotova (J. Chem. Ind. Russ., 1937, **14**, 369—373).—The velocity of dissolution of Na silicates of different $SiO_2$ contents and at various temp. has been determined. The solubility falls rapidly with increasing content of Mg, Ca, Al, and Fe oxides. R. T.

**Velocity of absorption of carbon dioxide by ammonia-salt solutions.** A. P. Belopolski, I. M. Boguslavski, and V. V. Urusov (J. Chem. Ind. Russ., 1937, **14**, 1—9, 164—170).—The initial velocity of absorption, $V$, of $CO_2$ by aq. $NH_3$–NaCl is equal to that by $NH_3$–$Na_2SO_4$, but is less for the latter solutions during the stage of pptn. of $NaHCO_3$. $V$ is independent of the initial $[NH_3]$, and is $\propto [CO_2]$ of the gas, for solutions of the same degree of carbonation; for a given $[HCO_3']$ it is $\propto [NH_3]$. $V$ falls rapidly during the initial stage, to a min. at the moment of saturation with $NaHCO_3$, after which $V$ is $\propto$ rate of crystallisation of $NaHCO_3$; during this stage the optimum temp. is 45°, whilst after pptn. of most of the $NaHCO_3$ it is 30°. R. T.

**Preparation and density of aqueous hydrogen sulphide, and the velocity of dissolution of hydrogen sulphide in water.** J. Stalony-Dobrzański (Rocz. Chem., 1937, **17**, 353—362).—The rate of absorption, $V$, of $H_2S$ by $H_2O$ is due to the lower $d$ of the solution ($d_{20}^{20}$ 0·99994), as a result of which a saturated surface layer forms, preventing further diffusion. For this reason $V$ for $CO_2$ is 4 times as great as that for $H_2S$, in spite of the higher solubility of the latter. $V$ for $H_2S$ rises rapidly with rise in temp., owing to formation of convection currents. R. T.

**Velocity of dissolution of comminuted substances. IV. Determination of the most commonly encountered values of the coefficient ξ. V. Application of the simplified kinetic equation to substances readily soluble in water.** W. Jacek (Rocz. Chem., 1937, **17**, 293—300, 301—308).—IV. The val. of the coeff. ξ in the equation previously derived (this vol., 250) is found empirically to be 1·35 for irregular fragments obtained by crushing larger crystals of NaCl, and 1·15 for similar fragments with rounded corners.

V. The vals. of ξ found for NaCl apply also to KCl. R. T.

**Rate of dehydration of manganous oxalate dihydrate.** M. Volmer and G. Seydel (Z. physikal. Chem., 1937, **179**, 153—171).—Topley and Smith's experimental results (A., 1935, 588) have been confirmed, but their explanation is criticised. The form of the graph of velocity against pressure of $H_2O$ vapour, $p$, is attributed to the variation, revealed by heat of hydration measurements, in the structure of the product with $p$. $X$-Ray investigation shows that dehydration in a high vac. yields a practically amorphous product, whereas for $p = 0·7$ mm. the product has the lattice of the anhydride. R. C.

**Kinetics of polymeric aldehydes. V. Formation of polyoxymethylene dihydrates having a single chain length and their characterisation by their dissolution velocity constants.** J. Löbering and K. P. Jung (Monatsh., 1937, **70**, 281—296).—Polyoxymethylenes of different degrees of polymerisation may be characterised by their rate of dissolution. Products the rate of dissolution of which is diminished by drying are mixtures of different polymerides and the drying process causes partial fractionation. By polymerisation of $CH_2O$ solutions under suitable conditions products the rate of dissolution of which is const. and reproducible can be obtained. These consist essentially of a single polymeride. The effects of temp., concn., and catalysts on the degree of polymerisation have been studied and are interpreted by a theory of the polymerisation process. F. J. G.

**Passivity of iron and steel in nitric acid solution. XVII.** Y Yamamoto (Bull. Inst. Phys. Chem. Res. Japan, 1937, **16**, 383—396; cf. this vol., 415).—The electrochemical dissolution of Fe in $HNO_3$ increased with rise in temp. and the passivation was retarded. The decomp. voltage of $HNO_3$ decreased with rise in temp., and the ability of $HNO_3$ to render Fe passive increased with decreasing voltage, a min. occurring in the voltage to make Fe passive at 30°. Fe in 41% $HNO_3$ became passive at 30°, but not at 20° and 40°. R. S. B.

**Inhibitions of organic decompositions by nitric oxide.** H. W. Thompson and M. Meissner

(Nature, 1937, **139**, 1018—1019).—Changes in the absorption spectrum of a reacting mixture of NO and $Me_2O$ show that as the reaction proceeds the NO bands weaken and are replaced with increasing intensity by those of $NH_3$. The stage at which NO disappears agrees with that expected from kinetic measurements, indicating that whatever the primary stage in the interaction of radicals with the NO may be, a final product, which does not affect the reaction rate, is $NH_3$. $CH_2{:}N{\cdot}OH$ may be an intermediate product and the condensation by liquid air of a blue product from the reaction mixture may indicate an unstable NO-compound. With $Et_2O$, the NO bands are gradually replaced by a continuum and feeble, diffuse bands indicative of the presence of $NH_2Me$. L. S. T.

**Effect of iodine on the rate of decomposition of ethylene oxide.** R. F. Faull and G. K. Rollefson (J. Amer. Chem. Soc., 1937, **59**, 1361—1363).—The decomp. of $(CH_2)_2O$ into $CH_4$ and CO at temp. $>350°$ is catalysed by I. For most of the reaction the rate is const. and determined by $[I]^2$. The results are in agreement with the theory of compensating reactions (cf. this vol., 314). E. S. H.

**Mechanism of hydrogen ion catalysis.** K. F. Bonhoeffer and O. Reitz (Z. physikal. Chem., 1937, **179**, 135—147).—The maintenance of equilibrium between the catalyst, the substrate, and an additive complex of the two despite the further reaction of the complex is possible, not only in sp. H ion catalysis, but in acid catalysis generally. It may be tentatively assumed that in reactions which proceed more rapidly in $D_2O$ than in $H_2O$ equilibrium is maintained, whilst in reactions which are slower in $D_2O$ it is not. Application of the current theory of H binding accounts for the mutarotation of glucose being the sole example of an H ion catalysis which is slower in $D_2O$ than in $H_2O$. R. C.

**Acid and base catalysis in light and heavy water. Bromination of acetone catalysed by hydrogen ions.** O. Reitz (Z. physikal. Chem., 1937, **179**, 119—134).—In $D_2O$–$H_2O$ mixtures at 25° the rate of enolisation, $k$, of $COMe_2$ and $CO(CD_3)_2$, as measured by the rate of bromination, increases with the $D_2O$ content of the solvent, $c$, but more slowly at lower than at higher vals. of $c$. For $CO(CD_3)_2$ in $D_2O$ in presence of $D_3O^+$ ions $k$ is 2·1 times as great as for $COMe_2$ in $H_2O$ in presence of $H_3O^+$ ions, suggesting that the equilibrium concn. of the complex formed by union of the catalyst with the O of the ketone is in $D_2O >$ in $H_2O$. For a given $c$, $CO(CD_3)_2$ is enolised 7·7 times less rapidly than $COMe_2$, a deuteron being released from C less readily than a proton. For $COMe_2$ in equilibrium with the solvent the observed val. of $k$ agrees with the val. calc. by assuming that the readiness with which a proton is released from a Me group is not affected by the presence of some D atoms in the group. The rate of bromination of $COMe_2$ is equal to the rate at which, under similar conditions, the first H is exchanged for D, suggesting that exchange occurs through the enol form. R. C.

**Influence of the carrier on catalysts.** I. E. Adadurov (J. Gen. Chem. Russ., 1937, **7**, 1321—1327).—Polemical, in reply to Ivannikov (this vol., 143). R. T.

**Reaction of oxygen with hydrogen at a palladium surface. I, II.** T. Tucholski (Rocz. Chem., 1937, **17**, 284—292, 340—348).—I. The reaction between $H_2$ and $O_2$ at a Pd surface is of zero order at 0—160°/10—15 mm., but becomes of higher orders at higher temp. When $H_2$ is introduced before $O_2$ the velocity of reaction is initially high, but then rapidly falls to a const. level, determined by the concn. of the substrates. When $H_2$–$O_2$ mixtures are introduced the reaction is accelerated by excess of $O_2$, and retarded by excess of $H_2$.

II. The ratio of the velocity of reaction of $H_2$ to that of $D_2$ at a Pd surface falls from 2 : 1 at 0—100°/10 mm. to 1 : 1 at 270°. The energy of activation of $H_2$ and $D_2$ is 4·4 and 4·3 kg.-cal. per g.-mol., respectively, and is approx. equal to that of the velocity of diffusion in Pd. It is concluded that the velocity of reaction $\propto$ the rate of diffusion of $H_2$ or $D_2$ through Pd. R. T.

**Chlorination in presence of catalysts.** E. I. Kretsch (J. Gen. Chem. Russ., 1937, **7**, 1249—1263).—The view is expressed that certain substances (C, $SiO_2$) act as chlorination catalysts, by forming unstable chlorides which readily eliminate active Cl. R. T.

**Fine structural changes in metallic solid solutions and their influence on the properties of these alloys as catalysts.** G. Rienäcker (Metallwirts., 1937, **16**, 633—634).—Recent work has shown that the catalytic effect of alloys with an ordered structure is $<$ that of alloys with a disordered structure. C. E. H.

**Oxidation of chromous to chromic sulphate.** B. B. Knapp and J. H. Walton (J. Physical Chem., 1937, **41**, 679—686).—The autoxidation of $CrSO_4$ is catalysed slightly by finely-divided Ag and by $H^+$, greatly by Ag + $H^+$. Unlike the autoxidation of $SnCl_2$ (cf. A., 1933, 232), inhibition is not caused by org. substances. Induced oxidation of only $SnCl_2$ is caused by autoxidation of $CrSO_4$. F. R. G.

**Catalytic interaction of heavy hydrogen and benzene on platinum.** A. Farkas and L. Farkas (Trans. Faraday Soc., 1937, **33**, 827—837).—Two simultaneous reactions take place in the gaseous phase, hydrogenation of $C_6H_6$ and exchange of H atoms. The rate of hydrogenation $\propto$ $H_2$ pressure and is independent of $C_6H_6$ pressure, and the rate of exchange, corr. for variations in $H_2$ pressure due to hydrogenation, is independent of the $H_2$ pressure and approx. $\propto$ the 0·4 power of the $C_6H_6$ pressure. The apparent heats of activation for the two reactions are respectively 7 and 9 kg.-cal. The rates of both reactions in the liquid phase are $<$ in the gaseous phase. In the liquid phase the catalyst is covered with a $C_6H_6$ film which displaces $H_2$ and reduces the reaction rate. The data are discussed with reference to the rate of conversion of para-H. C. R. H.

**Mechanism of hydrogenation reactions and the formation of stereochemical isomers.** A. Farkas and L. Farkas (Trans. Faraday Soc., 1937, **33**, 837—844).—It is suggested that both H atoms of a $H_2$ mol. are simultaneously added during catalytic

hydrogenation of unsaturated compounds, in contrast to addition of nascent H which involves consecutive addition of two H atoms. Acetylenic, *cis*- and *trans*-ethylenic compounds should yield *cis*-ethylenic, *meso*- and racemic derivatives respectively on hydrogenation, and should yield the stable stereoisomerides, usually *trans*-ethylenic and *meso*-derivatives, on taking up nascent H. A review of published data supports this view. A parallel is drawn between the stereoisomerides formed by addition of nascent H and halogens to double linkings. C. R. H.

**Effect of a high-tension electrical discharge on contact catalytic reactions. II. Reduction of nitrobenzene.** I. SETO and M. OZAKI (J. Soc. Chem. Ind. Japan, 1937, **40**, 190B; cf. B., 1935, 559).—$PhNO_2$ is reduced with $H_2$ in presence of Ni on kieselguhr. The liquid is mixed with paraffin to increase its electric resistance. Application of a static discharge of up to 28,000 volts had a marked accelerating effect on the reaction. The effect is a function of the voltage, not of the discharge current. C. I.

**Velocity of catalytic hydrogenations. IV.** A. KAILAN and F. HARTEL (Monatsh., 1937, **70**, 329—373).—The influence of the conditions on the velocity of hydrogenation of $CHPh{:}CH{\cdot}CO_2H$ and $C_{17}H_{33}{\cdot}CO_2H$ and their esters has been investigated. With increasing % of catalysts the velocity increases to a max. and then falls. The position of the max. is different with different catalysts. The unimol. "constants" vary approx. as the square of the pressure of $H_2$. With rising temp. the velocity rises rapidly from 100° to 120° and then slowly to a max. at 180—200°. The efficiency of the catalyst is the greater the higher is the temp. at which it was reduced. The more efficient is the catalyst, the greater is the amount of $H_2$ it adsorbs. Esters having an even no. of C atoms are more rapidly hydrogenated than those having an odd no. F. J. G.

**Organic catalysts. XVII. Hydration of crotonaldehyde to aldol.**—See A., II, 368.

**Contact sulphuric acid manufacture. V—VII.**—See B., 1937, 776.

**Contact activity of chromium oxide in oxidation of sulphur dioxide to sulphur trioxide.**—See B., 1937, 778.

**Catalytic oxidation of hydrogen sulphide in presence of active charcoal.**—See B., 1937, 778.

**[Catalytic] reaction between methane and water vapour.**—See B., 1937, 746.

**Ammonia and methyl alcohol catalysts.**—See B., 1937, 777.

**[Catalytic] synthesis of methyl alcohol and higher alcohols from water-gas.**—See B., 1937, 756.

**Electrolytic deposition of silver from non-aqueous solutions containing aluminium bromide.** V. A. PLOTNIKOV, D. P. ZOSIMOVITSCH, and E. I. KIRITSCHENKO (Mem. Inst. Chem. Ukrain, Acad. Sci., 1937, **4**, 15—27).—A fine cryst. deposit of Ag can be obtained by electrolysis of solutions of AgCl or AgBr in PhMe or xylene containing $AlBr_3$. Working details are given. F. J. G.

**Electrolytic and chemical exchange methods for the separation of the lithium isotopes.** T. I. TAYLOR and H. C. UREY (J. Chem. Physics, 1937, **5**, 597—598).—Electrolysis of aq. LiOH until the Li in solution is reduced by a factor of 600 raises the isotopic ratio $^7Li : {}^6Li$ from 12·5 to 14·2, indicating a process fractionation factor of 1·020, in accord with the val. of Lewis and Macdonald (this vol., 106). Extraction of LiBr from $H_2O$ by methylamyl alcohol, or *vice versa*, gave no isotope separation. Slow passage of aq. LiCl through a 35-ft. column of zeolite raised the isotope ratio from 11·6 to 13·3. The passage of $NH_4Cl$ through a similar column increased the ratio of $^{14}N^{14}N : {}^{14}N^{15}N$ in the $N_2$ produced from it from 124 to 137. Hence the lighter isotope of Li and the heavier isotope of N are preferentially absorbed. J. W. S.

**Electrodeposition of magnanese from aqueous solutions. I, II.**—See B., 1937, 798.

**Electrochemical protection of iron from corrosion by alkalis.**—See B., 1937, 797.

**Metals co-deposited with tungsten from the alkaline tungsten plating bath.**—See B., 1937, 798.

**Chemical reactions in the silent electric discharge. XVI. Reactions between hydrogen and solid inorganic compounds.** S. MIYAMOTO (Bull. Chem. Soc. Japan, 1937, **12**, 313—315).—$K_2CrO_4$ and $K_2Cr_2O_7$ yield KOH, $Cr_2O_3$, and $H_2O$. $(NH_4)_2CrO_4$ and $(NH_4)_2Cr_2O_7$ yield $NH_3$, $Cr_2O_3$, and $H_2O$. $Ca(ClO_3)_2$ and $NaClO_3$ are reduced to the chlorides. $BaSO_3$ yields BaS and $H_2S$. $Th(NO_3)_4$ yields $Th(OH)_4$. $(NH_4)_2S_2O_8$ and $K_2S_2O_8$ yield $H_2S$ and the sulphates. J. G. A. G.

**Oxidation of sulphur vapour at low pressures.** W. PIEKIELNY (Rocz. Chem., 1937, **17**, 367—381).—The chain reaction between S vapour and $O_2$ can be initiated by a silent electrical discharge only within a certain pressure range, the limits of which widen with increasing temp. (0·93—10 mm. at 55°, and 0·17—120 mm. at 95°). The reaction will not take place at $<50° \pm 1°$, at which temp. it will proceed only at $2{\cdot}5 \pm 0{\cdot}5$ mm.; the shape of the reaction vessel does not affect the results. The velocity of the reaction at 65—95° $\propto$ [S], but not $[O_2]$, and inversely as the $[SO_2]$ of the gas. The reaction products are $SO_2$ with about 17% of $SO_3$. The theoretical aspects of the above observations are discussed. R. T.

**Primary photochemical processes in solution.** G. K. ROLLEFSON and W. F. LIBBY (J. Chem. Physics, 1937, **5**, 569—571).—Under the usual experimental conditions a close analogy between reactions in solution and in the gas phase cannot be explained by a symmetrical retardation of both dissociation and recombination processes by the solvent. It has been shown by the radioactive indicator method that the high efficiency of the photo-dissociation of $Cl_2$ in $CCl_4$ is not due to reaction of the Cl atoms with the solvent. J. W. S.

**Influence of velocity of decomposition on the quantitative yield of the photolysis of ammonia.** W. MUND, G. BRENARD, and L. KAERTKEMEYER (Bull. Soc. chim. Belg., 1937, **46**, 211—226).—

Variations in the quantum yield in the photochemical decomp. of $NH_3$ are considered. A kinetic treatment involving a secondary mechanism agrees with experimental data. Other published work does not appear to be irreconcilable with the view put forward. W. R. A.

**Effect of pressure on the photolysis of ammonia** W. MUND and A. VAN TIGGELEN (Bull. Soc. chim. Belg., 1937, **46**, 227—230).—The mechanism of Wiig (this vol., 370) for the photolysis of $NH_3$ is criticised. Kinetic formulæ based on Wiig's mechanism are derived, but they are not in accord with experimental variation of the quantum yield with variation in pressure. W. R. A.

(A) **Mercury-photosensitised exchange reaction of deuterium and phosphine.** H. W. MELVILLE and J. L. BOLLAND. (B) **Photochemical decomposition and oxidation of trideuterophosphine.** H. W. MELVILLE, J. L. BOLLAND, and H. L. ROXBURGH (Proc. Roy. Soc., 1937, **A**, **160**, 384—406, 406—423).—(A) The exchange reactions of D with $PH_3$ and of H with $PD_3$ have been investigated. Two mechanisms of exchange, one predominant at low and the other at high temp., occur. The bimol. velocity coeff. of the reaction $D + PH_3 = PH_2D + H$ is evaluated. An analytical method of measuring the $D_2$ content of $H_2$–$D_2$ mixtures, requiring 0·015 c.c. of gas at n.t.p., is described.

(B) The quenching radii of $PH_3$ and $PD_3$ for excited Hg atoms are evaluated. The mechanism of the decomp. of $PH_3$ and $PD_3$ is investigated. A study of the kinetics of oxidation shows that the upper and lower explosion limits of $PH_3$ and $PD_3$ are coincident and that the chain reactions proceed with similar velocities. G. D. P.

**Photochemical reduction of ceric ions by water.** J. WEISS and D. PORRET (Nature, 1937, **139**, 1019—1020).—When irradiated by ultra-violet light from a strong Hg arc, aq. solutions of $Ce(ClO_4)_4$ liberate $O_2$ without appreciable decomp. of $ClO_4'$. Owing to the formation of $Ce^{\cdot\cdot\cdot}$, the speed of the reaction decreases as the reaction proceeds; it is unchanged by filtration of the light through 20% $HClO_4$ solution. The reaction does not occur when $Ce(SO_4)_2$ in $H_2SO_4$ solution is irradiated, owing to the scarcity of free $Ce^{\cdot\cdot\cdot\cdot}$. The mechanism proposed is (i) $Ce^{\cdot\cdot\cdot\cdot} + h\nu = Ce^{\cdot\cdot\cdot\cdot}$ (excited ion), (ii) $Ce^{\cdot\cdot\cdot\cdot}$ (excited ion) $+ H_2O = Ce^{\cdot\cdot\cdot} + H^{\cdot} + OH$, (iii) $2OH = H_2O + O$, $2O = O_2$ or (iv) $Ce^{\cdot\cdot\cdot} + OH = Ce^{\cdot\cdot\cdot\cdot} + OH'$. (iv) is responsible for the effect of $Ce^{\cdot\cdot\cdot}$ and for the low quantum efficiency. L. S. T.

**Influence of light on the rhythmic precipitation of silver chromate in gelatin.** M. KÖHN and L. MAINZHAUSEN (Kolloid-Z., 1937, **79**, 316—318; cf. A., 1934, 730).—In the absence of Cl′ light has no influence on the rhythmic pptn. of $Ag_2CrO_4$ in gelatin gels. In presence of 0·00025—0·001*N*-KCl rhythmic pptn. does not occur in the dark, but in the light rings with a secondary structure are formed. At 0·002*N* rings are again formed in darkness, but in distinction to those formed in the light they are more diffuse and exhibit no secondary structure. F. L. U.

**Distribution of spectral sensitivity of sensitised silver halide films at low temperatures.** G. UNGAR (Z. Physik, 1937, **106**, 322—328).—At −180° the long-wave optical sensitivity of all sensitised Ag halide films is reduced. With eosin and pinachrome-violet the red-sensitivity is reduced below the blue, whereas with pinacyanine the red and blue are almost equally desensitised. L. G. G.

**Influence of physical development in the region of solarisation.** A. J. REARDON (Physical Rev., 1936, [ii], **49**, 196; cf. A., 1935, 1211).—The three methods of physical development described showed no reversals in the region of solarisation for extra fast, undyed, dry Hammer plates. In each case a continuous increase in the density of the latent image showed that in this region there is no decrease in the amount of Ag deposited by the light exposure, and that the prolonged light action does not decrease the amount of Ag already deposited. Solarisation of the latent image may be due to the closing of the fissures in the emulsion. L. S. T.

**Reduction potential and photographic developers; effect of sulphite in developer solutions.** R. M. EVANS and W. T. HANSON, jun. (J. Physical Chem., 1937, **41**, 509—534).—Oxidation-reduction potential measurements with org. developers, both with and without the addition of $Na_2SO_3$, show that the developers are continuously reversible in the same sense as $Fe^{II}$ complex developers. The primary effect of the addition of KBr to a developer is to decrease the p.d. between the developer and the image by an amount = that predicted by the application of the mass law. The primary action of sulphite in a developer solution is that of an acceptor for the oxidised form. This explains its protective properties against atm. $O_2$, its preventive action against the formation of staining products of development, and its augmenting action on the max. developable density for a given exposure. O. J. W.

**Photo-decomposition of aldehydes and ketones.** R. G. W. NORRISH and C. H. BAMFORD (Nature, 1937, **140**, 195—196; cf. this vol., 91).—Results obtained in the photo-decomp. of COMeEt and $COEt_2$ in 10% liquid paraffin solution are described. The free radicals formed in the photolysis react mainly with mols. of solvent rather than combine together, as they do in the vapour. With COMeEt, the results suggest that the reaction $MeCO + C_nH_{2n+2} \rightarrow MeCHO + C_nH_{2n+1}$ can occur in this solution. Aldehydes differ from ketones in that photo-decomp. occurs in solution at room temp., and the gaseous products are, in the main, the same as those in the gas phase. Independent evidence is furnished for the conclusion that the hydrocarbon is produced from aldehydes mainly in one act, viz., $RCHO \rightarrow RH + CO$. L. S. T.

**Thermal and photochemical decomposition of acetyl peroxide.** O. J. WALKER and G. L. E. WILD (J.C.S., 1937, 1132—1136).—The principal products of both the thermal and photochemical decomp. of $Ac_2O_2$ are $CO_2$, $CH_4$, and $C_2H_6$. $CH_4$ is the chief hydrocarbon product in each case, but $C_2H_6$ is produced in greater proportions in the

photochemical reaction. It is inferred that at least two simultaneous or consecutive reactions occur in each case. The similarity of the products with those of electrolysis of acetate solutions cannot be used as evidence for the peroxide mechanism of electrolytic oxidation. The absorption spectrum of $Ac_2O_2$ is very similar to that of $H_2O_2$ and contains a continuous absorption band below 2800 A. J. W. S.

**Photochemistry of polyatomic molecules containing alkyl radicals. VI. Photolysis of mercury dimethyl.** H. W. THOMPSON and J. W. LINNETT (Trans. Faraday Soc., 1937, **33**, 874—880).—Previous investigations (cf. this vol., 255) have been extended to measurements at high temp. and to the determination of the influence of NO. The quantum yield increases with rise in temp. A scheme based on a series of chain-propagating stages is suggested in explanation, and an estimated val. for the energy of activation for the reaction between free radicals and $HgMe_2$ mols. is 11,000 g.-cal. In presence of NO the reaction at room temp. follows a completely different course, a white solid product being formed, but the quantum efficiency in terms of disappearance of $HgMe_2$ is still approx. unity. At higher temp. the reaction is even more complex. It is suggested that $HgMe_2$ reacts with NO to form MeNO which isomerises to $CH_2{:}N{\cdot}OH$, and that the solid formed is a polymeride of $CH_2O$. At higher temp. the oxime would decompose into CO and $NH_3$. C. R. H.

**Photochemistry of reversible reduction–oxidation processes. I. Quantum sensitivity of photochemical reaction between methylene-blue and phenylhydrazinesulphonate in yellow and red light.** G. HOLST (Z. physikal. Chem., 1937, **179**, 172—194; cf. this vol., 255).—In a solution of $p_H$ 3·0 under such conditions that absorption is practically complete and the dark reaction negligible and with the phenylhydrazinesulphonate ($BH_2$) concn. $\gg$ that of methylene-blue ($A$) the quantum yields, $\gamma$, are 0·11 and 0·14 in light of λλ 579 and ~667 mμ, respectively. The relation between $\gamma$ and the reactant concns. is discussed in relation to Bodenstein's theory (A., 1913, ii, 819). The absorption spectra of $A$, $BH_2$, and benzenediazosulphonate have been determined. With decreasing concn. the absorption max. of $A$ shifts towards the red and the band narrows. R. C.

**Irradiation of compounds of the ergosterol type.**—See A., II, 376.

**Photolysis of sodium chloride by *X*-, β-, and γ-rays.** J. HOFFMANN (Z. anorg. Chem., 1937, **233**, 184—196).—The action of *X*-rays and of β- and γ-radiation on NaCl, and the influence of traces of $H_2O$, have been studied. Rock-salt is discoloured but alkalinity cannot be detected. Powdered NaCl always contains traces of $H_2O$ even when free from Mg. After irradiation strong alkalinity and free $Cl_2$ can be detected. Free Na can be detected as alkali after irradiation of NaCl dehydrated by fusion in high vac. F. J. G.

**Sensitivity variation of *X*-ray photographic films.** W. H. GEORGE (Proc. Physical Soc., 1937, **49**, 357—363).—Two films with the sensitive surfaces in contact were simultaneously exposed to *X*-rays. Two exposures were made, the films being turned between the exposures so that in the second exposure the radiation passed through the films in the reverse direction. After development by a method devised to ensure abs. uniformity, the dry films were measured with a Moll microphotometer. With films blackened until they transmit about half the incident light, the variations in sensitivity may lead to max. deviations in individual measurements of *X*-ray intensities of the order of ±6% and ±3% for single- and double-film exposures, respectively. C. R. H.

**Kinetics of the colouring of glass by *X*-rays.** C. E. NURNBERGER and R. LIVINGSTON (J. Physical Chem., 1937, **41**, 691—697).—An earlier theory (A., 1935, 1469) has been modified in an attempt to fit the experimental results. F. R. G.

**Formation of benzene in the radiochemical polymerisation of acetylene.** C. ROSENBLUM (J. Physical Chem., 1937, **41**, 651; cf. A., 1937, II, 236).—Further manometric measurements show that about 20% of the reacting $C_2H_2$ yielded $C_6H_6$. The diminishing $C_6H_6$ : cuprene ratio may be due to the succession of polymerisations: $3C_2H_2 \rightarrow C_6H_6$; $nC_6H_6 \rightarrow (C_6H_6)_n$. O. J. W.

**Reaction between silver permanganate and hydrogen.** F. HEIN [with W. DANIEL and H. SCHWEDLER] (Z. anorg. Chem., 1937, **233**, 161—177).—The abnormally high oxidising power of $AgMnO_4$ solutions towards $H_2$ has been studied. The effect is increased by addition of Ag salts, independently of the anion, and is heterogeneously catalysed by the insol. products of the reaction. Other substances, especially silvered $SiO_2$ gel, act as contact catalysts. The effect is attributed to the presence of undissociated $AgMnO_4$ mols. in the solution or adsorbed on the catalysts, and this view is supported by comparison of the oxidising potentials and absorption spectra of $AgMnO_4$ and $KMnO_4$ solutions. F. J. G.

**Organo-phosphors with inorganic ground-materials. I. Phosphors based on mono-alkaline-earth phosphates and free phosphoric acids.** H. CHOMSE (Z. anorg. Chem., 1937, **233**, 140—144).—Phosphorescent substances are formed by partial dehydration (best at about 240°) of $M(H_2PO_4)_2$ (M = Be, Mg, Sr, or Ba) (or mixtures of MO and $H_3PO_4$) containing traces of certain org. substances. The phosphorescence is greatest when the composition approximates to $MH_2P_2O_7$. When $H_4P_2O_7$ is used the product is phosphorescent without dehydration. Free $H_4P_2O_7$ or $H_3PO_4$ forms products which are phosphorescent at liquid air temp., whilst $HPO_3$ forms products which are phosphorescent at room temp. F. J. G.

**Basic magnesium chlorocarbonate.** (MME.) L. WALTER-LÉVY (Compt. rend., 1937, **204**, 1943—1946).—The formation of the *compound* $MgCl_2,2MgCO_3,Mg(OH)_2,6H_2O$ has been investigated. J. G. A. G.

**Brightly fluorescent zinc oxide [obtained] by partial decomposition of the basic carbonate.** E. BEUTEL and A. KUTZELNIGG (Monatsh., 1937, **70**, 297—301).—Partial decomp. of basic Zn carbonate

gives fluorescent products; the fluorescence is greatest when about 0·11 mol. of ZnO has been formed, and increases when the products are exposed to air.
F. J. G.

**Action of bromine on yellow mercuric oxide.** M. LEMARCHANDS and P. PIERRON (Compt. rend., 1937, **204**, 1946—1948).—The reaction has been investigated under several conditions. Br vapour and HgO yield, finally, $HgBr_2$ and $Hg(BrO_3)_2$, $HgOBr_2$ being an unstable intermediate compound. In $CCl_4$, $HgBr_2$ and a little $Hg(BrO_3)_2$ are produced. HgO and liquid Br with $O_2$ under pressure afford pure $HgBr_2$. J. G. A. G.

**Organo-phosphors with inorganic ground-materials. II. Oxygen-sensitive boric acid phosphors.** H. CHOMSE (Z. anorg. Chem., 1937, **233**, 145—150).—By treating dehydrated $H_3BO_3$ with certain org. substances dissolved in EtOH, products which become phosphorescent in vac. are obtained. The phosphorescence is destroyed by air or $O_2$ but not by $N_2$. F. J. G.

**Precipitation of aluminium basic sulphate by carbamide.** H. H. WILLARD and N. K. TANG (J. Amer. Chem. Soc., 1937, **59**, 1190—1196).—The characteristics of the ppt. obtained in presence of various anions are described. The proportion of $SO_4$ in the ppt. increases with decreasing $p_H$ and, to a smaller extent, with increasing $[SO_4'']$ in the solution. The solubility of the basic sulphate is equiv. to 0·2 mg. of $Al_2O_3$ per litre at $p_H$ 6·5—7·5, but increases at lower or higher $p_H$. The advantages of $CO(NH_2)_2$ in avoiding, by its slow decomp. in hot solution, the production of local differences of $p_H$ are discussed.
E. S. H.

**Precipitation of basic gallium sulphate by means of carbamide. I. Study of the precipitate produced.** H. H. WILLARD and H. C. FOGG (J. Amer. Chem. Soc., 1937, **59**, 1197—1199).—The composition of the ppt. varies from $Ga(OH_3)$ at $p_H$ 8·5 to the ratio Ga : $SO_4$ = 6·35 at $p_H$ 3·26. Digestion in a solution of higher $p_H$ removes $SO_4$ readily, but the reverse process is slow. Pptn. in 0·02*M*-$(NH_4)_2SO_4$ is most complete at a final $p_H$ 4—5·5, when 0·2 mg. of Ga per litre remains in solution. E. S. H.

**Complex fluorides of gallium and the alkali metals.** W. PUGH (J.C.S., 1937, 1046—1048).—$GaF_3,3H_2O$ is most easily prepared by dissolving the metal in $HNO_3$ and evaporating the solution with HF. Addition of the theoretical quantities or excess of alkali fluorides to aq. $GaF_3$ ppts. the sparingly sol. *Na gallifluoride*, $3NaF,GaF_3$ (a fine white powder, stable in air), $3NH_4F,GaF_3$ (octahedra, stable in air at room temp., decomposed by warming in moist air), *Li gallifluoride*, $3LiF_3,GaF_3$, *K gallifluoride monohydrate*, $2KF,GaF_3,H_2O$ (I) (probably monoclinic), *Rb gallifluoride dihydrate*, $RbF,GaF_3,2H_2O$ (II), and *Cs gallifluoride dihydrate*, $CsF,GaF_3,2H_2O$ (III). (I), (II), and (III) are all stable in air at 110° and completely dehydrated at 230°, the product from (I) undergoing no rapid change in air at room temp., whereas that from (II) reabsorbs 1 mol. of $H_2O$ in 2 days and thereafter shows no rapid change, and that from (III) absorbs 1 mol. of $H_2O$ rapidly and then continues to absorb $H_2O$. J. W. S.

**Titanium. VII. Thermodynamics of chlorination.** I. N. GODNEV and A. V. PAMFILOV (J. Gen. Chem. Russ., 1937, **7**, 1264—1267).—It is shown, on thermodynamic grounds, that a reaction gas containing 50 vol.-% of $TiCl_4$ can be obtained by chlorination of $TiO_2$–C mixtures at 400°. R. T.

**Preparation and properties of titanium monoxide.** W. DAWIHL and K. SCHRÖTER (Z. anorg. Chem., 1937, **233**, 178—183).—TiO, prepared by strongly heating an intimate mixture of Ti and $TiO_2$ in a high vac., is a definite compound having a face-centred cubic lattice with *a* 4·154 A., *d* 4·93, m.p. 1750°; it dissolves in dil. acids giving $H_2$. Data on conductivity and hardness are given. F. J. G.

**Attempts to prepare cerous amide.** F. W. BERGSTROM (J. Amer. Chem. Soc., 1937, **59**, 1374—1375).—The prep. from $KNH_2$ and $CeI_3$ in liquid $NH_3$ of $CeI_3,Ce(NH_2)_3,10NH_3$ and $CeI_3,Ce(NH)NH_2$ is described. E. S. H.

**New oxide of lead.** C. HOLTERMANN and P. LAFFITTE (Compt. rend., 1937, **204**, 1813—1815).—$Pb_7O_{11}$ is formed by dissociation of $PbO_2$ or interaction of $PbCO_3$ and $O_2$ at 365—460° and 200 atm. pressure. A. J. E. W.

**Concentration of $^{15}N$ by a chemical exchange reaction.** H. C. UREY, M. FOX, J. R. HUFFMAN, and H. G. THODE (J. Amer. Chem. Soc., 1937, **59**, 1407—1408).—A 6·5-fold increase in $[^{15}N]$ has been obtained by an exchange reaction between $NH_3$ and aq. $(NH_4)_2SO_4$. E. S. H.

**Preparation and properties of nitrites ($NH_4$, Li, Na, K, Cu, Ag, Be, Mg, Ca, Sr, Ba, Zn, Cd, Hg, Pb).** J. BUREAU (Ann. Chim., 1937, [xi], **8**, 5—142).—Methods for the determination of nitrites in presence of nitrates, and for the determination of impurities in nitrites, are discussed. The accuracy of absorption methods for determining gaseous NO and $NO_2$ has also been investigated for various NO–$NO_2$ ratios and concns. Absorption in conc. $H_2SO_4$ is recommended except at high dilutions, for which cases absorption by amine solutions is preferred. The prep. of pure nitrites by interaction between NO and $NO_2$ and metallic hydroxides or carbonates, and the conditions for avoiding nitrate formation, have been studied. The physical properties of the nitrites have been studied and thermal and other consts. determined. From an examination of nitrite–$H_2O$ and nitrite–nitrate–$H_2O$ systems the existence of the following *hydrates* is indicated. $NaNO_2,0{\cdot}5H_2O$; $KNO_2,0{\cdot}5H_2O$; $LiNO_2,1{\cdot}5H_2O$; $Ba(NO_2)_2,H_2O$ (hexagonal below 40°, rhombic above 40°); $Sr(NO_2)_2,4H_2O$; $Mg(NO_2)_2,9H_2O$; $Mg(NO_2)_2,6H_2O$. The last three compounds have been isolated. C. R. H.

**Amides of nitric, chloric, iodic, and acetic acids.** G. BECK (Z. anorg. Chem., 1937, **233**, 155—160).—The possibility of compound formation between acid anhydrides and metallic amides and nitrides, as suggested by theoretical considerations (cf. this vol., 464), has been investigated. $Ac_2O$ in $CCl_4$ with $NaNH_2$ and $Li_3N$ forms *Na amidoacetate* $Na[NH_2,Ac_2O]$ and *Li nitriloacetate* $Li_3[N,2Ac_2O]$, respectively. $I_2O_5$ with $NaNH_2$ in liquid $NH_3$ forms

*Na amidoiodate* together with $NaIO_3$. $NO_2$ in $CCl_4$ with $NaNH_2$ forms a mixture of *amidonitrite* and *amidonitrate*, $Na[NH_2N_2O_3]$ and $Na[NH_2N_2O_5]$, whilst with $Li_3N$ the *nitrilonitrate* $Li_3[N,3N_2O_5]$ is formed, NO being evolved. $ClO_2$ in $CCl_4$ with $NaNH_2$ forms the *amido-chlorate*. $I_2O_5$ and liquid $NH_3$ give a substance which on warming to room temp. forms N iodide, and this explodes spontaneously. F. J. G.

**Ammoniates of ammonium chloride, bromide, and iodide. (Tensimetric studies.)** G. SPACU and P. VOICHESCU (Z. anorg. Chem., 1937, **233**, 197—200).—Tensimeter curves between −79° and 17·5° show that $NH_4Cl$ and $NH_4Br$ form only *tri-ammoniates* which decompose below −29°, whilst $NH_4I$ forms *penta-*, *tetra-*, *tri-*, *di-*, and *mono-ammoniates*, all of which decompose below 0°. F. J. G.

**Nitrogen compounds of phosphorus.** P. RENAUD (Bull. Soc. chim., 1937, [v], **4**, 1291—1293; cf. A., 1935, 833).—The facts do not support the views advanced (this vol., 372). J. G. A. G.

**Nitrogen compounds of phosphorus.** H. MOUREU and G. WETROFF (Bull. Soc. chim., 1937, [v], **4**, 1293—1297).—A reply (cf. preceding abstract; A., 1936, 440). J. G. A. G.

**Preparation and properties of alkaline-earth arsenates.** H. GUÉRIN (Bull. Soc. chim., 1937, [v], **4**, 1249—1259).—The normal arsenates pptd. by interaction of $CaCl_2$, $SrCl_2$, and $BaCl_2$ with sol. arsenates contain 1—3% of Cl. The following pure compounds have been prepared by interaction of aq. $As_2O_5$ with $Ca(OH)_2$, $Sr(OH)_2$, and $Ba(OH)_2$ under the conditions described: $Ca_3(AsO_4)_2,8H_2O$; $Sr_3(AsO_4)_2,3H_2O$; $Ba_3(AsO_4)_2$; $Ca_2H_2(AsO_4)_2,4H_2O$; $Sr_2H_2(AsO_4)_2,2H_2O$; $Ba_2H_2(AsO_4)_2,2H_2O$; $CaH_4(AsO_4)_2$; $SrH_4(AsO_4)_2$; and $BaH_4(AsO_4)_2,H_2O$. The dehydration and solubilities of these salts have been investigated. J. G. A. G.

**Chemical nature of iodobismuthic acid and its relationship to the alkali iodide compounds of bismuth iodide.** A. E. JURIST and W. G. CHRISTIANSEN (J. Amer. Pharm. Assoc., 1937, **26**, 501—504).—Solubility data for BiOI in aq. HI indicate the existence of $HBiI_4$ and $H_2BiI_5$. Na "iodobismuthites" are probably salts of these acids, the Bi being anionic. F. O. H.

**Interchange reactions of oxygen. I. Interchange of oxygen between water and potassium phosphate in solution.** E. BLUMENTHAL and J. B. M. HERBERT (Trans. Faraday Soc., 1937, **33**, 849—852).—Equilibrium in the reaction $K_3PO_4 + 4H_2{}^{18}O \rightleftharpoons K_3P^{18}O_4 + H_2O$ is established in <3 hr. at room temp., three, and probably four, of the O in $K_3PO_4$ exchanging with the O of the $H_2O$. A possible mechanism to account for the data is discussed. C. R. H.

**Molybdenum-blues. Amorphous colloidal molybdenum-blue.** V. AUGER and (MLLE.) N. IVANOFF (Compt. rend., 1937, **204**, 1815—1817).—The blue prepared by Guichard's method (A., 1900, ii, 658) is $Mo_2O_5,4MoO_3,7H_2O$ (I). Other Mo blues consist of (I) containing adsorbed $MoO_3$; the latter can be removed by washing a solution of the blue in BuOH with very dil. acid. (I) behaves as an ionisable complex in aq. solution. A. J. E. W.

**Reducing properties of fuller's earth.** E. ERDHEIM (Österr. Chem.-Ztg., 1937, **40**, 344—345).—Solutions of $(NH_4)_2SO_4,Fe_2(SO_4)_3,24H_2O$ are reduced when shaken with the earth. E. S. H.

**Transformations from γ-FeOOH and γ-$Fe_2O_3$ to α-$Fe_2O_3$ at lower temperatures and the irreversible transition γ-FeOOH to α-FeOOH.** L. A. WELO and O. BAUDISCH (Phil. Mag., 1937, [vii], **24**, 80—87; cf. this vol., 192).—γ-FeOOH (I) in presence of $H_2O$ in a closed tube is irreversibly transformed at 136° into α-FeOOH, which is dehydrated to α-$Fe_2O_3$ at the same temp. γ-$Fe_2O_3$ undergoes similar transitions, the first stage being hydration to (I). Dry (I) gives γ-$Fe_2O_3$ at 250° in an open tube; this is irreversibly transformed into α-$Fe_2O_3$ at 380°. A. J. E. W.

**Complex salts of tervalent cobalt, chromium, and rhodium with racemic and optically-active *trans*-1 : 2-diamino*cyclo*hexane.** F. M. JAEGER and L. BIJKERK (Z. anorg. Chem., 1937, **233**, 97—139).—Complex salts of *trans*-1 : 2-diamino*cyclo*hexane (Chxn) with $Co^{III}$, $Cr^{III}$, and $Rh^{III}$, and of 1 : 2-diamino*cyclo*pentane (Cptn) with $Cr^{III}$, have been prepared and their optical activity studied. Complex salts obtained from the racemic base and $CoCl_2$ can be resolved by means of *d*-tartaric acid into optically-active components which are identical with the salts obtained from the active forms of the base. Mixed salts such as $[Co(d\text{-Chxn})(l\text{-Chxn})_2]Cl_3$ are not formed but give the racemic salt and (*e.g.*) $[Co(l\text{-Chxn})_3]Cl_3$. The only complexes which can exist are $[Co(l\text{-Chxn})_3]_D^{III}$ and $[Co(d\text{-Chxn})_3]_L^{III}$. The curves of [α] against λ are of a characteristic form resembling those for the $[Co(en)_3]^{III}$ salts and for salts containing both Chxn and en. Similar relationships are found with $Cr^{III}$ and $Rh^{III}$ salts. *Compounds* *l*-Chxn, m.p. 42·7°, b.p. 82°/14 mm., $[\alpha]_D = -36°$; *d*-Chxn, $[\alpha]_D = +34°$; *r*-, *d*- and *l*-Chxn *hydrochloride* and *nitrate*; *r*-, *d*-, and *l*-$[Co(Chxn)_2Cl_2]Cl$; *r*-$[Co(Chxn)_3]Cl_3,H_2O$; *d*- and *l*-$[Co(Chxn)_3]Cl_3,4H_2O$ (also with $3H_2O$); *r*-, *d*-, and *l*-$[Co(Chxn)_3](NO_3)_3,3H_2O$; *r*-$[Co(Chxn)_3](ClO_3)_3,3H_2O$ (also anhyd.); *r*-$[Co(Chxn)_3](ClO_4),3H_2O$; $[Co(l\text{-Chxn})_3]_DCl,d\text{-}C_4H_4O_6,2H_2O$; $[Co(d\text{-Chxn})_3]_LCl,d\text{-}C_4H_4O_6,5H_2O$; $[Co(l\text{-Chxn})_3]_DI_3,2H_2O$; $[Co(en)_2(d\text{-Chxn})]Cl_3,H_2O$; $[Co(en)(d\text{-Chxn})_2]Cl_3,3\cdot5H_2O$; $[Co(en)_2(r\text{-Chxn})]I_3,H_2O$; *L*-$[Cr(d\text{-Chxn})_3]Cl_3,3H_2O$; *L*-$[Cr(d\text{-Cptn})_3]Cl_3,3H_2O$; *d*- and *l*-$[Rh(Chxn)_3]Cl_3,3H_2O$; *L*-$[Rh(d\text{-Chxn})_3](NO_3)_3,3H_2O$; *L*-$[Rh(d\text{-Chxn})_3](ClO_4)_3,2H_2O$; $[Ir_2(l\text{-Chxn})_3]Cl_6\cdot5H_2O$. Polarimetric and crystallographic data are given. F. J. G.

**Metal-like nickel hydrides.** W. BUSSEM and F. GROSS (Metallwirts., 1937, **16**, 669—671).—Ni vaporised in vac. or in a normal $H_2$ atm. has a cubic structure, but when evaporated by moderate heat in the presence of active H it forms the same hydride, with a hexagonal lattice, as has been produced by cathodic disintegration. The essential requirement

for the formation of the hexagonal phase is the presence of active H. C. E. H.

**Oxidation of hydroxylamine compounds of platinum.** I. I. TSCHERNIAEV and V. I. GOREMIKIN (Compt. rend. Acad. Sci. U.R.S.S., 1937, **15**, 344—346).—The oxidation of *cis*- and *trans*-$[Pt,2NH_3,2Hx]Cl_2$ ($Hx = NH_2OH$) with $Cl_2$ has been examined. $(NH_4)_2PtCl_6$ is obtained, indicating that the migration of $NH_3$ occurred at the moment of oxidation of the $NH_2OH$. $[Pt,NH_3,Hx,Cl_2]$ also gave $(NH_4)_2PtCl_6$, and $[Pt,Hx,NH_3,2C_5H_5N]Cl_2$ gave $[Pt,2C_5H_5N,Cl_4]$ on oxidation. Migration of $NH_3$ occurs in the *trans*-position to $NH_2OH$, irrespective of the no. of $NH_2OH$ mols. in the inner zone, or of the type of complex. $[Pt,Hx,NH_3,C_5H_5N,Cl]Cl$ gave $NH_4[C_5H_5N,Cl_5,Pt]$ on oxidation. The $NO_2$ of $[Pt,Hx,(NO_2),C_5H_5N,NH_3]Cl$ is removed from the inner zone on oxidation, $[Pt,C_5H_5N,NH_3,Cl_4]$ being formed. A. J. M.

**Hydroxylamine pyridine compounds of bivalent platinum.** I. I. TSCHERNIAEV and V. I. GOREMIKIN (Compt. rend. Acad. Sci. U.R.S.S., 1937, **15**, 341—343).—The stability of $NH_2OH$–$C_5H_5N$ derivatives of Pt depends on composition, being greater as $C_5H_5N$ is replaced by $NH_2OH$. The *compounds* $[Pt,Hx,3C_5H_5N]Cl_2$, *cis*-$[Pt,2Hx,2C_5H_5N]Cl_2$, and $[Pt,3Hx,C_5H_5N]Cl_2$ ($Hx = NH_2OH$) are colourless, cryst. substances, sol. in $H_2O$, EtOH–$H_2O$, and less readily in EtOH. With $K_2PtCl_4$ they give *platinichlorides* $[Pt,Hx,3C_5H_5N]PtCl_4$, $[Pt,2Hx,2C_5H_5N]PtCl_4$, and $[Pt,3Hx,C_5H_5N]PtCl_4$. A. J. M.

**Quantitative emission spectrum analysis. I. Relative broadening of lines.** F. EISENLOHR and K. ALEXY (Z. physikal. Chem., 1937, **179**, 241—255).—A method of quant. analysis is described depending on the fact that if an element is mixed with a suitable material as base the width of its spectral lines increases with its concn. The substance for analysis is conveniently made into a bead with microcosmic salt, serving as base, emission being induced by passing sparks between the bead and a Pt wire, and the width of some line of the element to be determined relative to a suitable line of the base or of an added substance is measured on a photograph of the spectrum. The width of a spectral line on a photograph ∝ the logarithm of the time of exposure. R. C.

**Evaluation of accuracy of analytical methods.** S. M. RAISKI (Zavod. Lab., 1937, **6**, 265—269).—Methods are described. R. T.

**Analysis of mixtures of volatile acids.** M. N. BECHTEREVA and N. D. JERUSALIMSKI (Zavod. Lab., 1937, **6**, 312—316).—The methods of Virtanen *et al.* (B., 1928, 688) and of Allgeier *et al.* (A., 1929, 1093) are recommended. R. T.

**Diphenylguanidine as a standard in neutralisation processes.** W. M. THORNTON, jun., and C. L. CHRIST (Ind. Eng. Chem. [Anal.], 1937, **9**, 339).—The impure, commercial product is not satisfactory. E. S. H.

**Determination of chlorine in silicates.** V. M. ZVENIGORODSKAJA and R. G. GOTSDINER (Zavod. Lab., 1937, **6**, 298—299).—The method previously described (this vol., 324) is applied to determination of Cl in silicates. R. T.

**Nephelometric end-point of at. wt. titrations.** A. F. SCOTT and F. H. HURLEY, jun. (J. Amer. Chem. Soc., 1937, **59**, 1297—1302).—The end-point of equal opalescence is valid at room temp., but not at 0°. The apparent excess of Cl′ at 0° is not due to adsorption by the ppt., but to the fact that the opalescences of the suspensions are not strictly ∝ [Ag′] and [Cl′] in the solutions. It is suggested that the solubility of AgCl is increased in solutions containing excess of Cl′. The influence of colloidal AgCl on the end-point is discussed. E. S. H.

**Determination of iodine in extracts from brine.**—See B., 1937, 778.

**Determination of iodine [in drugs].**—See B., 1937, 839.

**Potentiometric titration of fluorides.** I. G. RISS and N. G. BAKINA (Zavod. Lab., 1937, **6**, 172—177).—Excess of $Na_2SiF_6$ is added to the solution of fluoride, which is titrated (quinhydrone electrode) with $N$-$Ca(NO_3)_2$. $SO_4''$ does not interfere. R. T.

**Determination of sulphur dioxide and sulphur trioxide in sulphur burner gases.**—See B., 1937, 778.

**Determination of sulphur in wool.**—See B., 1937, 765.

**Rapid determination of sulphur in pyrites cinder.**—See B., 1937, 778.

**Qualitative test for selenium. I.** H. A. LJUNG (Ind. Eng. Chem. [Anal.], 1937, **9**, 328—330).—The reduction of $SeO_3''$ to Se by $NH_4CNS$ in presence of HCl serves to detect 1 part of Se in 2—4 × $10^7$ parts of solution. Interference is caused by $Fe^{\cdot\cdot}$, $Sb^{\cdot\cdot\cdot}$, and $Sn^{\cdot\cdot}$, but not by $Fe^{\cdot\cdot\cdot}$, $Mn^{\cdot\cdot}$, $Cr^{\cdot\cdot\cdot}$, $Al^{\cdot\cdot\cdot}$, $Zn^{\cdot\cdot}$, $Ni^{\cdot\cdot}$, $Co^{\cdot\cdot}$, $Pb^{\cdot\cdot}$, $Cu^{\cdot\cdot}$, $Bi^{\cdot\cdot\cdot}$, $Cd^{\cdot\cdot}$, or $Hg^{\cdot\cdot}$. E. S. H.

**Determination of dissolved nitrogen in water.** N. W. RAKESTRAW and V. M. EMMEL (Ind. Eng. Chem. [Anal.], 1937, **9**, 344—346).—The $H_2O$ is sprayed repeatedly into an evacuated chamber and the extracted gas removed after each injection. The total quantity of gas is measured manometrically at const. vol., and the content of $O_2$ and $N_2$ determined in the same way after reaction with P and Li. Results for sea-$H_2O$ are given. E. S. H.

**Xylenol method for determining nitrate-nitrogen and its use in studying the physiology of the sugar-beet.** F. WERR (Z. Wirts. Zuckerind., 1937, **87**, 119—154).—The following form of the xylenol method (B., 1929, 370; 1934, 112, 113) is recommended. 0·02—0·5 mg. of $NO_3'$-N may be determined without preliminary destruction of org. matter. A mixture of 25 c.c. of 75 vol.-% $H_2SO_4$, 0·1 c.c. of xylenol, and 5 c.c. of $H_2O$ containing the sample is allowed to react at room temp. for 15 (in some cases 30) min. and is then diluted with 100 c.c. of $H_2O$; 40—50 c.c. are distilled from it in 15 min. into 25 c.c. of 0·2$N$-NaOH, the distillate is made up to 100 c.c., and its extinction coeff. determined with the Leifo photometer, using a colour filter transmitting at 460 mμ. The following substances interfere:

$H_2O_2$, nascent H, halides (>1—2 mg. of KCl), >10 mg. of $KMnO_4$, and $NO_2'$ (destroyed by means of $NaN_3$). Reaction times and max. quantities of different kinds of material are specified. J. H. L.

**Rapid Kjeldahl method for nitrogen determination.**—See B., 1937, 829.

**Determination of very small amounts of hydroxylamine, nitrite, and nitrate.** G. ENDRES and (FRL.) L. KAUFMANN (Annalen, 1937, **530**, 184—194).—0·28—2·8 × $10^{-6}$ g. per 10 c.c. of $NO_2'$ is determined photometrically by the diazo-method with $p$-$NH_2$·$C_6H_4$·$SO_3H$–AcOH–β-$C_{10}H_7$·$NH_2$; Beer's law holds for this range of concn., but more conc. solutions should be diluted. 5 × $10^{-6}$ g. in 10 c.c. give a brown colour due to phenols. $NH_2OH$ is quantitatively converted by I into $HNO_2$ and HI; the $HNO_2$ may then be determined as above, the error being ±2—3% for 0·1—0·2 × $10^{-6}$ g. of $NH_2OH$-N in 10 c.c. $NO_2'$ is determined in <9 : 1 mixtures of $NO_2$-$NH_2OH$ by the diazo-method; a second aliquot is treated with I and then by the diazo-method, the excess being due to the $NH_2OH$. For >9 : 1 mixtures the bulk of the $NO_2'$ must be first destroyed by adding the theoretical amount of $NaN_3$, bringing to $p_H$ 4 by $p$-$NH_2$·$C_6H_4$·$SO_3H$, and boiling for 3 min., or by adding 0·9 mol. of $NaN_3$, bringing to $p_H$ 3 by AcOH, and keeping at room temp. for 30 min.; in the latter case the $NO_2'$ remaining undestroyed must be determined. 2—14 × $10^{-6}$ g. of $NO_3'$-N in 5 c.c. are determined photometrically by the brucine test. Mixtures containing 0·3 × $10^{-6}$ g. $NH_2OH$-N, 0·3 × $10^{-6}$ g. of $NO_2'$-N, and 4 × $10^{-6}$ g. of $NO_3'$-N are analysed by the above methods, 10—20 c.c. being required. Blank tests and cleanliness are required. R. S. C.

**Detection of small amounts of boric acid in glass.**—See B., 1937, 781.

**Determination of lime-solvent carbonic acid in waters.**—See B., 1937, 849.

**Determination of potassium in ammonia synthesis catalysts.**—See B., 1937, 777.

**Photo-nephelometric determination of calcium.**—See B., 1937, 795.

**Rapid determination of calcium and magnesium oxides.** P. N. GRIGORIEV (Zavod. Lab., 1937, **6**, 238).—Ca is pptd. as oxalate, and Mg as $MgHPO_4$, from the filtrate from pptn. of sesquioxides. The washed ppt. is dissolved in hot 10% $HNO_3$, and the Ca and Mg contents are derived from the $C_2O_4''$ and $PO_4'''$ contents of the solution, determined by the ordinary methods. R. T.

**Determination of barium, sulphur, and sulphates. Rapid and accurate volumetric method.** S. J. KOCHOR (Ind. Eng. Chem. [Anal.], 1937, **9**, 331—333).—Standard analytical procedures have been examined and co-ordinated into a scheme. Examples of determinations of S in coal, rubber, cement, steel, insecticides, etc. are given. E. S. H.

**Determination of magnesium in medicines.**—See B., 1937, 839.

**Determination of small amounts of zinc.** L. E. KARLSON (Zavod. Lab., 1937, **6**, 300—302).—Zn (<0·02 mg.) is determined by pptn. with 8-hydroxyquinoline (I), by a colorimetric method involving coupling of (I) from the washed ppt. with diazotised sulphanilic acid. Should the material under analysis contain Cu, this is readily separated by Tzinberg's method (*ibid.*, 1935, **4**, 1161). R. T.

**Separation of zinc from cobalt, nickel, and manganese by means of hydrogen sulphide, and final precipitation of zinc with anthranilic acid. II.** E. A. OSTROUMOV (Ann. Chim. Analyt., 1937, [iii], **19**, 173—176; cf. this vol., 426).—Zn is pptd. from neutral or slightly acid (AcOH) solution by means of Na anthranilate at room temp. The ppt. is dried at 105—110°. J. S. A.

**Determination of minute quantities of lead.** P. G. JACKSON (J.S.C.I., 1937, **56**, 211—213T).—In the colorimetric determination of Pb as PbS, the colour is deeper in AcOH than in $NH_3$ solutions; 1—2 ml. of 33% AcOH are best added. Traces of Cu, as also $Fe^{\cdot\cdot\cdot}$, but not $Fe^{\cdot\cdot}$, greatly diminish the colour; in $NH_3$ solutions the effect is augmented by KCN. Cu and Fe should be completely removed before testing for Pb. Gelatin diminishes the colour in acid solutions, but is advantageous as a stabiliser. For the initial separation of traces of Pb as $PbSO_4$, the vol. of $H_2SO_4$ should be ≯0·125 ml. The method is applicable to the separation of traces of Pb in, *e.g.*, beer, which is first oxidised with $HNO_3$, 0·5 ml. of 25% $H_2SO_4$ being added towards the end of the evaporation. J. S. A.

**Determination of lead.** J. P. HOCHSTEIN (Zavod. Lab., 1937, **6**, 269).—Polemical, against Gaptschenko and Scheintzis (*ibid.*, 1935, **4**, 868, 1014). R. T.

**Bromopotentiometric titration of thallium with chloroamine.** C. DEL FRESNO and A. AGUADO (Z. anal. Chem., 1937, **109**, 334—338).—$Tl^{\cdot}$ is oxidised to $Tl^{\cdot\cdot\cdot}$ in acid solutions by $NH_2Cl$ in the presence of KBr. For potentiometric titrations, $NH_2Cl$ is used in 1·4% aq. solution. J. S. A.

**Specific determination and separation of thallium with thionalide [thioglycollic β-aminonaphthylamide].** R. BERG and E. S. FAHRENKAMP (Z. anal. Chem., 1937, **109**, 305—315).—Tl is pptd. by thionalide (I) (used as conc. solution in $COMe_2$) from cold solutions which are $N$ in free NaOH, in the presence of 2 g. of Na tartrate and 3—5 g. of KCN per 100 c.c. The ppt. is coagulated by heating, and separated from the cooled solution. V, $Fe^{\cdot\cdot\cdot}$, $Pt^{IV}$, $Pd^{IV}$, and $Au^{III}$ are reduced with $NH_2OH$ before adding (I). In presence of Cd, the [KCN] is doubled; in presence of $UO_2^{\cdot\cdot}$, $(NH_4)_2CO_3$ is added to dissolve any pptd. Na uranate. Hg, Bi, and Pb are partly pptd. with the Tl, but copptn. is avoided by using a 10-fold excess of (I) in sufficient $COMe_2$ to make the final [$COMe_2$] 30%. In the presence of Ca, Sr, Ba, or Mg, the solution is made alkaline with aq. $NH_3$. The Tl-(I) ppt. may be determined gravimetrically after drying at 100°, or may be dissolved in AcOH + $H_2SO_4$, and oxidised with 0·02$N$-I, followed by back titration with $Na_2S_2O_3$. J. S. A.

**Volumetric determination of copper and nickel present together.** RASCHUTIN (Maslob. Shir. Delo, 1937, No. 2, 24).—Ni and Cu are deter-

mined cyanometrically in one portion of solution, and Cu alone iodometrically in a second portion. R. T.

**Determination of copper in metallic nickel.**—See B., 1937, 795.

**Standardisation of ceric sulphate with potassium iodide by the acetone method.** D. LEWIS (J. Amer. Chem. Soc., 1937, **59**, 1401).—The titre varies with the acid concn. Within the range 0·9—2·7*N*-$H_2SO_4$ the results are accurate to 0·1%. E. S. H.

**Volumetric determination of cerium in rare earth oxide mixtures.** V. G. SCHTSCHERBAKOV (Zavod. Lab., 1937, **6**, 160—161).—0·25—0·3 g. of oxides is heated with 50 ml. of 50% $H_2SO_4$ and 2 ml. of 3% $H_2O_2$, to evolution of $SO_3$, and the solution is poured into 100 ml. of $H_2O$, with cooling. The solution is made neutral with aq. $NH_3$, $H_2SO_4$ is added to 1%, and the solution is boiled with 1 g. of $(NH_4)_2S_2O_8$ (I) for 2 min., cooled to 50°, again boiled with 1 g. of (I), again cooled, and once more boiled with 2 g. of (I) and 20 ml. of 20% $H_2SO_4$, for 30 min., to decompose excess of (I). 0·1*N*-$H_2O_2$ is added to the cooled solution, and excess of $H_2O_2$ is titrated with 0·1*N*-$KMnO_4$ (1 ml. = 14·025 mg. Ce). R. T.

**Potentiometric titration of cerium, lanthanum, and thorium, as ferrocyanides.** F. M. SCHEMJAKIN and V. A. VOLKOVA (J. Gen. Chem. Russ., 1937, **7**, 1328—1332).—Sharp end-points are obtained in the titration of $Ce^{III}$, $Th^{IV}$, or $La^{III}$ by $K_4Fe(CN)_6$; when these are present together their sum, but not the individual salts, may be determined. $Ce^{III}$ may be determined in presence of Th and La by titration with $K_3Fe(CN)_6$. R. T.

**Reactions of rare earths and allied elements with pyrogallol, gallic acid, and morphine. V.** F. M. SCHEMJAKIN (Compt. rend. Acad. Sci. U.R.S.S., 1937, **15**, 347—350).—The reactions of nitrates of Pr, Er, Y, and a mixture of Pr and Nd with an ammoniacal solution of gallic acid (I) and with pyrogallol (II) are described. The presence of Ti, Nb, and Ta inhibits the reaction of Ce with (I) and (II). The action of morphine hydrochloride on salts of Pr, a mixture of Pr and Nd, Er, Y, Ti, Zr, and $K_2NbF_7$ and $K_2TaF_7$ has been examined. A. J. M.

**Determination of aluminium in nitrate solution by potentiometric titration with an antimony electrode.** K. L. MADSHAGALADZE (Zavod. Lab., 1937, **6**, 305—308).—$Al(NO_3)_3$ and free $HNO_3$ may be determined by electro-titration (Sb electrode). Should > traces of Fe be present no sharp breaks in the potential curve are obtained until titration of Al + Fe + $HNO_3$ is completed. R. T.

**Determination of aluminium by titration with alkali.** A. E. MARTIN (J.S.C.I., 1937, **56**, 179—180T).—Al in slightly acid solution is titrated with alkali either by using a simple electrometric method or with indicators. The $p_H$ remains practically const. during the pptn. of $Al(OH)_3$ and it is only necessary to recognise the rapid changes of $p_H$ which occur for small additions of alkali before and after the pptn. Bromophenol-blue is used before pptn. ($p_H$ 3·7) and Me-red (in addition) afterwards ($p_H$ 6·0). A. E. M.

**Effect of anions on the titration of aluminium chloride.** T. H. WHITEHEAD, J. P. CLAY, and C. R. HAWTHORNE (J. Amer. Chem. Soc., 1937, **59**, 1349—1350).—In the potentiometric titration of $AlCl_3$ with NaOH a low result is obtained in presence of many anions. The order of their effect is: citrate > $C_2O_4''$ > tartrate > succinate > $SO_4''$ > OAc′ > $NO_3'$. $Na^{\cdot}$, $K^{\cdot}$, and $NH_4^{\cdot}$ have relatively little effect on the titration. E. S. H.

**Determination of aluminium in presence of iron.**—See B., 1937, 797.

**Resorcylaldoxime as a reagent for the colorimetric determination of ferric iron.** S. L. CHIEN and T. M. SHIH (J. Chinese Chem. Soc., 1937, **5**, 154—161).—1 c.c. of 0·2% resorcylaldoxime (I) in 5% EtOH–$H_2O$ gives a purple colour with 50 ml. of a slightly acid solution containing >0·3 p.p.m. of $Fe^{\cdot\cdot\cdot}$. The colour fades only very slowly and 0·3—5 p.p.m. of $Fe^{\cdot\cdot\cdot}$ can be determined colorimetrically in the presence of small quantities of a large no. of ions. $Hg^{\cdot\cdot}$, $Au^{\cdot\cdot\cdot}$, $Pd^{\cdot\cdot}$, Mo, $UO_2^{\cdot\cdot}$, $Sb^{\cdot\cdot\cdot}$, $Sn^{\cdot\cdot\cdot\cdot}$, and especially $Ti^{\cdot\cdot\cdot\cdot}$, strong acidity or alkalinity interfere. $Cu^{\cdot\cdot}$ is quantitatively pptd. by the reagent (cf. A., 1932, 160), but the ppt. is unsuitable for gravimetric work. J. G. A. G.

**2 : 4-Dihydroxyacetophenone as a qualitative reagent for ferric iron.** S. R. COOPER (Ind. Eng. Chem. [Anal.], 1937, **9**, 334—335).—The reagent in EtOH serves to detect 2 p.p.m. $Fe^{\cdot\cdot\cdot}$ in solution by means of the red colour produced. Co, Cu, Ni, Mn, Hg, Al, and Cr salts interfere when present in large excess; oxalates, tartrates, and citrates also interfere. $PO_4'''$ must be absent. E. S. H.

**Quantitative separation of ferric, aluminium, and chromic ions from the ions of the ammonium sulphide group.** G. CHARLOT (Bull. Soc. chim., 1937, [v], **4**, 1235—1244).—The solubilities of $Fe^{\cdot\cdot\cdot}$ and $Al^{\cdot\cdot\cdot}$ at $p_H$ 5·4 are <0·1 mg. and <1·0 mg. per 100 c.c., respectively. By adjusting the slightly acid solutions to $p_H$ 5·4 by means of $(CH_2)_6N_4$–HCl buffer solution [400 g. of $(CH_2)_6N_4$ + 1000 c.c. of $H_2O$ + 100 c.c. of 12*N*-HCl], the following separations are effected in the cold (cf. A., 1933, 1133): Fe–Zn; Fe,Al–Ca,Mg; Al–Ce; Fe,Al–Co; Fe–Ni; Fe,Al–Mn; and, with double pptn., Al–Zn; Al–Ni; Fe–Ce. With a large proportion of Fe relative to Cr, some Cr is co-pptd. with the Fe, whilst with excess of Cr, Fe is retained in solution. J. G. A. G.

**Quantitative separation of aluminium and ferric ions from calcium ions in presence of phosphoric ions.** G. CHARLOT (Bull. Soc. chim., 1937, [v], **4**, 1244—1246).—Al and Fe hydroxides and phosphates are pptd. at $p_H$ 5·4 by means of $(CH_2)_6N_4$–HCl buffer solution and $NH_4Cl$, whilst $Ca^{\cdot\cdot}$ and any excess of $PO_4'''$ remain in solution. Double pptn. is necessary with excess of $PO_4'''$, and the solubility of $Al^{\cdot\cdot\cdot}$ is 1 mg. per 100 c.c. J. G. A. G.

**Qualitative analysis [of the ions] of the ammonium sulphide group in the presence of $PO_4'''$ ions.** G. CHARLOT (Bull. Soc. chim., 1937, [v], **4**, 1247—1248).—$PO_4'''$, $Al^{\cdot\cdot\cdot}$, $Fe^{\cdot\cdot\cdot}$, and $Cr^{\cdot\cdot\cdot}$ are pptd. in the presence of excess of $Fe^{\cdot\cdot\cdot}$ by adjusting the $p_H$ to 5·4 with $(CH_2)_6N_4$–HCl buffer solution. $Zn^{\cdot\cdot}$, $Ni^{\cdot\cdot}$, and

$Co^{\cdot\cdot}$ are pptd. from the filtrate by $H_2S$. The $Mn^{\cdot\cdot}$ is then pptd., after removing the $H_2S$, by aq. $NH_3$ and $H_2O_2$. J. G. A. G.

**Accuracy of potentiometric titration in the oxidation-reduction reaction between bivalent iron and potassium dichromate.** N. J. Chlopin (Zavod. Lab., 1937, **6**, 227—229).—More accurate results are obtained with electro-titration of $Cr_2O_7''$ than with other methods; the error is least when the result is taken as the mean of direct titration with standard $Fe^{II}$, and of back-titration of excess of $Fe^{II}$ with standard $K_2Cr_2O_7$. R. T.

[**Use of perchloric acid in steel analysis.**]—See B., 1937, 793.

**Rapid determination of cobalt in steel.**—See B., 1937, 793.

**Colorimetric determination of cobalt in metallic nickel.**—See B., 1937, 795.

**Volumetric determination of nickel.** N. S. Krupenio (Zavod. Lab., 1937, **6**, 239).—Ni is pptd. with methylglyoxime, and the ppt. is dissolved in 0·1*N*-HCl, excess of which is titrated with 0·1*N*-NaOH; the Ni content is hence calc. R. T.

**Drop method of detection of chromium.** T. P. Lexaschova (Zavod. Lab., 1937, **6**, 369).—2—3 drops of 1 : 1 : 1 $H_2SO_4$–$HNO_3$–$H_2O$ are placed on the cleaned metal surface, transferred to a watch-glass, and heated with excess of $Na_2O_2$. The suspension is placed on a folded filter-paper, and a drop each of benzidine in AcOH and of aq. $H_2O_2$ are placed on the spot forming on the lower sheet; a blue coloration indicates Cr. R. T.

**Colorimetric determination of tungsten and molybdenum.** F. A. Ferjantschitsch (Zavod. Lab., 1937, **6**, 289—292).—In absence of Mo or Sb, colorimetric determination of W may be effected using $TiCl_3$ in place of $SnCl_2$ (0·2 ml. 15% $TiCl_3$ equiv. to 2·5 g. of $SnCl_2,2H_2O$); As does not interfere. $TiCl_3$ may similarly be used in place of $SnCl_2$ in the colorimetric determination of Mo in absence of W. R. T.

**Precipitation and determination of antimony using a mixture of hypophosphorous and sulphuric acids.** L. Fauchon and L. Vignoli (J. Pharm. Chim., 1937, [viii], **25**, 541—545).—Sb is quantitatively pptd. as such by a mixture of $H_3PO_2$ and $H_2SO_4$. The ppt. is sol. in a mixture of KI and tartaric acid, and a quant. method is described. Under the same conditions, pptn. of As is incomplete. Sb can also be determined diaphanometrically using this method, the limit being 0·02 mg. as in the case of As. J. N. A.

**Determination of antimony by formation of iodine-antimony-potassium complex.** L. Fauchon (J. Pharm. Chim., 1937, [viii], **25**, 537—541).—Colorimetric and volumetric methods are described. They depend on the fact that KI and $H_2SO_4$ produce a golden-yellow colour with Sb salts, due to formation of an Sb–I–K complex. The end-point is sharp. J. N. A.

[**Determination of antimony in lead.**]—See B., 1937, 795.

**Determination of bismuth as phosphate.** W. R. Schoeller and D. A. Lambie (Analyst, 1937, **62**, 533—537).—In presence of $SO_4''$, $Bi_2(SO_4)_3$ is co-pptd. with $BiPO_4$. Schoeller and Waterhouse's method (A., 1921, ii, 135) is modified so as to prevent $Bi_2(SO_4)_3$ from appearing in the final ppt. after dissolution of the $Bi_2S_3$ ppt. in $HNO_3$. Bi is pptd. as $Bi_2(CO_3)_3$ leaving $SO_4''$ in solution. The $Bi_2(CO_3)_3$ is taken up in $HNO_3$ and the original method followed. E. C. S.

**Burner with adjustable flame spreader.** P. Blackman (Chem. and Ind., 1937, 656). J. S. A.

**Construction of electrically heated laboratory [muffle] furnaces.** M. Mields (Chem.-Ztg., 1937, **50**, 516—517).—Details for furnaces working up to 1350° are discussed. J. S. A.

**Cylindrical nickel-chromium electro-furnace giving a temperature of 1100°.** V. I. Serdjukov (Zavod. Lab., 1937, **6**, 247—248). R. T.

**Laboratory furnace for fusion and pouring out of metals in a vacuum.** S. V. Sergeev and D. S. Schreiber (Zavod. Lab., 1937, **6**, 242—246). R. T.

(A) **Small laboratory cryptol furnace.** (B) **Adaptation of cylindrical cryptol furnaces for combustions.** V. A. Lebedev (Zavod. Lab., 1937, **6**, 376—377, 379—380).—Apparatus is described. R. T.

**Mixing device for thermochemical calorimeters.** W. P. White and H. S. Roberts (J. Amer. Chem. Soc., 1937, **59**, 1254—1256).—The device permits powders to be liberated very rapidly into a solution, after being immersed so as to reach the calorimeter temp. E. S. H.

(A) **Thermoregulators and thermostats for measurements of prolonged heat effects.** (B) **Apparatus for automatic registration of prolonged heat effects.** W. Swientosławski and J. Pomorski. (C) **Calorimetric study of slow reactions.** W. Swientosławski (Rocz. Chem., 1937, **17**, 254—261, 262—268, 269—283).—Apparatus and methods are described. R. T.

**Improved mercury-toluene thermoregulator.** I. G. Nagatkin (Zavod. Lab., 1937, **6**, 255). R. T.

**Gas thermoregulator.** R. M. Kingsbury (Ind. Eng. Chem. [Anal.], 1937, **9**, 333).—The device is suitable for controlling the temp. of a 12-litre bath within ±0·5° over the range 50—100°. E. S. H.

**Sulphur b.p. apparatus with internal electric heating.** C. R. Barber (J. Sci. Instr., 1937, **14**, 227—229).—The apparatus described, suitable for calibrating thermocouples, is made of Pyrex glass with a Pt heater immersed in the S and connected to Pt leads sealed directly through the Pyrex below the S. This method of heating reduces risk of fracture on remelting. The b.p. is accurate to 0·1°. N. M. B.

**Modification of the Berl-Kullmann m.p. block. Electrically heated, glass m.p. apparatus.** F. W. Bergstrom (Ind. Eng. Chem. [Anal.], 1937, **9**, 340—341).—Apparatus and technique are described. E. S. H.

**Colour pyrometer for measurement of high temperatures.** N. I. SINJAKOV (Zavod. Lab., 1937, **6**, 327—332).—The construction and use of colour pyrometers of the type developed by Neser (Mitt. Kaiser-Wilh. Inst. Eisenforsch., 1929, 373) are described. R. T.

**Properties of radiation detectors, with special reference to thermo-elements.** H. THEISSING (Physikal. Z., 1937, **38**, 557—564).—The sensitivity of thermo-elements, thermopiles, and bolometers for the determination of radiation is considered. A. J. M.

**Coated porcelain tubes as stable protective sheaths for thermo-couples.** S. P. ZAMOTAEV and S. M. BESEDIN (Zavod. Lab., 1937, **6**, 377—379).—Porcelain tubes are coated with a paste consisting of carborundum 90, fireclay 5, and dextrin 5 parts, in $H_2O$, and this coating is covered with a second one of fireclay made up into a paste with aq. Na silicate. The tube is dried at 120°, and then fired for 1 hr. at 1200°. R. T.

**Thermal conductivity of rocks.** F. BIRCH and H. CLARK (Physical Rev., 1936, [ii], **49**, 479).—An apparatus for routine measurements of the thermal conductivity of rocks etc., up to 500°, has been constructed. L. S. T.

**Thermal conductivity method for the determination of isotopic exchanges in the simpler gaseous molecules.** N. R. TRENNER (J. Chem. Physics, 1937, **5**, 382—392).—Constructional and operational details of a thermal conductivity gauge of good mechanical stability, freedom from poisoning effects, and high accuracy are given. The applicability of the apparatus is considered and its use in studying the various isotopic species of the lower paraffins and hydrogen is discussed. The theory of the gauge is developed. W. R. A.

**Analysis of ternary gas mixtures by thermal conductivity measurements.** J. L. BOLLAND and H. W. MELVILLE (Nature, 1937, **140**, 63).—A method which may be applied to any ternary mixture, one component of which is $H_2$ and the other two are gases of different thermal conductivity, is described. The vol. of gas required may be reduced to 0·01 c.c. at n.t.p. by the use of a micro-cell. L. S. T.

**Interrupted arc for spectral analysis.** N. S. SVENTITZKI (Zavod. Lab., 1937, **6**, 325—326).—Apparatus is described. R. T.

**Measurement of pressures in the upper atmosphere.** J. KAPLAN (Nature, 1937, **139**, 1112).—A spectroscopic method is suggested. L. S. T.

**Optical measurement of the thickness of a film adsorbed from a solution.** I. LANGMUIR and V. J. SCHAEFER (J. Amer. Chem. Soc., 1937, **59**, 1406).—Technique is described and preliminary results are reported. E. S. H.

**Determination of crystal lattice parameters on the basis of unilateral röntgenograms (micro-section method).** E. I. SOVS (Zavod. Lab., 1937, **6**, 332—334).—Mathematical. R. T.

**Polarisation filters employing dichroic crystals.** M. HAASE (Z. tech. Physik, 1937, **18**, 69—72).—A lecture. The transmission and degree of polarisation of the Zeiss filters have been measured from 7500 to 4500 A., and the effect of oblique incidence has been determined. O. D. S.

**Polaroid films.** H. FREUNDLICH (Chem. and Ind., 1937, 698—699).—The polaroid film is a new device for producing polarised light, excelling in its large aperture. It is based on the strong dichroism of herapathite and similar salts and consists of a suspension of very small, anisotropic particles of such a substance, oriented by streaming, in a layer of a cellulose ester.

**High-speed high-precision microphotometer.** H. B. VINCENT and R. A. SAWYER (J. Opt. Soc. Amer., 1937, **27**, 193—197).—A new type of instrument using high-aperture lenses is described. N. M. B.

**Fluorometer based on the effect of Debye and Sears.** L. A. TUMERMANN and V. SCHIMANOVSKI (Compt. rend. Acad. Sci. U.R.S.S., 1937, **15**, 323—326).—The apparatus depends on the use of diffraction of light by ultrasonic waves. It gives higher intensities of modulated light than the method using the Kerr effect, and it can be used in the ultra-violet. A. J. M.

***X*-Ray microscope.** L. VON HÁMOS (Nature, 1937, **140**, 30; cf. A., 1934, 980).—An *X*-ray microscope, by means of which a true enlarged image of chemically different layers is obtained, depends on the focussing of the characteristic secondary radiation emitted from a surface layer of an object subjected to primary *X*-ray irradiation. Chemical analysis for many elements in objects $\not>10^{-8}$ c.c. without dissipating the sample becomes possible. L. S. T.

***X*-Ray intensifying screens adapted to structure analysis.** N. H. KOLKMEIJER, C. J. KROM, and H. KUNST (Nature, 1937, **140**, 67—68).—The use of the Ilford Fluorazure screen shortens the time of exposure needed to obtain *X*-ray photographs of tissue fibres for analysis of their structure. L. S. T.

**Sources of light for photochemical processes.** K. VOGL (Chem. Fabr., 1937, **10**, 296—299).—The different types of electric lighting available—incandescence, Hg and Na vapour, and arc lamps—are compared. I. C. R.

**Use of Jena dispersion filter as a monochromator for photochemical purposes.** G. HOLST (Z. wiss. Phot., 1937, **36**, 145—155).—The filter consists essentially of an optically isotropic borosilicate glass in coarse powder with a filter liquid (BzOH ester), the two phases having the same refraction within only a certain small range of $\lambda$, depending on the temp. By use with a prismatic spectrometer and a suitable source of light, nearly monochromatic light can be obtained, between 700 and 400 mμ, according to temp. The relation between the mean $\lambda$ and temp. has been determined. J. L.

**Action of ultra-violet light an aliphatic hydrocarbons. II. Universal apparatus for the study of photochemical reactions of gases.** W. KEMULA

(Rocz. Chem., 1937, **17**, 175—180).—Apparatus is described. R. T.

**Preparation of galvanometer indicators.** G. V. FRIDRICH (Zavod. Lab., 1937, **6**, 380).—A cylinder of Al foil (0·02 mm.) is prepared by wrapping around 0·3 mm. wire. R. T.

**Automatic null-point adjustment device for titration.** L. P. ADAMOVITSCH and N. R. VOLKOV (Zavod. Lab., 1937, **6**, 253). R. T.

**The Beha moisture-meter.** F. MENDLIK (Chem. Weekblad, 1937, **34**, 465—466).—The instrument measures the capacity of a condenser filled with the substance the $H_2O$ content of which is to be determined, viz., a moist powder or granular material such as yeast, corn, or meal. From this the dielectric const. and hence, for any given substance, the $H_2O$ content can be deduced. The instrument can be graduated to indicate the dielectric const. directly, and, if used always with one type of material, the $H_2O$ content. Data showing good agreement with direct determinations are reported for yeast. D. R. D.

**Sealed-in glass micro-electrode.** G. E. PICKFORD (Proc. Soc. Exp. Biol. Med., 1937, **36**, 154—157).—An electrode with capacity 0·06—0·25 c.c. is described. W. O. K.

**Salt bridge for electrometric measurements.** W. M. BRIGHT and E. L. MILLER (Ind. Eng. Chem. [Anal.], 1937, **9**, 346).—Modified apparatus is described. E. S. H.

**Brightness of cathodo-luminescence at low current densities and low voltages.** T. B. BROWN (J. Opt. Soc. Amer., 1937, **27**, 186—192).—With artificial willemite as the luminescent substance, for low c.d. $J$, and accelerating potentials $V$ 200—800 volts, the brightness of luminescence $B$ is given by $B = KJV^2$. A method of overcoming the difficulty of determining the potential of the target surface for work at low voltages is described. N. M. B.

**Controlled cathode sputtering.** G. TIMOSHENKO (Nature, 1937, **140**, 67).—The apparatus described allows accurate measurements of the rates of sputtering and of secondary electron emission from solid metals bombarded by A ions to be made. L. S. T.

**Use of krypton-filled ionisation chambers for cosmic-ray measurements.** S. ZIEMECKI (Nature, 1937, **140**, 150—151).—Ionisation due to cosmic rays is > twice as great in Kr as in A. L. S. T.

**Recording field current electrons with a Geiger–Müller counter.** R. T. K. MURRAY (Physical Rev., 1936, [ii], **49**, 195). L. S. T.

**Geiger–Müller photon counter. Quantitative aspects, detection of small intensities, use in absorption spectroscopy.** W. D. CLAUS and A. HOLLAENDER (Physical Rev., 1936, [ii], **49**, 409). L. S. T.

**Determination of frequency distribution characteristics with a photo-electric integrator.** I. J. SAXL (Physical Rev., 1936, [ii], **49**, 479).—The photo-electric device developed automatically measures the relative times of exposure of a photo-cell placed in the path of a moving beam of light. Frequency distribution curves thus obtainable have been applied to the analysis of textile yarns and metal wires. L. S. T.

**Gas density balance for determination of the absolute density of protium–deuterium mixtures and other gases.** N. R. TRENNER (J. Amer. Chem. Soc., 1937, **59**, 1391—1395).—Modified apparatus and technique are described. E. S. H.

**Hydrostatic micro-balance and its application to study of kinetics of heterogeneous reactions.** N. A. FIGUROVSKI (Zavod. Lab., 1937, **6**, 335—340).—The construction and use of a hydrostatic balance are described. R. T.

**Sedimentation analysis with a specific gravity balance.** E. HOFFMANN (Kolloid-Z., 1937, **79**, 314—315).—The principles underlying the use of a sp. gr. balance for the size-analysis of heterogeneous suspensions of a single substance are explained. Better results are obtained if the cylindrical buoyancy piece is only partly immersed. F. L. U.

**Operation of analytical micro-balances highly sensitive to temperature changes.** F. BREUER (Ind. Eng. Chem. [Anal.], 1937, **9**, 354).—Precautions are discussed. E. S. H.

**Laboratory gas generator.** G. P. ISCHTSCHENKO (Zavod. Lab., 1937, **6**, 254).—Apparatus for generating gas from petrol is described. R. T.

**Macro- or micro-Gooch filter.** R. E. DUNBAR (Ind. Eng. Chem. [Anal.], 1937, **9**, 355). E. S. H.

**Simple apparatus for automatic filtration.** A. P. WEBER (Chem. Weekblad, 1937, **34**, 515—516).—A simple apparatus constructed from a conical flask or bottle, glass tubing, and a Buchner filter is described. S. C.

**Preparation of membranes having graded porosities. Properties of "gradacol" membranes as ultrafilters.** W. J. ELFORD (Trans. Faraday Soc., 1937, **33**, 1094—1104; cf. A., 1933, 546).—The production of membranes with graded porosities by incorporating various liquids in the parent collodion and evaporating under known conditions is described. The behaviour of these membranes as ultrafilters, and the derivation, significance, and dependability of the "factor" employed in deducing the particle diameter of a suspension from the limiting pore diameter capable of retaining all the disperse phase, are discussed. J. W. S.

**Improvements in apparatus for centigram elementary analysis.** B. BROBAŃSKI (Z. anal. Chem., 1937, **109**, 338—341).—A needle valve is used for regulating the $O_2$ supply in C–H combustions. Improvements in $O_2$-purification tubes, in the gas regulator, and in the making of connexions to the combustion tube are described. J. S. A.

**Micro-centrifuge.** W. MACNEVIN (Ind. Eng. Chem. [Anal.], 1937, **9**, 356).—The apparatus is suitable for centrifuging hot solutions (*e.g.*, in the separation of $PbCl_2$ and AgCl). E. S. H.

**Ultra-centrifuge and the study of high-molecular compounds.** T. SVEDBERG (Nature, 1937, **139**, 1051—1062).—Apparatus and experimental pro-

cedure are described and illustrated. Recent work on proteins is summarised and mol. consts. are tabulated. L. S. T.

**Sedimentation equilibrium in the simplest air-driven tops.** J. W. McBain and C. Alvarez-Tostado (Nature, 1937, **139**, 1066).—A simple rotor for ultracentrifuging solutions of pure substances such as sucrose in order to determine mol. wt. is described. L. S. T.

**Micropreparative methods in organic chemistry.** A. Dadieu and H. Kopper (Angew. Chem., 1937, **50**, 367—372).—A general description of technique is given and apparatus is figured. F. L. U.

**Intermittent tube-inverter.** J. F. Barrett (J. Sci. Instr., 1937, **14**, 247—248).—The apparatus, for inverting tubes used in the extraction of pigments and fats from aq. solutions by org. solvents, operates and is regulated by the flow of water alternately into two cups which can rotate in a circle in a vertical plane about a horizontal axis supporting a bar at the ends of which the cups are mounted. N. M. B.

**Apparatus for analysis of nitrate–nitrite mixtures.** E. I. Gavasch and V. P. Vaniaschina (J. Chem. Ind. Russ., 1937, **14**, 423—424).—A gasometric method, involving decomp. of $NO_2'$ by $AlCl_3$, and of $NO_3'$ by $Fe^{II}$, is described. R. T.

**Reaction micro-apparatus.** D. S. Binnington (Ind. Eng. Chem. [Anal.], 1937, **9**, 353).—Modified apparatus is described. E. S. H.

**Sloping manometer.** M. Burton (Ind. Eng. Chem. [Anal.], 1937, **9**, 335).—The apparatus is suitable for the continuous reading of pressures of about 1 mm. undergoing const. variation. E. S. H.

**Recording by means of emanating power of changes in structure and surface even of very short duration. Thermal decomposition of thorium oxalate.** H. J. Born (Z. physikal. Chem., 1937, **179**, 256—262).—A modified apparatus for Hahn's emanation method of investigating the above changes is described; the ionisation current produced by the emanation flows to earth through a high resistance, the p.d. between the ends of which is recorded continuously by an electrometer. Application of the new procedure to the decomp. of $Th(C_2O_4)_2,6H_2O$ indicates that the state of combination of two of the $H_2O$ mols. differs from that of the other four. R. C.

**Building nuclear crystal structure models.** D. J. Fisher and E. H. Stevens (Amer. Min., 1937, **22**, 268—278).—A simplified method is described and illustrated by directions for the construction of a model of sanidine. L. S. T.

**Purification and determination of the degree of purity of liquids.** W. Swientosławski (Trav. Congr. Jubil. Mendeléev, 1937, **2**, 283—297).—Ebulliometric methods are described (cf. A., 1936, 1482). C. R. H.

**Principle of the Cartesian diver applied to gasometric technique.** K. Linderstøm-Lang (Nature, 1937, **140**, 108).—A method for measuring small amounts of gas liberated during chemical reactions is described. L. S. T.

**Pressure regulator for vacuum distillation.** R. L. Emerson and R. B. Woodward (Ind. Eng. Chem. [Anal.], 1937, **9**, 347—348). E. S. H.

**Laboratory purification of gases by fractional distillation.** H. S. Booth and A. R. Bozarth (Ind. Eng. Chem., 1937, **29**, 470—475).—A method and automatic apparatus for purifying gases, *e.g.*, chlorofluorides, by low-temp. fractional distillation, together with methods of testing the reflux ratio, and the m.p. and v.p. of the product, are given. D. K. M.

**Influence of expansion of vapours on the efficiency of distillation.** W. Swientosławski and E. Ramotowski (Rocz. Chem., 1937, **17**, 201—208).—The liquid is distilled in an apparatus consisting of four condensers, into which the vapour enters successively through valves, at the same time undergoing adiabatic expansion, so that a temp. gradient is formed. The apparatus gives more efficient rectification than do other types. R. T.

**Design and analysis of fractionating columns for complex mixtures.**—See B., 1937, 737.

**Jean Beguin and his "Tyrocinium Chymicum."** T. S. Patterson (Ann. Sci., 1937, **2**, 243—298).—Historical.

## Geochemistry.

**Thermal springs in Central America.** E. C. Deger (Chem. Erde, 1937, **11**, 249—255).—The $H_2O$ of medicinal hot springs in the volcanic district around Quezaltenango, Guatemala, contains free $H_2SO_4$, $Al_2(SO_4)_3$, $Na_2SO_4$, colloidal $H_2SiO_3$, etc. L. J. S.

**Influence of bog-water on the water of the Upper Vltava River.** J. Koran (Chem. Listy, 1937, **31**, 253—257).—The peat bogs at the sources of the Vltava do not contribute significantly to the contamination of the river $H_2O$. R. T.

**Salt efflorescences and ground waters of the Hungarian Great Plain.** S. A. Arany and J. Babarczy (Mezög. Kutat., 1937, **10**, 89—96).—Deterioration due to alkali and Mg is uniform throughout the region, the efflorescences consisting mainly of Na salts, $Na_2SiO_3$ being uniformly present in considerable amounts. The ground waters are all alkaline, the anions corresponding with those present in the efflorescences in the various districts. E. C. S.

**Composition of well-water of the Hungarian Great Plain.** S. A. Arany (Mezög. Kutat., 1937, **10**, 107—118).—The $H_2O$ from both drilled (deep) and dug (shallow) wells was alkaline in the northern region. E. C. S.

**Sediments dredged by the "President Théodore Tissier." (Continental shelf of the English**

**Channel and the North Sea.** L. BERTHOIS and J. FURNESTIN (Compt. rend., 1937, **204**, 1876—1878).—The sand deposits of various parts of the Continental shelf have been examined and classified according to size of grains. The results indicate that the mineral deposits off the coast of Holland may have their origin in the rocks of the English and French coasts. Currents play an important rôle in the building up of sand deposits and may considerably modify the mineral composition. W. R. A.

**Geochemistry and the periodic system of the chemical elements.** V. M. GOLDSCHMIDT (Trav. Congr. Jubil. Mendeléev, 1937, **2**, 387—396).—The geochemical properties of Ga, Sc, and Ge are discussed in relation to their positions in the periodic table, and the probable properties of elements having at. no. >92 are deduced. C. R. H.

**Outgrowths on zircon in the Middle Jurassic of Yorkshire.** F. SMITHSON (Geol. Mag., 1937, **74**, 281—283; cf. this vol., 102). L. S. T.

**Rocks of the Kedong Scarp, Kenya Rift Valley.** S. J. SHAND (Geol. Mag., 1937, **74**, 262—271).—Chemical analyses of a trachyrhyolite and an olivine-basalt are recorded. L. S. T.

**Geology and ore deposits of the Bayard area, Central Mining District, New Mexico.** S. G. LASKY (U.S. Geol. Survey, 1936, Bull. 870, 144 pp.).—The general character and distribution of the rocks, rock alteration, and ore deposits, their mineralogy and paragenisis, are described. L. S. T.

**Geology of the Coastal Plain of S. Carolina.** C. W. COOKE (U.S. Geol. Survey, 1936, Bull. 867, 196 pp.).—Mainly stratigraphical. Mineral resources are briefly discussed. Chemical analyses of the ground $H_2O$ of the various counties are recorded. L. S. T.

**Geology of the Monument Valley–Navajo Mountain region, San Juan County, Utah.** A. A. BAKER (U.S. Geol. Survey, 1936, Bull. 865, 106 pp.).—Mineral resources are discussed. Chemical and physical properties of oil from the San Juan oilfield are recorded. L. S. T.

**Geology of the Tonsina district, Alaska.** F. H. MOFFIT (U.S. Geol. Survey, 1936, Bull. 866, 38 pp.). L. S. T.

**Braunite from Mason Co., Texas.** D. F. HEWITT and W. T. SCHALLER (Amer. Min., 1937, **22**, 785—789).—Braunite (I) (chemical analysis and goniometric measurements given) forms the principal Mn mineral of the Spiller mine. The common oxides of Mn are absent. Isomorphous relationships between $Mn_2O_3$ and $Fe_2O_3$ in (I) are discussed. L. S. T.

**Chalcomenite from Bolivia.** C. PALACHE (Amer. Min., 1937, **22**, 790—795).—Chalcomenite from a new locality, Hiaco mine, Pacaake, is orthorhombic with $a:b:c = 0{\cdot}7325:1:0{\cdot}8077$, $a_0$ 6·65, $b_0$ 9·10, $c_0$ 7·36 A., $a_0:b_0:c_0 = 0{\cdot}731:1:0{\cdot}809$; space-group $P2_12_12_1$, and $Cu_4Se_4O_{12},8H_2O$ per unit cell; $d$ 3·35, hardness 2+; $n_X$ 1·712, $n_Y$ 1·732, $n_Z$ 1·732, all $\pm$0·002. Crystals are clear blue, transparent, and pleochroic. L. S. T.

**Helvite from the Butte district, Montana.** D. F. HEWETT (Amer. Min., 1937, **22**, 803—804).—The occurrence of helvite, $3MnBeSiO_4,MnS$, as sparse yellow grains in a specimen consisting mainly of rhodonite and rhodochrosite is described. L. S. T.

**Cristobalite at Crater Lake, Oregon.** C. E. DUTTON (Amer. Min., 1937, **22**, 804—806). L. S. T.

**Relation between chemical composition and physical properties in the garnet group.** M. FLEISCHER (Amer. Min., 1937, **22**, 751—759).—The direct relationship between chemical composition and physical properties observed by Ford (A., 1915, ii, 570) has been confirmed by an examination of the analyses of garnets published since 1915. Calc. and observed vals. of $n$, and chemical compositions in % of pyrope, grossularite, spessartite, almandite, uvarovite, and andradite, of 57 garnets from numerous localities are recorded. Calc. and observed ($X$-ray) vals. of $a_0$ for 19 garnets are given. L. S. T.

**Crystal structures of alunite and the jarosites.** S. B. HENDRICKS (Amer. Min., 1937, **22**, 773—784).—$X$-Ray diffraction data give the following vals. of $a$ and $c$ for alunite (I), jarosite (II), argento-, natro-, ammonio-, and plumbo-jarosite, and the synthetic compound $3Fe_2O_3,4SO_3,9H_2O$: 6·96, 17·35; 7·20, 17·00; 7·22, 16·40; 7·18, 16·30; 7·20, 17·00; 7·20, 33·60; 7·16 and 16·90. Vals. for $d_{calc.}$ are 2·80, 3·24, 3·80, 3·29, 3·09, and 3·71, respectively. Crystals of (I) and (II) are pyroelectric, and for (I) this requires the space-group to be $C_{3v}^5 - R3m$, and the univalent jarosites probably have the same structure. The crystal structure of the (I)–(II) group of minerals, including karphosiderite, borgströmite, and hamlinite, is illustrated and discussed, and an explanation of the various types of isomorphous replacements shown by the group is advanced. These structures are characterised by linking between OH groups and an O of an $SO_4$. L. S. T.

**Mixed crystals $Mg_2Si_2O_6$–$LiAlSi_2O_6$ and $Mg_2SiO_4$–$LiAlSiO_4$.** E. DITTLER and A. HOFMANN (Chem. Erde, 1937, **11**, 256—277).—In the system $Mg_2Si_2O_6$–$LiAlSi_2O_6$ (Roozeboom's type V) $MgSiO_3$, as clinoenstatite (m.p. 1557°), can take up 20 mol.-% of $LiAlSi_2O_6$ in solid solution, and $LiAlSi_2O_6$, as optically uniaxial α-spodumene (m.p. 1380°), can take up 10 mol.-% $MgSiO_3$; in the gap there is an eutectic at 1250°. In the system $Mg_2SiO_4$–$LiAlSiO_4$ (Roozeboom's type IV), $Mg_2SiO_4$, as forsterite (m.p. 1890°), takes up 30 mol.-% of $LiAlSiO_4$, and $LiAlSiO_4$, as hexagonal α-eucryptite (m.p. 1388°), takes up 10 mol.-% $Mg_2SiO_4$; in the gap there is a break down to Li-spinel and mixed crystals of clinoenstatite with α-spodumene, and a eutectic at 1270°. Here there is a replacement of $Mg_2$ by LiAl in the crystal structure. L. J. S.

**Formation of dolomite and dolomitisation.** G. LINCK (Chem. Erde, 1937, **11**, 278—286).—A criticism (cf. Reuling, Abh. Senckenb. Naturf. Ges., 1934, **428**, 1—44). L. J. S.

**Montmorillonite from Dolmar, Meiningen.** H. JUNG (Chem. Erde, 1937, **11**, 287—293; cf. this vol., 206).—Analysis of the more abundant

pale yellow material associated with the pink shows this to be also montmorillonite. L. J. S.

**Occurrence of montmorillonite in some decomposition products of basalt in the Vogelsberg.** W. NOLL (Chem. Erde, 1937, **11**, 294—306).—Clayey material ("bole") found in fissures and pockets in weathered basalt at several localities was found in most cases to show the *X*-ray pattern of montmorillonite (I). *n* is also near to that of (I) from Montmorillon (1·541 on material dried at 110°). A white bole from Langsdorf gave $SiO_2$ 50·72, $Al_2O_3$ 15·97, $Fe_2O_3$ 2·14, MgO 5·73, CaO 1·99, $H_2O+$ 7·84, $H_2O-$ 15·92, = 100·31, and a dehydration curve similar to that of montmorillonite; the excess of $SiO_2$ (over $Al_2O_3:SiO_2 = 1:2$) is no doubt due to admixed quartz. The spacing $d_{001}$ ranges from 19·18 A. for moist material, 14·46 air-dried, to 11·77 dried at 110°. The formation of (I) is favoured with a Mg-rich rock and alkaline solutions; under other conditions kaolin is formed (A., 1936, 449). L. J. S.

**Alteration of biotite.** M. MEHMEL (Chem. Erde, 1937, **11**, 307—332).—50% aq. $H_2SO_4$ passed over small flakes of biotite for many hr. extracted all the bases and some $SiO_2$, leaving white flakes of amorphous $SiO_2$ (*n* 1·420). More dil. acid acts in the same direction but much more slowly. Alkali produces a red Fe coating on the flakes. When heated at 450—700° the biotite changes to yellow, *n* from 1·650 to 1·823, and 2*E* from 0° to 82°. It is suggested that bleached biotite (bauerite) in sedimentary rocks has been confused with muscovite and clay minerals. L. J. S.

**New types of pleochroic haloes.** G. H. HENDERSON (Nature, 1937, **140**, 191; cf. this vol., 275).—Examination of numerous biotite specimens from all parts of the world shows the existence of six types of pleochroic haloes. Four of these types, three of which are new, appear to arise from parents of such short periods that all activity has ceased. Ring radii and associated α-particles are given. All six types can be accounted for by known radioactive elements, and the radii appear to be const. in haloes contained in minerals of all geological ages. L. S. T.

**Roweite, a new mineral from Franklin, New Jersey.** H. BERMAN and F. A. GONYER (Amer. Min., 1937, **22**, 301—303).—Roweite, *d* 2·92±0·02, hardness approx. 5, has (*X*-ray) $a_0$ 8·27 ±0·01, $b_0$ 9·01±0·01, $c_0$ 6·62 ±0·02 A.; MnO 28·30, MgO 1·66, ZnO 3·13, CaO 25·40, $B_2O_3$ 32·40, $H_2O$ 8·51, insol. 0·84, total 100·24%, corresponding with $4[H_2(Mn,Mg,Zn)Ca(BO_3)_2]$, with Mn : Mg : Zn = 10 : 1 : 1, mol. wt. of unit cell 873. L. S. T.

**Fluorescent sodalite.** L. L. SMITH (Amer. Min., 1937, **22**, 304—306).—The sodalite which occurs in the nepheline syenite from Beemerville, New Jersey, fluoresces a brilliant red-orange colour in ultra-violet light, by means of which it can be distinguished from the nepheline. A similar behaviour is shown by the sodalite which occurs in the nepheline syenite from Red Hill, New Hampshire. L. S. T.

**Paragenesis of the minerals from Blueberry Mountain, Woburn, Massachusetts.** W. E. RICHMOND, jun. (Amer. Min., 1937, **22**, 290—300).—These minerals are explained in terms of a magmatic sequence, granodiorite, granite, aplite, and pegmatite, followed by two periods of hydrothermal activity during which many minerals, including allanite, orangite, and babingtonite, were deposited in the pegmatites and intersecting veins and in the surrounding rocks. L. S. T.

**Minerals and associated rocks at Copper Mine Hill, Rhode Island.** A. QUINN and J. A. YOUNG, jun. (Amer. Min., 1937, **22**, 279—289). L. S. T.

**Thenardite crystals from Rhodes Marsh, Nevada.** P. S. HEINS (Amer. Min., 1937, **22**, 307—308). L. S. T.

**Occurrence of stilbite in the Border Conglomerate, near Culpepper, Virginia.** R. O. BLOOMER (Amer. Min., 1937, **22**, 309—310). L. S. T.

**Granite pegmatites of Southern Norway.** H. BJØRLYKKE (Amer. Min., 1937, **22**, 241—255).—Minerals found in Norwegian granite pegmatites are tabulated, and *X*-ray analyses of Norwegian columbites and tantalites are given. The origin of the pegmatites carrying rare minerals is discussed. The amounts of the characteristic elements, Ti, Nb, Ta, W, and Be, vary widely in the different pegmatites, and no relationship between the main composition of the pegmatite and the amount of rare minerals is apparent. The accessory elements of the granite pegmatites are divided into the four groups, (i) the rare-earth elements (Y, La, and lanthanides), Th, and U, (ii) Zr and Hf, (iii) Ti, Nb, Ta, and W, and (iv) Be. The absence of minerals containing Li and Sn is characteristic of these pegmatites. The sequence of crystallisation in the two genetic groups viz., (*a*) magmatic, and (*b*) hydrothermal pneumatolytic pegmatites, into which the granite pegmatites may be divided, is discussed in detail. L. S. T.

**(A) Geology of part of the Upper Luangwa Valley, N.-E. Rhodesia. (B) Pre-Karroo landscape of the Lake Nyasa region, and a comparison of the Karroo structural directions with those of the Rift Valley.** F. DIXEY (Quart. J. Geol. Soc., 1937, **93**, 52—76, 77—93). L. S. T.

**Carboniferous limestone of the Mitcheldean area, Gloucestershire.** T. F. SIBLY and S. H. REYNOLDS (Quart. J. Geol. Soc., 1937, **93**, 23—51).—The geological succession is described and illustrated. L. S. T.

**Kalgoorlie geology re-interpreted.** J. K. GUSTAFSON and F. S. MILLER (Econ. Geol., 1937, **32**, 285—317). L. S. T.

**Geology of the Little Long Lac [Gold] Mine [near Lake Superior].** E. L. BRUCE and W. SAMUEL (Econ. Geol., 1937, **32**, 318—334).—The ore deposits are lodes made up of narrow veins of quartz (I). Metallic minerals, mainly sulphides, are present, but are not abundant in the veins. Arsenopyrite and pyrite form approx. 1·5% of the ore. Au occurs somewhat abundantly and uniformly distributed throughout (I), so that 20% of (I) is sufficient to form ore. The wall rocks are scarcely altered and contain little Au. L. S. T.

**Origin of the bedding replacement deposits of fluorspar in the Illinois field.** L. W. Currier (Econ. Geol., 1937, **32**, 364—386).—The banded fluorspar deposits of the Cave In Rock district are attributed to replacement of limestone and the preservation of bedding and cross-bedding of the rock. Reaction between HF and $CaCO_3$ was stoicheiometric, but the consequent reduction in vol. was made good by continued deposition of $CaF_2$ from other places. Bastin's view (Illinois State Geol. Survey, 1931, Bull. 58) that banding is due to periodic pptn. is not supported. L. S. T.

**Mineralisation and metamorphism at the Eustis mine, Quebec.** J. S. Stevenson (Econ. Geol., 1937, **32**, 335—363).—The pyrite–chalcopyrite deposit of this mine is described, and the association with sodic rocks and the localisation of pyrrhotite and cubanite in the ore is pointed out. The country rocks comprise schistose sodic porphyry, muscovite schist resulting from its metamorphism, and a massive carbonate rock that is largely a hydrothermal alteration product of the schist. Chemical analyses [A. Willman] of these related rocks are given and discussed. The ore bodies were formed probably from hydrothermal solutions, source unknown, and not from aquo-igneous melts. L. S. T.

***X*-Ray analysis of the structure of fibrous tourmaline.** S. R. Swamy and K. Y. S. Iyengar (Proc. Indian Acad. Sci., 1937, **5**, **A**, 419—422).—Specimens of tourmaline, marginally fibrous, have been examined. The fibrous portion in which the crystallites are arranged with [*c*] as fibre axis have the same cell dimensions as the core, which is a single crystal, or a mosaic of similarly oriented crystallites. F. J. L.

**Genesis of the Permian salt deposits.** V. I. Nikolaev, N. I. Bujalov, and I. N. Lepeschkov (Bull. Acad. Sci. U.R.S.S., 1937, 399—412).—The salt deposits of Solikamsk and of Western Kazakstan originate from the drying up of the Permian Sea, which shrank in a S.W. direction. The Solikamsk deposits originate from a time when the brine had a concn. < the eutectic, and thus too low for crystallisation of K and Mg sulphates, which took place later, in W. Kazakstan, when the more conc. brine had flowed to the last remnants of the Permian Sea, now represented by Lake Inder. R. T.

**Kainite and polyhalite in the salt deposits of the Soviet Union.** N. S. Kurnakov, G. B. Borkij, and I. N. Lepeschkov (Compt. rend. Acad. Sci. U.R.S.S., 1937, **15**, 331—336).—The physical properties of kainite, found in the Osinki region, and of polyhalite, found in the Aschtscha–Bulak region, are described. A. J. M.

**Potash deposits on the right bank of the Volga and in Calmuck.** V. I. Nikolaev, O. K. Janatjeva, and V. D. Poljakov (Compt. rend. Acad. Sci. U.R.S.S., 1937, **15**, 337—340).—The composition of the deposits is given. A. J. M.

**Crystalline form of acmite.** G. Cesàro and J. Melon (Bull. Acad. roy. Belg., 1937, [v], **23**, 439—455).—An examination and discussion of available data. N. M. B.

**Chemical composition of three varieties of Hsin Shih or arsenic stones.** H. Y. Fang, C. L. Liu, and P. P. T. Sah (Sci. Rep. Nat. Tsing Hua Univ., 1937, **4**, **A**, 49—51).—Red, white, and black varieties of this stone contained $H_2O$ 0·01, 0·21, and 0·07, As 76·34, 74·4, and 74·66, S 0·01, 0·11, and 0·05, and unsublimable residue 0·07, 3·6, and 1·28 ($SiO_2$ 0, 2·6, and 0·86%), respectively. R. S. C.

**"Bidalotite," a new orthorhombic pyroxene derived from cordierite.** B. R. Rao and L. R. Rao (Proc. Indian Acad. Sci., 1937, **5**, **B**, 290—296).—This occurs in a biotite-cordierite-hypersthene-granulite near Bidaloti in Mysore. It differs from the associated hypersthene in containing $Al_2O_3$ 4·90—10·55%, in its striking pleochroism, $\alpha$ pale yellow to colourless, $\beta$ and $\gamma$ lilac or purple, and $\alpha$ 1·656, $\beta$ 1·667, $\gamma$ 1·672. L. J. S.

**Mineralogical nature of the clays of El Golea (Sahara).** J. de Lapparent (Compt. rend., 1937, **204**, 1776—1778).—The clays are of the attapulgite type, but contain more K; they are analogous to bravaisite. A. J. E. W.

**Attapulgus clay.** P. F. Kerr (Amer. Min., 1937, **22**, 534—550).—*X*-Ray diffraction studies, determinations of *n*, and chemical analyses point to the identity of the clay mineral constituent in the fuller's earth from Attapulgus with montmorillonite (I). Recent data concerning a new mineral species "attapulgite" are not verified. The clay probably represents an accumulation of (I) as a weathering product from the decomp. of certain cryst. rocks of the highlands. Field relations of the clay, its structure and texture, as well as settling experiments, indicate that the fuller's earth beds were accumulated under shallow $H_2O$.

**Identification of certain gem-stone materials by their emission spectra.** D. H. Howell (Amer. Min., 1937, **22**, 796—802).—The technique described requires approx. 0·1 mg. of material, and a test with specimens of garnet, spinel, jadeite, nephrite, epidote, sillimanite, tourmaline, and andalusite gave a satisfactory differentiation of the various species. The method is applicable generally in distinguishing between species which have similar optical and physical properties, but different chemical composition. L. S. T.

**Investigation of precious stones.** J. Bolman (Chem. Weekblad, 1937, **34**, 496—501).—The physical properties of natural and artificial gems and the methods of measuring these properties are described. D. R. D.

**Mineralogic study of silicosis.** R. C. Emmons and R. Wilcox (Amer. Min., 1937, **22**, 256—267).—The amounts of $SiO_2$ extracted from various minerals such as sericite, biotite, asbestos, quartz, talc, etc. of particle size 1 to 10 $\mu$ by human or ox serum at 37·5°±0·5° over a period of 2 months have been determined. A theory of the cause of silicosis, based on the presence of colloidal $SiO_2$ in the lung, and the possible beneficial effects of protecting dusts by flocculation of the dispersed $SiO_2$ in the lung, are discussed. L. S. T.