# BRITISH CHEMICAL AND PHYSIOLOGICAL ABSTRACTS

# **APRIL**, 1944

# A I—GENERAL, PHYSICAL, AND INORGANIC CHEMISTRY

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# **BRITISH CHEMICAL AND PHYSIOLOGICAL ABSTRACTS**

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

APRIL, 1944.

#### I.—SUB-ATOMICS.

Photo-excitation in hydrogen and deuterium by cresium ions of 2500–25,000 e.v. K. Mehnert (Z. Physik, 1941, 117, 41–54).— Excitation functions for collisions between  $Cs^+$  and  $H_2$  and  $D_2$  have been measured for a no. of H and  $Cs^+$  lines in the energy interval 2500–25 000 e.W. at low grap preserves and rates of injection been measured for a no. of H and Cs<sup>+</sup> lines in the energy interval 2500-25,000 e.v., at low gas pressures and rates of ionisation. Stronger excitation of both Cs<sup>+</sup> and H lines is produced by Cs<sup>+</sup>  $\rightarrow$  D<sub>2</sub> than by Cs<sup>+</sup>  $\rightarrow$  H<sub>2</sub>. For small kinetic energies, equal excitation of H<sub>a</sub>, D<sub>a</sub>, and Cs<sup>+</sup> lines is produced in collisions involving H<sub>2</sub> or D<sub>2</sub> mols. of equal kinetic energy, if the Cs<sup>+</sup> is considered as stationary. For higher energy, H<sub>2</sub> produced the greater excitation. If the centre of gravity of the collision partners is considered as stationary, excitation depends only on their kinetic energy. At high energies, L. I. greater excitation is produced in H<sub>2</sub>. L. J. J.

Exchange of charge with simultaneous excitation in collisions of alkali-metal ions with hydrogen, helium, and mercury. K. Mehnert and W. Maurer (Z. Physik, 1941, 117, 55–63).—Alkali-metal arc lines emitted in collisions of alkali-metal ions with  $H_2$ ,  $D_2$ , He, and Hg are due to exchange of charge between the collision partners with simultaneous excitation of the alkali-metal atom formed. The lines emitted show the Doppler effect expected. Their intensity increases linearly with the gas pressure. The resonance principle is complied with. Excitation functions of Cs  $3^2P_{3/2} \rightarrow 1^2S_{1/2}(\lambda 4555 \text{ A.})$ in Cs<sup>+</sup>  $\rightarrow$  H<sub>2</sub> and Cs  $\rightarrow$  D<sub>2</sub> are measured. L. J. J.

Atomic-ray apparatus for luminous excitation of elements which are volatilised with difficulty. W. Paul (Z. Physik, 1941, 117, 774-788).—The inverse Stark effect in the CrI resonance multiplet at 788).—The inverse Stark effect in the Cr1 resonance multiplet at 4254 A. is measured at field strengths of 200—300 kv. per cm. by absorption measurements in a Cr at. beam. The red displacements at field strengths 206, 234, and 275 kv. per cm. are 1.6, 2.1, and  $2.9 \times 10^{-3}$  A. The effect is in agreement with Lochte-Holtgreven's data. Measurements of the hyperfine structure of the Be II resonance line at 3130 A., obtained in emission by excitation of a beam of at. Be by electron bombardment, give a val. between -0.4 and -0.8 for the g factor of the Be nucleus. (See also C., 1944, Part 2.) L. I. I.

**Badiation fields of Pr**<sup>+++</sup> and Nd<sup>+++</sup> ions in hexagonal salt crystals. K. H. Hellwege (Z. Physik, 1941, 117, 198-204).—Analysis of 34 lines in the spectra of cryst.  $Pr_2Zn_3(NO_3)_{12}$ , 24H<sub>2</sub>O and Nd<sub>2</sub>Zn<sub>3</sub>(NO<sub>3</sub>)<sub>12</sub>, 24H<sub>2</sub>O, in which only electronic transitions are involved, shows that electrical dipole radiation is involved in every case. The results agree with Van Vleck's theory of forbidden transitions in crystals assuming a cubic crystal field. L. J. J.

**Absorption spectra of the iron group.** I. B. Borovski and E. E. Vainschtein (*Compt. rend. Acad. Sci. U.R.S.S.*, 1942, 36, 130–132).—Special attention is called to the influence of symmetry of the wave function of the initial state of transition  $\psi_{\rm I}$  ( $KL_{\rm I} - 1s$ ; 2s;  $L_{\rm II, III} - 2p$ ) on the intensity of distribution in the fundamental edge and at a distance of 50 at the transit. edge and at a distance of 50 e.v. from it. Thus for  $W-L_I$  the edge has knicks on the long-wave regions without white lines on the short-wave side. For  $W-L_{\Pi}$ ,  $W-L_{\Pi\Pi}$ ;  $Cu-L_{\Pi}$ ,  $Cu-L_{\Pi I}$ ;  $Ni-L_{\Pi I}$  simple funda-mental edges with bright white lines on the short-wave side exist, which are lacking in <sup>30</sup>Zn and <sup>79</sup>Au. A new method of analysis leads to an identification of the short-wave max.  $(\nu/R)L_{\Pi}L_{\Pi}$  with the line  $(\nu/R)L_{\Pi}$  of the L edges and the influence of the short-wave function. line  $(\nu/R)L_{I}$  of the  $L_{I}$  edges, and the inflexion lines are hence found to shift 6-8 e.v. For ionic compounds the max. of the absorption lines on the frequency scale is shifted only 1.5 to 1.2 c.v., but the shift of the  $(\nu_0/R)$  term reaches 7 c.v. for ions of max. valency.

J. O'M.-B. Stark effect in the strontium I resonance line at 4607 A. H. Kopfer-mann and C. Otzen (Z. Physik, 1941, 117, 156-167).—The method described in the proceeding of the strong described in the preceding abstract has been applied to the Stark effect in Sr I. The  $\sigma$  and  $\pi$  components are displaced, respectively, towards the violet and red. The displacement is cc  $X^2$  in the range 100—300 kv. per cm. The 5p  $^1P_1$  and 5s  $^1S_0$  terms are split to comparable extents. The displacements found are  $\ll$  those predicted by theory, e.g.,  $\Delta \nu = 0.0104$  cm.<sup>-1</sup> for  $\sigma$  and 0.0320 cm.<sup>-1</sup> for  $\pi$ .

Theory of the continuous X-ray spectrum : short-wave limit. R. Weinstock (*Physical Rev.*, 1943, [ii], **64**, 276-278).—Mathematical. By passing to the limit of zero velocity for the scattered 73 p (A t) 73 D (A., I.)

electron, an earlier result (cf. A., 1942, I, 310) for the intensity dis-tribution of continuous X-radiation is reduced to apply at the shortwave limit. N. M. B.

**Compton effect and the hole theory.** J. Smorodinski (J. Physics U.S.S.R., 1943, 7, 92).—The cross-section of the Compton effect calc. by Bhabha *et al.* (A., 1942, I, 384) on the basis of the hole theory bis incorrect, and their conclusions concerning inconsistency in the Dirac theory are unfounded. A. J. M.

Measurements on selenium rectifiers and barrier-layer cells (an experimental contribution to Schottky's boundary-layer theory). (Frl.) A. Schmidt (Z. Physik, 1941, 117, 754-773).—Measurements of rectification characteristics as functions of applied potential, and temp-dependence of barrier-layer resistance and capacity, show that Se rectifiers can be assumed to have a barrier layer in the "exhaus-tion region," the effect being modified by field emission effects at the metal-semiconductor boundary. The closest approach to theoretical behaviour is obtained when the covering metal has a small val. for the work of emission of defect-electrons, e.g., Bi and Au. The postulates of Schottky's boundary-layer theory are fulfilled by Se rectifiers, so that a "physical" barrier layer is pro-duced by the electronic effect of the covering metal. L. J. J.

Quantum mechanics of secondary electron emission from transition metals. H. Schlechtweg (*Naturwiss.*, 1943, 31, 204-205).—The quantum-theoretical basis of the emission of secondary electrons is connected with the Coulomb interaction between the primary electrons and the metal electrons which are not in the states of the metallic lattice. Two cases are distinguished : (a) true metals with completed inner shells, and (b) transition metals, in which the s-band overlaps the d-band of the conductivity electron. The scattering of the primary electrons at the metal electrons is dealt with by the Born approximation. The unperturbed eigenfunction of a system consisting of an s-electron and a primary electron is obtained, and a similar expression holds for d-electrons. The probability of the occurrence of  $s \rightarrow d$ ,  $s \rightarrow s$ , and  $d \rightarrow d$  transitions is considered.

A. J. M. Theory of static fields. I. Phenomenological attempt to determine the proper field of an electron. G. Beck (*Physical Rev.*, 1943, [ii], 64, 366—375).—Mathematical. N. M. B.

Effect of space charge on electron beams. J. Aharoni (*Phil. Mag.*, 44, [vii], 35, 36-50).—Mathematical. H. J. W. 1944, [vii], 35, 36-50).-Mathematical.

Theory of electrical electron microscope for objects emitting electrons. A. Recknagel (Z. Physik, 1941, 117, 689-708).—A method of calculating the paths of electrons emitted from a surface is derived and used to form an image of the surface, without the assumption that the paths of the electrons are throughout nearly parallel with the optic axis. L. J. J.

New form of field electron emission at very low pressures from metallic surfaces dusted with insulating substances. H. Paetow (Z. *Physik*, 1941, 117, 399-408).—When a fine insulating powder, *e.g.*,  $Al_2O_3$ , MgO, S, or bakelite, is spread on the cathode of a discharge tube evacuated to  $10^{-3}$ — $10^{-7}$  torr., and a discharge started at 1000 to the discharge started at ~1000 v., the cathode becomes uniformly covered with a thin film of particles  $< 1 \mu$ . in diameter, and acquires a high electron emissivity at low potentials, *e.g.*,  $\sim 100$  ma. per sq. cm. at 200 v. The emissivity persists over the pressure range  $10^{-6}$ —10 torr. L. J. J.

**Micro-analysis by electrons.** J. Hillier (*Physical Rev.*, 1943, [ii], **64**, 318—319).—A special form of electron micro-analyser is described for investigating the velocity distribution of the electrons transmitted by thin collodion films. With 15—50-kv. electrons and irradiated masses of  $10^{-14}$ — $10^{-16}$  g., the velocity losses due to the excitation of the K-levels of C, N, and O were observed, and those of Be, Al, and Si were detected, the last two being weak. The K-level excitation of Fe could not be detected, but the L-level was sharp and strong. A line, presumably due to an M-level excitation of Fe, was observed. N. M. B. Statistics of multiple colligions. F. Möglich and R. Rompe (Z.

Statistics of multiple collisions. F. Möglich and R. Rompe (Z. Physik, 1941, 117, 119-124).—The temp. coeff. in the expression for the frequency of multiple collisions between electrons and sound quanta in a solid is calc. on the basis of maintenance of thermo-dynamic equilibrium, in accordance with Planck's formula. a. L. J. J. 74

Velocity formula in electronic theory of metals. W. Glaser (Z. Physik, 1941, 117, 20-22).—An electronic velocity formula is derived directly from the quantum-mechanical definition of current.

Electrical conduction in metals. I. Supek (Z. Physik, 1941, 117, 125-144).—Mean free paths of conduction electrons are calc. by a treatment analogous to the kinetic theory of gases. Expressions are derived for the sp. conductivity over the whole temp. range, agreeing with Bloch's expressions at high and low temp.

L. J. J. Activation of nitrogen in the presence of mercury. S. S. Joshi and A. Purushotham (*Proc. Indian Acad. Sci.*, 1943, 18, A, 218– 221).—N, at a pressure of a few cm. was passed through a discharge tube  $(D_1)$  with Al electrodes, then through a second tube  $(D_2)$  with one Hg electrode, and finally over a powdered I indicator. When  $D_1$  was excited, but not  $D_2$ , an after-glow was observed in  $D_4$  at ordinary temp. With  $D_2$  at 140° the Hg luminescence increased to such an extent (owing to collisions of the second type) as to mask the N<sub>2</sub> after-glow, but the I indicator showed that the N<sub>2</sub> was still excited. When  $D_2$  alone was excited at 30° the N<sub>2</sub> after-glow was observed, strongly enough to be identified spectroscopically, over a wide range of pressures. With  $D_2$  at 160° there was an intense afterglow, due to collisions with metastable Hg atoms. H. J. W.

Effect of metastable excited states on the normal current density and normal cathode potential fall in glow discharges in rare gases and rare-gas mixtures. J. Meissner (Z. Physik, 1941, 117, 325-343).— The effect of pressure on the cathode potential fall and c.d. is in accordance with similarity laws in pure rare gases, but in No-A mixtures both characteristics fall to low vals., and deviations from the similarity laws occur. Addition of 0.5% of A to Ne eliminates contraction in the discharge. The deviations are ascribed to a cathode surface effect. Large differences between cathode fall and min. p.d. for the initiation of the discharge in gases with metastable excited at. states are due to liberation of electrons from the cathode by metastable atoms. L. J. J.

Relative abundance of the isotopes of potassium in Pacific kelps and in rocks of different geologic age. K. L. Cook (*Physical Rev.*, 1943, [ii], 64, 278—203).—In view of reported variations in the relative abundance of the stable isotopes of O, C, and K, investigations on the <sup>3</sup><sup>1</sup>K/<sup>41</sup>K ratio were made with a Dempster doublefocussing mass spectrograph. To 1% accuracy, the ratio for kelps, Upper-Cambrian fossils, and rocks of early pre-Cambrian to Tertiary age shows no measurable variation. The average val. is 14:12 $\pm$ 0.28. Fluctuations are attributed to isotope effects of the hot-filament ion source. N. M. B.

Isotope distribution in molybdenum and validity of the reciprocity law. H. Lichtblau and J. Mattauch (Z. Physik, 1941, 117, 502— 509).—The reciprocity law is not valid for all types of plates used in mass-spectroscopy, but for the plates used by the authors the Schwarzschild exponential law holds. This only slightly reduces the discrepancy between their results and those of Hönigschmid and Wittmann (A., 1936, 1439). L. J. J.

Molybdenum isotopes produced by the disintegration of uranium. O. Hahn and F. Strassmann (Z. Physik, 1941, 117, 789-800).---The products of artificial disintegration of U are: (i) a 12-min. Mo, giving a very short-lived isotope of Ma, and (ii) a 14-min. Mo, giving a 14-min. Ma isotope. The previously reported 18-min. Mo is a mixture of the above. The 67-hr. Mo previously described is verified. L. J. J.

**Exclusion rule for neutron and proton emission from nuclei with** an odd charge. C. F. von Weizsäcker (*Naturwiss.*, 1943, 31, 207– 208).—The  $\frac{31}{12}$ P nucleus can break down into  $\frac{30}{2}$ Si with proton emission, or into  $\frac{10}{12}$ P with neutron emission. There are twice as many resonances in the case of neutron emission as in that of proton emission. The resonances in the case of neutrons can be regarded as two pairs of doublets, and the proton resonances have the same energy as one of the components of the doublet. A similar phenomenon is observed with  $\frac{11}{11}$ Na. Both the  $\frac{31}{12}$ P and the  $\frac{23}{12}$ Na nuclei have, in addition to a-particles, 2 neutrons and 1 proton. The above facts can be explained on the assumption that the two states of the doublet differ only in the mutual spin orientation of these three "excess" particles, and that the remainder of the nucleus, after emission of the proton or neutron, remains in the ground state. There are three possible states, in which the spins of the three particles differ. The possible transitions are discussed, and exclusion rules are considered. A. J. M.

**Maximum energy of**  $\beta$ -rays of some isotopes produced by fission of uranium. H. J. Born and W. Seelmann-Eggebert (*Naturwiss.*, 1943, 81, 201-202),—Approx. vals. for the max. energy of  $\beta$ -rays from 17 isotopes produced by fission of U have been obtained by consideration of absorption curves of rays of known energy (*E*), and two characteristic curves, one giving the connexion between max. range and *E* (used when the prep. was sufficiently active), the other giving the dependence of half-val. thickness (mass of Al per sq. cm. which reduces initial intensity to one half) on *E*. A. J. M. Energies of the  $\gamma$ -rays from <sup>132</sup>Sb, <sup>115</sup>Cd, <sup>192</sup>Ir, <sup>54</sup>Mn, <sup>65</sup>Zn, and <sup>60</sup>Co. C. E. Mandeville and H. W. Fulbright (*Physical Rev.*, 1943, [ii], 64, 265—267).—The distributions in momentum of Compton recoils arising from  $\gamma$ -rays emitted in the disintegration of radio-elements were obtained by coincidence counting in a magnetic spectrograph. From the end-points of the distributions the calc. quantum energies in Me.v. are, respectively, 0.80, 0.65, 0.63, 0.86, 1.14, each  $\pm 0.02$ , and  $1.33\pm0.03$ . N. M. B.

Disintegration schemes of radioactive substances, V. <sup>130</sup>I. A. Roberts, L. G. Elliott, J. R. Downing, W. C. Peacock, and M. Deutsch (*Physical Rev.*, 1943, [ii], 64, 268–275; cf. Livingood, A., 1939, I, 54; Tape, A., 1940, I, 53).—The decay of <sup>130</sup>I, studied by spectrometer and coincidence methods, proceeds by two modes of negatron emission of max.  $\beta$ -ray energy  $0.61\pm0.02$  and  $1.03\pm0.02$ Me.v. The high-energy spectrum represents  $60\pm10\%$  of the disintegrations and is accompanied by  $\gamma$ -rays of energies  $0.537\pm0.005$ ,  $0.667\pm0.008$ , and  $0.744\pm0.010$  Me.v. The low-energy spectrum is accompanied by the same three  $\gamma$ -rays and by a  $\gamma$ -ray of energy  $0.417\pm0.005$  Me.v. The coeffs. of internal conversion in the K shell are 0.0031, 0.0038, 0.0069, and  $0.012 (\pm 20\%)$  in order of decreasing  $\gamma$ -ray energy. The conversion in the L shell is much smaller. The Fermi plot of the complex spectrum can be separated into straight lines which may be extrapolated to obtain the correct disintegration energies. N. M. B.

Disintegration schemes of radioactive substances. VI. <sup>56</sup>Mn and <sup>56</sup>Co. L. G. Elliot and M. Deutsch (*Physical Rev.*, 1943, 64, [ii], 321-331).—Both nuclei decay to stable <sup>56</sup>Fe, which has excited states with excitation energies 0.845, 2.11, 2.66, and 2.98 Me.v. De-excitation of the three high-energy states always leads to the 0.845 level and thence to the ground state. The negatron spectrum of <sup>56</sup>Mn consists of groups with max. energies 2.86, 1.05, and 0.73 Me.v., and relative abundance 60: 25: 15, leading to the first, third, and fourth of the above excited states. The positron spectrum of <sup>56</sup>Co consists mainly of a single group of max. energy 1.50 Me.v. leaving the <sup>56</sup>Fe nucleus in the 2.11-Me.v. state. Orbital electron capture also takes place involving several other excited states. Energies of 8  $\gamma$ -rays emitted by <sup>56</sup>Fe are 0.845, 1.26, 1.74, 1.81, 2.01, 2.13, 2.55, and 3.25 Me.v., apparently multiples 2, 3, 4, 5, and 6 of 0.425 Me.v. The  $\beta$ -ray spectra have "allowed" Fermi-theory shape, and this and probability of orbital electron capture are discussed in terms of tensor interaction. Mass differences between neutral atoms, obtained from disintegration schemes, are <sup>56</sup>Mn – <sup>56</sup>Fe = 3.98, and <sup>66</sup>Co – <sup>56</sup>Fe = 4.96, and the threshold for the reaction <sup>56</sup>Fe(p, n)<sup>56</sup>Co 5.47 Me.v. N. M. B.

Occurrence of isomeric atomic nuclei. (A) J. Mattauch. (B) S. Flügge (Z. Physik, 1941, 117, 246-255, 265-266).--(A) It is concluded empirically that the energetically favoured g-g nuclei possess no isomerides. Isomerides exist in the case of nuclei with spin  $\geq 9/2$ .  $h/2\pi$  in the ground state; this should hold for the stable <sup>209</sup>Bi isotope.

(B) The significance of the above conclusions is discussed.

Theory of nuclear isomerism. N. Koyenuma (Z. Physik, 1941, 117, 358-374).—Integrations over the spherical functions corresponding to individual rotational impulses, necessary for the calculation of matrix elements for  $\gamma$ -transition probabilities, are given for l = 0 to l = 6. L. J. J.

Distribution and dissipation curves for ultra-radiation impact transmitted from air to lead, iron, and aluminium. H. Schmid (Z. Physik, 1941, 117, 452–481).—Distribution and dissipation curves for impacts generating >136,000 ion-pairs (>10 corpuscles) in Pb, Fe, and Al targets have been determined with a thin-walled pressure ionisation chamber and a tube-electrometer. Dissipation curves for Fe and Al can show two max., whereas those for Pb show one max. only except at the highest energies. Max. are at 2.25 cm. for Pb, 4.5 and ~10 cm. for Fe, and ~6.5 and ~35 cm. for Al. The effect is ascribed to the superposition of two processes, the first involving a multiplication of the shower, the second caused by mesotrons.

L. J. J.

#### II.—MOLECULAR STRUCTURE.

Band spectrum of carbon deuteride. L. Gerö (Z. Physik, 1941, 117, 709–721).—Rotational analyses are made of the (0, 0) and (1, 1) bands of the  $A^2\Delta \rightarrow X^2\Pi$  system of CD, the (0, 0), (1, 1), and (2, 2) bands of the  $C^2\Sigma \rightarrow X^2\Pi$  system, and the (0, 0), (1, 0), and (1, 1) bands of the  $B^2\Sigma^+ \rightarrow X^2\Pi$  system. Predissociation is indicated in the upper states of each band system. Band-origins, rotational consts., and spin- and A-splitting are calc. L. J. J.

Rotational analysis of the emission spectrum of CuF. L. H. Woods (*Physical Rev.*, 1943, [ii], **64**, 259-204).—The emission spectrum of gaseous HF at ~0·1 mm. pressure in a hollow Cu cathode was examined at 7000-2000 A. and showed an unknown band of widely spaced lines at 2450-2600 A., thought to be the  ${}^{2}\Sigma \rightarrow {}^{2}\Pi$  transition of HF<sup>+</sup>. From the same source the emission spectrum of CuF, obtained and photographed, showed band systems at 5700, 5060,

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and 4920 A. A rotational analysis shows that the three systems have the same lower state and are of the types  ${}^{1}\Pi \rightarrow {}^{1}\Sigma$ ,  ${}^{1}\Sigma \rightarrow {}^{1}\Sigma$ , and  ${}^{1}\Pi \rightarrow {}^{1}\Sigma$ . Consts. for the states are reported. The calc. rotational isotope effect accords with the experimental val, N. M. B.

ε band-system of the NO molecule. L. Gerö, R. Schmid, and K. F. von Szily (Naturwiss., 1943, 31, 203).—Emission photographs with NO, using a 21-ft. grating, give the  $\epsilon$ -absorption bands with considerably greater intensity than the  $\gamma$  bands. Rotation analysis of the bands at 2021 and 2091 A. shows that their lower states are the v'' = 2 and v'' = 3 levels of the NO <sup>2</sup>II ground state. The two bands have a common upper state, the rotation const. B being 1.99 cm.<sup>-1</sup> This is somewhat > the  $B'_0$  val. of the  $\gamma$  bands. The bands which are given in Guillery's term scheme (A., 1927, 496) as v' > 3 therefore belong to a separate  $\epsilon$  band system. A. J. M.

Intensity distribution in quartet-doublet bonds. II. I. Kovács and A. Budó (Z. Physik, 1941, 117, 612-620).—Intensity distribution in the branches of quartet-doublet bands  ${}^{4}\Pi(a){}^{-2}\Sigma$ ,  ${}^{4}\Pi(b){}^{-2}\Sigma$ ,  ${}^{4}\Pi(a){}^{-2}\Pi(a)$ ,  ${}^{4}\Pi(a){}^{-2}\Pi(a){}^{$ 

Infra-red absorption spectrum of methylene bromide vapour. D. Bårcā-Gălāțeanu (Z. Physik, 1941, 117, 589—595).—The absorption spectrum of CH<sub>2</sub>Br<sub>2</sub> in the region 1-5—15  $\mu$ . has been measured. The bands at  $\nu\nu$  3001, 3070, and 1361 cm.<sup>-1</sup> are regarded as CH<sub>2</sub> fundamentals activation of the Benner bende 2022 2020 and fundamentals corresponding to the Raman bands 2986, 3050, and 1390 cm.<sup>-1</sup> Bands at  $\nu\nu$  813, 1144, and 1232 cm.<sup>-1</sup> are ascribed to the mutual fundamental vibrations of the CH2 and CBr2 groups.

Absorption spectrum of chromyl fluoride vapour. K. H. Hellwege (Z. Physik, 1941, 117, 596-601).—The absorption spectrum of  $(CO_2F_2)$  is qualitatively very similar to that of  $CO_2C_2$ , with at least five diffuse bands repeated ~20 times in the region 17,500—21,500 cm.<sup>-1</sup>, with a period of 200 cm.<sup>-1</sup>, compared with 136 cm.<sup>-1</sup> for the chloride. The period is identified with a vibration frequency.

L. J. Absorption spectra of some organic solutions in the vacuum ulta-violet. J. R. Platt, I. Rusoff, and H. B. Klevens (J. Chem. Physics, 1943, 11, 535-544).—By the use of n-C<sub>6</sub>H<sub>14</sub> and n-C<sub>7</sub>H<sub>16</sub> as solvents, it is possible to investigate the ultra-violet absorption of org. com-pounds down to 1700 A. in 0.3-mm. cells, with a fluorite spectro-graph. The transmission limits in such cells have been determined for a no of solvents including H O. EtOH. MaOH. a. C. H. a. C. H. graph. The transmission mints in such tens have been determined for a no. of solvents, including  $H_2O$ , EtOH, MeOH,  $n-C_6H_{14}$ ,  $n-C_7H_{16}$ , Et<sub>2</sub>O, COMe<sub>2</sub>, and *iso*-C<sub>6</sub>H<sub>18</sub>. Absorption curves of some alcohols, ethers, ketones, acids, Bu<sup>β</sup>CHO, and  $\Delta^{\gamma}$ -octene (I) are given. The double-bond peak at 1840 A. for (I) is clearly obtained.

A. J. M.

Glass structure according to infra-red absorption spectra. J. I. Gerlovin (Compt. rend. Acad. Sci. U.R.S.S., 1943, 38, 126-127).-Γ. Τ. Gerlovin (Compt. rend. Acad. Sci. U.R.S.S., 1943, 38, 126-127).-Glass films of thickness ~10  $\mu$ . show a strong absorption max. at 9-10  $\mu$ , and fused quartz at 9  $\mu$ . This supports the assumption that silicate glasses consist of SiO<sub>4</sub> tetrahedra. A band at 12-13  $\mu$ . indicates a ring structure of the tetrahedra. Addition of metal oxides causes the max. of the bands to become more diffuse and to shift to longer  $\lambda$ . Results indicate that glass has cryst. properties which diminish as the composition becomes more complex. N. M. B.

N. M. B.

Relation between chemical composition and glass transmission in the infra-red. J. I. Gerlovin (*Compt. rend. Acad. Sci. U.R.S.S.*, 1943, 38, 170–172).—30 borate, 20 silicate, and 4 phosphate glasses, and vitreous SiO<sub>2</sub> and B<sub>2</sub>O<sub>3</sub> (with 0.5% PbO to prevent decomp. turbidity), were investigated. Silicate systems show the greatest transmission, with a broad feeble transmission band for Pb silicate glasses at 2.92.8-3.8  $\mu$ . Borate glasses show absorption bands at 2.85 and 3.7  $\mu$ . and, for lighter glasses, at 2.2 and  $2.4\,\mu$ .; B<sub>2</sub>O<sub>3</sub> has the least transmission. Phosphate glasses show absorption at 2.2 to a max. at a 3.5  $\mu$ . Fused quartz has a sharp absorption at 2.2 and a feebler max. at 3.7  $\mu$ . In all cases, addition of metal oxides to the glasses increases the transmission, the increase being more marked in passing from light- to heavy-metal oxides. N. M. B.

Polarisation of fluorescence and anisotropy of molecules of organic dyes. P. P. Feofilov (J. Physics U.S.S.R., 1943, 7, 68-79).— Curves showing the dependence of polarisation of fluorescent light on the  $\lambda$  of the exciting light (polarisation spectra) are obtained for on the  $\lambda$  of the exciting light (polarisation spectra) are obtained for rhodamine-B, Na fluorescein, Na eosin (I), trypaflavine (II), acridine-orange (III), benzoflavin (IV), Na perylenetetracarboxylate, æsculin, and pinakryptol-yellow. These polarisation spectra are sp. for each dye. For (I)—(IV) the variation of dichroism of oriented mols. with  $\lambda$  is investigated, and there is a correspondence between this and the polarisation spectrum. This indicates that the angles between emitting and abcorbing conflictors are not preceded during between emitting and absorbing oscillators are not produced during the excitation, but are inherent in the mol. The anisotropy of the mols. can be interpreted by means of an oscillator model in which the fluorescing mol. is regarded as an emitting oscillator with a no. of absorbing oscillators rigidly coupled to it. A. J. M.

Fluorescence of chlorophyll. Effects of concentration, temperature, and solvent. F. P. Zscheile and D. G. Harris (*J. Physical Chem.*, 1943, 47, 623-637).—Fluorescence spectra of chlorophyll-a (I) in 13 solvents and of chlorophyll-b in Et<sub>2</sub>O were investigated. With increase in concn. max. absorption shifts towards the red as a result of reabsorption of fluorescence. Fluorescence intensity decreases with time of exposure to the source of excitation, the intensity recovering after a period of darkness in the case of some solutions, e.g., in  $C_6H_6$ . With decrease in temp. the fluorescence max. of  $Et_2O$  solutions of (I) shifts towards the red and the fluorescence intensity C. R. H. increases.

Decay of phosphorescence of crystalline phosphors. M. Schön (*Naturwiss.*, 1943, 31, 203-204).—The decay curves for phosphorescence of two cryst. ZnS phosphors with the same activator eventually become exponential. This can be explained on the theorem of radiation provential to be chosen and the provential of the same activator eventually become exponential. theory of radiationless reversibility of electrons in the excited activator. Since the radiationless transitions are  $\infty$  the concn. (*n*) of electrons, and the transition giving rise to the glow is  $\propto n^2$ , a point must be reached in the course of the decay when the recombination of electrons with the excited activator must be decided by the *n* term. The reaction mechanism is then almost exclusively unimol., and the decay curve becomes exponential. The fact that only two of the phosphors give this exponential curve agrees with the fact that radiationless transitions depend greatly on structure. The onset of the exponential decay takes place earlier at higher temp.

A. J. M. ion. V. V. Luminescence of phosphors at the moment of excitation. Antanov-Romanovski (Compt. rend. Acad. Sci. U.R.S.S., 1942, 36, 125-129).-On the cessation of excitation the intensity of luminescence of  $CdSiO_3$  and  $CdB_2O_5$  powders activated by Mn falls at once to  $\sim 0$ . The luminescence increases quite smoothly from 0, so that the fall is not explicable by the presence of fluorescence. The kinetics of phosphorescence are examined; the simple bimol. theory can account for these results. A limited general comparison with experimental data is given, but this is hindered by experi-mental difficulties such as the (unknown) quenching properties of the exciting light. J. O'M.-B.

Phosphorescence and scintillation spectra. W. Kutzner (Z. Physik, 1941, 117, 575–588).—Comparison of phosphoresence spectra of ZnS phosphors produced by ultra-violet irradiation (<3700 A.) with spectra of scintillations produced by impact of a-particles shows that both spectra are compounded of the same six bands, with max intensities at 4650, 4800, 5200, 5560, 5930, and 6450 A. Spectra obtained with phosphors containing different activators, or with different methods of excitation, show different relative intensities in the six bands. The shorter- $\lambda$  bands are more prominent with a-ray excitation. These effects indicate that both spectra originate in the same source, *i.e.*, Zn or S atoms. L. J. J.

Structure of halide phosphors containing tin. M. Hüniger and J Rudolph (Z. Physik, 1941, 117, 81–99).—Luminescence in alkali, alkaline-earth, and NH<sub>4</sub> halides containing small amounts of Sn<sup>II</sup> halides is excited by the same  $\lambda\lambda$  as are absorbed by single crystals of the phosphors and by conc. aq. solutions containing the halides with additions of Sn as completely co-ordinated complex salts. The no. of luminescence centres, determined from absorption measurements, is  $\sim 10^{-4}$ — $10^{-5}$  per halide mol. The emission spectra resemble those produced in reduction of Sn<sup>1v</sup> halides by alkali-metal vapours.

Raman spectrum of glycine, its dependence on pH, and the possitraining spectrum of glycine, its dependence on pH, and the possibility of its analytical use. J. Goubeau and A. Lüning (Ber., 1940, 73, [B], 1053—1058).—The Raman spectrum of glycine (I) is recorded from pH 13 to pH 0. (I) exists as  $NH_4 \cdot CH_2 \cdot CO_2^-$  at pH < 11.5, as  $^{+}NH_3 \cdot CH_2 \cdot CO_2^-$  at pH  $9 \cdot 4$ , and as  $^{+}NH_3 \cdot CH_2 \cdot CO_2H$  at pH < 1. Spectra of hydrolysates from gelatin and peptone indicate presence of (I), but other lines are also present. Raman spectra can probably be used generally to detect (I) (cf. C., 1944, Part 2; also Wright et al., A., 1937, I, 282). A., 1937, I, 282). R. S. C.

New experimental data on the structure of the Rayleigh line in benzene. M. F. Vuks (*Compt. rend. Acad. Sci. U.R.S.S.*, 1943, 38, 120—125).—Data obtained by a new method of investigating the distribution of intensity within the Rayleigh line, based on measuring the absorption of light passing through a resonance filter, are reported for  $C_8H_6$ . The calculation of the shape of the line from these data N. M. B. is given.

Electrostatic contribution to hindered rotation in certain ions and dipolar ions in solution. I, II. T. L. Hill (*J. Chem. Physics*, 1943, 11, 545—551, 552—557).—I. Effective dielectric consts. ( $\epsilon_E$ ) are calc. for  $H_2C_2O_4$ ,  $(CH_2 \cdot NH_2)_9$ , glycine,  $\alpha$ -alanine, leucine, and  $NH_3 \cdot CHEt \cdot CO_2H$  from the experimental dissociation consts. and structural parameters. The electrostatic contribution to hindered structural parameters. The electrostatic contribution to hindered

rotation can be calc. from the  $\epsilon_{\rm E}$ . In the case of  ${\rm H_2S_2O_6}$ , for which the dissociation consts. are unknown, an approx. val. of  $\epsilon_{\rm E}$  (30) and sp. locations of point charges in the mol. are assumed. The electrostatic potential barriers are considered, and the ionic equilibria in  $H_2S_2O_6$  are discussed. II. The method used for the above work is extended to mols.

with an additional angle of rotation  $\{NH_2:[CH_3], NH_2, CH_2(CO_2H]_2, \beta$ -alanine, and  $H_4P_2O_7\}$ . The electrostatic contribution is considerably less important than other factors, and may be negligible in some cases. It is probable that in the cases of  $H_4P_2O_7$  and

 $H_2S_1O_6$  the treatment is over-simplified and that one  $\epsilon_E$  is insufficient for a complete solution of the problem. A. J. M.

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Polymorphism and dielectric constant. S. D. Gokhale, N. L. Phalniker, and S. D. Bhave (J. Univ. Bombay, 1943, 12, A. Part 3, 75-80).—The dielectric const. (c) of solid, fused, and supercooled liquid resorcinol, o- and p-NO<sub>2</sub>·C<sub>6</sub>H<sub>4</sub>·OH, and o- and p-C<sub>6</sub>H<sub>4</sub>Cl·OH was measured at  $\lambda\lambda$  520 and 90 m. and at various temp., and from the inflexions in the e-T curves the transition temp. between the unstable  $\beta$ - and stable a-forms are deduced. With o-NO<sub>2</sub>·C<sub>6</sub>H<sub>4</sub>·OH the transition point is 35°. With p-C<sub>6</sub>H<sub>4</sub>Cl·OH there are two forms, of m.p. 41° and 33°, respectively, but no definite transition point is detected. In other cases the results are in accord with previous observations. J. W. S.

Behaviour of solids in high-frequency electric rotating fields. H. Hartmann and W. Stürmer (*Naturwiss.*, 1943, **31**, 206).—According to Debye, a body suspended in a rotating electric field should experience a turning moment if the frequency of the field is of the order of a dispersion frequency of the body. The effect of rotating fields of  $\lambda$  1·2—5 m. on vinidur, calcite, parafin, alberite, COPh<sub>2</sub>, p-NO<sub>2</sub>·C<sub>4</sub>H<sub>4</sub>·OH, and p-C<sub>4</sub>H<sub>4</sub>Cl·NO<sub>2</sub> has been investigated, and the variation of turning moment with frequency has been determined.

A. J. M. **Nature of the chemical bond in some inorganic compounds.** G. B. Boki and E. E. Vainschtein (*Compt. rend. Acad. Sci. U.R.S.S.*, 1943, 38. 307-309).—The very short Al—Al and Pt—Pt distances 0.64 A. and 1.4 A., respectively, in (AlCl<sub>3</sub>)<sub>2</sub> and *cis*-[Pt(NH<sub>3</sub>)(C<sub>2</sub>H<sub>4</sub>)Cl<sub>3</sub>]<sub>2</sub> can be explained by a new type of intermetallic linking involving 2p and 5d electrons, respectively, corresponding with calc. vals. 0.35 and 0.71 A. for the at. radii. A similar linking is predicted for B.

General theory of fluctuations. H. Scheffers (Z. Physik, 1941, 117, 444-451).—A general parameter of state is included in a statistical treatment of generalised thermodynamic theory. L. J. J.

Derivation of Trouton's rule. M. S. Telang (J. Indian Chem. Soc., 1943, 20, 271–276).—Methods of deriving Trouton's rule are reviewed, and a new derivation, based on empirical rules of Guldberg  $(T_{\rm B} = \sim 0.66T_{\rm e})$  and Sugden  $(V_0 = 0.27V_{\rm e})$  and Sugden's density-temp. relation, is given. F. J. G.

#### III.-CRYSTAL STRUCTURE.

Rules for the conventional orientation of crystals; a correction. J. D. H. Donnay (*Amer. Min.*, 1943, 28, 470; cf. A., 1943, I, 272). L. S. T.

Vitreous state. M. L. Huggins, K. H. Sun, and A. Silverman (J. Amer. Ceram. Soc., 1943, 26, 393-398).—The difficulty of strictly defining the vitreous state and certain border-line cases is briefly discussed. The vitreous states of SiO<sub>2</sub>, SiO<sub>2</sub> glasses, S, Se,  $B_2O_3$ ,  $P_2O_5$ , etc., glucose, and polyvinyl alcohol (H-bridges), and the org. polymers, are described in some detail. J. A. S.

Structure of vitreons substances. E. A. Porai-Koschitz (Compt. rend. Acad. Sci. U.R.S.S., 1942, 36, 267-269).—X-Ray observations indicate the presence of individual crystallites of Na<sub>2</sub>O,4B<sub>2</sub>O<sub>3</sub> and of quartz in an Na<sub>2</sub>O-B<sub>2</sub>O<sub>3</sub>-SiO<sub>2</sub> glass. F. J. G.

Linkages in metallic calcium. P. Gombás (Z. Physik, 1941, 117, 322-324).—The author's theory of metallic lattices is employed for the determination of the chief lattice characteristics of Ca. Theoretical and experimental vals. for the radius of the elementary sphere in the equilibrium position of the atom, for the sum of the first and second ionisation energies of Ca, and for the sublimation energy of metallic Ca, respectively, are: 2·19, 2·17 A.; 456·2, 452·4 kg.-cal. per g.-mol.; 43·0, 39·2 kg.-cal. per g.-mol. L. J. J.

Chemistry of oriented growth of crystals of organic compounds. I. Oriented growth of anthraquinone on antimony. J. Willems (Naturwiss., 1943, 31, 208–209).—It is possible to grow anthraquinone (I) crystals from  $C_4H_8$  solution on a (0001) face of Sb in three positions. (I) separates in needle-shaped crystals with the long axis parallel to the (0221) or (01I2) axes of the Sb. A. J. M.

#### Isomorphism of organic compounds.-See A., 1944, II, 100.

Model substance for silicates. H. O'Daniel and L. Tscheischwili (Naturwiss., 1943, 31, 209-210).— $\beta$ -Wollastonite (CaSiO<sub>3</sub>) resembles NaBeF<sub>3</sub> in structure. Unit cell dimensions are given for both compounds; both have 12 mols. per unit cell and space-group  $C_{24}$ . Be<sub>3</sub>F<sub>3</sub> is a possible structural element in some beryllofluorides. The compound Na<sub>2</sub>[LiBe<sub>2</sub>F<sub>3</sub>] (I) can be obtained from the ternary system LiF-NaF-BeF<sub>2</sub>. Its powder diagram resembles that of gehlenite, Ca<sub>2</sub>[AISIAIO<sub>7</sub>]. Be<sub>2</sub>F<sub>3</sub> double tetrahedra are present as structural elements in (I). A. J. M.

Structural type of perowskite (CaTiO<sub>3</sub>). S. von Náray-Szabó (Naturwiss., 1943, **31**, 202—203).—Oscillation photographs with Cu Ka radiation (and some with Mo Ka radiation) have been obtained and agree with a pseudo-cubic unit cell, a 7.60 Å. Perowskite was formerly supposed to belong to the G5 type, but calculation based on Goldschmidt's ionic radii shows that the lattice is monoclinic; space-group  $C_{2A}^{2} - P_{21/m}$ . Other substances of the perowskite type (ABO<sub>3</sub>) have also been investigated. For many the type is G5 (e.g., BaTiO<sub>3</sub>, a 3.98 Ti-O 1.99 A.; BaSnO<sub>3</sub>, a 4.10, Sn-O 2.05 A.; BaZrO<sub>3</sub>, a 4.19, Zr-O 2.09 A.). The Goldschmidt radius for Zr<sup>4+</sup> (0.87 A.) is corr. to 0.77 A. PbZrO<sub>3</sub> (a 9.28 A.) and CdSnO<sub>3</sub> (a 7.80 A.) belong to the new perowskite type. The existence of the two types is due to the fact that the ions are arranged in the closest packing. A. J. M.

#### Crystal structure of braunite, 3Mn<sub>2</sub>O<sub>3</sub>, MnSiO<sub>3</sub>.—See A., 1944, I, 72.

Interpretation of the crystal structure of cementite. N. J. Petch (J. Iron and Steel Inst., Feb., 1944, Advance copy, 8 pp.).—From X-ray examination of cementite (I), extracted from quenched steel (C 1.8%), it is suggested that (I) is essentially a framework of close-packed Fe atoms held together by metallic bonding, with the small C atoms in the largest interstices, these atoms also being held in position by bonding which has a certain degree of metallic nature. Graphitisation of (I) is discussed. T. D. F.

X-Ray analysis of a new type of complex compound of quadrivalent platinum. A. M. Rubinschtein and V. G. Kuznetzov (Compt. rend. Acad. Sci. U.R.S.S., 1943, 38, 85–92).—The double salt  $[Pt(NH_3)_4Cl_2]Cl_2.[Pt(NH_3)_4NH_2Cl]Cl_2$  (cf. A., 1941, I, 278) gives a powder X-radiogram differing from those of its components and their mechanical mixture. F. R. G.

X-Ray studies of supercooled ethyl alcohol. A. Prietzschk (Z. Physik, 1941, 117, 482—501).—X-Ray diffraction curves of EtOH at  $-150^{\circ}$  show well-defined max. at  $\sin \theta/\lambda 0.14$ , 0.22, and 0.4 and inflexions at  $\sim 0.3$  and  $\sim 0.5$ . Apparent radial density distribution curves show max. at 0.5, 1.4, 2.3, 2.7, 4.1, and 5.6 A. In comparison with Harvey's results (A., 1940, I, 13) at 75°, the intramol. max. are very similar, whilst the intermol. max. are better defined. The no. of H linkings between O atoms is increased from 1.2 to 2 per mol., indicating formation of chains. L. J. J.

Change of colour and optical properties of beryls on heating.—See A., 1944, I, 71.

#### IV.—PHYSICAL PROPERTIES OF SUBSTANCES.

Magnetic spectrum in infra-low frequency. S. S. Lavrentiev (Compt. rend. Acad. Sci. U.R.S.S., 1943, 38, 233-236).—The induction in a soft Fe wire in a sinusoidal magnetising field consists of a part in phase with the field and a part with a phase lag of 90°. Measurements of the corresponding permeabilities as functions of the period show that the in-phase permeability increases in the range of periods near 1 min., whilst the out-of-phase component exhibits a max. This behaviour is in agreement with Arkadiev's theory of magnetic viscosity. H. J. W.

Preparation and properties of some compounds in the system  $H_2O-Na_4O-P_2O_5$ . E. Ingerson and G. W. Morey (Amer. Min., 1943, 28, 448-455).—Optical properties of all known compounds of Na<sub>2</sub>O and P<sub>2</sub>O<sub>5</sub> are given. Some of the data are new. Crystallographic and  $\rho$  data and methods of prep. are also given for some of the compounds. Nomenclature is discussed. Vals. of n for 11 glasses in the system NaPO<sub>3</sub>-Na<sub>4</sub>P<sub>2</sub>O<sub>7</sub> are recorded. L. S. T.

**Refractive index nomograph for liquid fatty acids.** D. S. Davis (Ind. Eng. Chem., 1943, 35, 1302).—From the data of Dorinson et al. (A., 1943, I, 119) a nomograph is constructed for determining the n of n-fatty acids from  $C_5H_{11}$ ·CO<sub>2</sub>H to  $C_{17}H_{36}$ ·CO<sub>2</sub>H at  $> 80^\circ$ . J. W. S.

Melting time of safety fuses. III. J. A. M. von Liempt and J. A. de Vriend (Z. Physik, 1941, 117, 18-19).—" Inertia consts." are determined for a no. of metals and alloys. No difference is found between vals. for wires of circular and rectangular crosssection. L. J. J.

Polymorphism of trilaurin. G. B. Ravitsch and G. G. Tzurinov (Compt. rend. Acad. Sci. U.R.S.S., 1943, 38, 314—316).—The smooth cooling curve of melted trilaurin shows an arrest at  $35.5^{\circ}$ , the m.p. of the *a* phase. The heating curve, after chilling to  $26^{\circ}$ , shows an arrest at  $46.5^{\circ}$ , the m.p. of the  $\beta$  phase, and after rapid chilling to  $20^{\circ}$ , an exothermal effect at  $34.5^{\circ}$ , ascribed to a transition of the *a* phase. Very rapid chilling to  $-15^{\circ}$  showed an arrest at  $20^{\circ}$  and an exothermal effect at  $15^{\circ}$ . A liquid-cryst.,  $\gamma$ , form is assumed, with m.p.  $15-20^{\circ}$ . L. J. J.

Joule effects in air. H. D. Baker (*Physical Rev.*, 1943, [ii], 64, 302—311).—Joule effect determination methods are reviewed historically, and features of apparatus and technique necessary for precision measurements are analysed. Construction and operation of apparatus built to these requirements are described, and sample data for air are given and compared with available vals. It is concluded that with detail improvements the method developed will reach 0.1% accuracy. N. M. B.

**Viscosity of** *n*-pentane. R. M. Hubbard and G. G. Brown (*Ind. Eng. Chem.*, 1943, 35, 1276–1280).—The viscosity ( $\eta$ ) of liquid n-C<sub>5</sub>H<sub>13</sub> is measured with a rolling-ball viscometer at 25–250° and

15—1000 lb. per sq. in. pressure. The results are compared with previous data. The  $\eta$  of  $n-C_3H_{12}$ , determined at 25° with a Bingham capillary-tube viscometer, is  $0.002296 \pm 0.000005$  poise.

I. W. S.

Viscosities at the b.p. of some primary amines, cyclohexane, and some of its derivatives. J. N. Friend and W. D. Hargreaves (*Phil.* Mag., 1944, [vii], 35, 57-64).—Continuing previously reported work on the rheochor (R) (cf. A., 1943, I, 301), measurements of  $\eta$ for a series of primary amines give a mean R = 20.6 for NH<sub>2</sub>. From *cyclo*hexane and its derivatives it is concluded that ring formation is accompanied by a loss of from 4.4 to 6 units in R. H. J. W.

Rigidity modulus of liquids and its dependence on temperature. M. Kornfeld (Compt. rend. Acad. Sci. U.R.S.S., 1943, 38, 298-300) .-- Measurements of effective modulus of rigidity and angle of phase displacement between deformation and stress for rosin at  $-5^{\circ}$ to 70° and frequencies  $2\cdot8 \times 10^3$ ,  $1\cdot3 \times 10^5$ , and  $2\cdot9 \times 10^5$  Hertz show agreement with Maxwell's representation of shear as the sum of viscous and elastic components. The rigidity modulus decreases with increasing temp., and is  $\ll 10^{10}$  dynes per sq. cm. L. J. J.

Critical shear stress [exerted on a sediment by a flowing fluid]. M. S. Quraishy (J. Univ. Bombay, 1943, 12, A, Part 3, 37-46). Assuming that the force impressed on a layer of sand by a moving fluid of the gravitational force on the particles when falling freely in a stationary column of the fluid, a theory of the transport of sediment by fluid currents is derived. It leads to results in accord with observation. J. W. S.

#### V.—SOLUTIONS, DISPERSIONS, AND MIXTURES.

Thermal diffusion in mixtures of molecules of small mass difference. K. E. Grew (*Phil. Mag.*, 1944, [vil], 35, 30-36).—Three gaseous mixtures were examined in a Clusius-Dickel column. In Ne-NH<sub>3</sub> the Ne, if present in concns. >75%, diffuses down the temp. gradient, but this behaviour is reversed at lower concns. In A-HCl the heavier mol. always diffuses down the gradient, and in  $N_2O-CO_2$  the  $N_2O$  does so. These results are discussed in terms of Chapman's theory (A. 1941, I, 201), and it is concluded that the mol. repulsions are not adequately represented by an inverse power law. H. J. W.

Diffusion of hydrogen through iron in relation to the nature of the surface, and its connexion with catalysis. H. Betz (Z. Physik, 1941, 117, 100—118).—The diffusion of H<sub>2</sub> through an Fe cathode bom-barded with H ions in a glow discharge is almost completely inhibited when the entry side of the Fe is abraded with emery, but is increased 2.4 fold when the exit side is so treated. The corresponding effects when the surface is ruled with parallel scratches, as a function of their distance apart, has been examined. The effect is attributed to return of the H into the discharge space from active centres on the sharp edges, where the recombination of H atoms is catalysed.

L. I. I Penetration of rare gases into metals. W. Bartholomeyczyk, W. Funk, and R. Seeliger (Z. Physik, 1941, 117, 651-656).— Preliminary investigation of the removal of rare gases in discharge tubes at low pressures indicates that the gas penetrates into the cathode as ions, while the cathode metal is disintegrated and redeposited by diffusion. L. J. J.

Adiabatic compressibilities of some aqueous ionic solutions and their variation with indicated liquid structure of the water. V. B. Corey (*Physical Rev.*, 1943, [ii], 64, 350–357).—Vals. are reported for single concns. of aq. solutions of 27 strong electrolytes determined at 25° from sound velocity measurements at a supersonic frequency [1015-24] her provide the provided event the structure of the structur (1015.24 kc. per sec.), and show a marked correlation with corresponding vals. of the partial molal vol. of the solvent  $H_2O$ . The change in compressibility per mol. fraction of solute accords with X-ray and other indications of  $H_2O$ -structure change. There is strong evidence that  $H_2O$  has a liquid structure which becomes more bighty concrited and compact with the interduction of increment. highly co-ordinated and compact with the introduction of ions.

N. M. B. **Cyanamide as a solvent and reaction medium**. E. C. Buckner (*Iowa State Coll. J. Sci.*, 1943, 18, 19-21).—Solvent properties of liquid CN·NH<sub>2</sub> are similar to those of H<sub>2</sub>O. Anomalous results in conductivity measurements and compound for conductivity measurements and compound formation are attributed to polymerisation of the solvent. F. R. G.

X-Ray study of dissociation of an iron-copper-nickel alloy.--See A., 1944, I, 54.

Solubility of hydrogen in palladium. E. A. Owen (Phil. Mag., 1944, [vii], 85, 50-57).—X-Ray investigations of the lattice changes 1944, [vii], 35, 50–57).—X-Ray investigations of the lattice changes when H is occluded by Pd at low pressures at 60–130° confirm the existence of a hysteresis effect. The X-ray reflexions from the  $\beta$  phase (rich in H) are always diffuse, even after annealing; this phase is thus finely divided. The *a* phase (Pd-rich) gives sharp reflexions which decrease in intensity as the H<sub>2</sub> pressure increases, but it is regenerated from the  $\beta$  phase during desorption in small aggregates giving diffuse lines. The results suggest a system not in thermal equilibrium. No evidence was found for the occurrence of metallic hydrides (cf. Lacher, A., 1937, I, 560). H. J. W. Solubility of lithium bromate and its hydrates. II. I. N. Averko-Antonovitsch (J. Gen. Chem. Russ., 1943, 13, 272—277).—Solubility data for LiBrO<sub>3</sub> (I) in the range  $-45^{\circ}$  to the b.p. of the saturated solution (143°) are given. Above  $52^{\circ}$  (I) crystallises out and below  $52^{\circ}$  LiBrO<sub>3</sub>, H<sub>2</sub>O (II) is the stable solid phase, but supercooled colutions for more reacting the solution of the saturated reacting the stable solid phase. I. N. Averkosolutions form very readily and exist as viscous syrups even at  $-70^{\circ}$ . The conversion of (I) into (II) below 52° is slow and determination of the solubility of (I) in the metastable region as far as 4° was possible; the solutions in contact with (I) could be kept for several days at  $-6^{\circ}$  to -7°. Extrapolation below  $-45^{\circ}$  on the ice-(II) f.p. diagram gave the subsetic point  $-47^{\circ}$  at 54.5% of (I). R. C. P. the eutectic point  $-47^{\circ}$  at 54.5% of (I).

Isolation of pure potassium nitrite from the commercial substance. T. M. Oza and B. R. Walavalkar (J. Indian Chem. Soc., 1943, 20, 315-317).—Pure KNO<sub>2</sub> can be obtained by cooling (ice + NH<sub>4</sub>Cl) with const. stirring a conc. solution of commercial KNO<sub>2</sub>. After removal of mother-liquor from the crystals the operation is repeated with the liquor. The m.p. of pure KNO<sub>2</sub> is  $407-408^{\circ}$ . The solubilities at 0° and at the cryohydric point of ice and NH<sub>4</sub>Cl are  $34\cdot3-34\cdot5$  and  $31\cdot5-31\cdot8$  g.-mol. per l. respectively, these vals. being > those hitherto accepted. C. R. H.

Solubility of ammonium persulphate in water and in solutions of solubility of aminomian persubilitie in water and in solutions of subburic acid and ammonium sulphate. J. F. Gall, G. L. Church, and R. L. Brown (J. Physical Chem., 1943, 47, 645—649).—Solubility (s) data at 15° and 20° for  $(NH_4)_2S_2O_8$  in  $H_2O$  and in solutions of  $H_2SO_4$  and  $(NH_4)_2SO_4$  and mixtures thereof are recorded.  $[H_2SO_4]$  range from 0 to 400 and  $[(NH_4)_2SO_4]$  from 0 to 100 g. per l. s decreases with increase in  $[H_2SO_4]$  and  $[(NH_4)_2SO_4]$ . s in  $H_2O$  is 520 g. per l. at 15° and 542 g. per l. at 20°. C. R. H.

Solubility of naphthalene in aqueous solutions of methyl, ethyl, *n*-propyl, and *n*-butyl alcohol at several temperatures. O. W. Mannhardt, R. E. De Right, W. H. Martin, C. F. Burmaster, and W. F. Wadt (*J. Physical Chem.*, 1943, 47, 685—702).— $C_{10}H_8$  solubility data at various temp. have been obtained for alcohol-rich aq. solubility of McOU EtoOU EtoOU and ParOU and wood for the data tions of MeOH, EtOH, PrºOH, and BuºOH and used for the detertransformation of the upper or, within the solubility gap, the upper two transformation temp. When considered in relation to published data they give a fairly good idea of the nature of the ternary ditectic surface, the line of three-phase monotectic equilibrium, and the ternary dispertion surface. B C. R. H. ternary dichortic surface.

Anthracene derivatives. V. Solubility of some salts of anthracene-mono- and -di-sulphonic acids. B. P. Fedorov and N. A. Lodi-gin (J. Appl. Chem. Russ., 1942, 15, 164-172).-100 g. of saturated aq. solution contain at 20° the following amounts of the salts without aq. solution contain at 20° the following amounts of the salts without hydrate  $H_{2}O$ : anthracene-1-sulphonic acid, K 0·41, Na 0·041, Ba  $(+3H_{2}O)$  0·071, Ca  $(+3H_{2}O)$  0·019, Mg  $(+4H_{2}O)$  0·073, Pb  $(+2H_{2}O)$  0·060, Zn  $(+6H_{2}O)$  0·048; anthracene-2-sulphonic acid, K  $(+2H_{2}O)$  0·060, Zn  $(+6H_{2}O)$  0·020, Ca  $(+H_{2}O)$  0·016, Pb  $(+2H_{2}O)$  0·007; anthracene-1: 5-disulphonic acid, K  $(+2H_{2}O)$  4·60, Na  $(+2H_{2}O)$  2·51, Ba  $(+4H_{2}O)$  0·37, Ca  $(+3H_{2}O)$  0·27, Mg  $(+3H_{2}O)$  0·15, Pb  $(+2H_{2}O)$  0·22, Zn  $(+4H_{2}O)$  0·15; anthracene-1: 8-disulphonic acid, K  $(+H_{2}O)$  0·060, Ca  $(+5H_{2}O)$  0·15; Pb  $(+2H_{2}O)$  0·23, Na  $(+3H_{2}O)$  2·26, Ba  $(+4H_{2}O)$  0·060, Ca  $(+5H_{2}O)$  0·18, Mg  $(+3H_{2}O)$  2·04, Pb  $(+2H_{2}O)$  0·018, Zn  $(+3H_{2}O)$  2·39; anthracene-2: 6-disulphonic acid, K 1·64, Na  $(+H_{2}O)$  1·21, Ba  $(+5H_{2}O)$  0·046, Ca  $(+5H_{2}O)$  0·24, Mg  $(+4H_{2}O)$  0·12, Pb  $(+4H_{2}O)$  0·048, Zn  $(+6H_{2}O)$  0·054; anthracene-2: 7-disulphonic acid, K 1·00, Na  $(+2H_{2}O)$  1·09, Ba  $(+6H_{2}O)$  0·90, Ca  $(+3H_{2}O)$  0·11, Mg  $(+2H_{2}O)$  0·067, Pb  $(+3H_{2}O)$  0·80, Zn  $(+4H_{2}O)$  0·11, Mg  $(+2H_{2}O)$  0·067, Pb  $(+3H_{2}O)$  0·80, Zn  $(+4H_{2}O)$  0·11, Mg  $(+2H_{2}O)$  0·067, Pb  $(+3H_{2}O)$  0·80, Zn  $(+4H_{2}O)$  0·18, Mg  $(+3H_{2}O)$  0·80, Zn  $(+4H_{2}O)$  0·19, Ba  $(+6H_{2}O)$  0·90, Ca  $(+3H_{2}O)$  0·11, Mg  $(+2H_{2}O)$  0·067, Pb  $(+3H_{2}O)$  0·80, Zn  $(+4H_{2}O)$  0·77 g. Vals. for 100° are given also. J. J. B. I. I. B. given also.

Permutoids. H. Kautsky (Kolloid-Z., 1943, 102, 1-14).—Permutoids, which are materials of such open lattice structure that gases and liquids can penetrate them and interact with their structural units, are discussed with particular reference to siloxen (I) and its units, are discussed with particular reference to shokel (I) and its derivatives. The degree of openness depends on the conditions of formation and subsequent treatment. The internal surface is determined from the adsorption isotherm; (I) is found to possess maximal subdivision, *i.e.*, the whole material is accessible to the adsorptive. The H atoms in (I) can be replaced rapidly and quantit-atively by halogens, OH, or NH<sub>2</sub>. Chemical changes are sensitive to energy-liberating processes, *e.g.*, the action of light, and many derivatives of (I) are coloured. Luminescence phenomena, which are common in oxidised (I) are described. Permutoid structures are common in oxidised (I), are described. Permutoid structures are inhomogeneous as regards composition and arrangement, and the concept of mols. cannot be applied. The importance of such structures in plant materials is pointed out. R. H. F.

Selective adsorption of hydrocarbons and water vapour on alumina at atmospheric pressure. C. C. Ku, R. L. Huntington, and L. S. Reid (Amer. Inst. Min. Met. Eng., 1943, Tech. Paper 1628, 13 pp.; Petrol. Tech.,  $\theta$ , No. 7).—The adsorption of H<sub>2</sub>O-hydrocarbon vapour mixtures by activated Al<sub>2</sub>O<sub>3</sub> occurs in three stages. In the first both components are adsorbed and the ratio of one component to the other remains const. In the second phase H<sub>2</sub>O vapour continues to

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be adsorbed at the expense of adsorbed hydrocarbon which is desorbed. The third phase obtains when the Al<sub>2</sub>O<sub>3</sub> is saturated with respect to both components. The adsorptive capacity of Al<sub>2</sub>O<sub>3</sub> for hydrocarbon is reduced in presence of H<sub>2</sub>O vapour although the adsorptive capacity for H<sub>2</sub>O is not seriously affected by the presence of hydrocarbons. The data and theory presented are applied to several problems relating to the large-scale design and operation of plants for the dehydration of natural gas. R. H.

Relationship between energy of adsorption of a vapour on a solid and of immersion of the solid in a liquid. G. Jura and W. D. Har-kins (J. Chem. Physics, 1943, 11, 561-562).—The heat of adsorption of a vapour on a solid can best be calc. from heats of immersion and condensation, but equations given in the literature for the relationship between these quantities are incorrect. A term involving heat of emersion of the solid and adsorbed vapour to form a clean surface should be subtracted from the usual expression. A. J. M.

Surface tension and activity of sulphur dioxide solutions of potassium thiocyanate. W. G. Eversole, T. F. Hart, and G. H. Wagner (J. Physical Chem., 1943, 47, 703-709).—The surface tension ( $\gamma$ ) at 15°, 20°, and 25° of dil. solutions of KCNS in liquid SO, has been determined. Activity coeffs. at the same temp. have been calc. from v.p. data. The plot of  $\gamma/\gamma_0$  against mol. concns. gives vals. which agree with the Onsager-Samaras equation (A., 1934, 1068) only at infinite dilution. At higher concns. the observed vals. of  $\gamma/\gamma_0$  are > the calc. vals. C. R. H. the calc. vals.

Interfacial tension of sodium secondary alkyl sulphate solutions against oils. R. G. Aickin (J. Soc. Dyers and Col., 1944, 60, 36– 40).—Interfacial tensions of solutions of Na sec.-alkyl sulphates (I) against hydrocarbon and other oils at 20° fall with increasing concn. A sharp break in the smooth curve occurs at the crit. concn. of 0.95 g. per l. whatever the nature of the oil phase. Addition of electrolytes to (I) reduces the interfacial tension and crit. concn., this effect being due almost entirely to positive ions, although it is demonstrated that negative ions have a slight influence in certain concns. The results are explained on the basis of a long-chain ion being the surfaceactive entity. C. S. W.

Antonoff's rule. G. Antonoff (J. Physical Chem., 1943, 47, 709-710).—A criticism of Yoffe and Heymann (cf. A., 1943, I, 276) and a defence of the rule. C. R. H. and a defence of the rule.

**Oil-water interface of mineral oil-polar compound mixtures.** R. G. Aickin (*J. Soc. Dyers and Col.*, 1944, **60**, 41-43).-Measurc-ments of the interfacial tension between H<sub>2</sub>O and various mixtures of mineral oil (I) with oleic acid, oleyl alcohol, and glyceryl monoleate (II) indicate the presence of a stable 1:1 (I)-polar compound complex over a wide range of concns., which explains the stability of emulsions stabilised by mixtures of oil-sol. and H2O-sol. polar compounds. (II) reduces the interfacial tension of (I) against  $H_2O$  to a very low val. and is active at concns. >2 g. per l. Solutions of (II) in (I) are shown to be micellar. C. S. W.

Extension of attractive energy of a solid into an adjacent liquid or film and decrease of energy with distance. W. D. Harkins and G. Jura (J. Chem. Physics, 1943, 11, 560-561).—Experiments on the attractive energy between TiO. (in the form of anatase) and H.O. and its variation with the thickness of the  $H_2O$  layer, indicate that films of  $N_2$  at -195.8°, and of  $H_2O$  at 25° are multimol. on many solids at higher pressures. The layers of the above liquids under the temp. conditions stated are 7-10 mols. thick. A. J. M.

Flotation experiments with 8-hydroxyquinoline as collector. V. Flotation experiments on oxide-like compounds in the presence of metallic salts. H. Erlenmeyer, H. Kam, and W. Theilheimer (*Helv. Chim. Acta*, 1943, 26, 1129—1131).—Addition of various metallic salts produces marked and sp. effects on the flotation of various metallic oxides, etc. in presence of 8-hydroxyquinoline. Results with Eq. 0. Cr. 0. hydroxyquinoline. with Fe<sub>2</sub>O<sub>3</sub>, Cr<sub>2</sub>O<sub>3</sub>, hæmatite, and chromite are tabulated.

. G.

Charge and stability of colloids. V. Potentiometric titrations of chromium hydroxide sol. VI. Absorption of precipitating and stabilising ions by  $As_3S_3$  and  $Fe(OH)_3$  sols at their coagulating concentrations. B. P. Yadava (*J. Indian Chem. Soc.*, 1943, 20, 219—222, 223—226; cf. A., 1943, I, 256).—V. Cr(OH)\_3 sols give results corresponding with those found for  $Fe(OH)_3$  and  $Al(OH)_3$ . The mechanism of the Cl' release is attributed to electrical adsorption on the surface of the colloidal particles. on the surface of the colloidal particles. VI.—Direct measurements of the adsorption of both ions of an

electrolyte by  $As_2S_3$  and  $Fe(OH)_3$  during coagulation of their sols show that ions bearing the charge of the same sign as the sol are adsorbed to an extent that decreases with increasing valency of the coagulating ion. The mol. ratios of coagulating ions of different valency adsorbed during coagulation vary only slightly with the speed of coagulation, and differ greatly from the ratios of their reciprocal valencies. The abs. adsorption of coagulating ions decreases with increasing valency, although the relative adsorption increases. The above statements refer to the total amounts of adsorbed coagulating ions minus the amount equiv. to the adsorbed non-coagulating ion. F. R. G.

Dependence of viscosity of nitrocellulose solutions on the degree of esterification. H. A. Wannow (Kolloid-Z., 1943, 102, 29-34). -Two esterindation. H. A. Wannow (*Rotiota-2.*, 1943, 102, 29-34).—1WO celluloses were nitrated in five mixtures of  $H_3PO_4-P_2O_5-HNO_3$  of varying HNO<sub>3</sub> content to give nitrocelluloses (I) of N content from 10.70 to 13.85%. The degree of polymerisation of (I) was found by osmotic pressure measurements to be closely similar throughout the series. The  $\eta$  of (I) in COMe<sub>2</sub> solution increased with N content of (I), extrapolated vals, of  $\eta_{\rm H_2}/c$  at  $c \rightarrow 0$  ranging from 0.168 to 0.316 in one instance. The increase is attributed to greater solvation of the (I). R. H. F.

"Viscosation," molecular form, and solvation [of colloidal solu-tions]. Proposal for standardisation. H. Fromm (Kolloid-Z., 1943, 102, 86-90).—The term "viscosation" is used to describe the increase of  $\eta$  with conc.. Methods of expressing conc.. are examined in relation to the change in size of solute particles arising examined in relation to the change in size of solute particles arising from solvation. New terms and symbols are proposed for the principal magnitudes in  $\eta$ -concn. relationships. R. H. F.

pH measurements on thixotropic gel systems using the glass electrode. R. C. Vogel and M. W. Lisse (J. Physical Chem., 1943, 47, 678—685).—The first gelation of three gel-forming substances  $[Fe(OH)_3, Th(MOO_4)_2$ , and bentonite], their thixotropic liquefaction, and the re-gelation of the sols have been examined. In the primary and the resolution of the system showed no pH change, whereas the pH of the  $Fe(OH)_3$  system decreased and the pH of the  $Th(MOO_4)_2$  system increased. No pH changes were observed during the subsequent liquefactions and re-gelations. C. R. H.

Theory of genesis of fibres. I. W. Ostwald (Kolloid-Z., 1943, 102, 35-60).-The general conditions determining formation of fibres of all types, natural and artificial, are discussed. A fibre can originate by translatory motion of a nuclear disc (solid fibre) or ring (hollow fibre), and can grow either basally or apically. It may result from any of the processes of condensation, deformation, dissolution, or partial dispersion. Five fundamental questions regarding the physico-chemical conditions necessary for fibre growth are considered in detail, viz., (1) processes providing material for the growing fibre, (2) transport mechanism making the material available at the right (2) transport international matring the matchinal available at the right point, (3) energy-providing processes, (4) factors determining direc-tion of growth, (5) formative mechanism controlling shape and size of fibres. The phenomena of growth of Ag fibres on heated  $Ag_2S$ and of Cu fibres on Cu<sub>2</sub>S are described in detail, and theories advanced which could be a solution of the could be advanced. which comply with the 5 conditions for growth. The Ag ions in which comply with the or contribution for growth. The has not be heated  $Ag_2S$  are mobile and exert an ionic pressure on a particle of Ag in contact with the  $Ag_2S$ . This leads to deposition of Ag atoms, electronic equilibrium being maintained by volatilisation of S derived from S ions in the lattice. Many details of the phenomenon are in accordance with the theory. The electrochemical processes are different in Cu fibre formation. R. H. F. are different in Cu fibre formation.

Electrokinetic properties and surface conductivity of cellulose and oxycellulose, with reference to the carboxyl group content. G. Rabinov and E. Heymann (J. Physical Chem., 1943, 47, 655-668). Experimental conditions and theoretical considerations affecting the streaming-potential method of determining the  $\zeta$ -potential of cellulose (I) are discussed. The samples examined were purified controlse (1) are discussed. The samples examines that here particular cottons, cotton wool, oxidised (I), mercerised (I), and regenerated (I). In distilled  $H_2O \zeta$  decreases and surface conductivity (K) increases with increase in acid val. of (I). Partial substitution by Na or Ca of H in the CO<sub>4</sub>H in (I) decreases  $\zeta$  slightly and K con-siderably. The effect of electrolytes is generally to decrease  $\zeta$ , but alkali chlorides increase  $\zeta$  to a max. at ~0.0001N., above which concn. & decreases. This max. is not due to dispersion of K. K is increased by uni-univalent and bi-univalent electrolytes and reduced by electrolytes furnishing ter- and quadri-valent cations. Of two explanations to reconcile increase of K with simultaneous decrease in  $\zeta$ , one assumes preferential anion adsorption on negatively charged surfaces, the other assumes that the parts of the double layer which determine  $\zeta$  and those which determine K are not identical.

C. R. H.

#### VI.—KINETIC THEORY. THERMODYNAMICS.

Attainment of thermal equilibrium between a gas and a hot surface. P. M. Doty (J. Chem. Physics, 1943, 11, 557-559).—Experimental data due to Bryce (A., 1937, I, 85) can be used to show that all the  $H_2$  mols. reaching a hot W wire come to equilibrium and return to the gas phase as atoms and mols. in equilibrium concns. governed by the temp. of the wire and the no. of mols. striking it. This is not applicable generally to gases in contact with hot surfaces. Mols. which suffer only elastic collisions with the hot surface are not in contact long enough for the attainment of equilibrium. It is probable that complete thermal equilibrium is attained only for mols. and surfaces between which chemi-adsorption occurs. A. J. M.

Isomerisation equilibrium allene  $\Rightarrow$  methylacetylene. D. A. Frank-Kamenetzki and V. G. Markovitsch (Acta Physicochim. U.R.S.S., 1942, 17, 308-313).—The vals. of the equilibrium const., calc. from spectroscopic and heat of hydrogenation data, are 15.6, 9.9, 5.5, 4.7, and 4.2 at 82°, 200°, 400°, 500°, and 600° respectively. With rise of temp. the proportion of  $C(:CH_2)_2$  in the equilibrium mixture rises from 6.0% to 19.2%. Revised vals. for the entropy of  $C(:CH_2)_2$  at these temp. are 60.92, 65.87, 73.44, 76.78, and 79.91 g.-cal. per degree per mol. respectively. C. R. H.

Transitions between homogeneous and heterogeneous systems. J. Stauff (Z. Elektrochem., 1941, 47, 820).—If the state of aggregation is determined as a function of total concn. by means of the law of mass action, it is possible to distinguish between homogeneous and heterogeneous equilibria in colloid systems. The equilibrium between colloidal aggregates and single mols. has been investigated in the case of soaps by means of colour indicators. The colour change of the indicator is determined spectrophotometrically. When the aliphatic chain has 8, 10, or 12 C the equilibrium is homogeneous.

A. J. M. Thermodynamic dissociation constants of hydroxy- and alkoxy-benzoic acids. B. Jones and J. C. Speakman (J.C.S., 1944, 19-21). -Thermodynamic dissociation consts., measured at 20° by a potentio-metric method, have been obtained for o-, m-, and p-OR·C<sub>6</sub>H<sub>4</sub>·CO<sub>2</sub>H where R = H, Me, Et, Pr<sup>a</sup>, and Pr<sup>β</sup> and for m-OBu<sup>a</sup>·C<sub>6</sub>H<sub>4</sub>·CO<sub>2</sub>H. where R = H, Me, Et,  $Pt^{o}$ , and  $Pt^{o}$  and for  $m \circ b = 0_{e} m_{e}^{2} e_{e}^{2} m_{e}^{2}$ . Where R = H or Me, pK increases in the order o < m < p, but where R = Et,  $Pt^{o}$ , or  $Pt^{\beta}$  the order is m < o < p. The influence of the size of R on pK varies with the position of the substituent in the nucleus. For o-compounds pK increases in the order  $H < Me < Et < Pt^{o} = Pt^{\beta}$ , but for m- and p-compounds the change in pK as R increases from H to  $Pt^{\beta}$  is irregular. The data are disjuncted with reference to existing theories of the effect of substituents cussed with reference to existing theories of the effect of substituents in C<sub>8</sub>H<sub>6</sub> compounds. C. R. H.

Raman spectra of some complex halides of mercury. M. R. Nayar and J. R. Saraf (J. Indian Chem. Soc., 1943, 20, 312—314).—Raman frequencies of mixed solutions of K and Hg<sup>II</sup> halides afford evidence of the existence in solution of the ions HgCl<sub>3</sub>', HgCl<sub>4</sub>'', HgBr<sub>4</sub>'', and HgI<sub>4</sub>''. The characteristic frequencies are 300, 274, 172, and 126 cm.<sup>-1</sup> The data favour the view that equimol. mixtures of HgCl<sub>2</sub> and KCl form KHgCl<sub>3</sub> in solution. Solubility difficulties prevented evidence being obtained for the formation of KHgBr<sub>3</sub> and KHgI<sub>3</sub> in solution. C. R. H. C. R. H. solution.

Thermodynamics of polar-non-polar solutions. H. Hartmann (Z. Elektrochem., 1941, 47, 856-858).—It is assumed that in a solution of polar mols. in a non-polar solvent, there is a statistical mol. atm. of dipolar mols. similar to the atm. of ions in strong electrolytes. Quant. treatment leads to no contradiction of experi-mental thermodynamic results. The view adopted gives a better explanation of dependence of concn. on f.p. depression.

A. J. M. Inter-relation of oxygen pressure, temperature, and composition in the system  $Fe_{2}O_{3}$ - $Fe_{3}O_{4}$ . N. G. Schmahl (Z. Elektrochem., 1941, 47, 821-836).—The relation between  $O_{2}$  pressure (p), temp., and composition in the above system has been investigated over the range 1290—1410°. The decomp. pressure over a known mass of vale was determined at const. temp. oxide was determined at const. temp., after which a definite quantity of  $O_1$  was withdrawn, and the decomp. pressure again determined. A univariant equilibrium exists over a certain range of compositions near the pure oxides. It varies with temp. according to the reaction near the pure oxides. It varies with temp, according to the reaction isochore. The heat of the reaction  $4Fc_3O_4 + O_2 = 6Fc_3O_3$  is calc. to be 124.3 kg.-cal., a val. which differs only slightly from that obtained by direct determinations at room temp. An equilibrium diagram is given (1100–1800°) including two isobars at p = 159 and 760 mm. A. J. M.

Binary system NaPO<sub>3</sub>-Na<sub>4</sub>P<sub>3</sub>O<sub>7</sub>. G. W. Morey and E. Ingerson (*Amer. J. Sci.*, 1944, 242, 1-6).—The work of Partridge *et al.* (A., 1941, I, 211) is, in general, confirmed. Phase equilibrium data and the phase diagram reproduced show that there is a eutectic at 552° and 0.31 wt.-fraction Na<sub>4</sub>P<sub>3</sub>O<sub>7</sub>, at which the cryst. phases are NaPO<sub>3</sub> and Na<sub>5</sub>P<sub>3</sub>O<sub>10</sub>, the only binary compound between the two end members. Na<sub>5</sub>P<sub>3</sub>O<sub>10</sub> melts incongruently at 622°, forming crystals of Na<sub>4</sub>P<sub>3</sub>O<sub>7</sub> and liquid containing 0.495 wt.-fraction Na<sub>4</sub>P<sub>3</sub>O<sub>7</sub>. Optical properties of these three compounds are recorded.

L. S. T.

Nature of the difference in the character of the phase diagrams of the higher fatty acids and corresponding triglycerides. G. B. Ravitsch and V. A. Volnova (*Acta Physicochim. U.R.S.S.*, 1942, 17, 323-336).—Various physical properties of the systems stearic acid-nel trigteering triggering triggering and the palmitic acid and tristearin-tripalmitin have been examined and the phase diagrams of the systems have been compared. In the acid system a mol. compound is formed giving limited solid solutions with both acids. If it is assumed that it is the H bond which enables mol. compounds to be formed, then the absence of  $CO_2H$  groups in the triglyceride systems explains why a similar mol. compound is not formed in this system. On the other hand continuous solid not formed in this system. On the other hand continuous solid solutions are formed which disintegrate with time as a result of the transformation of one of the triglycerides into a more stable form with a higher m.p. C. R. H.

Phase boundaries in ternary systems of sodium oleate, compared with other soaps. J. W. McBain, R. D. Vold, and K. Gardiner (*Oil* and Soap, 1943, 20, 221-223).—The boundaries of the region of

isotropic solution have been determined for freshly made solutions of Na oleate (I) in  $H_aO$  containing NaCl at 90° and 100° (cf. Vold, A., 1940, I, 112). Prolonged heating in glass tubes alters solutions (I), rendering the scap less sol. ( $\theta_i$  increases), apparently owing to instability of the scap itself rather than to reaction with glass. When Na silicate replaces NaCl, (I) is not salted out, but the solution tends to set to a clear jelly on cooling. Existing published data for the boundaries of isotropic solution of six individual pure soaps [Na and K laurate, Na palmitate and stearate, and (I) and K oleate] and the Na soaps of tallow, olive, and coconut oils in H<sub>2</sub>O containing salt at 90° and other temp., have been collated and the curves redrawn to the same scale for comparison.  $\theta_{\bullet}$  (temp. of ready solubility, cf. McBain, *et al.*, B., 1941, II, 390) for these and other commercial soaps are tabulated. In spite of its high solubility in H<sub>2</sub>O, (I) is almost as readily salted out by NaCl as is the stearate. The binary diagram found for pure (I) in  $H_2O(\theta_1 \text{ and } \theta_0 \text{ curves})$  is compared with the picture obtained for systems containing small amounts of NaCl (1.5% of the oleate present) such as are met with in commercial soap boiling. E. L.

Polytherm of the ternary system: sodium chloride-sodium bromidewater from complete f.p. to 50°. N. A. Vlasov and A. G. Bergman (Compt. rend. Acad. Sci. U.R.S.S., 1943, 38, 211-214).—Solubilities of NaBr and NaCl in  $H_2O$  are recorded for  $-20^\circ$  to  $50^\circ$ . In this temp. range there are two fields of solid solutions, one consisting of the anhyd. salts, the other of the dihydrates. The fields of crystallis-ation of icc, Na(Cl,Br),2H<sub>2</sub>O, and Na(Cl,Br),5H<sub>1</sub>O meet in a sutsetic point at  $-29\cdot2^{\circ}$  with NaCl 6.0, NaBr 31.6, H<sub>2</sub>O 62.4%.

R. G Fusibility diagram of the ternary system sodium chloride-fluoride-chromate. I. S. Rasonskaja and A. G. Bergman (Compt. rend. Acad. Sci. U.R.S.S., 1943, 38, 176-177).—In a study of baths for thermal treatment of metals, heat carriers, and welding fluxes, the ternary and the three component binary systems were investigated. NaCl-NaF has m.p. 675° (33.5 mol.-% NaF); NaCl-Na<sub>2</sub>CrO<sub>4</sub> has m.p. 572° (78.5 mol.-% Na<sub>2</sub>CrO<sub>4</sub>); NaF-Na<sub>2</sub>CrO<sub>4</sub> has m.p. 642° (81.5 mol.-% Na<sub>2</sub>CrO<sub>4</sub>); all are simple eutectics. The eutectic point of the ternary system is at 526° and NaF 13, NaCl 21.5, Na C-O 65.5 mol. 9 Na, CrO, 65.5 mol.-%. N. M. B.

Ternary systems barium chloride-dioxan-water and calcium chloride-dioxan-water. H. F. Bogardus and C. C. Lynch (J. Physical Chem., 1943, 47, 650-654).—Data for the 25° isotherm for both systems are presented in tabular and triangular diagrammatic form. The solvate,  $CaCl_2, C_4H_8O_2, 2H_2O$ , has been isolated. C. R. H.

Sulphate nitrophoska. I. Polytherm of the ternary system  $H_2O-K_2SO_4$ -  $(NH_4)_2SO_4$ . A. G. Bergman and M. L. Schelochovitsch (J. Appl. Chem. Russ., 1942, 15, 187-193).—The eutectic point for the  $H_2O-K_2SO_4$  system is at 6.5 wt.-% of  $K_2SO_4$  and  $-1.5^\circ$ , and for  $H_2O$  and  $(NH_4)_2SO_4$  at 39.6 wt.-% of  $(NH_4)_2SO_4$  and  $-18.85^\circ$ .  $(NH_4)_2SO_4$  and  $K_2SO_4$  form a complete series of solid solutions between the f.p. and 30° (no measurements above 30°).

J. J. B. Bergman (*Compt. rend. Acad. Sci. U.R.S.S.*, 1943, 38, 304-306).— In the system Ca(NO.) - KNO. NoNO. Bergman (Compt. rend. Acad. Sci. U.R.S.S., 1943, 38, 304—306).— In the system Ca(NO<sub>3</sub>)<sub>2</sub>-KNO<sub>3</sub>-NaNO<sub>3</sub> glasses are obtained by the solidification of melts in the field of primary crystallisation of  $4\text{KNO}_3$ , Ca(NO<sub>3</sub>)<sub>2</sub> and adjoining regions. The eutectic is at 133° and the ternary transition point is at 160° and 53.9% KNO<sub>3</sub>, 29.4% Ca(NO<sub>3</sub>)<sub>2</sub>. The system Ca(NO<sub>3</sub>)<sub>2</sub>-NaNO<sub>3</sub> has a eutectic at 232° and 54.9% of NaNO<sub>3</sub>, with no compound formation. The system Sr(NO<sub>3</sub>)<sub>2</sub>-KNO<sub>3</sub>-NaNO<sub>3</sub> shows neither glass nor compound form-ation L. J. J. ation.

Heat of formation of sodium aluminate solution and of cryolite. W. A. Roth (Z. Elektrochem., 1941, 47, 813) .- A preliminary note reporting thermochemical determinations with Na aluminate solution and Na<sub>3</sub>AlF<sub>6</sub>. The solubility of Na<sub>3</sub>AlF<sub>6</sub> and the sp. heat and electrical conductivity of its solutions have also been determined. No numerical data are given. A. J. M.

Enthalpy and heats of dilution of the system HCl-H<sub>2</sub>O. Van Nuys (*Trans. Amer. Inst. Chem. Eng.*, 1943, 39, 663—678).— The thermal properties of the system are represented on two charts, which enable direct determination of the heat changes in any interaction of HCl and  $H_2O$  to be made. F. RD.

High-temperature heat content of calcium carbide. G. E. Moore (Ind. Eng. Chem., 1943, 35, 1292-1294).—The heat content of  $CaC_2$  (purity 91%) has been measured at 200-1000°, and the results Care, (party of  $\gamma_0$ ) has been measured at 200—1000, at 447°  $\pm 5^{\circ}$  with  $\Delta H = 1330$  g.-cal. per g.-mol.  $C_p = 16.40 + 2.84 \times 10^{-3}T - 2.07 \times 10^5 T^{-2}$  at 25—447° and 15.40 + 2.00 × 10<sup>-3</sup>T at >447°. J. W. S.

#### VII.—ELECTROCHEMISTRY.

Electrical resistance of dilute alloys of copper, silver, and gold. J. O. Linde (*Metallurits.*, 1941, 20, 1140-1141).--The resistance and pressure coeff. of resistance of a no. of alloys of Cu, Ag, and Au

have been determined. The regularity of the results gives an indication of the condition of the outer electrons of the atoms going into solid solution. It is considered that with dissolved elements which have an outer electron configuration of the inert-gas type when in the free gas condition, the same configuration will often be formed in the dil. solid solution. The theoretical discussion of the regularity of the results is in agreement with Mott's views.

C. E. H.

Hydrogen bonds and electrolytic conduction. P. Wulff and H. Hartmann (Z. Elektrochem., 1941, 47, 858-867).—Huckel's theory of proton conduction in H<sub>2</sub>O is examined. The mobility of H' in dioxan-H<sub>2</sub>O mixtures was investigated, but no inference concerning the accuracy of Hückel's view could be made. Diffusion of H in acids does not agree with Hückel's theory. The theory that the bridges of the type  $\begin{pmatrix} H-Q-H-Q-H \\ H \end{pmatrix}^+$  or  $\begin{pmatrix} Q-H-Q-H-Q \\ H \end{pmatrix}^-$ , produced by polar association of OH groups with H bonds, is proposed. This is in agreement with the small temp. coeffs. of the mobilities of these ions, and gives a reasonable explanation of the effect of pressure on conductivity of acids and bases. A. J. M.

Electro-dialysis in a two-chamber cell. G. Untermann (Z. Elek-trochem., 1941, 47, 876-879).—If a cell, separated into an anode and cathode compartment by a diaphragm, is filled with a dil. acid, a stationary state is set up. Only H ions migrate through the diaphragm. The concn. change in the diaphragm is linear, and is an exponential function of potential. The potential at the dia-phragm is very small for the concns. involved. The current intensity is  $\infty$  concn. difference between anode and cathode compartments, and inversely  $\infty$  thickness of diaphragm. The concn. of electrolyte  $(C_{\mathbf{R}})$  in the cathode compartment when the cell is filled with acid can (C<sub>E</sub>) in the cathode compartment when the cent is more with action that the cathode compartment when the cent is the with action that be calc. from the formula  $C_x = C_0(4RTL\gamma/EFd)(u_{11}^* \cdot u_A) = 1 \pm \sqrt{\{1 - (i/i_0)\}}$  where  $C_0$  = initial concn., E = terminal voltage, L = half electrode distance, d = thickness of diaphragm,  $\gamma$  = free cross-section in the diaphragm for the solution,  $u_{11}^*$  = mobility of H<sup>\*</sup> in diaphragm,  $u_{11}, u_{21}$  = mobilities of ions in H<sub>2</sub>O, i = final current,  $i_0$  = initial current. A similar formula holds for the concn. in the mode compartment when the cell is filled with a base anode compartment when the cell is filled with a base.

A. J. M.

Contact potentials at water phases of meteorological interest. E. Lange (Z. Elektrochem., 1941, 47, 867-876).—In order to investigate the origin of atm. electricity, the contact potentials at the surfaces of the various  $H_1O$  phases have been determined. The ionisation method was used for  $H_1O$  phases in damp air. For the system fresh hoar-frost/ice, a contact potential of -0.30 v. was found in air. The val. depends on temp., frost and ice at temp. >  $-10^{\circ}$  giving no marked potential. For the system H<sub>2</sub>O/ice in air a potential of -0.10 v. was obtained. The effect of impurities was investigated. Metals have a positive potential against H<sub>2</sub>O in air, but in contact with a place is curfect that have a positive potential with a plane ice surface they have a negative potential.

A. Theory of concentration polarisation. B. Levitsch (Acta Physico-chim. U.R.S.S., 1942, 17, 257-307).—Mathematical. The influence of electrode rotation, electrode shape, and stirring of the electrolyte on the rate of supply of ions to the electrode has been investigated and extinct a contribute determine the back of the polytic state of the polytic state of the polytic state of the polytic back of the polytic state of the polytic back of the p and satisfactorily applied to available data. C. R. H.

Relation between metal overvoltage and activity of added organic substances in electrolytic deposition of metals. H. Fischer and J. Goesch (Z. Electrochem., 1941, 47, 879-889).—Addition of alkylamines to CuSO, solution causes an increase in the potential of separation of Cu with free acid present. The increase of potential rises with increasing concn. of the added substance. The larger is the added mol. the greater is the increase of potential, but isomeric amines may produce different effects. The magnitude of the increase and the form of the potential-time curve are dependent on the concn. of acid in the electrolyte in the case of many amines. The potential rise is usually not permanent, but has a marked effect on the nature has be deposit. For overvoltages >30 mv. finer-grained deposits are formed. A. J. M.

#### VIII.—REACTIONS.

Limits of inflammability and ignition temperatures of acetic anhydride. G. W. Jones, F. E. Scott, and B. S. Scott (U.S. Bur. Mines, 1943, Rept. Invest. 3741, 5 pp.).—The temp. between which air saturated with Ac<sub>2</sub>O forms innammable infittures are 4.6 and 74.4°, the respective concess of Ac<sub>2</sub>O being 2.67 and 10.13 vol.-%. The flash point of Ac<sub>2</sub>O determined in a Tag closed-cup tester is 51°, and the ignition temp. in air and O<sub>2</sub> are 392° and 361° respectively. C. R. H. air saturated with Ac<sub>2</sub>O forms inflammable mixtures are 47.3° and

Kinetics of consecutive reactions consisting of bimolecular and nimolecular stages. A. A. Balandin and L. S. Leibenson (Compt. rend. Acad. Sci. U.R.S.S., 1943, 39, 22-24).—The equations for consecutive reactions of the type  $2A \rightarrow B \rightarrow C$  are solved, and the results compared with experiment in the case of the formation of CH<sub>4</sub> from equimol. mixtures of NaOAc and NaOH. The reaction is made up of two consecutive ones. The formation of the formation of is made up of two consecutive ones. The first, the formation of an

intermediate compound, is bimol., and has a velocity coeff. « that of the unimol. conversion of the intermediate compound into the final products. The concn. of the intermediate compound is small. A. J. M.

Ether-like compounds. VII. Action of chlorine atoms on the returner-like compounds. VII. Action of chlorine atoms on the velocity of the spontaneous hydrolysis of esters by water. E. J. Salmi and T. Suonpaä (Ber., 1940, 73, [B], 1126—1131; cf. A., 1940, II, 64).—Relative  $k_{\mu}$  for hydrolysis of CCl<sub>3</sub>·CO<sub>3</sub>R at 25° in H<sub>2</sub>O or 50% dioxan are R = Me 480, Et 100, [CH<sub>2</sub>]<sub>3</sub>·OMe 275, and [CH<sub>2</sub>]<sub>3</sub>·Cl 796 (cf. A., 1939, I, 327). For CCl<sub>3</sub>·CH<sub>2</sub>·OAcyl  $k_{\mu}$  at 35° are acyl = CH<sub>2</sub>Cl·CO 0.000431 and CHCl<sub>3</sub>·CO 0.0302, and  $k_{\mu}$  at 35° are acyl = CH<sub>2</sub>Cl·CO 0.000431 and CHCl<sub>3</sub>·CO 0.0302. are acyl = Ac 0.00384, CH<sub>2</sub>Cl·CO 0.00653, and CHCl<sub>s</sub> CO 0.0314. For compounds, CRR'<CO  $\sim$ CH·CCl<sub>s</sub> relative h are R = R' =

H 237, R = H and R' = Me 100, R = R' = Me 8.02, and R = Me and R' = Et 2.23; corresponding vals. for  $k_a$  at 25° are 169, 100, 9.45, R. S. C. and 2.93, respectively.

Catalytic action of natural mineral waters. II. G. Cronheim (J. Physical Chem., 1943, 47, 638-645; cf. A., 1941, I, 214).---The catalytic oxidation of  $HCO_3H$  by  $H_3O_3$  and natural mineral The catalytic oxidation of  $HCO_{g}H$  by  $H_{2}O_{g}$  and hatthat initeral waters (M) from Saratoga Springs has been studied. Oxidation is complete in presence of  $H_{2}O_{g}$  and M, but in absence of M oxidation is very slow. Fe" ions are necessary for catalysis but their concn. is of secondary importance. The rate of oxidation depends on  $[H_{2}O_{g}]$ . The rise in pH due to removal of  $HCO_{g}H$  increases the dissociation of  $H_{2}O_{g}$  and the  $HO_{g}'$  formed reduces Fe" to Fe" which are necessary for catalysis. Cu", Mn", and to a small extent Pd" ions accelerate oxidation by influencing the oxidation-reduction ions accelerate oxidation by influencing the oxidation-reduction C. R. H. equilibrium of Fe ions.

Effect of temperature on rate of hydrolysis of triglycerides by pancreatic lipase.—See A., 1944, III, 284.

Catalysis of the liquid-phase stage of coal hydrogenation.—See B., 1944, I, 88.

Electrochemical oxidation of nickel hydroxide. N. P. Fedoteev and V. V. Svetschnikova (J. Appl. Chem. Russ., 1942, 15, 105-119).—The best conditions for electrochemical oxidation of an aq. 119).—The best conditions for electrochemical oxidation of an aq. suspension of NiO in a one-compartment cell are:  $\sim 28$  g of NiO per l., [NaCl]  $\gg 5_{\rm N}$ , [NaOH] = 0.025N, 16 amp. per l. of electrolyte, cathodic c.d. 0.075 amp. per sq. cm., anodic c.d. 0.1—1 amp. per sq. cm., the electrodes being of graphite. The black hydrate (I) obtained contains I.71 O per l Ni atom; the energy consumption is 20—30 kw.-hr. per l kg. of active O. A similar hydrate can be pre-pared by electrolysing 5N-NaCl between a Ni and a graphite anode and a Ni cathode but the energy consumption is higher since a large fraction of the OCl' produced is decomposed before meeting a particle of NiO; the ratio O: Ni in this hydrate is  $\leq 1.7$ . (I) can be used for pptg. Co" from the NiSO<sub>4</sub> baths for Ni refining in the same way as black hydrate manufactured by chemical oxidation with NaOCl. black hydrate manufactured by chemical oxidation with NaOCl. The electrochemical oxidation is more economical. J. J. B.

Electrolytic oxidation of thiosulphate [ions] in ethylene glycol solution.—See B., 1944, I, 98.

Alloy [electro]deposition.-See B., 1944, I, 111.

Quantitative effect of X-rays on ascorbic acid in simple solution and in mixtures of naturally occurring compounds .- See A., 1944, III, 284.

Photo-reduction of ferric chloride in aqueous solutions in presence of organic acids and sugars. P. R. Bavdekar (J. Univ. Bombay, 1943, 12, A. Part 3, 47–56).—The photochemical reduction of FeCl<sub>3</sub> in presence of  $H_2C_2O_4$ , citric or tartaric acid, glucose, sucrose, or fructose is of zero order. The temp. coeff. over the range 30– 40° is ~1.2. The rate of reduction increases with decreasing  $\lambda$ , and  $\alpha$  the intensity of the incident radiation, but the quantum efficiency at 35° is <0.5 under the most favourable conditions studied ( $0.05{\rm M}_{\odot}$ at 35° is <0.5 under the most layout able contradiction). FeCl<sub>3</sub> in presence of H<sub>2</sub>C<sub>3</sub>O<sub>4</sub> and with 4725 A. radiation). J. W. S.

J. W. S. Action of ultra-violet light on liquid benzene.—See A., 1944, II, 93.

Splitting of sucrose by ultrasound. I. L. Roitsch and A. S. Starker-man (Compt. rend. Acad. Sci. U.R.S.S., 1943, 39, 10-12).—The inversion of sucrose (I) by ultrasonic waves formerly reported (cf. Sokolov, A., 1936, 1077) may be due to changes of temp. The effect of temp. on the rate of inversion of (I) in acid solution has been investigated. The rate increases considerably with rise of temp. The effect of ultrasonic waves on the inversion has also been investigated, both in presence and in absence of acid, and with strict temp. control. In absence of acid, no change in the optical rotation of the solution was observed, and in solutions of (I) in dil. HNO, the variation of the rotation with time was identical in a sample which had been exposed to ultrasonic waves, and in another which had not. Hence ultrasonic waves of the intensity (0.25 w. per. sq. cm.) and frequency  $(6 \times 10^7)$  used have no effect on the inversion of (I). A. J. M.

#### IX.—PREPARATION OF INORGANIC SUBSTANCES.

Separation of molecules of equal masses in a separation tube. K. Clusius and H. Kowalski (Z. Elektrochem., 1941, 47, 819).  $C_3H_8-CO_2$  and He-D<sub>2</sub> mixtures have been separated by a separation tube, the  $C_3H_8$  and  $D_2$  appearing on the "heavy" side. Pure  $D_2$ has also been separated from  $H_2$ -HD mixtures. A. J. M.

Properties and dihydrate of lithium bromate. I. N. Averko-Antonovitsch (J. Gen. Chem. Russ., 1943, 13, 267-270).— $\rho$  and  $\eta$ of aq. solutions containing 10-52% of LiBrO<sub>3</sub> (I) are given; at 0°, the saturated solution contains 61.2% and at 20°, 64.5% of (I). At room temp., (I) readily forms supersaturated solutions from which the metastable phase [anhyd. (I)] separates; it forms pyramidal crystals consisting of fine aggregates in which the crystallites are there there are the supersaturated solution and straight short prisms with high n, strong double refraction, and straight extinction. LiBrO<sub>3</sub>,  $H_2O$  (II) separates from almost saturated solutions after seeding, in long thin rhomboidal plates having similar optical properties to (I); at 110°, (II) loses  $H_2O$  without melting. The *dihydrate*, LiBrO<sub>3</sub>,  $2H_2O$  (III), was isolated from the crystals deposited at ~-50° from a solution saturated at room temp. (III) forms short or flat prisms with optical properties similar to (I), melts in its H<sub>2</sub>O of crystallisation at  $60^{\circ}$ —70° and loses all H<sub>2</sub>O at 110°. This observation provides some evidence that, near the eutectic point (-47°), (I) crystallises as (III). R. C. P.

Complex compounds of diguanide with bivalent metals. VII. Copper, nickel and cobalt(ous) ethylenebisdiguanide salts. Cobaltous diguanidinium sulphate and hydroxide. P. Ray and S. P. Ghosh (*J. Indian Chem. Soc.*, 1943, 20, 291-297).— $(CH_2 \cdot NH_2)_2$ ,2HCl and dicyanodiamide (1 mol.) are fused at 140-150°, and the filtered  $CH_2 \cdot NH \cdot C(\cdot NH) \cdot NH \cdot C \cdot NH_2$  aq. extract is pptd. with CuSO<sub>4</sub>, to



give the complex sulphate, (I),  $[CuE \cdot H_{2}]SO_{4} \cdot 4H_{2}O_{3}$  almost insol. in  $H_{2}O_{3}$  stable to dil. but not conc. acids; the formula (A) is suggested for the complex. Digestion with NaOH affords the crude complex hydroxide,

(4.) affords the crude complex hydroxide, from which and the appropriate NH<sub>4</sub> salt the following salts are obtained:  $[CuE ext{H}_2](2, 1.5H_0 ext{II}); [CuE ext{H}_2]Br_2.1.5H_0;$  $[CuE ext{H}_2]I_2.1.5H_0; [CuE ext{H}_2](NO_3)_2.1.5H_2O.$  The following salts are obtained from (II) and Na or K salts:  $[CuE ext{H}_2]S_2O_3.2.5H_0;$  $[CuE ext{H}_2](SCN)_2.1.5H_2O; [CuE ext{H}_2](NO_3)_2.1.25H_2O; the base,$  $<math>[CuE],H_2O, is pptd. from (II) by dil. NH_3.$  The prep. of the Ni complex salts,  $[NiE ext{H}_2]SO_4,H_2O_4 and [NiE ext{H}_2]I_2.1.5H_2O (III), is$ analogous to that of (I), whilst the following salts are obtained from $(III): <math>[NiE ext{H}_2]SO_4.2.5H_2O; [NiE ext{H}_2]I_4.1.5H_2O;$  $[NiE ext{H}_2]SO_3.2.5H_2O; [NiE ext{H}_2](CNO_3)_2.1.5H_2O;$  $[NiE ext{H}_2](NO_2)_2.1.5H_2O; [NiE ext{H}_2](NO_3)_3.1.5H_2O;$  $[NiE ext{H}_2](NO_2)_2.1.5H_2O; [NiE ext{H}_2](NO_3)_3.1.5H_2O;$  $[NiE ext{H}_2](NO_2)_2.1.5H_2O; [NiE ext{H}_2](NO_3)_3.1.5H_2O;$  $[NiE ext{H}_2](NO_2)_2.1.5H_2O; [NiE ext{H}_2](NO_3)_3.1.5H_2O;$  $[NiE ext{H}_2](NO_2)_2.1.5H_2O; MiE ext{H}_2](NO_3)_3.1.5H_2O;$  $[NiE ext{H}_2](NO_2)_2.1.5H_2O, which gives a violet solution of a hydroxo aquocobaltic complex in BaCl<sub>2</sub> or boiling H_0. With very dil.$ NaOH, it gives impure base, <math>[CoE], but with NH<sub>3</sub> it gives a red solution containing Co<sup>TT</sup>. No other salts can be prepared. From diguanide sulphate,  $[CoD_2 ext{H}_2]SO_4.4H_2O$  is prepared analogously, and is dehydrated at 105° in N to  $[CoD_2 ext{H}_3]O(H)_3$  and  $Co(OH)_3$ , and in boiling H\_2O gives a violet hydroxoaquocobaltic bisdiguanide complex; the anhydro-base,  $[CoD_2 ext{H}_3]O(H)_3$  and  $Co(OH)_3$ , and in boiling H\_2O gives a violet hydroxoaquocobaltic bisdiguanide complex; the anhydro-base,  $[CoD_2 ext{H}_3]O(H)_3$  and  $Co(OH)_3$ , and in boiling H\_2O gives a violet hydroxoaquocobaltic bisdiguanide complex; the anhydro-base,  $[CoD_2 ext{H}_3]O(H)_3$  and  $Co(OH)_3$ , and in boiling H\_2O gives a violet hydroxoaquocobaltic bisdiguanide complex; the anhydro-base, [CoD

S. A. M. Equilibrium reactions important for chemical analysis. N. A. Tananaev and R. A. Lovi (J. Appl. Chem. Russ., 1942, 15, 214– 222).—Ag<sub>3</sub>PO<sub>4</sub> is transformed (99.8%) into AgCl by 0.1N-NaCl; the reverse reaction  $3AgCl + Na_3PO_4 \rightarrow Ag_3PO_4$  leads to the same equilibrium. Similarly,  $Ag_3AsO_4$  is transformed into AgCl, MgNH<sub>4</sub>PO<sub>4</sub> into  $Ag_3PO_4$  (by AgNO<sub>3</sub>) and Pb<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> (by Pb(NO<sub>3</sub>)<sub>2</sub>), and Mg(OH)<sub>2</sub> into AgOH (by AgNO<sub>3</sub>). (See also C., 1944, Part 2.)

B

Normal beryllium tungstate. V. I. Spitzin and V. I. Schostak . Gen. Chem. Russ., 1943, 13, 279-285).-BeWO4, 3H2O (I) was (J. Cen. Chem. Russ., 1943, 13, 219-250).--BeWO4, 3H<sub>2</sub>O (I) was obtained as a pale yellow viscous mass by prolonged interaction in aq. suspension at room temp. of Be(OH)<sub>2</sub> (II) and H<sub>2</sub>WO4 (III); its properties suggest a non-ionised structure [Be(H<sub>4</sub>O)<sub>3</sub>(WO4)]. Over P<sub>2</sub>O<sub>5</sub>, (I) is converted into BeWO4,2H<sub>2</sub>O. On heating, gradual dehydration of (I) occurs with rise of temp.; loss of the last mol. of H<sub>2</sub>O begins above 250° and is accompanied by dissociation into BeO and WO into BeO and WO<sub>3</sub>. Aq. solutions of BeSO<sub>4</sub> and Na<sub>2</sub>WO<sub>4</sub> interact with formation of basic Be tungstates; (II) and (III) when boiled together in aq. suspension yield small amounts of sol. complexes in which BeO : WO<sub>3</sub> approximates to 1 : 1.5. R. C. P.

Low-temperature yellow zinc silicate phosphor. H. C. Froelich (J. Physical Chem., 1943, 47, 669-677).—Yellow Zn<sub>2</sub>SiO<sub>4</sub> phosphors have been prepared by heating  $(800-850^\circ)$  a mixture of ZnO, SiO<sub>2</sub>, and preformed MnSiO<sub>3</sub> in steam and in absence of O<sub>2</sub>. The MnSiO<sub>3</sub> is prepared by heating MnCO<sub>3</sub> or MnO with SiO<sub>2</sub> in steam and H<sub>2</sub> at 800-850°. The primary reaction product is an amorphous

E (A., I.)

orthosilicate complex which crystallises at >775°. The Mn is present either as MnO or a Mn<sup>II</sup> silicate, and reduction of Mn<sub>3</sub>O<sub>3</sub> to MnO appears to be necessary. Phosphor formation probably pro-ceeds thus:  $2nZnO + Mn_2O_3 + (n + 1)SiO_2 \rightarrow nZn_3SiO_4,Mn_2SiO_4 +$  $\frac{1}{2}O_2$ , where  $n \ge 1$ . ZnO or Zn\_3SiO\_4 evidently catalyses the reduction of Mn\_2O\_3. Rooksby and McKeag's interpretation (cf. A., 1941, I, 343) of the low-temp. forms of yellow Zn\_2SiO\_4 is erroneous. C. R. H.

Dehydration of mirabilite by a mixture of sodium and potassium chlorides.-See B., 1944, I, 133.

Chemistry and morphology of the basic salts of bivalent metals. XII. Cadmium hydroxyfluorides. XIII. Zinc hydroxyfluorides. W. Feitknecht and H. Bucher (Helv. Chim. Acta, 1943, 26, 2177-2195, 2196—2204).—XII. Basic Cd fluorides were prepared in three ways: (a) incomplete pptn. of aq. CdF<sub>2</sub> with alkali, (b) reaction of Cd(OH)<sub>2</sub> with aq. CdF<sub>2</sub>, and (c) reaction of CdO with NH<sub>4</sub>F. From method (a) there is first obtained an unstable hydroxyfluoride III [CdF, 2-9Cd(OH)], which in solutions containing excess of CdF, changes rapidly into hydroxyfluoride I [CdOHF]. III is more stable in alkaline solution, but slowly changes to hydroxyfluoride II  $[CdF_{.4} - 6Cd[OH]_{.5}]$ . I has a solubility product ( $[Cd''] \times [OH'] \times [F']$ ) of  $2 \cdot 2 \times 10^{-10}$ . By method (c) large rhombic crystals are obtained. It has a lattice containing 6-co-ordinate Cd. II has a layer lattice structure similar to the hydroxide. III has a  $B_s$  type lattice, in which only half the spaces available for the Cd are filled.

XIII. Basic Zn fluorides were obtained by pptn. of aq.  $ZnF_2$  with aq. NaOH and allowing the ppts. to age. Hydroxyfluoride I has a formula ZnOHF although some of the F' ions can be replaced by OH' ions. It is stable only to small Zn'' concns. and has a lattice containing 4-co-ordinate Zn. Hydroxyfluoride II [4Zn(OH)<sub>2</sub>,ZnF<sub>2</sub>] is stable only over a very small conc. range. It has a double layer lattice like the corresponding hydroxychloride. Hydroxyfluoride III has an ideal formula  $[Zn(OH)_{1,5}F_{0,5}]$ . It has a  $C_5$  type lattice; replacement of some of the F' ions by OH' ions increases the diswith those of Cd. The basic fluorides of Zn are compared J. F. H.

Reaction of niobium pentoxide with sodium hydroxide. I. V. I. Spitzin and A. V. Lapitzki (J. Appl. Chem. Russ., 1942, 15, 194– 203).—Even after being heated at  $1000^{\circ}$  Nb<sub>2</sub>O<sub>5</sub> reacts with N—4N-NaOH on a H<sub>2</sub>O-bath or with molten NaOH at 650°. After dissolving the reaction product in  $H_2O$  the salt  $Na_{14}Nb_{13}O_{37},32H_2O$  (I) is formed. It is sol. in  $H_2O$  (1·6 g. in 100 c.c. of solution at 20°) but the solubility is much lowered by NaOH (at 90° 0.11 g. in N-NaOH, 2.6 g. in H<sub>2</sub>O). NaNbO<sub>3</sub> after being heated at 1000° is not attacked by boiling 5—40% NaOH; it cannot be an intermediate product in the alkaline dissolution of Nb<sub>2</sub>O<sub>5</sub>. With NaOH, NaNbO<sub>3</sub>,3.5H<sub>2</sub>O easily affords (I). (See also C., 1944, Part 2.) J. J. B.

Sulphur monoxide. N. M. Emanuel (Compt. rend. Acad. Sci. U.R.S.S., 1942, 36, 145—149).—The part played by SO as an intermediate in the oxidation of  $H_2S$  has been studied by examination of the influence of synthetic SO on the induction period of the reaction and on the explosion limits. Results confirm the view previously advanced by the author from the absorption spectra data (A., 1941, I, 217) that SO is the chief active intermediate product in the oxidation reaction. I. O'M.-B.

Complex compounds of rhenium. V. V. Lebedinski and B. N. Ivanov-Emin (J. Gen. Chem. Russ., 1943, 13, 253-265).-No stable complexes are formed on treating K<sub>s</sub>ReCl<sub>6</sub> (I) or  $K_3$ ReCl<sub>6</sub> (II) with NH<sub>3</sub>, C<sub>5</sub>H<sub>6</sub>N, or CS(NH<sub>2</sub>) in aq. solution. In anhyd. NH<sub>3</sub>, (I) and (II) partly dissolved, giving orange and yellowish-green solutions respectively, but no complexes were isolated. Saturated aq. solurespectively, but no complexes were isolated. Saturated aq. solu-tions of (II) or (II) with a large excess of  $(CH_2 \cdot NH_2)_2, H_2O$  give the *compound* [ReO<sub>2</sub>en<sub>2</sub>]Cl (III), crystallising in yellow prisms. (III) with aq. KI gives the yellow cryst. *iodide*, [ReO<sub>2</sub>en<sub>2</sub>]I, and similarly, the sparingly sol. *chlorate*, *picrate*, *platinichloride*, and *cobaltinitrite*. Addition of HCl to aq. (III) (pH 5-6) gives a red coloration at pH  $2 \cdot 8 - 3 \cdot 2$ , violet at HCl concn.  $2 \cdot 5 \text{ N}$ , and deep blue at 8 N, the change being reversible on addition of alkali. From the red solution, the *compound* [ReO(OH)en<sub>2</sub>]Cl. (IV) may be ppd, with EtOH: the the compound  $[ReO(OH)en_3]Cl_2$  (**IV**) may be ptd. with EtOH; the corresponding cream-coloured *platinichloride*  $[ReO(OH)en_3][PtCl_3]$ and dark red *iodide*  $[ReO(OH)en_2]I_2$  may be pptd. from aq. solutions of (**IV**). Evaporation at room temp. of the blue solution or pptn. with EtOH gives pale blue needles of the compound  $[Re(OH)_{2}en_{2}]Cl_{2}(\nabla)$ . Heating  $(\nabla)$  with conc. HCl gives a green cryst. substance of . unknown composition. R. C. P.

Periodates of cobalt and nickel. R. K. Bahl, S. Singh, and N. K. Bali (J. Indian Chem. Soc., 1943, 20, 227–228).—The following periodates have been prepared :  $3CoO_2, Co(1O_3)_2, 10H_2O$ ;  $Co_4I_2O_{11}, 12H_2O$ ;  $Ni_5(IO_6)_2, 13H_2O$ , and  $7NiO, 2I_2O_7, 25H_2O$ . F. R. G.

Iridium sulphito-chlorides. V. V. Lebedinski and M. M. Gurin (Compt. rend. Acad. Sci. U.R.S.S., 1943, 38, 128—130; cf. A., 1943, I, 97).—In the filtrate from the isolation of Na<sub>5</sub>Ir(SO<sub>3</sub>)<sub>2</sub>Cl<sub>4</sub>,7H<sub>2</sub>O are formed yellow crystals of Na<sub>5</sub>Ir(SO<sub>9</sub>)<sub>4</sub>Cl<sub>2</sub>,7H<sub>2</sub>O (I), and, on further heating the solution, the 5H<sub>2</sub>O salt (II). (I) is almost insol. in H<sub>2</sub>O

and loses 7H<sub>2</sub>O at 100°; the dry salt is stable and is not decomposed and loses  $M_2O$  at 100°, the dry sair is scale and is not decomposed at 250°. (II) loses 4  $H_2O$  at 100° and the remaining  $H_2O$  at 170°; the salt is stable and does not decompose below 300°. On heating (II) in an aq. solution of  $H_2SO_*$ , transparent cryst. plates (III) separated after cooling; the reaction was (II) +  $H_2SO_3 \rightarrow$ Na  $H_2Ir(SO_3)_4Cl_2 + Na_2SO_3$ . The properties of (III), which crystallises with  $10H_2O$ , are discussed. N. M. B.

Preparation of monohydroxo-derivatives of quadrivalent platinum. A. A. Grünberg and L. J. Michelis (Comp. rend. Acad. Sci. U.R.S.S., 1943, **38**, 209—210).—HOCl with  $K_2PtCl_4$  yields  $K_2[PtCl_4](OH)Cl$ ; with cis- and trans-[Pt(NH<sub>3</sub>)<sub>2</sub>Cl<sub>2</sub>] yields [Pt(NH<sub>3</sub>)<sub>2</sub>Cl<sub>2</sub>](OH)Cl; with [Pt(NH<sub>3</sub>)<sub>4</sub>]Cl<sub>2</sub> yields mainly [Pt(NH<sub>3</sub>)<sub>4</sub>OHCl]Cl<sub>2</sub>; and with [Pt(NH<sub>3</sub>)<sub>4</sub>]SO<sub>4</sub> yields [Pt(NH<sub>3</sub>)<sub>4</sub>OHCl]SO<sub>4</sub>. F. R. G.

#### XI.—GEOCHEMISTRY.

Content of radon in the waters of the Tartar autonomous S.S.R. . Tscherdintzev (Compt. rend. Acad. Sci. U.R.S.S., 1942, 36, TT 206-208) .- The average content of Rn in waters in the region of Cristopol is low, probably owing to the well-preserved tectonic structure of the rocks which, accordingly, show low emanating L. S. T. powers.

Sulphide waters of the Permian of the Polasna-Krasnokamsk A. M. Kuznetzov (Compt. rend. Acad. Sci. U.R.S.S., anticlinal. 1943, 39, 159-163) .- Well waters in Kama basin contain up to 1 g. of  $H_4S$  per l. The [H<sub>2</sub>S] usually is the higher the longer the H<sub>4</sub>O was underground. H<sub>2</sub>S probably is produced by bacteria from CaSO<sub>4</sub> and petroleum. Analyses are given. J. J. B.

Diurnal fluctuation of oxygen and pH in fresh waters. Whitney (J. Exp. Biol., 1942, 19, 92-99). G. H ters. R. J. G. P. W.

Thiamin in lake waters and aquatic organisms.—See A., 1944, III, 199.

Calcareo-dolomitic muds of the Balkhash lake. D. G. Saposh-nikov (Compt. rend. Acad. Sci. U.R.S.S., 1942, 36, 150-153).—The nikov (Compl. rend. Acad. Sci. U.R.S.S., 1942, 30, 100-105).—The greatest proportion of the dolomite occurs in the eastern part of the lake, the examination being carried out colorimetrically with an alkaline solution of diphenylcarbazide (Feigl reaction). Samples rich in dolomite were also thermoanalysed. The dolomite content of the western part is probably small. There is a decrease of 34:1% delowing for an increase in depth of 60 cm for the bottom deposite dolomite for an increase in depth of 60 cm. for the bottom deposits. There is also an appreciable dolomite content in the mud of the south-west of the lake. The conditions of formation of these muds are unknown. J. O'M.-B.

Alleged mineral zoning at Mt. Isa. R. Blanchard (Amer. Inst. Min. Met. Eng., 1943, Tech. Publ. 1652, 27 pp., Min. Tech., 7, No. 6).—The mineral sulphide succession at Mt. Isa is described. The unorthodox mineral succession and pattern of mineral dis-tribution is shown to be the natural outcome of conditions that prevailed during the period of ore deposition. Doubt is thrown on the premises on which the zonal theory of mineral succession is based. L. S. T.

Tale deposits at D'Urville island and Cape Horn, Admiralty Bay. E. O. Macpherson (New Zealand J. Sci. Tech., 1943, 24, B, 219-227).—Deposits at Rock Point and Cherry Bay, and near Cape Horn, are described, and their geology is outlined. L. S. T.

Talc in north-west Nelson and north Westland. H. W. Wellman (New Zealand J. Sci. Tech., 1943, 24, B, 227-235).—Ten deposits or groups of deposits are described. L. S. T.

Formation of concretions. T. I. Chandamirov (Compt. rend. Acad. Sci. U.R.S.S., 1942, 36, 209-211).—The formation of concretions by the ferrugination of clayey boulders is discussed. The boulders of clay are penetrated and enriched to varying extents by ferrous salts from circulating waters. Evidence of this view is provided by the ferrugination of clay boulders in the Kirmakinski valley.

Apatites of two textural types from apatite-nepheline rocks of Chibiny. A. I. Volodtschenkova and B. N. Melenteev (Compt. rend. Acad. Sci. U.R.S.S., 1943, 39, 34-35).—Analyses of two apatites mottled and breccia-like-from the tundra of Chibiny are given.

A. I. M.

(A) Cordierite crystals from a glass furnace. (B) Cordierite from Horns Nek, Transvaal. S. J. Shand (*Amer. Min.*, 1943, 28, 391– 395).—(A) The formation of cordierite (I) on the walls of a glass tank in which the fused mass consisted of Al silicate and Mg borosilicate glass is described. The (I),  $\rho 2.516$ ,  $\alpha 1.5223 \pm 0.0003$ ,  $\gamma 1.5270 \pm 0.0003$ , contained SiO<sub>2</sub> 50.77, Al<sub>2</sub>O<sub>3</sub> 35.26, CaO 1.24, MgO 12.72, H<sub>2</sub>O 0.25, total 100.24%.

(B) In the nepheline granophyre from Horns Nek the mineral is cordierite and not nepheline. L. S. T.

**Crystal structure of gillespite, BaFeSi<sub>4</sub>O<sub>10</sub>.** A. Pabst (Amer. Min., 1943, 28, 372–390).—Rotation, oscillation, Laue, and powder X-ray patterns show that  $a_0 = 7.495 \pm 0.010$  and  $c_0 = 16.050 \pm 0.010$  A., the space-group is  $D_{4h}^{2}$ —P4/ncc, and the unit cell contains 4 BaFeSi<sub>4</sub>O<sub>16</sub>.  $\rho_{calc.}$  is 3.407 and  $\rho_{obs.}$  3.40 $\pm 0.02$ . A structure with 11 parameters gives agreement between calc. and observed intensities; it is a silicate sheet structure with 0 atoms in 3 kinds of positions and unshared corners of SiO<sub>4</sub> tetrahedra on both sides of the sheets. Single and double Fourier summations both sides of the sheets. Single and double Fourier summations check the structure. Ba has an 8-fold and Fe a 4-fold co-ordination. The changes produced by leaching in apophyllite, gillespite, and biotite with removal of cations and addition of  $H_2O$  are similar. The flakes retain their shape and some of their optical properties, but yield no X-ray powder diffraction pattern. L. S. T.

Crystallography of acanthite, Ag.S. L. S. Ramsdell (Amer. Min., 1943, 28, 401–425). —Weissenberg and powder photographs give  $a_0$  9.47,  $b_0$  6.92,  $c_0$  8.28, vol. of unit cell 449.8 A.<sup>3</sup>, and 8 Ag<sub>2</sub>S.  $\rho_{calc}$  is 7.27 and the probable space-group is  $B2_1/c$  ( $C_{23}^{e}$ ). The observed cell dimensions and the twinning are such that the monoclinic symmetry is easily reconciled with the previous assignment of acanthite to the orthorhombic and to the cubic systems.

L. S. T. Alkaline vitrophyre dyke, Cape Neddick, Maine. J. C. Haff (Amer. Min., 1943, 28, 426-436).—A petrographic description of an unusual alkaline vitrophyre dyke intruding a mass of breccia is given. Chemical analysis [F. A. Gonyer] indicates its strong nordmarkitic or solvsbergitic affinities. L. S. T.

Genesis of granitic pegmatites. N. M. Uspensky (Amer. Min., 1943, 28, 437-447).—The pegmatite veins of Gold Mountain with accompanying graphic granite originated by a pneumatolytic-hydrothermal transformation of aplite dykes. The active agents in this process were aq. siliceous alkaline solutions containing a small L. S. T. amount of F'.

Bixbyite-sitaparite-partridgeite. (A) J. E. de Villiers. (B) M. Fleischer (Amer. Min., 1943, 28, 468-469, 469).—(A) Partridgeite should be applied to Mn-Fe-sesquioxides containing <10% Fe<sub>2</sub>O<sub>3</sub>, sitaparite to those containing 10-30% Fe<sub>2</sub>O<sub>3</sub>, and bixbyite to the mineral containing >30% Fe<sub>2</sub>O<sub>3</sub>. (B) The name sitaparite should be discarded. L. S. T.

Autoradiography of minerals. C. Goodman and G. A. Thompson (Amer. Min., 1943, 28, 456-467).—Autoradiographic studies of some common minerals have been made, the stray slow neutrons from a cyclotron being used (cf. A., 1943, I, 241). The distribution of Mn, Au, Cu, W, P, K, Ba, Na, and As revealed by the autoradio-graphs (reproduced) of these minerals is discussed. L. S. T.

Parkerite, Ni<sub>3</sub>Bi<sub>2</sub>S<sub>2</sub>, from Sudbury, Ontario. Re-definition of the species. C. E. Michener and M. A. Peacock (*Amer. Min.*, 1943, 28, species. C. E. Micheler and M. A. Peacock (Amer. Min., 1945, 28, 343-355).—Parkerite (I), orthorhombic,  $\rho_{obs}$ . 8·4,  $\rho_{calc}$ . 8·50,  $a_0$  4·02,  $b_0$  5·52,  $c_0$  5·72 A.; probable space-group  $Pmm2-C_{2v}^2$ , contains one Na<sub>3</sub>Bi<sub>2</sub>S<sub>2</sub> per unit cell. A chemical analysis [W. Wagner] and X-ray data are given. (I), hardness 3 (B+), is non-magnetic, and a good electrical conductor. It is sol. in conc. HNO<sub>3</sub>, but not in conc. HCl. A spectrographic analysis showed the presence of Ni, Bi, and traces of Cu and Sn, and the absence of Fe, Mn, W, Ti, Sc, Co, Pd, Ag. Cd. Ir. Pt. Fe. As and Sb. (I) occurs sparingly embedded with Ag, Cd, Ir, Pt, Te, As, and Sb. (I) occurs sparingly embedded with galena, sulphides, arsenides, and tellurides, in the extremities of one of the ore-bodies in the Sudbury district. It can be synthesised in cryst. masses by fusing the elements in  $N_2$  or in a vac. L. S. T.

Mineralogy and genesis of hydroxylapatite. L. Mitchell, G. T. Faust, S. B. Hendricks, and D. S. Reynolds (*Amer. Min.*, 1943, 28, 356-371).—X-Ray powder photographs of Swiss hydroxylapatite (I) and of a new occurrence of (I) from Cherokee Co., Georgia, are (I) and of a new observation of (I) non choose obtained from fluor-apartic (II) and synthetic (I). Optical properties, recorded for these and other apartites, show that the presence of OH for F increases the vals. of u.  $\rho$  for (I) and (II) are practically identical. The Swiss (I) is actually a fluor-(I). Chemical analyses are recorded and discussed. Spectroscopic determination of Cu in 4 synthetic samples of (I) showed a correlation between intensity of pink colour and the presence of adventitious Cu. The pink colour is easily seen in a sample containing 0.003% Cu. Petrology is described and genesis discussed. (I) is found associated only with talc and chlorite schists; this indicates that it is formed by metamorphism in presence of much  $H_2O$ , and with simultaneous formation of other minerals rich in OH group. L. S. T.

Electrochemical properties of clay minerals. Differentiation of hydrogen clays and bentonites by electrochemical methods .- See A., 1944, I, 60.

Thermal analysis of clay minerals and acid extraction of alumina from clays.-See B., 1944, I, 133.

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