# BRITISH CHEMICAL AND PHYSIOLOGICAL ABSTRACTS

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# A., I.—GENERAL, PHYSICAL, AND INORGANIC CHEMISTRY

## CONTENTS

## I.—SUB-ATOMICS.

**Arc spectrum of bismuth, Bi I.** S. Mrozowski (*Physical Rev.*, 1942, [ii], **62**, 526—533).—The light-source was a heated quartz tube containing Bi and a few mm. of He and excited by a 4-m. oscillator. The intense arc spectrum showed all known lines and many new lines. With a high-quality 30-ft. grating photographs showing in the third order a very high resolution of ~400,000 were obtained. Hyperfine structure measurements for 55 lines, separations, and term vals. are tabulated and discussed, and available data are corr. and extended. N. M. B.

**Spectral structure and ionisation potential of neutral gadolinium.** H. N. Russell (*Astrophys. J.*, 1942, **96**, 11—14).—The anticipated terms, $^{11}P\,^{11}D\,^{11}F$ (combining with a higher $^{11}D^0$) and slightly higher $^9D^0$ and $^9S^0$ terms are identified. The first ionisation potential is 6·16 v. $4f^76s^5d\,^{10}D^0$ is confirmed as the lowest configuration of Gd II. $4f^76s^2\,^8S^0$ is probably 0·5 v. higher. E. R. R.

**Configurations** *ll's*. G. Racah (*Physical Rev.*, 1942, [ii], **62**, 523—525; cf. A., 1942, I, 221).—The spectra of the configurations are calc. by Dirac's vector model, and are compared with experimental data for Sc I, Y I, and Cu I. N. M. B.

**Extension of the prismatic solar spectrum from 14 μ. to 24 μ., through a new atmospheric window in the infra-red.** A. Adel (*Astrophys. J.*, 1942, **96**, 239—241).—Three records, obtained by means of a KBr prism and a vac. thermopile and periodic radiometer, are given. Transmission through the window depends on $H_2O$ vapour. E. R. R.

**Rowland intensity scale.** F. E. Roach and J. G. Phillips (*Astrophys. J.*, 1942, **96**, 71—74).—Intensity data for solar spectrum lines at 3530—3915 A. are used in a statistical examination of the Rowland intensity scale. E. R. R.

**Microphotometry of solar lines, λλ 3530—3915 A.** J. G. Phillips (*Astrophys. J.*, 1942, **96**, 61—70).—Measurements (made from 7 spectrograms obtained with the 75-ft. spectrograph and the 150-ft. tower telescope) of equiv. width, degree of blending, and central intensity with respect to both the local and the true backgrounds for 1135 Fraunhofer lines are tabulated. E. R. R.

**Influence of fluorescence on the central intensities of the solar D-lines.** R. R. Dempster (*Astrophys. J.*, 1942, **96**, 295—305).—Transition probabilities for the Na D-lines are calc. An equation of transfer is derived and applied to these lines. Reasons for the discrepancy between calc. and observed results are discussed. E. R. R.

**Abundance of neutral iron atoms in the sun.** F. E. Roach and J. G. Phillips (*Astrophys. J.*, 1942, **96**, 75—77).—$(4·0 \pm 0·25) \times 10^{18}$ and $(5·1 \pm 0·35) \times 10^{18}$ atoms of Fe I over 1 sq. cm. of the solar photosphere are the vals. obtained by two independent calculations. E. R. R.

**Typical stellar spectra with high dispersion. II. Spectrum of γ-Cygni.** F. E. Roach (*Astrophys. J.*, 1942, **96**, 272—291).—λλ, intensities, and identifications of 664 lines in the Coudé spectrograms of γ-Cygni from 3977·76 to 4404·76 A. are recorded. These include lines of Ce II, Pr II, Nd II, Sm II, Eu II, Gd II, Tb II, and Dy II. E. R. R.

**Spectrographic observations of peculiar stars. IV.** P. Swings and O. Struve (*Astrophys. J.*, 1942, **96**, 254—271; cf. A., 1942, I, 310).—AX Persei showed intense lines of [Fe v] and [Fe vi], and other changes, in Jan. and Feb., 1942. RW Hydræ showed no fluorescence excitation in O II, but strong H I singlets $(2p\,^1P^0 - nd\,^1D)$. Z Andromedæ has returned to a stage similar to that of Aug., 1940. T Coronæ Borealis showed bright lines of Fe II, but no [Ne v]. Fluorescence excitation is discussed in relation to the problem of selectivities among emission lines of peculiar stars. E. R. R.

**Discovery and observation of stars of class Be. III.** P. W. Merrill, (Miss) C. G. Burwell, and W. C. Miller (*Astrophys. J.*, 1942, **96**, 15—19).—86 bright-line stars discovered by objective-prism photographs of the Hα line, and 41 other stars showing this line, are listed. E. R. R.

**Singly-ionised calcium emission in 56 Pegasi.** P. C. Keenan and J. L. Greenstein (*Astrophys. J.*, 1942, **96**, 309—310).—Very strong H- and K-lines of Ca II are reported. The intensity (R ~0·8) is

probably variable and a weak and narrow reversal of the K-line may occur. E. R. R.

**Intensities of metallic lines in the ultra-violet spectrum of a² Canum Venaticorum.** W. S. Tai (*Astrophys. J.*, 1942, **96**, 218—223).—Struve's estimated line intensities are used to confirm the conclusion that Ti II belongs to class A, while Cr II and Fe II belong to class B. The intensities of lines of several elements are compared with those of a-Lyræ. E. R. R.

**Coefficient of limb-darkening for YZ(21) Cassiopeiæ in red light.** G. E. Kron (*Astrophys. J.*, 1942, **96**, 173—187).—A method of observing the light curve sufficiently accurately to determine darkening coeffs., using a red-sensitive Cs cell, is described. The darkening coeff. of the A3 component is 0·33, that of the F5 is 0·5 at a mean of 6700 A. E. R. R.

**Radiation pressure in the point-source stellar model.** L. R. Henrich (*Astrophys. J.*, 1942, **96**, 106—123). E. R. R.

**Continuous emission in the spectra of planetary nebulæ.** T. Page (*Astrophys. J.*, 1942, **96**, 78—100).—Continuous emission spectra are observed in 31 out of 58 nebulæ. Intensity ratios have been measured, and intensities correlated with surface brightness and with excitation, which is peculiar in nebulæ of low brightness. E. R. R.

**Continuous emission in the spectra of gaseous nebulæ.** P. Swings and O. Struve (*Astrophys. J.*, 1942, **96**, 310—311).—The visual continua in the spectra of Orion nebulæ, IC418, and IC2165, photographed through a narrow slit, are not produced by the blending of at. emission lines. With a wide slit, strong He I lines just beyond the Balmer limit may vitiate intensity distribution measurements in the continua. E. R. R.

**Crab nebula.** W. Baade (*Astrophys. J.*, 1942, **96**, 188—198).—The nebulosity consists of an outer system of filaments and an inner mass of amorphous structure. In the region of Hα, the former give rise to the line spectrum, the latter to the continuum, which contributes >80% of the light and is probably an emission spectrum. The south preceding star is probably the exciting star. E. R. R.

**Crab nebula.** R. Minkowski (*Astrophys. J.*, 1942, **96**, 199—213).—The filaments on the outside of the nebula produce emission lines of H (faint), He I, He II, [N II], [O I], [O II], [O III], and [S II]. The spectrum of the main diffuse nebulosity is continuous, except at the Balmer limit, and contains practically all the energy emitted by the nebula; the colour temp. is ~8400° K. at 4500 A. and ~6700° K. at 6000 A. The continuous spectrum is explained on the basis of free–free and free–bound transitions of electrons in the highly-ionised gas. The electron density is ~10³ per c.c.; the electron temp. is ~50,000°; the temp. of the central star is ~500,000°. The high intensity of the [O II] lines in the filaments, compared with those in spectra of planetary nebulæ, and the faintness of H lines indicate a high central star temp. and a low H abundance. The results support Chandrasekhar's theory of the supernova process. E. R. R.

**Direct experimental determination of electron-affinity of chlorine.** K. J. McCallum and J. E. Mayer (*J. Chem. Physics*, 1943, **11**, 56—63).—The electron-affinity of $Cl_2$ has been determined by measuring the ratio of ions to electrons leaving a hot W surface in contact with a low pressure of gas containing Cl atoms. $Cl_2$ and $SnCl_4$ were used as carrier gases. The val. obtained, 85·84 ± 1·0 kg.-cal., agrees closely with that obtained by measurements on the dissociation of alkali halides, and the vals. calc. using theoretical lattice energies and the Born cycle. A. J. M.

**Periodic deviation from the Schottky line. II.** T. E. Phipps (*Physical Rev.*, 1942, [ii], **62**, 554—555).—An equation (cf. A., 1939, I, 589) is corr. The error probably accounts for a disagreement with the results of Seifert (*ibid.*). A sharp redefinition of terms and a survey of experimental results is advocated. N. M. B.

**Dynamics and scattering-power of Born's electron.** E. Schrödinger (*Proc. Roy. Irish Acad.*, 1942, **48**, A, 91—122; cf. *ibid.*, 1942, **47**, A, 77).—Mathematical. A treatment by approximation methods to ascertain the physical requirements of the mathematical solution, on the postulate that a classical must precede a quantum mechanical understanding, is given. N. M. B.

**Wave function for the negative hydrogen ion.** R. E. Williamson (*Physical Rev.*, 1942, [ii], **62**, 538—539).—A six-parameter wave function is derived and tested. N. M. B.

**Polarisability of H⁻.** L. R. Henrich (*Physical Rev.*, 1942, [ii], **62**, 545—547).—The val. computed from third- and from sixth-order Hylleraas-type wave functions is $11·58 \times 10^{-24}$ and $14·63 \times 10^{-24}$ c.g.s. unit, respectively. N. M. B.

**Saturation characteristics for $a$-particles in purified gases.** E. D. Klema and H. H. Barschall (*Physical Rev.*, 1943, [ii], **63**, 18—23).—In order to investigate the purity necessary to obtain improved saturation characteristics, saturation curves were taken in $N_2$, A, and an A–$H_2$ mixture. Even unpurified A and $N_2$ show saturation at very much smaller field strengths than air. On purification an appreciable lowering of the field necessary for saturation was observed. N. M. B.

**Electric arcs in gases at high pressures.** J. Basset (*Compt. rend.*, 1942, **214**, 715—716).—With C electrodes of ~2 mm. diameter in $N_2$ or A at $\not> 9000$ kg. per sq. cm. pressure, arcs at 250—600 v. have been obtained. The crater diameter is ~1 mm. and the estimated temp. ~5000°. C above the b.p. in the crater condenses in light graphite flakes. N. M. B.

**At. wt. of lead from a second sample of pitchblende, Great Bear Lake, N.W.T., Canada.** J. P. Marble (*J. Amer. Chem. Soc.*, 1942, **64**, 3047).—The val. of 206·057 agrees well with that of the first sample, 206·054 (cf. A., 1934, 578). W. R. A.

**Theory of successive radioactive transformation.** W. F. Sedgwick (*Proc. Camb. Phil. Soc.*, 1943, **39**, 68).—Corrections and a note on an alternative method (cf. A., 1942, I, 313). L. J. J.

**High centrifugal fields and radioactive decay.** S. Freed, A. H. Jaffey, and M. L. Schultz (*Physical Rev.*, 1943, [ii], **63**, 12—17).—Each type of radioactive decay (except fission) was investigated, by Geiger–Müller tube counter and by ionisation chamber and amplifier, under the influence of centrifugal fields of ~500,000$g$. No definite effect was found, but in $^{80}$Br there was some sign of systematic deviation from the accepted half-lives in a field of 632,000$g$. N. M. B.

**Diffusion length of carbon neutrons in water.** G. R. Gamertsfelder and M. Goldhaber (*Physical Rev.*, 1942, [ii], **62**, 556—557).—A more direct method of measurement with a spherically symmetrical source of C neutrons is described. The val. found is 3 cm.$\pm 10\%$, compared with available vals. 2·5 cm. (cf. Feeny *et al.*, A., 1942, I, 286) and 2·22 cm. (cf. Manley *et al.*, *ibid.*, 223). N. M. B.

**Effective cross-section of [atoms of] certain elements for thermal neutrons.** F. G. Houtermans (*Z. Physik*, 1941, **118**, 424—425).—Vals. obtained by the Fermi–Amaldi method for $^{55}$Mn, $^{63, 65}$Cu, $^{79}$Br, $^{103}$Rh, $^{108}$Pd, $^{107, 109}$Ag, $^{115}$In, $^{127}$I, $^{164}$Dy, $^{181}$Ta, $^{186}$W, $^{197}$Au, and $^{209}$Bi are recorded. L. J. J.

**Angular distribution of photo-neutrons ($\gamma_R$, Be).** T. A. Goloborodko (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **31**, 855—856).—Using the method previously described (A., 1941, I, 440), the angular distribution of faster photo-neutrons was determined with a larger amount of paraffin than usual surrounding the chamber, in order to absorb slower neutrons. With a sphere of paraffin of diameter 13 cm., $I_{90}/I_0 = 1·42$, whereas with a sphere of paraffin of diameter 6 cm., $I_{90}/I_0 = 1·05$. A. J. M.

**Diffusion problems.** W. Bothe (*Z. Physik*, 1941, **118**, 401—408).—Mathematical. Rigid expressions are developed for diffusion equation, diffusion const., diffusion distance, angular distribution, and albedo. The expressions, applicable to neutrons, are more rigid than those of Fermi, but less general than those of Halpern, Lueneburg, and Clark (A., 1938, I, 112). L. J. J.

**Diffusion from a point source.** W. Bothe (*Z. Physik*, 1942, **119**, 493—497).—An addition to a previous paper (cf. preceding abstract). A more exact expression for the density distribution in an infinite scattering and absorbing medium containing a point source is deduced. A. J. M.

**Frequency of odd and even atomic nuclei.** V. V. Tscherdintzev (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **33**, 22—23).—The application of the liquid drop theory of the at. nucleus leads to a formula which gives satisfactory results for the difference between the logs of the relative frequencies of odd and even nuclei. A. J. M.

**Angular correlation of successive $\gamma$-rays.** R. Beringer (*Physical Rev.*, 1943, [ii], **63**, 23—28).—In an attempt to evaluate the predicted angular correlations of successive quanta, a study of the angular dependence of $\gamma$–$\gamma$ coincidences for $^{24}$Na, $^{38}$Cl, and $^{82}$Br showed that coincidence rates were approx. independent of the relative directions of the quanta, except as the counters approached each other closely, when there was an increase which is attributed to scattered quanta. N. M. B.

**Scattering of protons by magnesium nuclei.** G. A. Wrenshall (*Physical Rev.*, 1943, [ii], **63**, 56—57).—An extension, obtained by further analyses, of results previously reported (cf. Wilkins, A.,

1941, I, 24, 441). There is evidence of a fifth group of scattered protons of estimated energy 5·3 Me.v. N. M. B.

**Scattering of 14-mv. neutrons by protons.** E. Amaldi, D. Bocciarelli, B. Ferretti, and G. C. Trabacchi (*Naturwiss.*, 1942, **30**, 582—584).—The angular distribution of neutrons scattered by protons has been reinvestigated (cf. *Ric. Scient.*, 1941, **12**, 830) with improved apparatus. Neutrons provided by the reactions $^2_1$D $+ ^{11}_5$B $= ^{12}_6$C $+ ^1_0n$ and $^2_1$D $+ ^7_3$Li $= ^8_4$Be $+ ^1_0n$ were used, those from B being more suitable than those from Li. Results are given for neutrons with energies 12·5, 13·3, and 14 mv. They agree with the anisotropy indicated by the theory of Bethe, but not with that of Rarita *et al.* (A., 1941, I, 317). A. J. M.

**Secondary radiation from $X$-ray filters. I. Single metal filters.** G. A. Wrenshall and H. J. Nichols (*Canad. J. Res.*, 1942, **20**, A, 185—194).—An ionisation chamber method is used to determine the intensity ($I_s$) and character of secondary radiation emitted in a forward direction from Al, Cu, Sn, and Pb foils penetrated by $X$-rays (intensity $I_p$) from a W anticathode operating at 85—115 kv. $I_s$ is max. for foils of mass 0·70, 0·04, 0·07, and $<0·02$ g. per sq. cm., respectively. The secondary radiation consists of $K$ fluorescence radiation from the filter and scattered primary rays. The effect of the geometrical disposition of the source, filter, and ionisation chamber on $I_s/I_p$ is studied; the conclusions of Seemann (A., 1938, I, 160) are, in general, verified. A. J. E. W.

**$\gamma$-Rays from $^{48}$Sc.** C. E. Mandeville (*Physical Rev.*, 1942, [ii], **62**, 555—556).—In view of discordant available data, Compton recoils of the $\gamma$-rays from $^{48}$Sc produced by Ca $+$ deuterons were investigated with a $\gamma$-ray spectrograph. The momentum distribution curves indicate a half-life of $44\pm1·5$ hr. The $\gamma$-rays are monochromatic. The spectral end-point corresponds with a $\gamma$-ray energy of $1·35\pm0·03$ Me.v. One probable mode of $^{48}$Sc disintegration is the emission of a negative electron spectrum of max. energy 0·640 followed by a $\gamma$-ray of energy $1·35\pm0·03$ Me.v. An excitation level in the $^{48}$Ti residual nucleus is established at $1·35\pm0·03$ Me.v. (cf. Walke, A., 1940, I, 141). N. M. B.

**$\beta$-Ray spectrum of antimony (124).** E. B. Hales and E. B. Jordan (*Physical Rev.*, 1942, [ii], **62**, 553—554).—Measurements of the continuous (negative electron) spectrum of a source produced by deuteron bombardment of Sb were started $>70$ days after bombardment. The curve shows that the spectrum consists of two components, the end-points corresponding with energies of $0·74\pm 0·03$ and $2·45\pm0·07$ Me.v. The difference agrees with the known energy val. of the hard $\gamma$-ray of $^{124}$Sb (cf. Mitchell, A., 1940, I, 338). The internal conversion lines correspond with two of the internally converted $\gamma$-rays emanating from the separated Te fraction. N. M. B.

**$\beta$-Spectrum of radioactive tungsten.** B. Dshelepov and A. Konstantinov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **31**, 853—854).—To decrease the background in a counter, a special arrangement of two counters is used. The apparatus can be used to examine sources which emit as few as 5 electrons per sec. in all directions from an area of 1·5 sq. cm. It has been used to investigate the $\beta$-spectrum of radioactive W prepared by irradiation of W powder with slow neutrons. A. J. M.

**Enrichment of the artificial radioactive uranium isotope $^{239}_{92}$U and its product $^{239}$93 (element 93).** K. Starke (*Naturwiss.*, 1942, **30**, 577—582).—Methods of enrichment of $^{239}_{92}$U are described. The separation of $^{239}_{92}$U from remaining U, and from U-$X$ and disintegration products, using complexes formed with benzoylacetone is described. The chemical properties of element 93 are discussed, and it is considered that a series of elements with properties similar to those of U commences with U in the same way as a series of elements begins with La. The general applications of the enrichment method are described. A. J. M.

**Spin inversion processes and nuclear spectroscopy.** G. Beck and J. L. R. Martins (*Physical Rev.*, 1942, [ii], **62**, 554; cf. A., 1942, I, 255).—Mathematical. Spin inversion processes may occur, as in the case of $^5$Li, with considerable probability even if they are due to small forces. N. M. B.

**Relation of cosmic radiation to geomagnetic and heliophysical activities.** J. W. Broxon (*Physical Rev.*, 1942, [ii], **62**, 508—522; cf. A., 1941, I, 289, 315). N. M. B.

**Number of slow neutrons in cosmic radiation.** A. P. Shdanov and A. S. Serdakov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **31**, 861—862).—Two thick-emulsion plates, one of them having been immersed in aq. $Na_2B_4O_7$, were left in a building with no $a$-, $\beta$-, or $\gamma$-ray or neutron sources for 20 days. After development the tracks with an air equiv. of ~1 cm. were counted. There were 10 times as many on the plate treated with $Na_2B_4O_7$ as on the untreated plate. This is probably due to fission of the $^{10}$B nucleus, induced by slow neutrons of cosmic rays. The no. of these slow neutrons was thus calc. as 10 per hr. per sq. cm. A. J. M.

**Theory of cosmic-ray showers. II. Fluctuation problem.** W. T. Scott and G. E. Uhlenbeck (*Physical Rev.*, 1942, [ii], **62**, 497—508; cf. A., 1940, I, 242).—Mathematical. The distribution in size of

cosmic-ray showers is completely determined when the average energy distribution of the particles is known. Previous vals. of the size fluctuation of showers are revised and extended. Simplified models are considered and ionisation is taken into account. Results are extended to the actual cosmic-ray problem.     N. M. B.

**Life period of the meson.** J. Juilfs (*Naturwiss.*, 1942, **30**, 584—585).—Investigation of the composition of cosmic radiation at different heights indicates the existence of mesons at sea level with a life period of $(2 \pm 1) \times 10^{-6}$ sec., but at greater heights, mesons exist with a much smaller life period.     A. J. M.

**Cloud-chamber track of a decaying mesotron.** R. P. Shutt, S. De Benedetti, and T. H. Johnson (*Physical Rev.*, 1942, [ii], **62**, 552—553; cf. A., 1942, I, 256).—Photographs are given of the disintegration of a mesotron of 40—400m. and estimated final energy $<10^8$ e.v. into a lightly ionising particle (electron) of energy probably $>3 \times 10^7$ e.v., which flies off at 85° with the direction of the primary mesotron track. The type of disintegration is that postulated to account for certain anomalies in the absorption of cosmic rays in the atm. The chamber pressure is 70 atm. in a mixture of A, $Pr^nOH$, and $H_2O$ vapour. The estimated probability of disintegration is $5 \times 10^{-7}$ per cm.     N. M. B.

**Theory of the bi-meson.** V. L. Ginzburg (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **31**, 857—860).—Wave equations are developed for the bi-meson, a particle having spin 0 in the lowest state, and 1 in the singly excited state.     A. J. M.

**Evolution of the main-sequence stars.** M. Schönberg and S. Chandrasekhar (*Astrophys. J.*, 1942, **96**, 161—172).—The decrease in H content in the central regions, due to the burning of H in the evolution of main-sequence stars, is calc. In this process the convective core shrinks in the very bright stars; in stars of low luminosity and in the later stages of evolution in bright stars, the convective core gives place to an isothermal core. The upper limit to the fraction of H which can be used is $\sim 10\%$; beyond this stage, evolution probably proceeds through non-equilibrium configurations.     E. R. R.

**Spin and radiation force.** W. Wessel (*Naturwiss.*, 1942, **30**, 606—607).—Theoretical.     A. J. M.

**Relativistic theory of excited spin states of the proton and neutron.** V. L. Ginsburg (*Physical Rev.*, 1943, [ii], **63**, 1—12).—Mathematical. The anomalous (theoretical) increase with energy of the cross-section for meson scattering by heavy particles must be explained by the neglect of the reaction of the proper field of the quasi-magnetic moment of the particle on the motion of this moment. The problem is treated by the introduction of the higher spin states.     N. M. B.

## II.—MOLECULAR STRUCTURE.

**Asymmetric rotor. I. Calculation and symmetry classification of energy levels.** G. W. King, R. M. Hainer, and P. C. Cross (*J. Chem. Physics*, 1943, **11**, 27—42).—A table of energy level patterns for rigid asymmetric rotors is given, from which rotational energies of all mols. up to $J = 10$ may be evaluated. The symmetry classification of each level is determined and expressed in terms of the $K$ vals. of the limiting prolate- and oblate-symmetric rotors. Energy calculations by perturbation methods can be carried out by the use of the transformation described.     L. J. J.

**Isotope shifts in some lines of nitrogen.** J. R. Holmes (*Physical Rev.*, 1943, [ii], **63**, 41—46).—Extensive experimental difficulties were overcome by mixing a trace of 70 at.-% $^{15}N$–30 at.-% $^{14}N$ with He at a few mm. pressure in a quartz tube cooled with liquid air and having external electrodes for excitation by a 12-m. oscillator. The line spectrum, photographed with a Fabry–Perot interferometer, was so sharp as to allow the resolution of the two components due to $^{14}N$ and $^{15}N$ in 9 infra-red lines. The lines arising from $^4P \rightarrow {}^4P$ and $^4S \rightarrow {}^4P$ transitions showed a negative isotope shift of $\sim 0.06$ cm.$^{-1}$, and those from $^2P \rightarrow {}^2P$ a positive shift of $\sim 0.07$ cm.$^{-1}$ The variations in the isotope shifts within the $^2P \rightarrow {}^2P$ multiplets indicate some deviation from Russell–Saunders coupling. No hyperfine structure was observed.     N. M. B.

**Spectra of CH stars.** P. C. Keenan (*Astrophys. J.*, 1942, **96**, 101—105).—Bands of CH appear at high intensity in 5 high-velocity C stars ("CH stars"). The (0, 0) and (1,1) bands of both the $^2\Delta$–$^2\Pi$ and $^2\Sigma$–$^2\Pi$ systems have been identified in two of the hottest of these stars, and explain the suppression of most at. lines at 3883—4430 A. Lines of H, $Sr^+$, $Ba^+$, and $Ti^+$ are visible; low-excitation lines of neutral elements are greatly weakened. The line spectrum of these stars is peculiar.     E. R. R.

**Laboratory production of the 4050 A. group occurring in cometary spectra; further evidence for the presence of $CH_2$ molecules in comets.** G. Herzberg (*Astrophys. J.*, 1942, **96**, 314—315).—The 4050 A. group is produced by an interrupted, electrodeless discharge through $CH_4$, or, at very high streaming speeds, by an uninterrupted discharge. The spectrum is compared with that of Comet 1940c, and the group attributed to $CH_2$. $CH_3$ and $CH_4$ cannot be excluded.     E. R. R.

**Presence of potassium hydride lines in the spectrum of the solar disc.** W. P. Bidelman (*Astrophys. J.*, 1942, **96**, 157—158).—Coincidences between lines of the KH spectrum and those of the solar disc are of the same order as those to be expected by chance.     E. R. R.

**Spectrum of comet 1942a (Whipple).** D. M. Popper and P. Swings (*Astrophys. J.*, 1942, **96**, 156—157).—A very strong reflected solar spectrum and a weak mol. emission are reported. Bands of CN, NH, and OH, and the 4050 A. group, are conspicuous. CH bands are absent.     E. R. R.

**Absorption spectra of double salts containing cobaltous chloride.** M. L. Schultz and E. F. Lilek (*J. Amer. Chem. Soc.*, 1942, **64**, 2748—2751).—Absorption spectra of crystals of $Cs_2CoCl_5$, $Cs_3CoCl_4$, and dipyridinium and diquinolinium $Co^{II}$ chlorides, when compared with that of $CoCl_2$ in conc. HCl, indicate the presence of the $CoCl_4''$ ion in all these compounds. The spectra appear to originate in coupled electronic–vibrational transitions.     W. R. A.

**Absorption spectra of the vapours of uranium chlorides.** I. M. Tolmatschev (*J. Phys. Chem. Russ.*, 1941, **15**, 592—596).—Vapour of $UCl_4$ shows a continuous absorption, the frontier of which is at 3490, 3950, 4190, 4410, and 4540 A. at 100°, 227°, 308°, 372°, and 445°, respectively. $UCl_5$ vapour shows two diffuse bands near 2680 and 3750 A. and two continuous absorption regions; above 60° it also shows the absorption spectrum of $Cl_2$.     J. J. B.

**Effects of solvents on the absorption spectra of dyes. I. Polymethine dyes.** S. E. Sheppard, P. T. Newsome, and H. R. Brigham. **II. Dyes other than cyanines.** S. E. Sheppard and P. T. Newsome (*J. Amer. Chem. Soc.*, 1942, **64**, 2923—2937, 2937—2946).—I. The absorption spectrum of a merocyanine dye has been determined for the gaseous state in a vac. The displacement of the absorption bands in various solvents is referred to that in a vac. Certain compounds show a definite correlation of the displacement with $n$ and the dielectric const. for non-polar solvents, and $\mu$ for polar solvents. Ionised cyanine dyes show no displacement by changes in $\mu$, but in non-polar solvents changes in $n$ and dielectric const. cause changes. Solvent effects in relation to the structures of the dyes and the exceptional behaviour of alkyl halides are discussed.

II. For dyes other than cyanines the above conclusions are supported. The sensitivity of the absorption spectra of dyes to solvent influence is related closely to the resonance system of the dye. The possibility of adducing information regarding the structure of the dyes and of the solvents by investigations of this kind is discussed.     W. R. A.

**Ultra-violet absorption spectra and structures of $N$-phenylpyrazolone derivatives.**—See A., 1943, II, 105.

**Spectrophotometric studies. I. Structural interpretation of the spectra of cyanide, pyridine, and carbon monoxide derivatives of cytochrome-$c$ and hæmoglobin.** D. L. Drabkin (*J. Biol. Chem.*, 1943, **146**, 605—617; cf. A., 1941, III, 831).—Absorption spectra of derivatives of ferro-proto-, -meso- (**I**), and -copro-porphyrin (**II**), hæmoglobin, and ferrocytochrome-$c$ (**III**) are studied. The max. of the $\alpha$- and $\beta$-bands of the spectra of ferromeso- and ferrocoprohæmin derivatives are at almost identical $\lambda\lambda$, whilst the spectra of corresponding derivatives of ferroprotohæmin are shifted towards longer $\lambda\lambda$. The max. of the spectra of (**III**) and its derivatives are located at $\lambda\lambda$ characteristic of (**I**) and (**II**) compounds. The spectra of the derivatives of the ferrohæmins can be classified into three groups, characteristic of the cyanide, $C_5H_5N$, and carbonyl complexes, respectively. The nature of the group co-ordinating with the hæmin Fe determines the intensity and shape of the absorption pattern in the visible spectral region ($\alpha$- and $\beta$-bands). The $\lambda$ location of the max. is a function of the hæmins themselves. The shift of absorption towards longer $\lambda\lambda$ in the case of protohæmin and its derivatives is probably due to the double linking in the vinyl groups. It is concluded that natural cytochrome-$c$ does not contain an unmodified protohæmin with free vinyl groups in its structure.     A. T. P.

**Fluorescence of phenylated anthracenes.** Y. Hirshberg and L. Haskelberg (*Trans. Faraday Soc.*, 1943, **39**, 45—48).—Fluorescence measurements with mono-, di-, and tetra-phenylanthracenes show that in every case phenylation increases the abs. intensity of fluorescence compared with that of anthracene. The most marked effects accompany substitution in the 9- and/or 10-positions. Theoretically dihydroanthracene derivatives should be non-fluorescent, but marked fluorescence is observed in 1 : 4 : 5 : 8-tetraphenyldihydroanthracene. The fluorescence, however, corresponds exactly with that of the corresponding anthracene derivative and is probably due to the presence of traces of the latter, the high abs. intensities being attributed to its high dilution.     F. L. U.

**Mechanism of luminescence in phosphors.** V. Antonov-Romanovski (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **31**, 863—865).—The luminescence of KCl, activated by Tl, has been investigated for various conditions of excitation. The decay of the fully excited phosphor follows a bimol. law, and the mechanism of the luminescence is of a recombination type, rather than a metastable one. If the excitation is weak, the luminescence is unimol. and later

bimol. . The unimol. nature of the initial stage is probably due to the fact that when the excitation is weak, the average distance of ejection of an electron from the phosphorescence centre is < the mean distance between the centres, so that each electron recombines with its own centre. The bimol. law is followed when the electrons become well " mixed " by diffusion. This theory is supported by experiments with red light. The mechanism of phosphorescence proposed makes it possible to explain the decay curve both qualitatively and quantitatively. The electron diffusion const. has been calc. from the decay curve.     A. J. M.

**Minimum wall-thickness and optimum wall-thickness of luminescent glasses in illuminating tubes.** H. Fischer and A. Schöntag (*Z. tech. Physik*, 1942, **23**, 194—196).—The effect of the thickness (*S*) of the luminescent material in the wall of a discharge tube on the light yield is examined. For max. efficiency with colourless luminescent glasses, *S* has a min. val. ($S_m$) which represents the penetration of the exciting radiation, and thus depends on the concn. of luminescent material in the glass. With coloured glasses max. efficiency requires an optimum *S* val. ($S_o$) which depends on the absorptive properties. Data for low-pressure Hg-vapour tubes of U glasses ($UO_3$ 0·7—2·1%; $S_o$ 0·7—0·12 mm.) are discussed.
    A. J. E. W.

**Luminescence of luminol. II. Action of complex ferric compounds on the chemiluminescence of luminol.** K. Weber, A. Režek, and V. Vouk (*Ber.*, 1942, **75**, [*B*], 1141—1153).—The brightness of the chemiluminescence of luminol (**I**) in the presence of $K_3Fe(CN)_6$ (**II**), salicylaldehyde–ethylenedi-imine $FeCl_3$ (**III**), chlorohæmin, methæmoglobin, ferritin (**IV**), and catalase (**V**) is frequently many hundred times > that in the absence of catalysts, and diminishes with time according to the law of a unimol. reaction. During the course of the change the catalysts are irreversibly altered chemically whilst (**I**) and $H_2O_2$ enter partly but by no means completely into reaction. For the initial brightness of the chemiluminescence there is an optimal [OH'] which lies at pH ∼12·6, whereas the ability to fluoresce, dependent on the conversion of the carbonyl- into the enol form, is almost completely suppressed at pH ∼9. With (**IV**) as catalyst the total light energy emitted tends towards a const. val. independent of [OH'], whereas in presence of (**III**) there is little change of intensity with [OH']. With hæmin increase in [OH'] causes first an increase and then a decrease in intensity. (**II**) causes a decrease but hæmoglobin (**VI**) or (**IV**) an increase of intensity with increase in [OH']. With very small concns. of catalyst there is an increase in initial brightness with catalyst concn. which gradually becomes less pronounced; increases in larger catalyst concns. may diminish the luminescence. Particularly in the presence of (**II**) and (**IV**) the chemiluminescence reaction appears to be accompanied by another redox reaction which, without emission of light, leads to a permanent chemical alteration in the reaction mixture. The catalytic activity of hæmin-Fe in (**VI**) and particularly in (**V**) is very markedly enhanced by its union with the protein residue, but the change is not a decomp. of $H_2O_2$ since there is no functional relationship between brightness of luminescence and $O_2$ evolved, and the optimal pH vals. for the processes are different. (**IV**) has no catalase or peroxidase action and its effect on (**I**) is comparable with that of (**II**) and immeasurably smaller than that of (**VI**), or (**V**). The mechanism of the reactions is discussed.     H. W.

**Luminous characteristics of phosphorescent materials.**—See B., 1943, I, 153.

**Excitation of ultra-violet phosphorescence in alkali halide phosphors activated with thallium.** M. L. Katz (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 178—180).—NaCl and KCl crystals activated with TlCl show phosphorescence in both their ultra-violet absorption bands (1990 and 2540 A. for NaCl, 1960 and 2480 A. for KCl). The phosphorescence quantum yield is 230—250 times as great in the short-λ as in the long-λ band. The λλ of phosphorescence and absorption max. in the latter agree. Phosphorescence intensity increases with [Tl] up to $15 \times 10^{-2}$ mol.-% TlCl.     L. J. J.

**Phosphorescence of adsorbed trypaflavine and its quenching by oxygen.** J. Franck and P. Pringsheim (*J. Chem. Physics*, 1943, **11**, 21—27).—The green phosphorescence of trypaflavine (**I**) adsorbed on $SiO_2$ gel is half-quenched by $O_2$ at $5 \times 10^{-5}$ mm. Further increase in $p_{O_2}$ increases quenching much more slowly, at a rate which agrees with the quenching of the green fluorescence by $O_2$. The phosphorescence is ascribed to two metastable tautomeric forms of (**I**) formed on irradiation, one rapidly oxidised by $O_2$, the other insensitive. Quenching at higher $p_{O_2}$ is due to oxidation of the primary excited state. The apparent quenching effect of $H_2O$ and $NH_3$ is due to $O_2$ displaced from the $SiO_2$ gel.     L. J. J.

**The ratio rule.** H. D. Noether (*J. Chem. Physics*, 1943, **11**, 97—99).—A rule for obtaining the fundamental frequencies of isotopic mols. is given. Taking $CD_3Cl$ for example, the fundamental frequencies can be calc. in terms of the corresponding frequencies of $CD_3X$, MeX, and MeCl by means of the relation $\nu_{nCD_3Cl} = (\nu_{nCD_3X})(\nu_{nMeCl})/(\nu_{nMeX})$. The agreement is good where Me and $CD_3$ groups are concerned, but not so good for the series $H_2O$–$D_2O$, $H_2S$–$D_2S$, $H_2Se$–$D_2Se$, where the structure of the mols. is quite different. There is no theoretical derivation of the rule.     A. J. M.

**Intensity of lines of dispersion of combination in solutions of different dilution as a function of concentration.** M. M. Suschtschinski (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **33**, 18—21).—In the case of mixtures of *cyclo*hexane and $C_6H_6$ the intensity of the lines of dispersion of combination ∝ concn. With mixtures of dioxan (**I**) and $C_6H_6$, the intensity of the 837-cm.⁻¹ line of (**I**) decreases much more slowly than concn., whereas that of the 2843-cm.⁻¹ line ∝ concn. The 837-cm.⁻¹ line of (**I**) lies very near to the strong 849-cm.⁻¹ line of $C_6H_6$, and the absence of proportionality may be explained by superposition.     A. J. M.

**Raman spectra of hydrocarbons. I** $\Delta^\alpha$-Octene, *cis-* + *trans-*$\Delta^\beta$-octene, *trans-*$\Delta^\gamma$-octene, *trans-*$\Delta^\delta$-octene, $\Delta^\delta$- and $\Delta^\alpha$-octinene. F. F. Cleveland (*J. Chem. Physics*, 1943, **11**, 1—6).—Raman frequencies, intensities, and depolarisation factors are recorded.     L. J. J.

**Raman spectra and structure of ketonic complexes of antipyrine and of carvone.** F. J. Taboury (*Compt. rend.*, 1942, **214**, 764—767). —Raman data are reported for antipyrine and for its cryst. derivative with 1 mol. of chloral hydrate. The 1500—1600-cm.⁻¹ lines are attributed to C:C linkings, and the 1600—1700-cm.⁻¹ lines to the ketonic C:O; of these, the 1658-cm.⁻¹ line of antipyrine is displaced and weakened in the complex, indicating that the liaison of the two mols. depends on the C:O group and not on the two N atoms. Raman data for carvone and for its cryst. derivative with 1 mol. of $H_2S$ show that the ketonic 1676-cm.⁻¹ line is correspondingly displaced in the complex.     N. M. B.

**Ionisation and dissociation by electron impact :** (*a*) *n*-propyl chloride and *tert.*-butyl chloride ; (*b*) *iso*butylene, propane, and propylene. D. P. Stevenson and J. A. Hipple (*J. Amer. Chem. Soc.*, 1942, **64**, 2766—2768, 2769—2772).—(*a*) The mass spectra of $Bu^\gamma Cl$ and $Pr^a Cl$ are given and appearance potentials of some ions in these spectra have been measured. The vertical ionisation potential of $Pr^a Cl$ is $10.7 \pm 0.2$ e.v. An estimate of *D* (Me—H) from the pressure data gives $4.4 \pm 0.2$ e.v., in agreement with other electron impact data.

(*b*) Mass-spectroscopic investigations of the ionisation and dissociation of $C_3H_6$, $C_3H_8$, and *iso*-$C_4H_8$ by electron impact yield vals. for the vertical ionisation potentials of $9.8 \pm 0.1$, $11.2 \pm 0.1$, and $8.9 \pm 0.1$ e.v. The mass spectrum of *iso*-$C_4H_8$ is given in detail and the significance of some of the observed appearance potentials of ions in this spectrum is discussed.     W. R. A.

**Theory of electrical discharge in liquids of simple structure.** R. Kronig (*Z. Physik*, 1941, **118**, 452—454).—Zener's theory of electrical discharge through solid dielectrics is applicable to simple liquids. Data for liquid A are in agreement.     L. J. J.

**Bond energy, bond distance, and nature of the covalent linking.** A. Burawoy (*Trans. Faraday Soc.*, 1943, **39**, 79—90).—Analysis of observed bond energies and bond distances indicates that the stability of covalent linkings will be due to (1) the fundamental covalent forces, (2) Coulomb forces, and (3) forces connected with deformation. Covalent linkings that can to a varying degree possess a polar character cannot be described in terms of ideal classical structures, *e.g.*, as resonance hybrids between ideal covalent and ideal ionic linkings, such an interpretation being inconsistent with the data.     F. L. U.

**Polarisability of molecules and intermolecular forces.** M. V. Volkenschtein (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 185— 188).—Mathematical. Consideration of the effect of anharmonicity and anisotropy in electronic oscillators predicts changes in mol. consts. associated with the anisotropy of the polarisability tensor, without change in refraction, as found experimentally for the Kerr effect and depolarisation of Rayleigh scattering. The theory is applied to Raman intensities.     L. J. J.

**Dipole moment, induction, and resonance in nitroethane and chloronitroparaffins.** E. C. Hurdis and C. P. Smyth (*J. Amer. Chem. Soc.*, 1942, **64**, 2829—2834).—Vals. of μ, calc. from measurements of the dielectric consts. of the vapours of $EtNO_2$, $CH_2Cl·NO_2$, $CHMeCl·NO_2$ and $CHEtCl·NO_2$, are given. Re-determination of μ for $CO_2$, $C_6H_6$, $H_2O$, and *n*-$C_8H_{18}$ vapours gave vals. in good agreement with existing data. The vals. for nitroparaffins indicate that inductive effects are inappreciable beyond the first two C in the chain. In the chloronitroparaffins the increases in μ in ascending the series indicate increased stabilisation of resonating polar forms by the distribution of the negative charge over two groups in the disubstituted compounds instead of the localisation on one group in the monosubstituted compounds.     W. R. A.

**Dipole moment and molecular structure. III. Dipole moments of diethyl esters of substituted malonic acids.** N. L. Phalnikar. **IV. Dipole moments of glyptals.** N. V. Sathe, N. L. Phalnikar, and B. V. Bhide (*J. Univ. Bombay*, 1942, **11**, A, Part 3, 87—91, 92—95).—III. Dipole moments in $C_6H_6$ of $CMe_2(CO_2Et)_2$ (2·32), $CEt_2(CO_2Et)_2$ (2·10), $CPr^a_2(CO_2Et)_2$ (2·15), and $CPr^\beta_2(CO_2Et)_2$ (2·40 D.), combined with certain assumptions about the positions taken up by the $CO_2Et$ groups (cf. Bhatkande *et al.*, A., 1942, I, 227), indicate that the vals. are in accordance with the valency deflexion hypothesis.

IV. Dipole moments in dioxan of the resins formed from glycerol

and $o$-$C_6H_4(CO)_2O$ increase from 1·85 to 6·88 D. with increasing time of formation. Anomalous dispersion occurs at 30—150 m. and the measurements were made at 300 m. F. R. G.

**Dipole moment of *ms*-tetraphenylporphine.** W. D. Kumler (*J. Amer. Chem. Soc.*, 1942, **64**, 2993—2994).—*ms*-Tetraphenylporphine has zero dipole moment and is, therefore, symmetrical and has the giant and pyrrole rings in one plane. The $C_6H_6$ rings do not appear to have free rotation and, consequently, $o$- and $m$-substituents on these rings should give rise to stereoisomeric forms. W. R. A.

**The magnetic ion.** F. Ehrenhaft and L. Banet (*Science*, 1942, **96**, 228—229; cf. A., 1942, I, 222).—Some particles of a minute amount of Fe, Ni, Mn, Cr, or Sb, placed in the centre of the lower "magnetrode" of a powerful magnet, move towards the upper pole. If the metal is placed in both magnetrodes, some particles from each source move towards the opposite pole. Particles in a Ni sol behave likewise. These observations are discussed on the basis of magnetic ions analogous to electric ions. E. R. R.

**Physical properties and chemical constitution. VII. Alkyl sulphides, disulphides, sulphites, sulphates, and orthophosphates.** A. I. Vogel and D. M. Cowan (*J.C.S.*, 1943, 16—24).—[$R$] and parachors of RR'S, $R_2S$, $R_2S_2$, $Ph_2Se$, $R_2SO_3$, $EtSO_2\cdot OEt$, $R_2SO_4$, and $R_3PO_4$ have been determined, and the contributions of S in disulphides, and of O in sulphites, sulphates, and orthophosphates, are calc. A. Li.

**Dispersion of the Kerr phenomenon of carbon disulphide.** G. Bruhat, C. Corolleur, and G. Raoult (*Compt. rend.*, 1942, **214**, 740—742).—The ratio $B/B_0$ of the Kerr const. for $CS_2$ has been determined for λ 2699 and 2754 A., a Hg arc with a const. $B_0$ relative to the 4054-A. line being used. J. L. E.

**Ionic character of links and the polarity of molecules. II.** M. E. Diatkina (*J. Phys. Chem. Russ.*, 1941, **15**, 597—614).—From the dipole moments, at. distances, etc., the relative abundance of various isomeric forms is calc. $H_2O$ contains 23% of homœopolar $H\cdot O\cdot H$, 21% of $\overset{+}{H}\overset{-}{O}\cdot H$, 4·5% of $\overset{+}{H}O\overset{+}{H}$, and >51% of the three transition forms. J. J. B.

**Rasumovski's theory of the structure of organic compounds.** M. Diatkina (*J. Phys. Chem. Russ.*, 1941, **15**, 694—696).—Rasumovski's theory (A., 1941, II, 277) is criticised. J. J. B.

# III.—CRYSTAL STRUCTURE.

**Lattice constants, atomic radii, and valency electron concentration.** H. Perlitz (*Metallwirts.*, 1941, **20**, 555—557).—A review. C. E. H.

**Long range of regular atomic spacing in mixed crystals.** B. L. van der Waerden (*Z. Physik*, 1941, **118**, 473—488).—Theoretical. A combination method is employed to show that long-range regularity of inter-component spacing in mixed crystals holds at temp. < a definite limit, for plane and three-dimensional rectangular lattices. Lattice irregularities are shown to involve only a small fraction of lattice spaces. L. J. J.

**Intercalation of ferric chloride in the graphite crystal lattice.** W. Rüdorff and H. Schulz (*Z. anorg. Chem.*, 1940, **245**, 121—156).—Graphite and anhyd. $FeCl_3$ were heated at 180—500°, and excess of $FeCl_3$ was sublimed. With increasing temp. of prep. the amount of residual $FeCl_3$ decreased from 72% to 5%. The $X$-ray pattern of $FeCl_3$ was absent and only part of the $FeCl_3$ was removed by $H_2O$, EtOH, or $Et_2O$. Up to ~57% of $FeCl_3$ the electrical conductivity is approx. the same as for pure C, but it decreases with further increase in [$FeCl_3$]. $X$-Ray patterns of the various products are discussed. With high [$FeCl_3$] the $FeCl_3$ has its normal lattice structure but with an increase in the Fe··· plane distances. $FeCl_3$ and C layers are alternate. As [$FeCl_3$] decreases the no. of C layers increases and for 30—37% of $FeCl_3$ there are 3 C layers to 1 of $FeCl_3$. The introduction of $FeCl_3$ into graphite does not alter the magnetic moment of Fe···, thus ruling out at. linking between C and Fe. Of other halides examined only $SbCl_3$ behaved similarly. $C$–$FeCl_3$ reacts with liquid $NH_3$ at 0° to form a hexammine. C. R. H.

**Positions of carbon atoms in martensite.** N. J. Petch (*Iron and Steel Inst.*, Feb., 1943, *Advance copy*, 7 pp.).—The variation in size of the martensite interstices with C content, and the fact that the lattice is tetragonal, indicate that the C atoms are at the mid-points of the long edges of the cell, and at the centres of the faces perpendicular to them. The C atoms are surrounded by octahedra of Fe atoms. If all these positions were filled it would require 2 C atoms per unit cell, but the observed max. C content is 0·16 per unit cell. A. J. M.

**Crystal structure of cordierite.** A. Byström (*Arkiv Kemi, Min., Geol.*, 1942, **15**, B, No. 12, 7 pp.).—The crystal structure of cordierite has been reinvestigated, and the formula $Mg_2Al_4Si_5O_{18}$ has been confirmed. The space-group is $D_{2h}^{20}$—*Cccm*. The structure is similar to that of beryl. The interat. distances are given. A. J. M.

**Characteristics of soap hemihydrate crystals.** M. J. Buerger (*Proc. Nat. Acad. Sci.*, 1942, **28**, 529—535).—The crystallographic charac-

teristics of single crystals of Na stearate and Na palmitate have been studied and the de Jong–Bourman photographs which are presented show that the mols. have the form 2Na stearate,$H_2O$. J. L. E.

**Structure of stilbene derivatives. Structure of 4 : 4'-dihydroxy-$\alpha\beta$-diethylstilbene.** G. Giacomello and E. Bianchi (*Gazzetta*, 1941, **71**, 667—676).—The *trans*-structure of 4 : 4'-dihydroxy-$\alpha\beta$-diethylstilbene (+EtOH) (I) (cf. Kuwada *et al.*, A., 1940, II, 215; 1941, II, 320; Wessely *et al.*, *Ber.*, 1941, **74**, [B], 777) is confirmed crystallographically. 4 : 4'-Dimethoxy-$\alpha\beta$-diethylstilbene, also of *trans*-structure, crystallising without EtOH, can be compared with œstrone (II) : it has the same space-group as (II), which it very closely resembles·in cell dimensions. Thus (I) and (II) are sterically as well as physiologically analogous. E. W. W.

**Determination of space-groups of crystals of diphenylbenzamide and anisic acid.** R. K. Rokade, R. H. Khabaria, and M. R. Kapadia (*J. Univ. Bombay*, 1942, **11**, A, Part 3, 37—44).—The unit cell of $NBzPh_2$ contains 8 mols.; the axes from rotation photographs are $a$ 17·65, $b$ 9·060, $c$ 17·96 A. and the space-group is $Qh^{15}$. $p$-OMe·$C_6H_4$·$CO_2H$ has a unit cell containing 4 mols.; the apparent axes are $a$ 16·94, $b$ 10·94, $c$ 3·953 A., but the true unit cell has $a$ 16·82 A., β 94° 54'; space-group $C_{2h}^5$. F. R. G.

**Electron polarisation.** C. G. Shull, C. T. Chase, and F. E. Myers (*Physical Rev.*, 1943, [ii], **63**, 29—37).—Experiments on double scattering of a 400-ke.v. beam of electrons by thin Au foils give a polarisation asymmetry of 8% which becomes 1% in the opposite direction on replacing one Au foil by an Al foil. A reflexion–transmission effect (cf. Chase and Cox, A., 1940, I, 387) is confirmed, and plays an important part in the polarisation experiments. A polarisation experiment with electrons reflected from the foils produces a much smaller asymmetry than with transmitted electrons. A final polarisation ratio of 1·12±0·02 is obtained. N. M. B.

**Polarisation of electrons.** E. Trounson and J. A. Simpson, jun. (*Physical Rev.*, 1943, [ii], **63**, 55).—Previous experiments (cf. preceding abstract) are repeated with apparatus redesigned to minimise spurious asymmetries. The apparent asymmetry due to polarisation for Au is 6·8%, and for Al —2·1%. The reflexion—transmission ratio for Au and Al foils is 1·49. N. M. B.

**Effect of oblique incidence on the conditions for single scattering of electrons by thin foils.** G. Goertzel and R. T. Cox (*Physical Rev.*, 1943, [ii], **63**, 37—40).—Mathematical. With electrons obliquely incident on a thin foil serious deviations may be caused by the combination of two deflexions of the same order of magnitude. Consequences are discussed (cf. preceding abstracts). N. M. B.

**Electron diffraction study of the structure of cadmium iodide.** S. G. Pinsker (*J. Phys. Chem. Russ.*, 1941, **15**, 559—576).—Measurements of spacings and intensities of electron diffraction lines from thin $CdI_2$ films prepared from'EtOH, or by sublimation, show three structures having (i) $a$ 4·24±0·1, $c$ 6·835 A., space-group $D_{3d}^3$; (ii) $a$ 4·24±0·1, $c$ 13·67 A., space-group $C_{6v}^4$; and (iii) $a$ 4·24±0·1, $c$ 20·50 A., space-group $D_{3d}^3$. Crystals obtained by slow crystallisation have the structure (ii). J. J. B.

**Molecular structure of methyl *isocyanide*.** W. Gordy and L. Pauling (*J. Amer. Chem. Soc.*, 1942, **64**, 2952—2953).—From electron-diffraction measurements MeNC is linear with Me—N = 1·44±0·02 and N—C = 1·18±0·02 A. W. R. A.

**Electron diffraction of retene and $\beta$-methylanthracene crystals.** V. L. Karpov (*J. Phys. Chem. Russ.*, 1941, **15**, 577—591).—Transmission patterns of mono- and poly-cryst. films and the intensities of the spots show that retene has $a$ 6·25, $b$ 8·51, $c$ 23·4 A., and belongs to a space-group $C_{2v}^{10}$, $D_2^3$, or $D_2^4$; β-methylanthracene has $a$ 7·7 and $b$ 5·8 A. J. J. B.

**Dependence of magnetic properties of a substance on frequency.** K. M. Polivanov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 181—184).—Ferromagnetic substances show variation of μ with frequency due to both macroscopic and microscopic non-homogeneity. The latter is determined by the presence of Weiss regions. L. J. J.

**Number of fine structure lines of Rayleigh scattering in optically aelotropic crystals.** V. V. Vladimirski (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **31**, 866—867).—It is shown that the Rayleigh line of an optically aelotropic crystal consists of 24 satellites with changed frequencies, and one with the primary frequency. Under certain conditions some of the lines coincide, *e.g.*, if an incident or scattered light wave is propagated along the optical axis, the no. of satellites is reduced, so that the Rayleigh line then has 13 components. Where the optical aelotropy is small, the satellites will group in fours. A. J. M.

**Statistical lengths of rubber-like hydrocarbon molecules.** F. T. Wall (*J. Chem. Physics*, 1943, **11**, 67—71).—The root mean square lengths of *trans*-, *cis*-, and random rubber-like hydrocarbon mols. are calc. The max. possible lengths for *cis*- and *trans*-mols. are also obtained. The *cis*-structure should be more elastic than the *trans*-, which is in qual. agreement with practice, though the calc. difference in elasticity is not great enough, especially at room temp. Polychloroprene has a *trans*-structure, yet possesses considerable elasticity.

Balata, on the other hand, lacks elasticity, and steric influences account for this.          A. J. M.

**Frictional phenomena. XI. c. Solids.** A. Gemant (*J. Appl. Physics*, 1942, **13**, 688—696).—The general features of plastic flow in solids are reviewed and illustrated by experimental data, and the Prandtl model of plastic properties is discussed. The theories of Becker and Orowan, and of Polanyi and Taylor, are also considered. Although the mechanisms of viscous flow in liquids and plastic flow in solids are similar, a liquid flows at any point and in any direction, whereas in a solid flow develops near flaws and in crystallographically determined directions.          A. J. E. W.

# IV.—PHYSICAL PROPERTIES OF SUBSTANCES.

**Behaviour of solid electronic semi-conductors at dissociation.** E. I. Mokeeva and N. I. Mokeeva (*J. Phys. Chem. Russ.*, 1941, **15**, 686—687).—The conductivity ($\kappa$) of $ZnCO_3$ at 25—100° complies with Ohm's law. At 135—150° $ZnCO_3$ dissociates, and $\kappa$ rises by a factor of 10—40 within 10 min., and drops again to 0 in the next 10—15 min. The behaviour of $MnO_2$ is similar.      J. J. B.

**Theory of superconduction.** A. Sommerfeld (*Z. Physik*, 1941, **118**, 467—472).—Welker's theory of superconductivity (cf. A., 1939, I, 132) is consistent with the Gorter–Casimir–Kok thermodynamic relation. Misener's data (A, 1940, I, 201) for threshold curves agree with Welker's theory in the case of Tl, but not in that of Hg and In.          L. J. J.

**Ionic [diamagnetic] susceptibility of barium.** M. Prasad, S. S. Dharmatti, and C. R. Kanekar (*Proc. Indian Acad. Sci.*, 1942, **16**, **A**, 307—318).—The susceptibilities of $BaCl_2,2H_2O$, $BaBr_2,2H_2O$, $Ba(NO_3)_2$, $BaCO_3$, $BaSO_4$, $BaSeO_4$, $Ba(ClO_3)_2,H_2O$, $BaCrO_4$, $BaSeO_3$, $(HCO_2)_2Ba$, $Ba(OAc)_2$, $BaC_2O_4$, $(CH_2 \cdot CO_2)_2Ba$, $(OH \cdot \overset{\cdot}{C}H \cdot CO_2)_2Ba$, $(CO_2H \cdot C_6H_4 \cdot CO_2)_2Ba,H_2O$, and $(OH \cdot C_6H_4 \cdot CO_2)_2Ba$ have been measured and a val. for $\chi_{Ba \cdot \cdot}$ has been deduced in good agreement with theoretical vals. calc. by the methods of Slater and Angus.          W. R. A.

**Magnetochemical investigations. XLIII. Magnetic behaviour of the nickel complexes with nitrilotriacetic acid and with ethylenediaminetetra-acetic acid. XLIV. Magnetic behaviour of some inner complexes of imines of salicylaldehyde.** W. Klemm and K. H. Raddatz. **XLV. Ionic diamagnetism. Addendum to I and II.** W. Klemm (*Z. anorg. Chem.*, 1942, **250**, 204—206, 207—222, 223—225).—XLIII. Ni ethylenediaminetetra-acetic acid and nitrilonickel acetate exhibit paramagnetic properties of the same order as those of the Ni ion; they are probably penetration complexes with a tetrahedral configuration.

XLIV. Ni complexes of salicylaldehyde-imine, -methylimine, -ethylenedi-imine, and -o-phenylenedi-imine are diamagnetic and are therefore planar penetration complexes. The *salicylaldehyde-methylimine complex*, for which two methods of prep. are given, also exists in a paramagnetic form. Salicylaldehyde-ethylenedi-imine-$Co^{III}$ hydroxide is diamagnetic or weakly paramagnetic. Salicylaldehyde-o-phenylenedi-imine-$Fe^{III}$ chloride is a normal complex. Salicylaldehyde-ethylenedi-imine-$Fe^{III}$ chloride and oxide are intermediate complexes comparable with Fe compounds of phthalocyanine. Salicylaldehydeimine-$Fe^{III}$ is also an intermediate complex, although its properties are close to those of a normal complex.

XLV. Comparison is made between vals. of ionic diamagnetic increments previously reported by the author (cf. A., 1943, I, 261) and those of Trew (cf. A, 1941, I, 404).          C. R. H.

**Refractive indices of gases at high radio frequencies.** F. J. Kerr (*Proc. Physical Soc.*, 1943, **55**, 92—98).—A detailed account of measurements, by the standing wave method, previously reported for dry air and $H_2O$ vapour (cf. A., 1942, I, 167).      N. M. B.

**Reflexion of light by a periodically stratified medium.** G. A. Ramachandran (*Proc. Indian Acad. Sci.*, 1942, **16**, **A**, 336—348).—Mathematical.          W. R. A.

**Properties of optical glasses with chemically altered surfaces. II.** H. Schröder (*Z. tech. Physik*, 1942, **23**, 196—208; cf. *ibid.*, 1941, **22**, 38).—The transparency of a polished glass surface after treatment with acid falls slowly on keeping, and is changed by heat-treatment owing to $H_2O$-adsorption effects at the surface. A study of the effects of temp. changes in the range 25—200° on the reflectivity of a dense crown glass shows the existence of a reversible (adsorption) and an irreversible process (sintering of a porous surface layer). The adsorption effects are studied in detail, and isotherms similar to that of Langmuir are obtained. Typical capillary condensation phenomena occur at saturation $H_2O$ pressures. At 20° and 70% R.H. the adsorbed $H_2O$ layer is $\not> 5.5$ mols. thick. The sintering process causes the surface layer of the glass to shrink by $\not> 10\%$ and increases its chemical stability.          A. J. E. W.

**Refractive indices and densities of normal saturated fatty acids in the liquid state.** A. Dorinson, M. R. McCorkle, and A. W. Ralston (*J. Amer. Chem. Soc.*, 1942, **64**, 2739—2741).—Vals. of $n$ at 20—80° and of $\rho$ at 80° have been measured for $n$-fatty acids from hexoic to

stearic. $n$ varies linearly with temp. with a change in slope at 40°. Mol. vols. and refractions have been computed.      W. R. A.

**Specific heat of pure iron at low temperatures.** K. K. Kelley (*J. Chem. Physics*, 1943, **11**, 16—18).—The sp. heat of carbonyl-Fe (Fe 99·94, O <0·001, Ni 0·03%) has been determined at 52—298° K. Vals. are 0·924, 1·407, 1·786, 2·326, 3·062, 3·725, 4·443, 4·942, 5·410, 5·952 g.-cal. per g.-atom per °K. at 54·6°, 65·6°, 73·7°, 86·2°, 105·0°, 125·5°, 155·8°, 186·0°, 225·9°, 295·1° K., respectively. $S_{298 \cdot 16}$ is $6 \cdot 49 \pm 0 \cdot 03$ g.-cal. per g.-atom per degree.      L. J. J.

**Specific heats at low temperatures of anhydrous sulphates of iron, magnesium, manganese, and potassium.** G. E. Moore and K. K. Kelley (*J. Amer. Chem. Soc.*, 1942, **64**, 2949—2951).—From $C_p$ measurements between 51° and 298° K. the following vals. of $S_{298 \cdot 16}$ have been computed: $FeSO_4$, $25 \cdot 7 \pm 0 \cdot 3$; $MgSO_4$, $21 \cdot 9 \pm 0 \cdot 2$; $MnSO_4$, $26 \cdot 8 \pm 0 \cdot 3$; and $K_2SO_4$, $42 \cdot 0 \pm 0 \cdot 6$ g.-cal. per °K. per g.-mol. Computed vals. of $\Delta G$, based on third law of thermodynamics calculations, are given.      W. R. A.

**Theoretical properties of dense hydrogen.** C. L. Critchfield (*Astrophys. J.*, 1942, **96**, 1—10).—The limits of $\rho$ (0·66 to $1 \cdot 12 \times 10^7$) within which H can exist as a metallic solid are deduced from theoretical considerations. The thermal conductivity is such that a layer of the cryst. solid might transfer the heat produced by radioactive reactions within the core of planets, thus replacing the $H_2O$ layer of Wildt's theory. The Curie point for proton ferromagnetism is estimated, and the consequences of a large amount of H near the surface of white dwarf stars are discussed.      E. R. R.

**Density and refractive index of cumene.** J. E. Troyan (*J. Amer. Chem. Soc.*, 1942, **64**, 3056).—Pyknometric vals. of $\rho_4^{\theta}$ and $n_D^{\theta}$ are representable by an expression of the form $a + b\theta + c\theta^2$. $\rho_4^{20} = 0 \cdot 8620$, $n_D^{20} = 1 \cdot 4911$.      W. R. A.

**Surface tension and vapour pressure.** L. Z. Pollara (*J. Physical Chem.*, 1942, **46**, 1163—1167).—The empirical relation $T \log p = -a\gamma[M/(D-d)]^{2/3} + b$, where $M$ = mol. wt., $D$ and $d$ are densities of liquid and vapour respectively, $\gamma$ = surface tension, $p$ = v.p. and $a$ and $b$ are consts., is proposed. From it an equation connecting $p$ with $T$, the b.p., and crit. consts. and a new form of Trouton's ratio are derived.      C. R. H.

**Vapour pressure nomogram for isomeric octanols.** D. S. Davis (*Ind. Eng. Chem.*, 1943, **35**, 232).—The nomogram given covers the temp. range 50—190° and the v.p. range 15—800 mm., for 22 octanols, and is based on the data of Dorough *et al.* (A., 1942, II, 128).      L. J. J.

**Vapour pressure of phenylhydrazine as a function of temperature.** G. E. Williams and E. C. Gilbert (*J. Amer. Chem. Soc.*, 1942, **64**, 2776—2777).—The v.p. of $NHPh \cdot NH_2$, measured at 105—192° with a precision of $\sim \pm 0 \cdot 4$ mm. by an isoteniscope, can be expressed by an empirical equation of the form $\log P = A - B/(\theta + 230)$. The latent heat of vaporisation at 25—240° has been calc.      W. R. A.

**Vapour pressure of phenothiazine.** O. A. Nelson and L. E. Smith (*J. Amer. Chem. Soc.*, 1942, **64**, 3035—3037).—The v.p. of phenothiazine at 63—121° and the rate of evaporation of the finely-powdered substance at 45° have been determined. The loss in toxicity is not due to evaporation.      W. R. A.

**Thermodynamic theory of the equation of state.** A. M. Rosen (*J. Phys. Chem. Russ.*, 1941, **15**, 688—693).—The theories of Jacyna (A., 1938, I, 240) are criticised.      J. J. B.

**Repulsive action between a heated solid surface and adjacent gas. I.** H. Spencer-Gregory (*Phil. Mag.*, 1943, [vii], **34**, 120—130).—Gas-kinetic theory is applied to calculate the thermo-mol. force on a heated surface in a partially rarified gas. The cases discussed are an axial hot wire in a circular cylinder, two concentric spheres, and two parallel plates. The magnitude of the effect depends on the temp. discontinuity at the surface. Numerical vals. are given for $H_2$ and He for the cylindrical arrangement.      H. J. W.

**Viscosity of pure liquids. I. Non-polymerised fluids. II. Polymerised ionic melts.** R. M. Barrer (*Trans. Faraday Soc.*, 1943, **39**, 48—59, 59—67).—I. The equation $\eta = \eta_0 e^{E/RT}$ is used in the study of a large no. of pure liquids belonging to the classes (*a*) liquefied permanent gases and apolar compounds, (*b*) polar liquids, (*c*) H- and OH-bonded liquids, (*d*) liquid metals, and (*e*) ionic liquids. $E$, the energy of activation, varies with the nature of the liquid, and may vary with or be nearly independent of $T$. The zone theory of viscous flow (cf. A., 1942, I, 362) gives a satisfactory account of various properties of $\eta_0$. *E.g.*, the graphs of $-\log \eta_0$ with $E$ are straight lines of which the slopes and intercepts on the $-\log \eta_0$ axis increase with decrease of $T$, whilst the graphs of $-\log \eta_0$ with $E/T$ are parallel straight lines; in both cases the intercepts are separated approx. by $\log T_1/T_2$ for two temp. $T_1$ and $T_2$, and the relations are independent of the nature of the liquid.

II. For glasses and polymerised ionic melts $E$ may be very large and frequently depends on $T$. The relation between $\eta_0$ and $E/T$ is expressed by $-\log_e \eta_0 = 0 \cdot 115E/T(1 + 0 \cdot 00152E/T)$; this equation is virtually linear over the range $E/T = 8 \cdot 6$—100. The straight line has, however, a slope and intercept different from

those for mol. and non-polymerised fluids. The zone theory is used to explain these results. In many of the systems examined (including non-polymerised fluids) the no. of degrees of freedom in each zone, the zone vol., and the total energy per activated degree of freedom necessary for flow to occur are calc.     F. L. U.

# V.—SOLUTIONS, DISPERSIONS, AND MIXTURES.

**Compressibility of gas mixtures. II. Equation of state for gas mixtures.** V. P. Markov (*J. Phys. Chem. Russ.*, 1941, **15**, 410—415).—Several equations of state are tested on mixtures of $H_2$ and $CO_2$, $N_2$ and $H_2$, etc. The equation given by Kritschevski and Kasarnovski (cf. A. 1939, I, 605) agrees best with the measurements.     J. J. B.

**Second virial coefficients of gaseous mixtures.** A. E. Edwards and W. E. Roseveare (*J. Amer. Chem. Soc.*, 1942, **64**, 2816—2819).—The theory and practice of a method of determining the second virial coeffs. of gaseous mixtures are described. The method gives data for mixtures corresponding in accuracy with those obtained by gas density measurements to ~0·002%. Vals. for the second virial coeffs., $B_{12}$, at 25° are given for nine mixtures ($H_2$–$N_2$, $H_2$–$CO_2$, $N_2$–$CO_2$, $O_2$–$CO_2$, $H_2$–$C_2H_4$, $CO_2$–$C_2H_4$, $N_2$–$C_2H_4$, He–$N_2$, He–$CO_2$) and vals. of $B_m$ for each of these have been plotted as functions of the compositions of the mixtures.     W. R. A.

**Coefficients of thermal diffusion of neon and argon and their variation with temperature.** L. G. Stier (*Physical Rev.*, 1942, [ii], **62**, 548—551; cf. Nier, A., 1940, I, 203).—Measurements of the thermal diffusion consts. α in seven temp. intervals over 90—720° K. are reported. For both gases α ∝ log $T$. Results are compared with vals. obtained from viscosity data and measurements on binary gas mixtures. There is poor agreement with vals. calc. from the Sutherland and Lennard-Jones models. Negative vals. of α predicted by the model near the crit. temp. of A are not observed.     N. M. B.

**Physical properties of very dilute solutions.** O. Reinkober (*Naturwiss.*, 1942, **30**, 603—604).—The infra-red absorption of $NO_3'$ in solutions of $KNO_3$ of different concn. has been investigated in order to test the results of Heintz (A., 1942, I, 393) on the special properties of progressively diluted solutions. The statements made by Heintz could not be verified, the absorption curves for dil. solutions showing the same smooth course as for pure $H_2O$.     A. J. M.

**Osmotic pressure.** E. C. Craven (*Chem. and Ind.*, 1943, 86—87).—When $n$ mols. of non-volatile solute are dissolved in $N$ mols. of solvent, it is assumed that each solute mol. influences one solvent mol. so that it cannot leave the liquid surface, *i.e.*, only $N - n$ mols. of solvent are able to leave. The fall in v.p. [∝ $(N - n)/N$] is thus due to a reduction in the no. of mols. able to evaporate. This view of osmotic pressure is suggested as being more understandable than the somewhat abstract view usually adopted.     C. R. H.

**Van't Hoff theory of the Soret effect (osmotic pressure in non-isothermal systems).** K. Wirtz (*Z. Physik*, 1941, **118**, 510—514).—The assumption of const. osmotic pressure $P$ in non-isothermal liquid systems, leading to the relation $\pi_{T_1}/\pi_{T_2} = T_2/T_1$ for the concn.-temp. gradient effect, is in disagreement with experimental data. $P$ varies with temp. in a manner which can be expressed as a function of the Soret coeff.     L. J. J.

**Variation in the structure of water in ionic solutions. II.** G. W. Stewart (*J. Chem. Physics*, 1943, **11**, 72—74).—An extension of earlier work (A., 1940, I, 25) to 38 strong electrolytes confirms the correspondence between rates of variation of partial molal ionic vol. with concn., and the rate of variation of $H_2O$ structure as approx. indicated by the X-ray diffraction pattern. The effect of concn. on adiabatic compressibility and of solubility on the variation of $H_2O$ structure is considered. The effect of ions on $H_2O$ structure, adiabatic compressibility, and temp. of min. compressibility can be qualitatively explained by supposing that increase of temp. and the presence of ions breaks the H bonds, altering the $H_2O$ structure and decreasing its molal vol., and also causes increase in molal vol. by expansion.     A. J. M.

**Solvent polarisation error and its elimination in calculating dipole moments.** I. F. Halverstadt and W. D. Kumler (*J. Amer. Chem. Soc.*, 1942, **64**, 2988—2992).—The increasing curvature in polarisation-concn. curves as concn. decreases leads to false vals. for μ calc. by extrapolation to zero concn., and to false vals. for association factors computed on the assumption that curvature indicates association. A new method of calculating polarisations at infinite dilution, which eliminates solvent polarisation, is described and has been applied successfully in several cases reported to be anomalous.     W. R. A.

**Molar dispersion and refraction of free and bonded ions.** N. Bauer and K. Fajans (*J. Amer. Chem. Soc.*, 1942, **64**, 3023—3034).—Molar dispersion (Δ) is measured by the difference between $R_D$ and $R_∞$, the molar refractions (Lorentz-Lorenz) for the Na–D line and $λ = ∞$ extrapolated from measurements in the visible; Δ for isoelectronic substances is representable by a single-term formula in the visible and is approx. ∝ $R_D{}^2$. This relation holds for the

inert gases, H halides, $H_2O$, $H_2S$, and $H_2Se$. For free gaseous ions of the inert gas type, the dispersion, $Δ_g$, is obtained from the corresponding vals. of $R$ and Δ for inert gases, and from the gradations of $Δ_g$ with gradations of the experimental molar dispersions for aq. electrolytes the effect of hydration on the apparent ionic dispersion has been estimated. Δ is more sensitive than $R$ to changes in the forces acting on the electronic systems of ions and mols. and the relative changes in Δ are approx. twice those in $R_D$.     W. R. A.

**Calcium chloride nomographs.** D. S. Davis (*Ind. Eng. Chem.*, 1942, **34**, 1393—1394).—Nomographs permitting calculation of the concn. and f.p. of a 6—34% $CaCl_2$ solution from its $d$ at any temp. between 10° and 30° are given.     J. W. S.

**System anhydrous aluminium chloride in liquid sulphur dioxide. II. Specific gravity of solutions.** U. Tesei (*Gazzetta*, 1942, **72**, 142—145).—The sp. gr. of solutions of $AlCl_3$ of varying concn. in liquid $SO_2$ at −20°, 0°, 25°, and 50° is determined in a glass pyknometer with metal top and tap.     E. W. W.

**System water–glucose as an example of the " ideal " solubility.** E. Pozner and A. C. Amirchanov (*J. Phys. Chem. Russ.*, 1941, **15**, 1137—1138).—From supercooled aq. solutions of glucose ice deposits in the range 0—71% of glucose, and the f.p. curve agrees with that expected from " ideal " solutions.     J. J. B.

**Solidification point nomograph for fatty acids.** D. S. Davis (*Ind. Eng. Chem.*, 1943, **35**, 105).—A nomograph, which gives the f.p. lowering of fatty acids due to the presence of $H_2O$, is reproduced. It is applicable to the normal saturated $C_6$—$C_{18}$ fatty acids.     C. R. H.

**High mol. wt. aliphatic amines and their salts. IX. Behaviour of various salts of dodecylamine in water, ethyl alcohol, and benzene.** C. W. Hoerr and A. W. Ralston (*J. Amer. Chem. Soc.*, 1942, **64**, 2824—2829).—The solubilities of dodecylammonium formate, acetate, propionate, *n*-butyrate, chloride, bromide, iodide, dodecylcarbamate, primary and *sec.* phosphates, and H and normal sulphates, $C_{12}H_{25}$·$NH_2$MeCl, and $NHMe_2$·$C_{12}H_{25}$ chloride and acetate have been determined in $H_2O$, EtOH, and $C_6H_6$. The phase changes of the $H_2O$ systems of $NH_3$·$C_{12}H_{25}$ formate, acetate, propionate and $C_{12}H_{25}$·$NHMe_2$·OAc have been investigated, and the hydrates formed by these salts are given. The osmotic coeff. of the salts in aq. solution is independent of the acid radical, and shows an abrupt decrease when the concn. reaches ~0·1M. owing to micelle formation. Mol. association of $Pr^n$·$CO_2$$NH_3$·$C_{12}H_{25}$ in $C_6H_6$ is discussed.     W. R. A.

**Generalisation of the Gibbs–Curie theorem for mixed crystals.** V. K. Sementschenko (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 175—177).—The effect of admixtures on equilibrium crystal form depends on the manner of their adsorption at the liquid–crystal interface. Positive adsorption retards crystal growth at low concn. and accelerates it at high concn.; negative adsorption has the reverse effect.     L. J. J.

**Photo-electric alloys of alkali metals.** A. Sommer (*Proc. Physical Soc.*, 1943, **55**, 145—154).—A detailed account of studies previously reported for $SbCs_3$ (cf. A., 1942, I, 17). $SbRb_3$, $SbK_3$, $BiCs_3$, and an As–Cs alloy have been produced. They show photo-electric sensitivity of much lower order than $SbCs_3$, have a more metallic character, and their sp. resistance is similar to that of metallic conductors.     N. M. B.

**Diagram of state for the nickel–niobium system.** S. A. Pogodin and A. N. Zelikman (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **31**, 895—897).—Thermal analysis indicates the existence of an α phase from 0 to 23·5% Nb, consisting of a solid solution of Nb in Ni, a β phase from 23·5 to 51·6% Nb, consisting of a solid solution of Nb in $Ni_3Nb$, and from 51·6% Nb upwards another compound, probably $NiNb$, which separates as a γ phase. There are two eutectics, one on each side of $Ni_3Nb$. One consists of α and β phases, contains 23·5% Nb, and has m.p. 1270°. The second has m.p. 1175°. The hardness of these alloys has been investigated. The solubility of Nb in Ni was studied by examining the microscopic structure of a series of Nb–Ni alloys.     A. J. M.

**Diffusion rate of carbon in iron–cobalt alloys.** R. Smoluchowski (*Physical Rev.*, 1942, [ii], **62**, 539—544).—Direct measurement confirms the accelerating influence of Co on the rate of diffusion of C in γ-Fe, and an increase in the diffusion coeff. is established. Addition of 4% of Co decreases the activation energy from 32,500 to 30,000 g.-cal., corresponding with ~100% increase of the diffusion rate at 1 at.-% C concn. At higher C contents the accelerating influence is smaller.     N. M. B.

**Determination of valency from X-ray absorption spectra.**—See A., 1943, I, 78.

**Solubility of hydrogen in *n*-butane.** E. E. Nelson and W. S. Bonnell (*Ind. Eng. Chem.*, 1943, **35**, 204—206).—The solubility ($S$) of $H_2$ in *n*-$C_4H_{10}$ has been determined at 23·9°, 82·2°, and 115·6°, at 22—106 atm. At pressures <30 atm. $S$ decreases, and at pressures >40 atm. $S$ increases, with increase of temp. At [$H_2$] >3 mol.-% there is a region of isobaric retrograde condensation at temp. ≪ the crit. region.     L. J. J.

**Solubility effect in solvents of low dielectric constant. II. Solubility effect in benzene.** A. A. Vernon and J. P. Masterson (*J. Amer. Chem. Soc.*, 1942, **64**, 2822—2823).—The solubilities of tetra*iso*-amylammonium iodide in $C_6H_6$ solutions of tetraisoamylammonium picrate and NHBu$_3$ picrate, and of tetra-amylammonium iodide in $C_6H_6$ solutions of tetra-amylammonium and NHBu$_3$ picrates have been determined. In both cases an increase in solubility of the saturating salt was found, and the relation of this to multiple ion phenomena is noted.      W. R. A.

**Solubility studies. VII. Solubility of isomeric ketones in water.** J. H. Saylor, V. J. Baxt, and P. M. Gross (*J. Amer. Chem. Soc.*, 1942, **64**, 2742—2744).—The solubilities of $COPr^{\alpha}_2$, $COPr^{\beta}_2$, and $COMe \cdot C_5H_{11}$ in $H_2O$ have been determined from 10° to 75°, and vapour solubilities, free energies, heats, and entropies of dissolution have been calc. The previous suggestion that equality of solute vol. as well as chemical similarity is necessary for a linear relation between entropies and heats of dissolution has been confirmed. In agreement with other isomeric ketones, large solubility differences and a large temp.-dependence of those differences were found.      W. R. A.

**Solubility of calcium oxalate monohydrate in water and neutral salt solutions at 25°.** W. H. McComas, jun., and W. Rieman, III (*J. Amer. Chem. Soc.*, 1942, **64**, 2946—2947).—The solubility of $CaC_2O_4,H_2O$ has been determined in $H_2O$ and in aq. solutions of NaCl, KCl, $HCO_2NH_4$, and $Na_2SO_4$ at 25° at various ionic strengths up to 1·0. The $H_2O$-solubility is $4.55 \times 10^{-5}M$. at 25°.      W. R. A.

**Effect of pH on the solubility of calcium oxalate.** W. H. McComas, jun., and W. Rieman III (*J. Amer. Chem. Soc.*, 1942, **64**, 2948—2949).—The semiclassical second ionisation const. $K_2'$ of $H_2C_2O_4$ has been determined at ionic strengths ($\mu$) from 0 to 1 in presence of NaCl, KCl, and $NH_4Cl$ and the solubility of $CaC_2O_4,H_2O$ in formate buffers at $\mu = $ const. $= 0.36$ has been measured over the pH range 5·96—2·60, in which the solubility increases from $2.23 \times 10^{-4}$ to $5.89 \times 10^{-4}M$. The observed vals. agree with those calc. by the use of $K_2'$.      W. R. A.

**Aqueous solutions of aluminium oxide in alkali hydroxides.** V. T. Sheth (*J. Univ. Bombay*, 1942, **11**, A, Part 3, 185).—The solubility of $Al(OH)_3$ in N- to 14N-NaOH and -KOH at 35—55° is for a sample pptd. from $Al_2(SO_4)_3$ > that of a Merck sample > that of a sample pptd. from $AlCl_3$ > that of a sample obtained by hydrolysis of $Al(OEt)_3$, and increases with concn. of the alkali and temp. The amount of $Al_2O_3$ pptd. by electrolyte is in the reverse order of the solubility.      F. R. G.

**Indium salts. II. Indium iodate.** F. Ensslin (*Z. anorg. Chem.*, 1942, **250**, 199—201).—A diagram for the solubility at 20° of $In(IO_3)_3$ in $HNO_3$ (0—900 g. per l.) has been constructed. A max. solubility of 16·89 g. of $In(IO_3)_3$ per l. occurs at $[HNO_3] = 300$ g. per l.      C. R. H.

**Solubility of carbon in silicochrome.**—See B., 1943, I, 168.

**Solubility of secondary uranium minerals.** I. E. Starik, A. G. Samartzeva, and M. L. Jaschtschenko (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **31**, 909—910).—The solubility of two secondary U minerals, zeunerite ($CuO,2UO_3,As_2O_5$) and an isomorphous mixture of torberite ($CuO,2UO_3,P_2O_5$) and autunite ($CaO,2UO_3,P_2O_5$), has been determined. The solubility of autunite in a natural $H_2O$ is 1·5 times > in distilled $H_2O$, whilst the ratio in the case of zeunerite is 15. The solubility is < that of $BaSO_4$.      A. J. M.

**Solubility of melamine in water.** R. P. Chapman, P. R. Averell, and R. R. Harris (*Ind. Eng. Chem.*, 1943, **35**, 137—138).—The solubility (S) of melamine in g. per 100 g. of $H_2O$ at 20—100° is given by $\log S = -1642/T + 5.101$.      L. J. J.

**Adsorption of propane and propylene by silica gel and metallised silica gel.** L. H. Reyerson and M. R. Cines (*J. Physical Chem.*, 1942, **46**, 1060—1068).—Palladised $SiO_2$ gel adsorbs $C_3H_6$ and $C_3H_8$ more strongly than does untreated $SiO_2$, $C_3H_6$ being more strongly adsorbed than $C_3H_8$. The data support the theory of Brunauer *et al.* (cf. A., 1938, I, 190).      C. R. H.

**Experimental study of the effect of force interactions on the adsorption process. I. Adsorption equilibrium. II. Adsorption kinetics.** J. M. Goldfeld and N. I. Kobosev (*J. Phys. Chem. Russ.*, 1941, **15**, 257—274, 275—295).—I. Adsorption isotherms at 0° between $10^{-5}$ and $10^{-1}$ mm. Hg of $H_2$, CO, $C_2H_4$, and propylene on Cu, and of $NH_3$ on Fe, are measured. They do not comply with Langmuir's equation and can be accounted for by assuming that an adsorbed mol. lowers the adsorption potential $U$ around it. The adsorption of CO on Cu containing $(CN)_2$ (*e.g.*, 0·25—0·65 c.c. per g. of Cu) is not only < that on pure Cu but the deviation of its adsorption isotherm from Langmuir's equation is increased. If $(CN)_2$ were just blocking the adsorbing surface this deviation would have been unchanged or reduced; its increase shows that adsorbed poison mols. strongly lower the $U$ of their neighbour mols. When the surface area of Cu is reduced by recrystallisation at 350°, the amount adsorbed ($x$) is less but the shape of the isotherm does not change.

II. The rate $v$ (c.c. per sec.) of desorption of CO, $H_2$, propylene, and $(CN)_2$ from Cu, and of $NH_3$ from Fe, is measured at $-40°$ to 180°. It rapidly decreases when $x$ diminishes, and the ratio $v/x$ decreases as well, showing that $U$ is the higher the smaller is $x$. The increase of $v/x$ with $x$ is less marked at higher temp. $(CN)_2$ raises $v/x$ and its increase with $x$ for desorption of CO from Cu; this shows that the $U$ of CO is lowered by the near-by mols. of $(CN)_2$.      J. B.

**Adsorption equilibrium and kinetics of processes on heterogeneous surfaces or in the presence of an interaction between adsorbed molecules.** M. I. Temkin (*J. Phys. Chem. Russ.*, 1941, **15**, 296—332).—Mathematical. The observed adsorption can be explained by taking into account either the heterogeneity of solid surfaces or the repulsive forces between the adsorbed mols. A convenient adsorption isotherm is $\theta = [\log_e (1 + a_0 p) - \log_e (1 + a_1 p)]/(\log_e a_0 - \log_e a_1)$, where $\theta$ is the degree of saturation of the surface, $p$ the gas pressure, and $a_0$ and $a_1$ are const.      J. B.

**Elimination of sorption–desorption hysteresis in hydrous oxide gels. II. Tantalum pentoxide, stannic oxide, and titanium dioxide.** H. B. Weiser, W. O. Milligan, and W. C. Simpson (*J. Physical Chem.*, 1942, **46**, 1051—1059).—Extension of the investigation of sorption–desorption hysteresis in $SiO_2$ gel (cf. A., 1942, I, 324) to gels of $Ta_2O_5$, $SnO_2$, and $TiO_2$ confirms earlier conclusions. Theories of such hysteresis are discussed.      C. R. H.

**Adsorption at the crystal–solution interface. XIII. Electron diffraction investigation of crystal surfaces of pure sodium bromate and sodium bromate with adsorbed dyes.** J. H. Blomquist and W. G. France (*J. Physical Chem.*, 1942, **46**, 1044—1050).—$NaBrO_3$ crystals grown in aq. dye solutions have lattice consts. different from those of pure crystals if the dye is adsorbed selectively. With other dyes the lattice consts. are unchanged. This lattice change is not regarded as due to solid solution of the dye mol. in the $NaBrO_3$ lattice, but rather to an inner potential effect.      C. R. H.

**Ion exchange between solid and liquid phases. I. Dependence of cation exchange on dilution.** A. N. Ivanov and E. N. Gapon. **II. Differential coefficients of sorption of two ions.** E. N. Gapon (*J. Phys. Chem. Russ.*, 1941, **15**, 659—664, 665—672).—I. In the ion exchange between a solid salt MX and a dissolved salt $BA$ the amount of $B$ sorbed is independent of dilution if M and $B$ have equal valencies; if the valency of $B$ is > that of M, the sorption of $B$ increases with dilution, and vice versa. These rules are deduced theoretically and supported by experiments with aluminosilicates saturated with Na or Ca and exchanging their cations with KCl, NaCl, and $CaCl_2$.

II. It is shown theoretically that the sorbed amount $s$ of an ion the activity of which is $a_1$ and valency $n_1$ generally depends on the activity $a_2$ and valency $n_2$ of another competing ion, according to the equation $s = \text{const.}_1 + \text{const.}_2 \times (\log_e a_1^{1/n_1} - \log_e a_2^{1/n_2})$.      J. B.

**Adsorption analysis of some triglycerides and fatty acids.** S. Claesson (*Arkiv Kemi, Min. Geol.*, 1942, **15**, A, No. 9, 9 pp.).—The adsorption method of Tiselius (A., 1943, I, 136, 139) has been applied to the adsorption of trilaurin, trimyristin, tripalmitin, and triolein in $Et_2O$ on C, the retardation vols. being determined. With the higher fatty acids, EtOH was the only solvent which gave a suitable difference in retardation vol. to enable a separation to be made. The adsorption differences between the various triglycerides and acids used are sufficiently great to enable a qual. analysis to be carried out by this method.      A. J. M.

**Adsorption of simple and complex cobalt ions on titanium dioxide.** D. G. Nicholson (*J. Amer. Chem. Soc.*, 1942, **64**, 2820—2822).—Co$^{\cdot\cdot}$ ions are adsorbed from aq. or AcOH solutions of Co(OAc)$_2$ by $TiO_2$ but the extent of adsorption is reduced when the Co$^{\cdot\cdot}$ ions, in AcOH, are co-ordinated with *o*-phenanthroline. This explains the shortened induction period characteristic of $TiO_2$-pigmented drying oils containing metal-*o*-phenanthroline complex driers.      W. R. A.

**Fluorescence and adsorption of stilbamidine.**—See A., 1943, III, 265.

**Dissolution of silver halides in aqueous halogen acids as an example of the influence of surface equilibria on the rate of heterogeneous diffusion.** W. Erber (*Z. anorg. Chem.*, 1942, **150**, 145—158).—The rate of dissolution ($v$) of Ag halides in solutions of the respective acids increases with increase in acid concn. ($c$). The kinetics of heterogeneous reactions are discussed, and an equation relating $v$ to $c$ and taking into account diffusion and conditions at the liquid-solid interface has been derived. There is good agreement between calc. and observed vals. of $v$ for small vals. of $c$, but as $c$ increases the observed val. of $v$ increases less rapidly than the calc. val.      C. R. H.

**Surface tensions of methane–propane mixtures.** C. F. Weinaug and D. L. Katz (*Ind. Eng. Chem.*, 1943, **35**, 239—246).—The surface tensions of $CH_4$–$C_3H_8$ liquid–vapour equilibrium mixtures at $-15°$ to 90° and 42—1500 lb. per sq. in. have been determined by capillary rise and drop-vol. methods. The results are in close agreement with an equation of the Fowler form in terms of the parachors and apparent molal vol. of the components in liquid and vapour phases.      L. J. J.

**Surface tension of solutions of electrolytes as a function of concentration. IV. Magnesium sulphate.** G. Jones and W. A. Ray (*J. Amer. Chem. Soc.*, 1942, **64**, 2744—2745).—Apparent relative $\gamma$ of aq. $MgSO_4$ (0·0001—2M.) have been measured at 25·00°. At extreme dilution $MgSO_4$ apparently gives a min. in the $\gamma$–M. curve, similar to those given by salts previously investigated (cf. A., 1942, I, 142). $MgSO_4$ increases $\gamma$ of $H_2O$ almost linearly with concn. at moderate and high concn., and behaves as a typical " capillary-inactive " substance.      W. R. A.

**Capillary behaviour in porous solids.**—See B., 1943, I, 134.

**Electron-microscopic and electron diffraction studies of the structure of volatilised metal films.** G. Haas (*Kolloid-Z.*, 1942, **100**, 230—242).—Very thin Ag films consist of isolated grains, the spaces between which become filled up when the films thicken, until crystallites up to 5000 A. long are formed when the thickness reaches 550 A. In such films the lattice const. is $4·085 \pm 0·01$ A. Films of Al are much finer-grained than films of Ag of equal thickness, and have a lattice const. of $4·05 \pm 0·01$ A. In thin Sb films there is complete orientation of the crystallites with the (0001) plane parallel to the supporting surface, and the grain size is very uniform. With increasing thickness the orientation progressively decreases and faults appear in the film.      F. L. U.

**Formation of films from emulsions. II.** H. Wagner and A. W. Böhmisch (*Kolloid-Z.*, 1942, **100**, 263—274; cf. A., 1936, 1459).—The properties of films made by painting emulsions on a glass surface are described and illustrated by photomicrographs. The emulsions studied were of both O/W and W/O types, one component being $H_2O$ and the other linseed oil or a solution (in $C_6H_6$, $CHCl_3$, etc.) of chlorinated rubber, Bunalite, polystyrene, or a vinyl resin; casein in aq. $NH_3$ and a sol of Na celluloseglycollate were used as emulsifiers.      F. L. U.

**Interferometric measurement of film thickness in adsorbed protein monolayers.** H. J. Trurnit and G. Bergold (*Kolloid-Z.*, 1942, **100**, 177—191).—Procedure is described. The method, when applied to monolayers of yellow enzyme and of hæmocyanin adsorbed on Cr, gives results agreeing with those to be expected from other data, assuming the surface to be completely covered by rectangular prisms the long axes of which are parallel to the surface, and the length of the long axis to be equal to the particle length as determined by other methods. The film thicknesses found for insect virus proteins are consistent with a form factor (long : short axis ratio) of 12, but this cannot be checked by independent data, and the results may be due to failure to form a complete layer. F. L. U.

**Diffusion of water in a foil as a cause of an electric current.** C. Fischer and F. H. Müller (*Naturwiss.*, 1942, **30**, 604).—Experiments are described which indicate that the diffusion of $H_2O$ through thin films of org. substances (cellulose triacetate and polystyrene) gives rise to an electric current, the variation of which with time has been investigated.      A. J. M.

**Structure of collodion membrane and its electrical behaviour. V. Influence of thickness of dried collodion membranes on their electromotive behaviour.** K. Sollner and C. W. Carr (*J. Gen. Physiol.*, 1943, **26**, 309—323; cf. A., 1943, I, 14).—Determination of the characteristic concn. p.d. across dried collodion membranes of 3—160 $\mu$. thickness, prepared from collodion preps. of different electrochemical activity, shows that the p.d. are a function of the thickness of the membrane. The thinnest membranes always give the lowest concn. p.d.; increase in thickness gives higher p.d. until a const. val. is attained which is characteristic of that particular collodion. With electrochemically active collodion, characteristic concn. p.d. which approach the thermodynamically possible max. are obtained with membranes only 10 $\mu$. thick, whilst thinner membranes give lower vals. The results support the micellar structural theory as applied to dried collodion membranes.      J. N. A.

**Diffusion of solubilised dyes in water and through membranes.** R. B. Dean and J. R. Vinograd (*J. Physical Chem.*, 1942, **46**, 1091—1098).—Measurements of the diffusion const. (*D*) of Aerosol OT in $H_2O$ and in presence of Yellow AB or Orange OT give no evidence that the presence of the dye lowers *D*. The dye diffuses as free mols. between the micelles. Diffusion experiments with Cellophane membranes show that solubilised dye and even large micelles of solubilising agent alone cannot, as such, cross the membranes. The solubilising agent has no direct influence on the movement of mols. inside the membrane but it permits diffusion to take place because it maintains a constantly renewed supply of dye mols. close to the membrane on one side and takes up dye mols. on the other side as fast as they diffuse through the membrane. On the basis of these results it is argued that bile salts may not carry fats out of the intestine but only carry fat mols. to the cell membrane so that diffusion can take place.      C. R. H.

**Descriptions of emulsions.** R. H. Marriott (*Chem. and Ind.*, 1943, 123).—The terms " obverse " and " reverse " are proposed for use instead of " oil in water " (O/W) and " water in oil " (W/O), respectively.      F. L. U.

**Applications of the electron microscope in colloid chemistry.** L. Marton (*J. Physical Chem.*, 1942, **46**, 1023—1032).—A review of the basic principles and achievements of the electron microscope.      C. R. H.

**Thixotropy and dilatancy.**—See B., 1943, I, 134.

**Sedimentation in angle centrifuge.** E. G. Pickels (*J. Gen. Physiol.*, 1943, **26**, 341—360).—Sedimentation of hæmocyanin from *Limulus polyphemus* in the angle centrifuge in vac. and in air is determined. Sedimentation in a given field of force is less efficient when determined in air owing to thermal convection. Correlations are established with results obtained in the analytical ultra-centrifuge and a theory of sedimentation in inclined tubes is proposed to explain the results. Under proper conditions the angle centrifuge can be used for approx. determination of particle size. Improvements for securing better sedimentation and interpreting the results are described. To counteract convective disturbances of thermal or inertial origin, the liquid is provided with a synthetic density gradient formed with sucrose or some other non-sedimentable substance.      J. N. A.

**Vapour pressure and electrodynamic volume of suspensions.** H. Löwy (*Phil. Mag.*, 1943, [vii], **34**, 101—104).—The $H_2O$ content of soil and desert sands is discussed in terms of Kelvin's theory for the v.p. over curved liquid surfaces. An extension of the theory, in which the dielectric const. is introduced, suggests an experimental method for determining the relation between v.p. and the curvature of the liquid surface of films for which Kelvin's theory fails.      H. J. W.

**Highly purified alumina–silica sols.** M. E. Schischniaschvili and V. A. Kargin (*J. Phys. Chem. Russ.*, 1941, **15**, 1121—1128).—Strongly dialysed mixed sols of $Al_2O_3$ and $SiO_2$ show no electrophoretic movement. In the presence of traces of $K_2SO_4$, $K_3PO_4$, or $KNO_3$ the cataphoretic mobility is $\sim 2 \times 10^{-4}$ cm./sec./v./cm. These results are of importance for the understanding of the exchange capacity of soils.      J. J. B.

**Nature of colloidal clay as revealed by the electron microscope.** B. T. Shaw (*J. Physical Chem.*, 1942, **46**, 1032—1043).—The results of an electron-micrographical investigation of montmorillonite (**I**) and kaolinite (**II**) are discussed. Ultimate dispersion of (**I**) leads to unit plates $\sim$1 m$\mu$. thick. Evidence in support of the view that the exchange positions are located on the plate edges of (**II**) is offered.      C. R. H.

**Clays as colloidal electrolytes.** C. E. Marshall and C. A. Krinbill (*J. Physical Chem.*, 1942, **46**, 1077—1090).—Potentiometric and conductometric measurements show that, for $Na^{\cdot}$, $K^{\cdot}$, and $NH_4^{\cdot}$, ionisation of the clay " salts " follows the order kaolinite (**I**) > montmorillonite (**II**) > beidellite (**III**) > illite (**IV**) whereas the apparent strengths of the clay acids are in the order (**II**) > (**III**) > (**IV**) > (**I**). (**I**) approaches more nearly than the other clays the normal behaviour of a weak acid with extensively dissociated salts. The small metallic cation dissociation of (**II**), (**III**), and (**IV**) may be ascribed to cationic tendency to penetrate some distance into the $Si_2O_3$ layers, thus partially neutralising the negative charges on the lattice.      C. R. H.

**Vapour pressure equations of solutions and osmotic pressure of rubber.** A. R. Miller (*Proc. Camb. Phil. Soc.*, 1943, **39**, 54—67).—The conception of solute and solvent mols. occupying sites on a regular lattice and potential energy arising from interaction between mols. occupying closest neighbour sites is extended to the derivation of the v.p. equations when each solute mol. consists of three groups or submols. and occupies three closest neighbour sites on the lattice. The results can be generalised for long-chain solute mols. The osmotic pressure $\sim A_1 c(1 + A_2 c)$, where $c$ is the solute concn. in g. per 100 c.c. and $A_1$ and $A_2$ determine respectively the mol. wt. and no. of submols. per mol. of the polymeride.      L. J. J.

**Physical chemistry of resin solutions.**—See B., 1943, II, 124.

**Theory of molecular size distribution and gel formation in branched-chain polymers.** W. H. Stockmayer (*J. Chem. Physics*, 1943, **11**, 45—55; cf. Flory, A., 1942, I, 97, 173).—Mol. size distributions are calc. for certain types of branched-chain high polymers by a mathematical method more general than that of Flory. The work of Flory, which showed that very large polymeric mols. appeared suddenly at a crit. extent of reaction occurring very nearly at the observed gel point, is confirmed. The transition liquid $\rightarrow$ gel is analogous to the condensation of saturated vapour.      A. J. M.

**Electron-microscopy of cellulose fibres.** A. Frey-Wyssling (*Kolloid-Z.*, 1942, **100**, 304—305).—Criticism of a paper by Wergin (A., 1942, I, 391).      F. L. U.

**Reaction between metal hydroxide solution and cellulose fibres. IV. X-Ray study of lattice changes in fibrous hydrocellulose regenerated from solutions of natural cellulose.** W. Schramek and O. Succolowsky (*Kolloid-Z.*, 1942, **100**, 299—303).—The action of aq. NaOH at concns. up to 50% was examined by means of X-ray diagrams. Unlike cotton and ramie, the regenerated cellulose–NaOH system shows a pure heterogeneous reaction-type, and diagrams with mixed patterns are not obtained. The difference is due to the

hindrance to reaction offered by the histological structure of the natural fibres.     F. L. U.

**Behaviour of cellulose fibres in the electron microscope.** A. Hamann (*Kolloid-Z.*, 1942, **100**, 248—254).—A method of preparing very fine fibres (diameter $< 1 \mu$.) of regenerated cellulose for electron-microscopical examination is described. With very weak electron radiation it is possible to obtain photographs of the fibres in their natural condition, but on increasing the intensity of the radiation the fibres lengthen, exhibit increasing movement, and become inflated and blistered, until finally the original structure is completely destroyed. The observations of Ruska (*ibid.*, 1940, **92**, 276) are thus seen to be due to the destructive action of the radiation, and the unoriented foam-like structure reported by him is not that of the natural fibres but of their decomp. products.     F. L. U.

**Action of light on cellulose. Viscosity–concentration relations of cellulose acetate solutions.** R. E. Montonna and C. C. Winding (*Ind. Eng. Chem.*, 1943, **35**, 214—216).—Since existing formulæ connecting relative $\eta$ ($\eta_r$) with the vol. of the dispersed phase of colloidal dispersions assume that the dispersed particles are approx. spherical and do not mutually interfere with one another, very dil. solutions must be used in determining data for particles of other shapes. Curves relating the concn. (*c*) and ($\eta_r - 1$)/*c* [= limiting sp. $\eta$ (*L*)] at $30 \pm 0.1°$ for dispersions of cellulose acetate (I) in $COMe_2$ are linear only for $c < 0.5$ g. per 100 c.c.; the deviation from linearity increases with the $\eta$ of the (I). The curves show that the equation $\eta_r = 1 + ac + bc^2$, which is analogous to the expanded Einstein and Kunitz formulæ, applies to such solutions, and enable *a* and *b* to be determined; the inclusion in the equation of a shape-factor, depending on the ratio major : minor axis of the particle, enables the vals. of *a* and *b* to be calc. for micellar structures and single, long-chain Staudinger-type macromols. *L* at infinite dilution may therefore be determined simply by making two $\eta$ determinations at concns. $< 0.5$ g. per 100 c.c. *L* may be correlated with mol. wt. determinations, and used to follow the degradation of cellulose derivatives independently of thixotropic effects and as a general means of characterising (I) solutions.     J. G.

**Vapour pressure of nitrocellulose gels in acetone.** E. Calvet (*Compt. rend.*, 1942, **214**, 767—768).—The mol. concn.–pressure curve for 16·3° shows a marked inflexion at a concn. corresponding with 6 mols. of $COMe_2$ per $C_6$ group. Available data for the 40° curve show that the two curves meet at the point of inflexion. The calc. heat of absorption at this point is zero, in agreement with experiment.     N. M. B.

**Gelatinisation of nitrocelluloses. Heats of absorption of acetone by fibres and films of nitrocellulose.** E. Calvet (*Compt. rend.*, 1942, **214**, 716—718).—Heat of absorption curves show marked max. near the absorption of 6 mols. of $COMe_2$ per $C_6$, independent of the no. of $NO_2$ groups fixed by the cellulose within the range N 11·5—14%. The heats of dissolution are greater for fibres than for films, and for tri- than for di-nitrated cellulose. The heat of absorption of $COMe_2$ by pure cellulose is approx. the same as for the nitrated forms. Explanations are discussed.     N. M. B.

**Diffusion velocity of ovalbumin in relation to its mol. wt.** L. Friedman and B. R. Ray (*J. Physical Chem.*, 1942, **46**, 1140—1150).—The diffusion coeff. of ovalbumin (I) at 4° from 0·2% solution has been measured. From these and $\eta$ and *d* data the radii, mol. wt., dissymmetry const., ratio of axes, and the possible extent of the (I) mol. being hydrated have been calc. The vals. obtained differ considerably according to the equation used in calculation, *e.g.*, mol. wt. 30,600—111,900 and dissymmetry const. 1·96—8·37.     C. R. H.

**Acid–base-binding capacity of collagen.** E. R. Theis and T. F. Jacoby (*J. Biol. Chem.*, 1942, **146**, 163—169).—A method for determining the H· and OH′-binding capacity of collagen has been developed. The collagen material is equilibrated in contact with aq. HCl or KOH of known pH val., pressed to remove unbound electrolyte, air-dried, and ground. The ground material (0·5 g.) is treated with $H_2O$ (50 c.c.) and 0·1N-HCl (10 c.c.) for 2 hr., after which 10 c.c. of KI–$KIO_3$ reagent (KI 200 g., $KIO_3$ 50 g. per l.) and 20 c.c. of 0·1N-$Na_2S_2O_3$ are added and allowed to react during 2 hr. The excess of $Na_2S_2O_3$ is titrated with 0·1N-HCl or -I and the H· or OH′ fixed per g. of protein is deduced from the 0·1N-$Na_2S_2O_3$ consumed. The results are in accord with other analytical data.     J. W. S.

**Electrophoretic patterns, colloid osmotic pressure, and viscosity of serum denatured by ultra-violet radiation.**—See A., 1943, III, 271.

**Coagulation of hydrophobic sols by electrolyte mixtures. V. Coagulation of negative silver iodide sol by ions (Hg··) reacting with the micelle.** L. Lepin and A. Bromberg (*J. Phys. Chem. Russ.*, 1941, **15**, 673—685).—$Hg(NO_3)_2$ forms with AgI sol stabilised by I′ ions first $Ag_2HgI_4$ and then $HgI_2$ (both detected spectroscopically). The coagulating concn. *C* of $Hg(NO_3)_2$ is independent of the concn. of $KNO_3$ or $K_2SO_4$ but is $= 0.5[I′]$, when [I′] is varied by addition of KI. At a const. [KI] *C* increases when [AgI] increases. The coagulation takes place when all the surplus I′ ions are transformed into either $HgI_4″$ or $HgI_2$.     J. J. B.

**Mutual coagulation of colloidal solutions. V. Effect of dilution on the mutual coagulation of colloidal solutions of ferric hydroxide and thorium hydroxide by Prussian-blue.** P. M. Barve, R. B. Naimpally, and B. N. Desai (*J. Univ. Bombay*, 1942, **11**, **A**, Part 3, 78—84).—No definite relationship exists between the charge on either positively charged $Fe(OH)_3$ or $Th(OH)_4$ when coagulated by negatively charged Prussian-blue, and the width of the zone of mutual coagulation.     F. R. G.

**Electrophoretic mobilities of deoxyribose- and ribose-nucleic acids.** S. S. Cohen (*J. Biol. Chem.*, 1942, **146**, 471—473).—The method of prep. of a nucleic acid affects its electrophoretic mobility and hence its electric charge. Deoxyribose- and ribose-nucleic acid possess similar or different charges depending on the method of isolation.     J. E. P.

**Theory and application of a two-path rectangular microelectrophoresis cell.** H. Beniams and R. G. Gustavson (*J. Physical Chem.*, 1942, **46**, 1015—1023).—The theory of the rectangular two-path microelectrophoresis cell and its construction are discussed. In accuracy, adaptability, and speed it compares favourably with the usual single-path cell.     C. R. H.

**Relation between $\zeta$-potential and the electrical capacity of the double layer.** W. G. Eversole and C. H. Estee (*J. Chem. Physics*, 1943, **11**, 63—66).—Errors in the usual calculation of the electrical capacity of the double layer from $\zeta$-potentials are pointed out, and an equation is deduced which makes allowance for the distribution of charge on both sides of the $\zeta$-potential plane. The capacity of a glass surface in contact with dil. aq. solutions of LiCl, KCl, and CsCl is calc. from $\zeta$-potentials. The vals. vary from 1 $\mu$F. per cm.² at $10^{-5}$M. to about 25 $\mu$F. per cm.² at M. concn. The connexion with electro-capillary phenomena is considered.     A. J. M.

# VI.—KINETIC THEORY. THERMODYNAMICS.

**Determination of equilibrium and reaction velocity in sulphur vapour by quenching experiments.** H. Braune and S. Peter (*Naturwiss.*, 1942, **30**, 607—608).—The amount of $S_\mu$ in S vapour has been determined at different temp., the results being in general agreement with those of Preuner (A., 1910, ii, 118). The dependence of the $S_\mu$ content on the partial pressure of S vapour agrees with the expected val. The $S_\mu$ content of the condensed vapour corresponds with the $S_6$ content of the vapour itself. The velocity of attainment of equilibrium was also investigated.     A. J. M.

**$Cr^{III}/Cr^{VI}$ indicator in the investigation of borate melts.** H. Lux and E. Rogler (*Z. anorg. Chem.*, 1942, **250**, 159—172).—The colour change of $Cr^{III}/Cr^{VI}$ indicator has been used to investigate the O″ activity in $Na_2O–B_2O_3–M_xO_y$ melts (M = K, Li, Pb, Ba, Mg, Be, La, Al, Si, or P) at 1100°. $B_2O_3$ behaves as a weak acid but the presence of strongly polarisable bi- and ter-valent cations increases its acidic character and renders the metaborate stage more stable. PbO, BaO, and $La_2O_3$ are particularly effective in this.     C. R. H.

**Ionisation constant of morpholine in water.** A. R. Ingram and W. F. Luder (*J. Amer. Chem. Soc.*, 1942, **64**, 3043—3044).—The ionisation const. of morpholine in $H_2O$ at 25° from $\Lambda$ measurements is $2.44 \times 10^{-6}$.     W. R. A.

**Thermodynamic properties of solutions of amino-acids and related substances. VIII. Ionisation of glycylglycine, ε-aminohexoic acid, and aspartic acid in aqueous solution at 1—50°.** E. R. B. Smith and P. K. Smith (*J. Biol. Chem.*, 1942, **146**, 187—195).—The two dissociation consts. of glycylglycine and ε-aminohexoic acid and the three dissociation consts. of aspartic acid have been determined at 1·0°, 12·5°, 25·0°, 37·5°, and 50° and the free energy, enthalpy, and entropy changes accompanying the ionisation are deduced.     J. W. S.

**Mean activity of solutions of thallous azide.** (Mme.) M. L. Brouty (*Compt. rend.*, 1942, **214**, 258—261).—E.m.f. measurements for a cell containing various concns. of $TlN_3$ are described. The normal potential calc. by La Mer's method is $(6298 \pm 1) \times 10^{-4}$ v., and data for e.m.f. and the activity coeffs. corresponding with each concn. are tabulated.     N. M. B.

**Temperature coefficients of hydrogen-ion concentration in blood and other buffers.**—See A., 1943, III, 271.

**Liquid–vapour equilibrium compositions in the hydrogen chloride–*n*-butane system.** J. H. Ottenweller, C. Holloway, jun., and W. Weinrich (*Ind. Eng. Chem.*, 1943, **35**, 207—209).—Data are recorded for compositions of equilibrium vapour–liquid phases in HCl–*n*-$C_4H_{10}$ systems at 70°, 120°, and 180° F., at pressures $< 550$ lb. per in.² The bubble-point curves give an approx. linear relation between mol.-% HCl and pressure.     L. J. J.

**Vapour–liquid equilibria for commercially important systems of organic solvents. Binary systems ethanol–*n*-butanol, acetone–water, and *iso*propanol–water.** A. S. Brunjes and M. J. P. Bogart (*Ind. Eng. Chem.*, 1943, **35**, 255—260).—Vapour–liquid equilibrium data for EtOH–$Bu^αOH$, $COMe_2$–$H_2O$, and $Pr^βOH$–$H_2O$, and activity coeffs. for the two latter systems, have been determined.     L. J. J.

**Pure hydrocarbons from petroleum. Vapour–liquid equilibrium of methyl*cyclo*pentane–benzene and other binary aromatic systems.** J. Griswold and E. E. Ludwig (*Ind. Eng. Chem.*, 1943, **35**, 117—119).—Data for the methyl*cyclo*pentane (I)–$C_6H_6$ system indicate a min.-boiling azeotropic mixture, b.p. 71·5°, containing ~90 mol.-% of (I). The influence of aromatics on fractionation is discussed. $C_6H_6$, through its tendency to form azeotropes, prevents complete resolution of $C_6$ fractions by distillation, whilst PhMe, although it does not form azeotropes, exhibits abnormally low relative volatility in certain mixtures and for this reason its presence increases the difficulty of but does not prevent complete resolution. C. R. H.

**Heterogeneous equilibria in aqueous solutions of the sulphates of quadrivalent vanadium at 30°.** C. S. Rohrer, O. E. Lanford, and S. J. Kiehl (*J. Amer. Chem. Soc.*, 1942, **64**, 2810—2816).—Solubility measurements are given for the system $VO_2$–$SO_3$–$H_2O$ at 30°, $VO_2,H_2O$, $VO_2,SO_3,5H_2O$, $VO_2,SO_3,3H_2O$, $2VO_2,3SO_3,4H_2O$, and $VO_2,SO_3$ exist as stable solid phases. Other reported compounds could not be detected. $VO_2,SO_3$ exists in a form, not previously reported, sol. in $H_2O$. W. R. A.

**Isotherms of the system sodium chromate–sodium chlorate–water.** J. E. Ricci and C. Weltman (*J. Amer. Chem. Soc.*, 1942, **64**, 2746—2748).—Solubility determinations on the system $Na_2CrO_4$–$NaClO_3$–$H_2O$ at 19°, 25°, and 50° give no evidence of formation of compounds or solid solutions by the two salts. W. R. A.

**Equilibrium relationships on liquidus surface in part of MnO–$Al_2O_3$–$SiO_2$ system.** R. B. Snow (*J. Amer. Ceram. Soc.*, 1943, **26**, 11—20).—Minerals with a stability range in this system are cristobalite, tridymite, $3Al_2O_3,2SiO_2$, corundum, $MnO,SiO_2$, $2MnO,SiO_2$ (I), $MnO,Al_2O_3$, $3MnO,Al_2O_3,3SiO_2$ (II) (identical with the garnet spessartite), and $2MnO,2Al_2O_3,5SiO_2$ (III) the basic structure of which is similar to that of cordierite, $MgO,2Al_2O_3,5SiO_2$. (III) seldom crystallises from the glass, but, on reheating the glass, high-extinction angle crystals readily form which in turn are replaced by (III) under suitable heat-treatment. Quintuple points and boundary lines of the field within the limits (II)–$SiO_2$, (II)–$Al_2O_3$, and $Al_2O_3$–$SiO_2$ have been determined and those within the field (I)–(II), (II)–$SiO_2$, and (I)–$SiO_2$ are indicated. J. A. S.

**Polytherm of the ternary system $H_2O$–KCl–KBr.** A. G. Bergman and N. A. Vlasov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1942, **36**, 57—61).—The system $H_2O$–KCl–KBr has been studied at ≯30°. The only solid phases formed are ice and KCl–KBr solid solutions. The eutectic point is at −13·4° and KCl 6·6%, KBr 25·6%. J. W. S.

**Mixed bismuth oxyiodides.** L. G. Sillén and E. Jörnstad (*Z. anorg. Chem.*, 1942, **250**, 173—198).—The systems Ba–Bi–O–I, Sr–Bi–O–I, and Cd–Bi–O–I have been investigated by means of X-ray analysis in order to determine the presence of oxyiodide structures. A detailed analysis of the respective lattice structures is given. Two phases of definite composition are reported, viz., $SrBi_3O_4I_2$, a space-centred tetragonal structure with a 4·035, c 31·89 A., and $CdBiO_2I$ with a 3·970, c 13·24 A. C. R. H.

**Thermodynamical calculation of quaternary systems. System *o*-xylene, *m*-xylene, *p*-xylene, ethylbenzene.** V. M. Kravtschenko (*J. Phys. Chem. Russ.*, 1941, **15**, 652—658).—Assuming the system to have an ideal solubility, the eutectic temp. and compositions are calc. The quaternary eutectic melts at −101·3°. J. J. B.

**Quaternary system of sodium, potassium, calcium, and magnesium nitrates and the component systems.** E. Jänecke (*Z. Elektrochem.*, 1942, **48**, 453—467).—The binary, ternary, and quaternary systems have been investigated over the complete composition range. The only compound definitely confirmed is $(KNO_3)_2,Mg(NO_3)_2$. J. W. S.

**Heat of formation of stannous chloride and of displacement of tin by zinc, and entropy of tin ion.** A. F. Kapustinski (*J. Phys. Chem. Russ.*, 1941, **15**, 645—651).—The heat of reaction Zn (solid) + $Sn^{\cdot\cdot}$ = $Zn^{\cdot\cdot}$ + Sn (solid) at 25° is −30·9 kg.-cal. This gives for the heat of formation of solid $SnCl_2$ from solid Sn and $Cl_2$ gas −83·6 kg.-cal. and for the entropy of $Sn^{\cdot\cdot}$ −15±2 g.-cal. per degree. J. J. B.

**Heats of combustion. II. Heats of combustion of methyl ethyl ketone and ethylene oxide.** R. S. Crog and H. Hunt (*J. Physical Chem.*, 1942, **46**, 1162—1163).—The heats of combustion of liquid COMeEt and gaseous $(CH_2)_2O$ are 582·28±0·37 and 312·55±0·20 kg.-cal. per mol. respectively. C. R. H.

**Orange-red and grey-black antimony trisulphide.** R. Fricke and E. Dönges (*Z. anorg. Chem.*, 1942, **250**, 202—203).—The heats of dissolution in 0·75N-$Na_2S$ of cryst. grey-black and amorphous orange-red $Sb_2S_3$ are 18·54 and 26·07 kg.-cal. per g.-mol., respectively, indicating 7·53 kg.-cal. per g.-mol. as the heat of crystallisation. C. R. H.

**New method of determining the heat of sorption.** A. V. Likov and M. Z. Brenner (*J. Phys. Chem. Russ.*, 1941, **15**, 1129—1136).—Heat (*H*) of sorption is measured by observing the rapid increase and slow decrease of the temp. of the sorbent during the sorption. Experiments on dry leather and $H_2O$ vapour show that *H* is < the

latent heat of condensation of $H_2O$. If moist leather is used, *H* is smaller still. J. J. B.

**Calculation of free energies, entropies, specific heats, and equilibria from spectroscopic data and the validity of the third law of thermodynamics. V₂. Advances in the period 1935—1940.** H. Zeise (*Z. Elektrochem.*, 1942, **48**, 476—509). A review. J. W. S.

**Nature of entropy.** (A) I. D. Campbell (B) H. S. Allen (*Nature*, 1943, **151**, 138—139, 225—226).—(A) If the temp. scale were designed so that temp. ∝ (heat energy)$^{\frac{1}{2}}$, entropy would, in a simple heat transfer, bear a straight-line relationship to temp., mean mol. velocity would be ∝ temp., and equal increments of temp. would represent a greater increment of energy at high than at low temp. (B) A criticism. A. A. E.

# VII.—ELECTROCHEMISTRY.

**Electrical conductivity of sodium and potassium guaiacoxides in guaiacol.** T. Shedlovsky (*J. Gen. Physiol.*, 1943, **26**, 287—292).—The data of Shedlovsky and Uhlig (A., 1934, 491) and new data on the conductivity of Na and K guaiacoxides in guaiacol at 25° have been computed by means of an improved conductance equation which is valid for higher concn. than are the equations formerly used. The new consts. are $\Lambda_0$ = 9·0 and K = 2·8 × 10⁻⁵ for Na and $\Lambda_0$ = 9·5 and K = 3·4 × 10⁻⁵ for K guaiacoxide respectively. J. N. A.

**Change in potential of silver–silver chloride electrodes with time.** E. R. Smith and J. K. Taylor (*J. Amer. Chem. Soc.*, 1942, **64**, 3053).—A reply to criticisms by Hornibrook, Janz, and Gordon (A., 1942, I, 239). W. R. A.

**Irreversible electrode potentials of tin.** A. J. Schatalov (*J. Phys. Chem. Russ.*, 1941, **15**, 401—409).—The potentials of Sn in solutions of KCl, NaCl, $NH_4Cl$, $BaCl_2$, HCl, KBr, KI, $KNO_3$, $Na_2SO_4$, and NaOH assume nearly const. vals. after some hr. or days of immersion. The pretreatment of the electrode affects the potential for only ~1 hr. The corrosion of Sn in 4N-$NH_4Cl$ is > that in 0·25N-$NH_4Cl$. Oxide films retard the corrosion. J. J. B.

**Potential of silver concentration cells with liquids of low dielectric constant.** A. Gemant (*J. Chem. Physics*, 1942, **10**, 723—730).—E.m.f. and conductivity measurements in concn. cells with Ag and Ag–AgCl electrodes in solutions of electrolytes (*e.g.*, LiCl, $NEt_4Cl$, $NBu_4Cl$, Ag picrate, $AgNO_3$) in solvents of low ε (≮2·6), *e.g.*, dioxan and xylene with small admixtures of $H_2O$ and EtOH, are described. Measurements are possible with κ as low as 10⁻¹¹ mho per cm. Vals. of transport nos. and dissociation consts. are deduced. The ions appear to be of mol. size. L. J. J.

**Electromotive force of the mercurous bromide electrode.** W. R. Crowell, R. W. Mertes, and S. S. Burke (*J. Amer. Chem. Soc.*, 1942, **64**, 3021—3023).—At 25° in 0·1002M-HBr the vals. for molal reduction e.m.f. in solutions free from air are ~0·5 mv. > those for solutions from which air has not been completely removed. E.m.f. measurements at 25° and 35° in N-, 2N-, and 3N-HBr are given. W. R. A.

**Effect of temperature on potential of glass electrodes for pH determination.** E. Wengel and N. Schrodt (*Naturwiss.*, 1942, **30**, 567—568).—The effect of temp. on the potential of glass electrodes made of Schott Jena glass 4073 III (~2 megohms resistance) and a low-resistance glass (~0·2 megohm) is linear. A. J. M.

**Salt error of the quinhydrone electrode in aqueous nitric acid, and potentials of the hydro-quinhydrone and quino-quinhydrone electrodes** H. I. Stonehill (*Trans. Faraday Soc.*, 1943, **39**, 67—72).—The salt error is determined by measuring the e.m.f. of the cells Pt (Au)|quinhydrone, $HNO_3(c)$|$HNO_3(c)$, quinhydrone, quinol or quinone|Pt (Au), the solutions being saturated with respect to the org. substances; the method depends on the absence of salt error in the hydro-quinhydrone and quino-quinhydrone electrodes. The average error $\Delta E_{KNO_3}$ = −0·0053c v. By using a glass electrode the salt error in aq. $KNO_3$ is found to be $\Delta E_{KNO_3}$ = −0·0038c v. Salt errors in mixed HCl and $KNO_3$ solutions are additive. The standard potentials of the hydro-quinhydrone and quino-quinhydrone electrodes at 25° are 0·6141 and 0·7459 v., respectively. F. L. U.

**Thallous-thallic redox potential in nitric and perchloric acids.** H. I. Stonehill (*Trans. Faraday Soc.*, 1943, **39**, 72—79).—The potentials are obtained by using the two cells Pt|$TlA(c_1)$, $TlA_3(c_2)$, HA(c)|HA(c), quinhydrone|Pt, where A represents $ClO_4$ and $NO_3$ in the respective cells. The liquid junction potential is eliminated by measuring the e.m.f. for each acid concn. with progressively decreasing Tl content, the ratio $c_2/c_1$ being maintained const., and extrapolating to [Tl] = 0, when the liquid contact potential vanishes. The results agree fairly with those obtained by Sherrill and Haas for $HClO_4$ (A., 1936, 938) and by Noyes and Garner for $HNO_3$ (*ibid.*, 1072), both of which are affected by uncertainties due to liquid junction potentials. The true standard redox potential is estimated to have the same val., 1·280 v., in both $HClO_4$ and $HNO_3$. F. L. U.

**Temperature correction devices in ion concentration measurements.** F. Lieneweg (*Z. tech. Physik*, 1942, **23**, 217).—A correction (cf. A., 1943, I, 63).      A. J. E. W.

**Cathodic processes at an iron electrode under conditions of corrosion with oxygen depolarisation.** N. D. Tomaschov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 203—205).—Cathodic polarisation curves on Fe surfaces supplied with $O_2$, in a bath at pH ~9, show 3 sections corresponding with (1) $O_2 + 4e + 2H_2O \rightarrow 4OH'$ up to c.d. ~1 mA. per sq. cm., (2) control of cathode reaction velocity by diffusion, up to −0·6 v., (3) discharge of $H^+$ above −0·6 v. An oxidised Fe cathode is less effective than a clean one. $Fe_3O_4$ is reduced when the potential is < −0·5 v. No $H_2O_2$ is formed.      L. J. J.

**Activity-waves in passive iron wires.** K. F. Bonhoeffer and W. Renneberg (*Z. Physik*, 1941, **118**, 389—400).—For passive piano-wire immersed in $HNO_3$ of $\rho$ 1·315—1·375, in glass tubes of varying diameter, the velocity ($v$) of activity-waves can be calc. from a knowledge of the surface potential distribution in the wave and the min. electrical impulse ($\epsilon$) required for activation. The movement of the active zone is determined by spontaneous surface potential changes. The val. of $\epsilon$ depends on the time ($t$) elapsed since a previous activation, with a min. val. for $t$ ~15 min., and increases with [$HNO_3$] from ~110 $\mu$-coulomb per sq. cm. at $\rho$ 1·24 to ~230 $\mu$-coulomb per sq. cm. at $\rho$ 1·40. Oscillographic wave potential profiles are recorded.      L. J. J.

**Hydrogen overvoltage and dissolution of metals. I. Dissolution of lead in acids.** J. Kolotirkin and A. Frumkin (*J. Phys. Chem. Russ.*, 1941, **15**, 346—358).—The rate $v$ of $H_2$ evolution by spongy Pb in 3N-HCl or 8N-$H_2SO_4$ is determined by the equilibrium potential of Pb and the overvoltage $\eta$ corresponding with this potential. If the spongy Pb is made a cathode and the straight line $\log_e v$–$\eta$ determined, it joins the point representing the $v$ in the absence of external current. At small c.d. (<3 × $10^{-8}$ amp. per sq. cm.) $v$ is < equiv. to the external current as the latter is used up for reduction of $O_2$ at the cathode. The equilibrium potential of Pb in 8N-$H_2SO_4$ is that of the electrode Pb|$PbSO_4$|8N-$H_2SO_4$.      J. B.

**Polarography of solutions of polymetaphosphates. I.** V. Caglioti, G. Sartori, and E. Bianchi (*Gazzetta*, 1942, **72**, 63—68).—Polarography of aq. $Na_3P_3O_9, 6H_2O$ (I) in presence of $ZnCl_2$, $FeSO_4$, $MnCl_2$, $CdCl_2$, $Pb(NO_3)_2$, and $CuSO_4$ shows that $Cu^{..}$ and $Cd^{..}$ do not form complexes, $Zn^{...}$, $Mn^{..}$, and $Pb^{..}$ form unstable complexes, and $Fe^{..}$ a more stable complex, with (I).      E. W. W.

**Polarography of organometallic compounds. I.** L. Riccoboni (*Gazzetta*, 1942, **72**, 47—62).—Polarograms of $PbEt_3Cl$ (I) in N-KCl containing a trace of fuchsin are compared with those of $PbCl_2$, and the results discussed mathematically. The cathodic reduction of (I) is univalent; the mean potential ($E_{1/2}$) is −0·723 v. (to N-HgCl electrode), −0·473 v. (to $Pb^{..}$ at 13°). The val. −0·473 v. (20°) for $E_{1/2}$ for $Pb^{..}$ is confirmed. Measurements relative to $Pb^{..}$ must take account of the association of this ion in solution. The method of calculating the activity coeff. $\gamma_{PbCl_2}$ for solutions containing varying quantities of $PbCl_2$ and KCl is discussed; $\gamma_{PbCl_2}$ is used (cf. Lingane, A., 1939, I, 525) to derive the product of the kinetic consts. as a function of electrolytic potential. Assuming that PbCl = TlCl in reticular energy, the heat of formation of PbCl is calc. as 13 kg.-cal. The thermochemistry of $PbEt_3$ is discussed.      E. W. W.

**Theory of metal corrosion. I. Distribution of the lines of current and potential in corrosion micro-cells.** V. S. Daniel-Bek (*J. Phys. Chem. Russ.*, 1941, **15**, 382—400).—The surface of a dissolving metal is, at a first approximation, equiv. to a system of two electrodes, a metal resistance, and three electrolyte resistances; more complicated models represent metals which dissolve in acids and are subject to an anodic or cathodic polarisation. If the potentials of the micro-anode and the micro-cathode are linear functions of the polarising current $i$, the reduction of the $H_2$ evolution caused by the polarisation is $\propto i$. A second approximation takes into account the variation of the potentials of the micro-anodes and the micro-cathodes caused by their polarisation by the micro-current itself. This polarisation is measured on a large-scale model (an electrode consisting of regularly arranged strips of Zn and Cu in N-HCl). The measurable potential of a mixed electrode is that of the boundaries between Zn and Cu patches.      J. J. B.

# VIII.—REACTIONS.

**Stability and structure of burner flames.** B. Lewis and G. von Elbe (*J. Chem. Physics*, 1943, **11**, 75—97).—The gas-flow pattern was investigated by photographing stroboscopically illuminated dust particles carried by the gas stream. The conditions for the stability of the flame above the orifice have been investigated for upright and inverted flames. Gas and burning velocities are equal near the rim of the orifice or an obstruction in the gas stream, equality being maintained by friction effects. There are two crit. gradients of gas velocity at the solid surface, the lower being near the flash-back, and the upper near the blow-off range. Vals. for these gradients in the range of laminar flow are calc. and it is shown experimentally that they are independent of tube diameter except

where this is very large. The effect of the surrounding atm. on the crit. blow-off gradient is shown. The burning velocity is const. over the surface of the inner cone of the flame except at the tip, where it increases to the axial gas velocity, and at the base, where it is zero. The temp. of the flame was determined by the Na line reversal method. The emission spectra of the flames were determined. The connexion between temp. distribution and flow pattern has been examined. An explanation of polyhedral flame cones is given.      A. J. M.

**Calculation of velocity of oxidation of nitric oxide to nitrogen peroxide with simultaneous absorption of the $NO \cdot NO_2$ formed in an absorbent.**—See B., 1943, I, 153.

**Tracer studies with radioactive carbon. Exchange between acetic anhydride and sodium acetate.** S. Ruben, M. B. Allen, and P. Nahinsky (*J. Amer. Chem. Soc.*, 1942, **64**, 3050).—The exchange between $MeC^*O_2Na$ and $Ac_2O$ at room temp. within 20 min. is ~55%.      W. R. A.

**Steric hindrance to ketonic function. I. Velocity of formation of oximes of cyclohexanone and its derivatives.** A. R. Poggi and A. Carrara (*Gazzetta*, 1942, **72**, 3—15).—The following methods of determining velocity of oxime-formation are compared experimentally, using cyclohexanone and its 2- (I), 3-, and 4-Me derivatives : (a) NaOH titration of HCl liberated from $NH_2OH, HCl$, using methyl-orange (cf. Brochet, *Thesis, Nancy*, 1923), or (b) using $p$-$C_6H_4Br \cdot OH$-blue (II) (cf. Anziani, *Thesis, Nancy*, 1927); (c) $H_2SO_4$ titration of free $NH_2OH$ (Anziani, *ibid.*) (method modified), using (II); and (d) titration of $NH_2OH$ (cf. Ruzicka *et al.*, A., 1932, 253). The best method is (b) (modified), although HCl liberated has catalytic action; this is absent in (d), which, however, gives somewhat variable results. (I) is less reactive than the other ketones studied.      E. W. W.

**Polarography of pyocyanine.** C. Cattaneo and G. Sartori (*Gazzetta*, 1942, **72**, 38—41).—The reduction of pyocyanine (cf. Elema, A., 1931, 1013) is shown polarographically to be of second order (0·058 v.) from pH 5 to pH 8·71, but of first order below pH 5, when the semiquinone (cf. Kuhn *et al.*, A., 1935, 1255) is intermediately formed.      E. W. W.

**Causes of the diversity in acid hydrolyses of starch substances.** —See A., 1943, II, 124.

**Rates of high-temperature oxidation of dilute copper alloys.**—See B., 1943, I, 169.

**Catalytic decomposition of potassium chlorate. I, II.** G. B. Kolhatkar and U. A. Sant (*J. Univ. Bombay*, 1942, **11**, A, Part 3, 96—100).—I. Decomp. of $KClO_3$ is catalysed in diminishing order by $Co_2O_3$, $Cr_2O_3$, $MnO_2$, $Fe_2O_3$, $Ni_2O_3$, and CuO. II. Catalytic decomp. is effected by $VCl_4$, $Ti(SO_4)_2$, $Cr_2(SO_4)_3$, $MnSO_4$, $FeSO_4$, $CoSO_4$, $NiSO_4$, and $CuSO_4$.      F. R. G.

**Reaction velocity with colloidal catalysts.** P. Harteck and H. Jensen (*Z. Physik*, 1941, **118**, 416—423).—Expressions are developed for effect of diffusion and catalytic activity on the rate of a reaction between a gas and a liquid, catalysed at the surface of solid spheres suspended in the liquid. The relation between the temp. coeff. of reaction rate and the catalytic activity and activation energy of the reaction is discussed.      L. J. J.

**Chemisorption of oxygen on charcoal.** B. K. Trivedi (*J. Univ. Bombay*, 1942, **11**, A, Part 3, 185—186).—NO at low temp. with charcoal starts and catalyses the auto-oxidation of NO, yielding $N_2$ together with $NO_2$ condensed on the charcoal, which produces chemisorbed $O_2$ and hence $CO_2$ and $N_2$. The reaction of sugar charcoal with $O_2$ and $NO_2$ has also been investigated at 0—300°.      F. R. G.

**Mixed heteropoly-acid catalysts for the vapour-phase air-oxidation of naphthalene.** H. T. Brown and J. C. W. Frazer (*J. Amer. Chem. Soc.*, 1942, **64**, 2917—2920).—Catalysts prepared from heteropoly-acid crystals containing W and Mo have been used in the oxidation of $C_{10}H_8$. The catalyst (I) from $H_4SiMo_9W_3O_{40}$ gave greater conversion into $o$-$C_6H_4(CO_2)_2O$ (II) than $H_4SiMo_{12}O_{40}$ or $H_4SiW_{12}O_{40}$. Addition of $CrO_3$ increased the yield of (II) but decreased the yield of maleic anhydride. (I) has also been employed in the oxidation of (II), 1 : 4-naphthaquinone, and CO.      W. R. A.

**Catalytic interchange of groups in aliphatic amines. I.** K. Nozaki (*J. Amer. Chem. Soc.*, 1942, **64**, 2920—2923).—The redistribution of groups attached to N when aliphatic amines are heated with metal halide catalysts has been studied, particularly with regard to the action of $AlCl_3$, $FeCl_3$, and $ZnCl_2$ on $NHBu^a_2$.      W. R. A.

**Relation of electrochemistry to aluminium and aluminium alloys. I—III.**—See B., 1943, I, 173.

**Indium plating.**—See B., 1943, I, 172.

**Chemistry of chromic acid anodic baths [for aluminium] and its application to bath control.**—See B., 1943, I, 172.

**Heavy nickel-plating.**—See B., 1943, I, 171.

**Use of palladium in electroplating.**—See B., 1943, I, 171.

**Photochemistry of mixtures of hydrogen and chlorine through a century.** M. Bodenstein (*Ber.*, 1942, **75** [*A*], 119—136).—A lecture. H. W.

**Photochemical boundary surface action.** G. M. Schwab and A. Issidoridis (*Ber.*, 1942, **75** [*B*], 1048—1051).—Layers of $UO_2(NO_3)_2$ adsorbed on $Al_2O_3$ or $ZnO$ are coloured brown-green in bright sunlight but no change is observed unless the solution is alkaline or when it is in contact with powdered glass, $MgO$, $SnO_2$, $SiO_2$, or $CdCO_3$. The representation of the reaction by the equation $4UO_2'' + 8OH' + nhv \rightarrow U_3O_8, 2H_2O + UO_4, 2H_2O$ is justified by the detection, after addition of acid, of $H_2O_2$ by the perchromic acid reaction and by use of $Ce(OH)_3$. H. W.

**Winther's photochemical storage cell.** G. Liandrat and A. Sator (*Compt. rend.*, 1942, **214**, 738—739).—An electrochemical explanation of the partial conversion of a solution of $HgCl_2$ and $FeCl_2$ into $HgCl_2$ and $FeCl_3$ is given, the oxidation–reduction ionic equilibrium being disturbed. J. L. E.

**Mechanism of photolysis of propaldehyde.** W. M. Garrison and M. Burton (*J. Chem. Physics*, 1942, **10**, 730—739).—In the photolysis of EtCHO at $\lambda\lambda$ 2537, ~2900, and ~3200 A., Et radicals, but not H atoms, can be detected by the Paneth mirror method. The ratio $C_2H_6$ : CO formed is 0·3—0·5. Two primary decomp. reactions are involved; one producing $Et + CHO$ preponderates at short $\lambda\lambda$, the other producing $C_2H_6 + CO$ at longer $\lambda\lambda$. L. J. J.

**Reversible photochemical processes in rigid media. Dissociation of organic molecules into radicals and ions.** G. N. Lewis and D. Lipkin (*J. Amer. Chem. Soc.*, 1942, **64**, 2801—2808).—Illumination of $N_2Ph_4$ in rigid solvents by ultra-violet radiation leads to the solution becoming coloured and exhibiting three main absorption bands due to $NPh_2$, $NPh_2$, and $N_2Ph_4$. $N_2Ph_4$ disappears by two processes: return of the electron or dissociation into $NPh_2$ and $NPh_2$. Similar experiments on various substances indicate that a mol. may be dissociated by light into (i) two radicals, (ii) positive and negative ions, or (iii) a positive ion and an electron. W. R. A.

# IX.—PREPARATION OF INORGANIC SUBSTANCES.

**Mechanism of the action of charcoal on potassium nitrate. I. Effect of the temperature, time, etc.** T. M. Oza and M. S. Shah (*J. Univ. Bombay*, 1942, **11**, A, Part 3, 56—69).—$KNO_3$ reacts with charcoal at 250° resulting in the intermediate formation of $KNO_2$ according to the equations $4KNO_3 + 2C = 4KNO_2 + 2CO_2$ and $4KNO_2 + 3C = 2K_2CO_3 + CO_2 + 2N_2$, the latter representing the net result of several reactions. F. R. G.

**Thermal decomposition of potassium nitrite.** T. M. Oza and M. S. Shah (*J. Univ. Bombay*, 1942, **11**, A, Part 3, 70—77).—The primary decomp. at 440—540° is considered to be $2KNO_2 = K_2O + NO + NO_2$. The amounts of $NO_2$ are $\ll$ of NO, due to the reactions $4KNO_2 + 2NO_2 = 4KNO_3 + N_2$ and $KNO_2 + NO_2 = KNO_3 + NO$, finally $KNO_3 = 2KNO_2 + O_2$. F. R. G.

**Cuprous cyanide. Preparation and use.** H. J. Barber (*J.C.S.*, 1943, 79).—CuCN is prepared by adding a solution of $NaHSO_3$ (280 g. in 800 c.c. of $H_2O$) to $CuSO_4$ (1 kg. in 3·2 l. of $H_2O$) followed by KCN (280 g. in 800 c.c. of $H_2O$), all solutions being at 60°. The hot solution is filtered and the ppt. is washed with hot $H_2O$ and EtOH and dried at 100°. C. R. H.

**Basic copper selenates.** A. Baroni (*Gazzetta*, 1942, **72**, 19—22).—The system $Cu(OH)_2 + CuSeO_4 + H_2O$ at 30° gives as solid phase (Schreinemakers' method) a *compound* (I), $SeO_3, 4CuO, 4H_2O$, which at 150° gives a *compound*, $SeO_3, 4CuO, 3H_2O$. At 100°, (I) and a *compound*, $SeO_3, 3CuO, 2H_2O$, are formed. E. W. W.

**Electron beam study of membranes formed by action of ammonia or potassium hydroxide on solutions of copper salts.** A. Baroni and G. B. Marini-Bettolo (*Gazzetta*, 1942, **72**, 22—27).—The membrane formed by action of $NH_3$ and air on 1% aq. $CuSO_4$ is shown by electron beam photogram to be feebly cryst. on formation, and later to develop more definitely cryst. character. Results at 20—70° are similar, indicating the formation of a single basic sulphate. The product from aq. KOH is at first amorphous, then cryst. $Cu(NO_3)_2$ and $NH_3$ give a const. type of photogram. $CuCl_2$ gives similar results with $NH_3$ and KOH, indicating the formation of a single basic salt. $(HCO_2)_2Cu$ gives no membrane; other org. salts give basic salts. Photograms of $Cu(OH)_2$ prepared in various ways are discussed. E. W. W.

**Reduction of silver oxalate.** T. H. James (*J. Chem. Physics*, 1942, **10**, 744—746).—$Ag_2C_2O_4$ ppts. age rapidly, and the ageing is not markedly impeded by adsorption of wool-violet or thiocarbocyanine dyes. Reduction with $NH_2OH$ is retarded by adsorption of gelatin up to formation of a complete adsorption layer, and also by ageing. $N_2O$ formation in the reaction is not reduced by addition of Br'. L. J. J.

**Hexahalogenoaurates. III. Double hexabromoaurates.** A. Ferrari and R. Cecconi (*Gazzetta*, 1942, **72**, 170—174).—The mixed salts to which Bayer (A., 1920, ii, 688) and Suschnig (A., 1921, ii, 514) attributed the formulæ $Cs_2Ag_xAu_{(2-x)/3}X_6$ (X = Cl or Br) can be formulated $Cs_2Ag_yAu_{(1-y)/3}[AuX_6]$ (I). For $y = 1$, this gives $Cs_2AgAuX_6$ (cf. Wells, A., 1922, ii, 449); for $y = 0$, $Cs_2Au_{1/3}AuX_6$ (cf. Ferrari and Coghi, *Gazzetta*, 1941, **71**, 440). From $H_4AuBr_6$, AgBr, CsBr, and HBr, a series of products of general formula (I) is obtained. X-Ray study of these shows that they have a monometric lattice of which the consts. are practically uninfluenced by the substitution of Au for Ag; the structure is of the type of $Co_2Ag[AuCl_6]$ and $Cs_2Au^I[AuCl_6]$ (cf. Ferrari, A., 1937, I, 350). The unit cell contains 4 $[AuBr_6]''''$ and 8 $Cs^\cdot$; its dimensions are determined by these ions, and thus uninfluenced by the replacement of Ag by Au. Whilst excess of Ag gives $CsAg[AuBr_6]$, excess of Au gives $CsAuBr_4$. E. W. W.

**Preparation and properties of beryllium.** R. Rohmer (*Compt. rend.*, 1942, **214**, 744—746).—Be–Al alloys have been prepared by heating $BeF_2, NaF$ with Al and $BaO_2$ or by heating mixtures of BeO (or $BeF_2, NaF$) and $Fe_2O_3$ with Al, $Al + BaO_2$, $Si + Ca$, or $Ca + CaCl_2$; the impure metal has been separated by heating $BeF_2, NaF$ with Mg or Ca in vac. at 600—700°, melting the mix at 1350°, and separating the resulting layers. J. L. E.

**Boric acid and its alkali salts. X. Kernite (rasorite). $Na_2B_4O_7, 4H_2O$.** H. Menzel and H. Schulz (*Z. anorg. Chem.*, 1940, **245**, 157—220).—Present knowledge of kernite (I) is reviewed. (I) is slowly hydrated in air at room temp. With increasing humidity 10-hydrate is formed which subsequently splits into 5- and amorphous 2-hydrate. In vac. over $P_2O_5$ or by heating at 100—120° cryst. 2-hydrate is formed. The latter change is reversible and the cryst. product, which has a different X-ray pattern from the product formed from the 10-hydrate, is called metakernite (II). (II) is irreversibly dehydrated at 160—180° to amorphous 1-hydrate. Polytherms of the system $Na_2B_4O_7$–$H_2O$ between 0° and 100° have been obtained. The stable transition point 10-hydrate $\rightleftharpoons$ (I) is at 58·2° with 14·55% of $Na_2B_4O_7$ in solution, the metastable transition point 10- $\rightleftharpoons$ 5-hydrate is at 60·6° with 16·55% of $Na_2B_4O_7$ in solution, and the metastable transition point 5- $\rightleftharpoons$ 4-hydrate is at $39 \pm 5°$ with ~12% of $Na_2B_4O_7$ in solution. The v.p. equilibrium 10- $\rightleftharpoons$ 5- $\rightleftharpoons$ 4-hydrate has been investigated. The prep. of artificial (I) is described and its crystallography has been examined. The crystallography of natural and synthetic probertite, ulexite, colemanite, and pandermite is discussed. C. R. H.

**Action of aluminium halides on aliphatic ethers. I. Aluminium oxyhalides.** W. Menzel [with M. Froehlich] (*Ber.*, 1942, **75**, [*B*], 1055—1061).—Freshly sublimed $AlCl_3$ and $Et_2O$ give the cryst. additive compound $AlCl_3, Et_2O$, m.p. 35°, which decomposes at 160—170° into EtCl and $Al(OEt)Cl_2$ and thence into EtCl and *Al oxychloride* (I), which when thus prepared contains 5—9% of condensation products which cannot be removed by distillation or washing with hydrocarbons since AlOCl is strongly absorptive. With excess of $Me_2O$ the *compounds* $AlCl_3, 2Me_2O$, m.p. 57° (decomp.) is formed which at 190—200° affords (I) containing only 1—2% of condensation products. Similarly $AlBr_3$ and $Et_2O$ give an *adduct*, m.p. 47°, which passes at 190—195° into EtBr and *Al oxybromide*. The Al oxyhalides are very hygroscopic and cannot be sublimed or distilled. They are insol. in $C_6H_6$ and hydrocarbons, and sol. in $PhNO_2$ or $COMe_2$ to brown or red solutions respectively. AlOCl reacts vigorously with EtOH giving *Al diethoxychloride* which can be isolated by pptn. with $Et_2O$; it is also obtained from Al and EtOH–HCl. Attempts to obtain $Al(OEt)Cl_2$ by the last method were unsuccessful. With liquid $NH_3$ AlOCl gives the *compound* $AlONH_2, NH_4Cl$ which continuously evolves $NH_3$ when exposed to air. It is hydrolysed by $H_2O$ to $Al(OH)_3$ and $NH_4Cl$. H. W.

**Gallium. VI. Separation of gallium and germanium from alkaline extracts of germanite by electrolysis. VII. Gallium perchlorate hydrates and a gallium perchlorate–urea complex.** D. J. Lloyd and W. Pugh (*J.C.S.*, 1943, 74—76, 76—77).—VI. An alkaline extract of germanite was electrolysed with Cu or Ni cathodes and Pt anode at 25—35° and c.d. 0·016—0·025 amp. per sq. cm. Alkali concn. had little effect on efficiency. Best results were obtained with Ga and Ge concns. 0·5 and 3 g. per l. respectively. The deposit, which represented >80% recovery of Ga and Ge, was chlorinated and the mixed tetrachlorides separated by distilling $GeCl_4$ and recovering the Ga from the residual solution by electrolysis after making alkaline.

VII. $Ga(ClO_4)_3, 6H_2O$ (I) and $Ga(ClO_4)_3, 9H_2O$ (II) were prepared. (I) is stable but (II) loses $3H_2O$ at 100°. At higher temp. $3Ga_2O_3, Ga(ClO_4)_3$ appears to be formed. $[Ga(CON_2H_4)_6](ClO_4)_3$, m.p. 179°, is formed by interaction of 1 mol. of (II) with 6 mols. of $CO(NH_2)_2$ in EtOH solution. Its aq. solution is unstable, $Ga(OH)_3$ being pptd. on warming. A compound with 6 mols. of $CS(NH_2)_2$ is formed in solution but it could not be isolated. C. R. H.

**Formation of elementary carbon from sugar charcoal.** U. Hofmann and F. Sinkel (*Z. anorg. Chem.*, 1940, **245**, 85—102).—Charcoal, prepared by heating sucrose at 280—300° for 18 hr., was further heated at 450—1000° in $H_2$ for 10—45 hr. X-Ray analysis showed that samples prepared at the highest temp. consisted of graphite-like crystals of dimensions ~10 × 30 × 30 A. Samples prepared at lower temp. showed similar structure with the particle size some-

what smaller. With increasing temp. of prep. the electrical resistance decreased from ~$10^7$ to 0·4 ohm per cm. The low-temp. products neutralised NaOH and liberated AcOH from $Ca(OAc)_2$. This is probably due to the presence of substances resembling humic acids since they were sol. in the same solvents as humic acids.

C. R. H.

**New halides of silicon. V. Silicon iodides.** R. Schwarz and A. Pflugmacher (*Ber.*, 1942, **75**, [*B*], 1062—1071).—Passage of I vapour in dry $N_2$ over Si (best obtained by heating pure $SiO_2$ with Mg and MgO at ~$800°$) heated at $650°$ gives $SiI_4$, m.p. 120·5°, b.p. 287·5°. This is immediately decomposed by air and transformed by dry, finely divided Ag at 250° into $Si_2I_6$, best purified from unchanged $SiI_4$ by fractional sublimation in a high vac. Evidence against the existence of iodides more complex than $Si_2I_6$ is adduced. $Si_2I_6$ and KOH react thus: $Si_2I_6 + 10KOH = 2K_2SiO_3 + 6KI + H_2O + H_2$. Thermal decomp. of $Si_2I_6$ at 350—400° gives *Si monoiodide*, $(SiI)_n$, an amorphous orange-red powder which becomes (reversibly) dark rust-red when heated. It is insol. in all org. media and has no m.p. or b.p. No evidence of the existence of Friedel and Ladenburg's $SiI_2$ was obtained. $(SiI)_n$ is transformed by N-HCl at 0° without evolution of $H_2$ into *hyposilicious acid* (I), ·$(OH)_2$Si·SiH$(OH)$·SiH$(OH)$·Si$(OH)_2$·, a homogeneous, amorphous, ivory-coloured compound, very sensitive to oxidising acids and alkalis but remarkably stable to dry $O_2$. At 460° (I) evolves $H_2$ leaving the copper-coloured *substances*, ·$(OH)_2$Si·SiO·SiO·Si$(OH)_2$· which does not react vigorously with alkali. At 580° there is again evolution of $H_2$ with production of a tobacco-brown material of doubtful homogeneity. Above 600° the remaining H is evolved, leaving a mixture of Si and $SiO_2$.

H. W.

**Preparation of germanium tetrachloride, $GeCl_4$.** L. S. Foster, J. W. Drenan, and A. F. Williston (*J. Amer. Chem. Soc.*, 1942, **64**, 3042).—When $GeO_2$, suspended in 6N-HCl, is refluxed with HCl being passed in some $GeCl_4$ escapes through the condenser and can be frozen out by a $CO_2$–Pr$^\beta$OH mixture. W. R. A.

**Zirconium vanadates. I. Existence of the vanadate, $3ZrO_2,2V_2O_5,9H_2O$. Existence and structure of the pyrovanadate, $ZrV_2O_7$.** G. Peyronel (*Gazzetta*, 1942, **72**, 77—83, 83—89).—I. Aq. $NH_4VO_3$ (I) and $ZrO(NO_3)_2$ (II) [Zr/V (mols.) = 4 to 1·33; pH (quinhydrone) 1·25—1·51] at 70° give a *product* which is apparently a complex polymeride since its conc. aq. solutions are viscous or gels. When Zr/V (mols.) is <1·33 (pH 2·1—6·9), *zirconyl tetravanadate*, $(ZrO)_3V_4O_{13},9H_2O$ (III), is pptd., which does not react with excess of (I).

II. Suitable proportions of (I) and (II) in presence of $H_2O_2$ give ppts. in which Zr/V (mols.) = 3/2, 1/1, and 1/2, and in which $V_2O_5,xH_2O$ is considered to be adsorbed on (III), since when the products have been heated at 250—670° they give identical X-ray photograms, corresponding with *zirconium pyrovanadate*, $ZrV_2O_7$ (IV) (monometric, face-centred, $a_0$ 8·74 A.; space-group $T_h^6$–$Pa3$) (structure discussed), also obtained by heating (III). (IV) so prepared contains $ZrO_2$. At 670—760°, (IV) decomposes into $ZrO_2$ and a product richer in V. Vanadates of Ti and Sn also give adsorption products under similar conditions. E. W. W.

**Zirconium arsenates. I. Existence of the arsenates $ZrO_2,As_2O_5,H_2O$ and $ZrO(AsO_3)_2$. II. Thermal decomposition of $ZrO(AsO_3)_2$; existence of $(ZrO)_2As_2O_7$ and $(ZrO)_3(AsO_4)_2$.** G. Peyronel (*Gazzetta*, 1942, **72**, 89—93, 93—97).—I. $ZrO(NO_3)_2$ with excess of 30—40% aq. $H_3AsO_4$ at 180—190° (10 atm.; 8—10 hr.) gives the *arsenate*, $ZrO_2,As_2O_5,H_2O$, which is regarded as $ZrO(H_2As_2O_7)$. At 280—300° this loses $H_2O$, and the *product* $ZrO_2,As_2O_5$ (I), shown by X-ray study to be of different structure from $ZrP_2O_7$, is regarded as $ZrO(AsO_3)_2$.

II. At 900°, (I) gives the *pyroarsenate*, $(ZrO)_2As_2O_7$, which at 950° gives the *orthoarsenate*, $(ZrO)_3(AsO_4)_2$, and at 1000°, $ZrO_2$, $As_2O_3$, and $O_2$. X-Ray study shows that all these arsenates are cryst. E. W. W.

**Disperity measurements on a highly polymerised metaphosphate prepared according to Tammann.** O. Lamm and H. Malmgren (*Z. anorg. Chem.*, 1940, **245**, 103—120).—$KH_2PO_4$ was heated to redness for 20 min. and powdered. When treated with conc. aq. NaCl the powder swelled to a viscous mass. The $\eta$ of a 1% aq. solution of the powder is 5 times $\eta$ of $H_2O$. Dil. HCl, NaOH, and NaCNS reduce $\eta$ to its normal val. whilst more conc. solutions cause pptn. Data for sedimentation const., diffusion coeff., and partial sp. vol. have been obtained. The mol. wt. of freshly prepared polymeride is ~20,000, but after treatment with NaCNS or NaOH it increases to ~100,000. Sedimentation const. data for technical hexametaphosphate suggest the presence of polymeride.

C. R. H.

**Formation of insoluble sulphur in the presence of gases other than sulphur dioxide.** E. A. Fehnel (*J. Amer. Chem. Soc.*, 1942, **64**, 3041—3042).—Insol. plastic S has been prepared in a closed system in presence of various gases. Clear, amber, plastic masses, formed in contact with air, $SO_2$, and HCl, contained 36% of insol. S after 6 days; with $H_2S$ the clear amber mass gave 8%, whilst with $N_2$ and $NH_3$ an opaque, yellow, brittle mass was formed containing

<4% of insol. S. The plasticity of the insol. S formed in presence of HCl or $H_2S$ is short-lived. The data disprove the theory that plasticity results from the presence of $SO_2$.

W. R. A.

**Polythionic acids and their formation. VI. New preparations for potassium tri- and tetra-thionate.** H. Stamm and M. Goehring [with U. Feldmann] (*Z. anorg. Chem.*, 1942, **250**, 226—228).—$K_2S_3O_6$ is prepared by mixing 800 c.c. of 5M-$KHSO_3$ (pH ~7) cooled to $-5°$ with a solution of $SCl_2$ in light petroleum (I) (100 g. in 1·5 l.) cooled to $-20°$. The temp. must not rise above 10°. $K_2S_3O_6$ (~86% purity) is pptd. at 0° and can be filtered off and washed with COMe$_2$. To prepare $K_2S_4O_6$, a solution of $SCl_2$ (75 g.) in (I) (500 c.c.) cooled to $-15°$ is mixed with 750 c.c. of saturated aq. $SO_2$. (I) is removed and air is passed through the aq. layer to remove $SO_2$, after which the solution is cooled to 0° and a cold solution of 150 g. of KOH in 1 l. of EtOH added. $K_2S_4O_6$ containing ~10% of KCl separates. Methods for recrystallising both compounds are given.

C. R. H.

**Chromium tetrachloride.** H. von Wartenberg (*Z. anorg. Chem.*, 1942, **250**, 122—126).—Gaseous $CrCl_4$ is formed when $CrCl_3$ and $Cl_2$ react at 600—700° and can be condensed by rapid cooling with solid $CO_2$. The condensate contains $CrCl_3$, formed as the result of decomp. of $CrCl_4$ which commences at ~ $-80°$. C. R. H.

**Anhydrous iron alums.** N. Schischkin [with E. A. Bachrak, A. W. Smirnowa, and T. S. Badeewa] (*Z. anorg. Chem.*, 1940, **245**, 226—228).—Anhyd. $NaFe(SO_4)_2$, $KFe(SO_4)_2$, and $NH_4Fe(SO_4)_2$ can be prepared by dissolving suitable amounts of alkali sulphate and $FeSO_4$ in hot $H_2SO_4$ (~16%) and oxidising with $HNO_3$. After filtering, the solution is conc. and hot $H_2SO_4$ (~80%) is added. Concn. is continued until crystallisation begins, when the liquid is filtered hot through a porcelain or asbestos filter. The crystals are washed with abs. EtOH and dried in vac. over $H_2SO_4$. C. R. H.

**Reactions of cobaltic, cobaltous, and ferrous oxides in liquid ammonia.** T. E. Moore and G. W. Watt (*J. Amer. Chem. Soc.*, 1942, **64**, 2772—2775).—At room temp. $Co_2O_3$, CoO, and FeO do not dissolve in or react with liquid $NH_3$. $Co_2O_3$ does not react with solutions of $NH_4Cl$ or $NH_4NO_3$ in liquid $NH_3$ at 100° but, under similar conditions, CoO and FeO are dissolved to some extent. Each reacts slowly with liquid $NH_3$ solutions of $KNH_2$ at room temp. to give complex mixtures only part of which is sol. Whereas $Co_2O_3$ is reduced to CoO and ultimately to Co by liquid $NH_3$ solutions of K at 0°, FeO is reduced to Fe to only a very limited extent.

W. R. A.

**Nitrosyl and hydroxylamine derivatives of $Ni(CN)_2$.** L. Malatesta and R. Pizzotti (*Gazzetta*, 1942, **72**, 174—183).—The violet salt (I), new formula $K_2[Ni^{III}(CN)_3·N(OH)·Ni^{III}(CN)_3]$ (cf. Job *et al.*, A., 1923, i, 904; Manchot, A., 1927, 33; Anderson, A., 1937, I, 95), is obtained either from aq. $K_2[Ni(CN)_4]$ (II), $NH_2OH,HCl$, and KOH, or from (II), $Ni(CN)_2$ and KOH with $N_2H_4,H_2O$, followed by NO. Aq. (I) with dil. AcOH or $HgCl_2$ gives an unstable *compound* of varying composition, $\{H[Ni(NO)(CN)_2]\}_2,Ni(CN)_2$ (?), which in boiling $H_2O$ loses $Ni(CN)_2$, forming a stable blue *compound*, $H[Ni(NO)(CN)_2]$. The presence of the ·N(OH)· bridge in (I) is shown by decomp. by HgO, giving $N_2$, $N_2O$, and NO in the same proportions as from $NH_2OH$. E. W. W.

**Co-ordination tenacity of unsaturated molecules.**—See A., 1943, II, 103.

# X.—ANALYSIS.

**Quantitative analysis for impurities by intensity estimation of one spectral line.**—See B., 1943, I, 173.

**Adsorption in chemical analysis.** G. N. Copley (*Ind. Chem.*, 1943, **19**, 142—148, 169).—A review. L. S. T.

**Adsorption analysis of solutions.** A. Tiselius (*Arkiv Kemi, Min., Geol.*, 1941, **14**, B, No. 22, 5 pp.).—In the method suggested a boundary between the solution and pure solvent is allowed to rise slowly through a vertical column containing a layer of powdered adsorbent. The boundary remains sharp but it is more or less retarded as compared with the meniscus of the solvent according to the extent to which the solute is adsorbed. A relationship between this retardation vol. and the adsorption isotherm is derived. With a mixture containing several components the boundary is split into an equal no. of separate boundaries which may be observed by Toepler's method. The separation by this method of a solution containing 1% each of NaCl, glucose, and PhOH is illustrated.

J. W. S.

**Reproducibility of pH measurements with glass electrode hydrogen ion meters.** R. U. Bonnar (*J. Assoc. Off. Agric. Chem.*, 1942, **25**, 973—980).—Collaborative results for test solutions are reported and analysed. The measurements converged to 0·01 pH. For temp.-sensitive systems discrepancies ≯0·3 pH may be expected. Systems permitting consistent measurements should show mutual agreement within ±0·05 pH. A. A. E.

**Separation of iodides, bromides, and chlorides.** N. E. Freeman (*J. Assoc. Off. Agric. Chem.*, 1942, **25**, 833—839).—Ashing methods for the separation of halides from org. matter are unsuitable if I' is

present; Br' and Cl' are readily retained by alkaline fixatives. Except for certain org. compounds the gravimetric open Carius procedure is recommended. The $NH_2OH$ method for recovery of halides from pptd. Ag salts is trustworthy. 5% aq. KI is a satisfactory absorption medium for I if $CO_2$ is used for aëration. $Ce(SO_4)_2$ is preferred for conversion of Br' into Br.    A. A. E.

**Purification and analytical determination of gaseous fluorine.** H. Schmitz and H. J. Schumacher (*Z. anorg. Chem.*, 1940, **245**, 221—225).—$F_2$, prepared by electrolysing fused $KHF_2$, is cooled in liquid $O_2$ to remove impurities and condensed in liquid $N_2$. Evaporation gives 97·5%-pure $F_2$. Gaseous $F_2$ can be analysed by measuring the reduction in vol. when shaken with Hg.    C. R. H.

**Amperometric determination of sulphates.** W. C. Davies and C. Key (*Ind. Chem.*, 1943, **19**, 167—169).—Apparatus and method for determining residual $SO_4''$ in $Al_2O_3,nH_2O$ by titration with $0.05M$-$Pb(NO_3)_2$ at a controlled pH in an atm. of $H_2$ are described. The method has been successively applied also to the determination of $SO_4''$ in boiler $H_2O$ and in wash waters.    L. S. T.

**Micro-determination of sulphates in sea-water.** D. A. Webb (*J. Exp. Biol.*, 1939, **16**, 438—445).—AcOH and solid $Ba(IO_3)_2$ are added and after 4 hr. excess of acidified KI liberates free I in amount $\propto$ the original $[SO_4'']$. The incompleteness of the reactions necessitates the use of a comparable standardised control solution.    D. M. Sa.

**[Volumetric] determination of selenious acid and selenites.** D. F. Adams and L. I. Gilbertson (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 926—927).—$SeO_3''$ is oxidised to $SeO_4''$ in aq. $HNO_3$ by excess of aq. $KBrO_3$, which is back-titrated with $Na_3AsO_3$ (Fast Red B) in presence of HCl. Details of procedure and test data are given. Colourless cations that form sol. selenates, and excess of $NO_3'$, do not interfere. Halides must be absent. The method is suitable for determining $SeO_3''$ and $H_2SeO_3$ in presence of $SeO_4''$.    L. S. T.

**Rapid determination of phosphate content of boiler water.**—See B., 1943, I, 133.

**Accurate determination of calcium, without reprecipitation, in presence of aluminium, iron, magnesium, manganese, phosphorus, sodium, and titanium.** W. H. McComas, jun., and W. Rieman, 3rd. (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 929—931).—$CaC_2O_4,H_2O$ is pptd. slowly in hot solution containing $HCO_2H$, digested for 5 min., cooled rapidly to room temp., and digested at 25° after adjustment of pH to 3·70 by means of $HCO_2NH_4$. The washed ppt. is dissolved in dil. $H_2SO_4$ and titrated with aq. $KMnO_4$ according to the Fowler–Bright procedure. Test data for pure solutions and for limestones, and data showing the effect of changes in various conditions, are recorded.    L. S. T.

**Alkalimetric method of determination of cadmium and zinc.** M. M. Tillu and M. S. Telang (*J. Univ. Bombay*, 1942, **11**, A, Part 3, 85—86).—In a mixture of Cd and Zn the Cd is pptd. by NaOH as $Cd(OH)_2$ which is determined by the author's method (A., 1943, I, 24); the Zn is pptd. with $NaHCO_3$ as $ZnCO_3$ which with KI yields $K_2CO_3$, titrated against HCl using Me-orange.    F. R. G.

**Systematic identification of the common metallic coatings.**—See B., 1943, I, 172.

**Polarographic determination of lead in lead-bearing steels.**—See B., 1943, I, 168.

**Determinations [of metals] with Chinosol.** H. T. Liem (*Pharm. Tijds. Nederl. Indië*, 1942, **19**, 13—16).—Chinosol ($C_9H_6ON\cdot KHSO_4$) or Superol can replace 8-hydroxyquinoline with advantage for the determination of Cu, Al, and Zn.    S. C.

**Colour reactions of *o*-phenanthroline derivatives.** M. L. Moss [with M. G. Mellon, and G. F. Smith] (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 931—933).—The reactions of 5-chloro-, 5-bromo-, 5-methyl- (I), nitro-, and 5-nitro-6-methyl-*o*-phenanthroline with Fe, Cu, and Mo have been investigated. A spectrophotometric investigation indicates that the compounds with Fe·· can be used for colorimetric determinations. With the exception of the (I) derivative, the complexes formed are not exceptionally stable, and are not preferred to *o*-phenanthroline (II)–Fe·· complex. Ammoniacal Cu·· solutions containing (II) or the above derivatives form insol., brown complexes with Cu·· when treated with $NH_4OH$. Solutions of these complexes in org. solvents are suitable for colorimetry. The (II) reagents are not satisfactory precipitants for Cu. $MoO_4''$ with (II) or its derivatives gives a reddish colour on reduction with $H_2SnCl_4$. The reaction will detect 0·5 p.p.m. of Mo, but is unsuitable for quant. purposes.    L. S. T.

**[Determination of nickel in used plating baths].**—See B., 1943, I, 171.

**Qualitative semimicro-analysis with reference to Noyes and Bray's system. Aluminium group.** (Miss) C. C. Miller (*J.C.S.*, 1943, 72—74).—An analytical scheme for the detection and approx. determination of 0·25—50 mg. of Al, Cr, or Zn and 0·25—10 mg. of Be, W, U, or V in mixtures containing $PO_4'''$ is presented. The solution of mixed chlorides is treated with $Na_2O_2$, and then boiled to decompose excess of $Na_2O_2$. Separate portions of the solution are tested for Be (fluorescence with morin), W [1 : 3 : 4-$C_6H_3Me(SH)_2$], V

(tannin), Zn (pptn. of Zn Hg thiocyanate), and Cr [CO(NH·NHPh)$_2$ after conversion into $Cr^{VI}$]. Al and U are separated by passing $CO_2$ and filtering, the ppt. containing Al and the filtrate U. Al is detected by Cs alum pptn. and U by pptn. with $K_4Fe(CN)_6$ after removal of V by cupferron and elimination of W.    C. R. H.

**Direct determination of aluminium in alloys.**—See B., 1943, I, 170.

**Dichromate–ferrous sulphate method for [determining] antimony.** R. B. Neill (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 955).—Standard $K_2Cr_2O_4$ is added to the aq. solution containing $Sb^{III}$, $H_2SO_4$, and HCl until the orange colour of an excess can be detected. $H_3PO_4$ and $NHPh\cdot C_6H_4\cdot SO_3H$ are added, and the solution is titrated with $Fe^{II}$ solution. The $K_2Cr_2O_4$ equiv. of the $Fe^{II}$ solution is determined by adding to the titrated solution a vol. equal to that used previously and titrating with $K_2Cr_2O_7$. Methods for dissolving Sn–Pb alloys containing Sb are described, and test data given.    L. S. T.

# XI.—APPARATUS ETC.

**Apparatus for the measurement of thermal expansion at temperatures up to 100°.** H. H. Macey (*J. Sci. Instr.*, 1943, **20**, 48—49).—By means of an optical system the length of a rod is compared with that of a rod of $SiO_2$ of known expansion.    A. A. E.

**Temperature determinations in theory and practice.** N. R. Tawde and H. A. Unvala (*J. Univ. Bombay*, 1942, **11**, A, Part 3, 166—171).—A survey.    F. R. G.

**Photo-electric tricolorimeter.** G. F. G. Knipe and J. B. Reid (*Proc. Physical Soc.*, 1943, **55**, 81—91).—The colorimeter described is designed to measure the colour of nearly white papers and to specify differences which are visible but indeterminable by visual colorimeters. It makes use of a double monochromator system and three diaphragms which select the correct proportion of light of each $\lambda$, enabling the result to be given in C.I.E. units directly. Calibration and performance are reported.    N. M. B.

**Ultrasonic fluorometer.** G. Goudet (*Compt. rend.*, 1942, **214**, 742—744).—A new fluorometer is described and the mathematical principle on which it depends is presented.    J. L. E.

**Cold-cathode *X*-ray diffraction tube.** F. G. Chesley (*Rev. Sci. Instr.*, 1943, **14**, 3—5).—Metal bellows permit adjustment of the cathode–target distance, and a simple target sealing assembly is employed.    A. A. E.

**Variable ratio-arm conductivity bridge.** W. F. Luder (*Rev. Sci. Instr.*, 1943, **14**, 1—3).—The bridge has a range of precision measurement of $> 10^6\ \Omega$.    A. A. E.

**Preparation and testing of satisfactory standard electrodes for spectrographic analysis of light metals.**—See B., 1943, I, 172.

**Circuits employing thyratrons and ignitrons.** A. J. Maddock (*J. Sci. Instr.*, 1943, **20**, 37—45).—Typical examples of circuits and applications indicating different methods of using thermionic gas-filled triodes and Hg pool diodes with igniter electrode are described and diagrams given.    A. A. E.

**Geiger counting methods.** W. Bothe (*Naturwiss.*, 1942, **30**, 593—599).—A review describing the construction and uses of various types of counter.    A. J. M.

**Localisation of the discharge in Geiger–Müller counters.** M. H. Wilkening and W. R. Kanne (*Physical Rev.*, 1942, [ii], **62**, 534—537).—The efficiency of various localising devices is investigated as a function of EtOH concn. in an A–EtOH filling. Localisation is more complete at low vals. of overvoltage. The effectiveness is given of various gas fillings, including inorg. gases which show both localisation and fast counter action.    N. M. B.

**Limits of resolution of the emission electron microscope.** E. Brüche (*Kolloid-Z.*, 1942, **100**, 192—206).—Applications of the emission electron microscope are described and the limits of resolution discussed.    F. L. U.

**[Optical] definition of objects lying near the limits of resolution of the microscope and of the electron microscope.** M. von Ardenne (*Kolloid-Z.*, 1942, **100**, 206—211).—The effects of slight alteration in adjustment on the definition of structures the dimensions of which lie near the limit of resolution are discussed and illustrated. In the electron microscope errors of adjustment lead to diminution of contrast but not to a false image, whereas with an ordinary microscope the lines and spaces of a grid having a const. equal to or twice as great as the resolution of the instrument may appear interchanged. In practice it is better to work with too large than with too small an effective aperture in the electron microscope.    F. L. U.

**Electron microscope images at higher pressures.** E. Ruska (*Kolloid-Z.*, 1942, **100**, 212—219).—Arrangements for the electron-microscopical examination of objects maintained under gas pressures up to 200 torr. are described. The images obtained show considerably reduced definition and contrast; the deterioration increases with the pressure, with the $d$ of the gas, and with the thickness of the atm., and the object also may sustain damage from secondary

radiation. The conversion of colloidal Ag in an atm. of $Cl_2$ into AgCl has been studied.      F. L. U.

**Thermally prepared aluminium oxide films.** H. Mahl (*Kolloid-Z.*, 1942, **100**, 219—228).—$Al_2O_2$ films made by heating very pure Al at 500°, examined by the electron microscope, are seen to consist of scaly crystallites of the $\gamma$-oxide lying parallel to the metal surface. Films formed by passing a Bunsen flame over Al foil are very fine-grained and show no marked fibrous structure. The cryst. scales produced by continued heating of the metal are generally formed by the collective crystallisation of very fine primary oxide grains, which are themselves formed anew as soon as the initial oxide layer becomes pervious to $O_2$ through crystallisation.      F. L. U.

**Preparation of thermally stable carrier-films for determining lattice constants of alloys by electron diffraction.** A. Boettcher (*Kolloid-Z.*, 1942, **100**, 228—230 ; cf. Hass and Kehler, A., 1942, I, 250).—Films of $Al_2O_3$ formed by condensing Al vapour on a surface of rock salt were examined by electron diffraction. Films annealed at 600—900° consist of $\gamma$-$Al_2O_3$ with $a$ 7·89±0·01 A. The use of such films as supports is illustrated by a study of the Ag–Al system, for which vapours of both metals were condensed on the same carrier-film. The diffraction patterns of the various phases, superposed on that of the $\gamma$-$Al_2O_3$, allow the lattice consts. to be determined with an accuracy of 0·15%.      F. L. U.

**Damping device for high-capacity balances.** H. L. Andrews, F. W. Oberst, and E. G. Williams (*Rev. Sci. Instr.*, 1943, **14**, 22—23). —An electromagnetic circuit for a 100-kg. balance requires only ~0·5 amp. at 12 v. and does not affect sensitivity. Loss in wt., *e.g.*, of a man at rest, can be recorded graphically.      A. A. E.

**A centrifugal micro-filter.** F. Boerner (*Amer. J. clin. Path. Tech. Sect.*, 1942, **6**, 68).      C. J. C. B.

**Simple automatic distilling unit.** B. N. Craver and H. L. Williamson (*J. Lab. clin. Med.*, 1943, **28**, 199—200).—The siphon principle is used.      C. J. C. B.

**Accurate cheap constant-temperature water-bath.** B. C. Riggs (*J. Lab. clin. Med.*, 1943, **28**, 210—213).      C. J. C. B.

**Adsorption analysis : experimental arrangement and some results with mixtures of glucose and lactose.** A. Tiselius (*Arkiv Kemi, Min., Geol.*, 1941, **14**, B, No. 32, 8 pp. ; cf. A., 1943, I, 136).—The apparatus used in the author's method is described. The relationship between the retardation vol. and the adsorption isotherm derived previously holds satisfactorily for aq. solutions of glucose and lactose, alone or together.      J. W. S.

**Accurate high-sensitivity Apiezon oil McLeod gauge.** J. Bannon (*Rev. Sci. Instr.*, 1943, **14**, 6—10).—Since the oil absorbs gas it is subjected continuously to very low pressure, the reservoir being in gas communication with the bulb, and the oil displaced by an externally controlled plunger. For single measurements, accuracy is ~1, 2, 8, and 25% for $10^{-3}$, $10^{-4}$, $10^{-5}$, and $10^{-6}$ mm. Hg respectively.      A. A. E.

**Sensitive relay operated by fluid flow.** J. H. J. Poole and J. C. Gilmour (*J. Sci. Instr.*, 1943, **20**, 49—50).—A piston provided with an axial hole moves freely in a vertical glass tube and completes an electrical circuit which is broken when the flow of $H_2O$ falls below a certain adjustable val.      A. A. E.

**Rapid determination of very small gas flows. Soap-bubble method.** L. Silverman and R. M. Thomson (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 928).—Details of procedure, and performance of the method, which involves the formation and measurement of soap bubbles at a capillary tip, are given. The method is suitable for the calibration of needle valves, capillary flowmeters, and other indicating devices.      L. S. T.

# XII.—LECTURE EXPERIMENTS AND HISTORICAL.

**George Macintosh (1739—1807) and Charles Macintosh (1766—1842).** N. L. Clow and A. Clow (*Chem. and Ind.*, 1943, 104—106).

# XIII.—GEOCHEMISTRY.

**Chemical evolution of the ocean.** E. J. Conway (*Proc. Roy. Irish Acad.*, 1943, **48**, B, 161—212).—General principles applicable to the development of the theory of oceanic evolution are outlined. This evolution is treated mainly on the basis of a constancy of oceanic vol. with the addition of HCl either from the original atm. or from volcanoes. Removal of $K^•$ from the ocean by living organisms, with subsequent conversion into glauconite and fall of [$K^•$], has played a major part in the chemical evolution of the ocean. The oceanic composition of the early Ordovician period, in or near to which the vertebrata first appeared, is compared with that of mammalian blood-plasma. The discrepancy between vals. for the age of the ocean as computed from the data of chemical denudation and from radioactive change is discussed.      L. S. T.

**Differential density of ground water as a factor in circulation, oxidation, and ore deposition.** J. S. Brown (*Econ. Geol.*, 1942, **37**, 310—317).—Evidence that differences in $\rho$ of natural ground waters are sufficient to explain their migrations to important depths below the $H_2O$ table in certain cases, producing chemical changes in wall rock, is presented.      L. S. T.

**Some peculiarities of the winter hydrochemical regime of the Volga River in 1939 and 1940, and their causes.** S. P. Shdanov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **33**, 84—88).—In 1939 there was greatly increased fish mortality in the Volga, which has been traced to $O_2$ deficiency in the $H_2O$. This deficiency was caused by the oxidation of effluents from paper mills by the $O_2$ dissolved in the $H_2O$.      A. J. M.

**Chlorophæite-bearing basalts from the Cuddapah traps (Precambrian).** M. R. S. Rao (*Current Sci.*, 1942, **11**, 396).—Chlorophæite (with $n$ > that of Canada balsam) occurs as amœboid patches in the top basaltic flows of the Cuddupah system (S. India), where it has developed at the expense of primary minerals.      A. Li.

**Rôle of the logarithmically normal law of frequency distribution in petrology and geochemistry.** N. K. Razumovski (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **33**, 48—49).—The frequency distribution of the content of elements in rocks obeys a logarithmic law. Averages obtained by the arithmetic mean method should be revised.      A. J. M.

**Admixture of barium and calcium in celestite.** L. M. Miropolski (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **33**, 64—65).—The % of BaO and CaO in a no. of samples of celestite (**I**) has been determined. The presence of Ba and Ca is determined by the medium in which the crystallisation of (**I**) occurred, and it can be interpreted by using the principle of polar directed isovalent isomorphism, or that of compensatory isomorphism.      A. J. M.

**Metaloparite, a new mineral from the Lovozero Tundras.** V. I. Gerasimovski (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **33**, 61—63).— The mineral, which was discovered in the Lovozero alkaline massif (Kola peninsula), is a secondary mineral, closely resembling loparite. The physical and optical properties of the mineral are recorded, and an analysis is given.      A. J. M.

**Augite from Cape Tourmente [Quebec].** H. M. Putman (*Natural. Canad.*, 1942, **69**, 261—263).—A chemical analysis is given. $\rho$ is 3·48, $a : b : c$ = 1·902 : 1 : 0·584, $\beta$ 105° 50′.      L. S. T.

**Metachromatism of minerals.** A. S. Uklonski (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 209—212).—A list of colour changes produced in minerals by illumination with a Hg-vapour lamp is given.      L. J. J.

**Heteromorph of venanzite.** A. Holmes (*Geol. Mag.*, 1942, **79**, 225—232).—Chemical analyses of venanzite, mafurite-venanzite, and related rocks are recorded and discussed.      L. S. T.

**Mineralisation of the Ajo Copper District, Arizona.** J. Gilluly (*Econ. Geol.*, 1942, **37**, 247—309).—The New Cornelia ore body at Ajo is a " porphyry copper " deposit consisting of chalcopyrite, with subordinate bornite, disseminated in quartz monzonite porphyry, and is the end product of a series of alterations of the porphyry through magmatic processes. Chemical analyses of the monzonite are recorded.      L. S. T.

**Physiographic setting of the nitrate deposits of Tarapacá, Chile ; its bearing on the problem of origin and concentration.** J. L. Rich (*Econ. Geol.*, 1942, **37**, 188—214).—Analysis of various theories of origin points to a derivation by weathering and concn. from the predominating lavas and tuffs of the bed rock. This agrees with features of the topographic setting revealed by aerial photographs.      L. S. T.

**Middle Jurassic rocks of Yorkshire. Petrological and palaeographical study.** F. Smithson (*Quart. J. Geol. Soc.*, 1942, **98**, 27—59).—20 mineral species are described and illustrated, and the % composition of the heavy minerals is discussed.      L. S. T.

**Great Nordenskiöld [metallic] iron boulder from Ovifak [Greenland] : microstructure and mode of formation.** H. Löfquist and C. Benedicks (*Kungl. Svenska Vet. Akad. Handl.*, 1941, **19**, 1—96).— The authors' previously published work (A., 1942, I, 346) is described in greater detail. The disintegration of samples of the boulder Fe stored indoors is due to formation of cracks in $Fe(OH)_3$-rich areas on drying, followed by enlargement of these by rusting.      M. H. M. A.

**Rôle and significance of epeirogenetic movements in the formation of deposits of iron and manganese ores and bauxites.** B. P. Krotov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **33**, 54—56).—The effect of epeirogenesis on the formation of ore deposits is due to the fact that it brings about the physico-geographical conditions for the formation of such deposits. Epeirogenetic movements also affect the composition of the deposits.      A. J. M.

**Source beds of manganese ore in the Appalachian Valley.** G. W. Stose (*Econ. Geol.*, 1942, **37**, 163—172).—The Mn oxide occurs in clays residual from impure limestone associated with glauconitic quartzite. Origin is discussed.      L. S. T.

# INDEX OF AUTHORS' NAMES, A., I.

## MAY, 1943.