ABSTRACTS OF THE PHYSICO-CHEMICAL LITERATURE IN JAPAN

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1—GENERAL
(STRUCTURE—PROPERTIES—REACTIONS)

Orientation of molybdenum crystals deposited on sodium chloride crystals. S. Shirai. *Proc. Phys.-Math. Soc. Japan*, 23, 11, 914—918 (1941).—Thin Mo films were prepd. by evaporation *in vacuo* on heat-treated cleavage faces of rocksalt. The structure of these films was examd. by the method of transmission of cathode rays and compared with that of Mo films prepd. on artificial sodium chloride crystal (*Proc. Phys.-Math. Soc. Japan*, 23, 1, 1941). The surface structure of the fresh and heat-treated cleavage faces of both natural and artificial sodium chloride crystals was also examd. under the microscope and by the method of reflection of cathode rays and it was ascertained that the difference between the structures of Mo films in the two cases was due to the different surface structures of the fresh and heat-treated cleavage faces. Author.

On the electronic structure of intermetallic compounds and superlattice alloys of the CsCl type. I. T. Katayama. *Bull. Inst. Phys. Chem. Research*, 20, 609—640 (1941).—The electronic structure of intermetallic compds. and superlattice alloys of the CsCl type is studied, by taking into consideration the fact that the potential energy of each electron constituting the said alloys is invariant under the operations of the elements of the space group of the crystal lattice and by using the Wigner-Seitz-Slater method of finding the eigenfunction and the eigenvalue of the electrons in the crystal lattice. The said invariance makes it possible to employ the group-theory method for the simplification of the procedure in solving the problem. In this way the general relations among the energy levels of various zones and the formula of finding the eigenvalues and eigenfunctions of the electronic states are found. Author.

On the mechanism of the crystallisation of plates and fibers of alkali halides. Y. Hudimura. *J. Chem. Soc. Japan*, 63, 2, 111—119 (1942).—The author has investigated the condition of crystallisation of plates and fibers from hot satd. soln. of alkali halides, and recognized that it is due to filtration or stirring of the soln. When potassium chloride crystallises out from filtrate of hot satd. soln., at first, plates appear with many cubes, and next fibers, gradually increasing, become, at the end of crystallisation, fine like hair. Among four alkali halides, potassium chloride, potassium bromide, potassium iodide and sodium chloride, the tendency of forming plates and fibers appears most remarkably in the case of potassium chloride, which often forms crossed or T type fiber. Lead ion retards the formation of plates or fibers in a marked degree, and agar-agar comes next to it. The effect of gelatine is comparatively small. Ethylene glycol retards the speed of crystallisation of fiber from hot satd. soln. of potassium chloride so remarkably that one can observe the process of formation of dendrite under a microscope. At first, a thin needle grows rapidly on a face of cubic crystal, then another

needle is generated in the middst of the first needle at right angle to it, and thus a dendrite is produced. The author has observed Tyndall phenomena in a marked degree at the part of the soln., which looks transparent after the pptn. of the fiber. He considers the mech. of crystallisation of plates and fibers as follows. At first, colloidal crystals are generated in the super satd. soln. by the stirring or filtration and if one of them attaches on a (100) face of another cube, then the next colloidal crystal attaches more easily on the first one, and thus a fiber is rapidly produced. In the case of super-satd. soln., more than two colloidal crystals often can attach simultaneously on the adjacent surface of the same cube, which developes as a plate. Lead ions in crystal lattice of salt may retard the attachment of colloidal crystals, and agar-agar may retard the formation of colloidal crystals. Ethylene glycol may stabilise the colloidal state of potassium chloride. Author.

Studies on the hydrates of alkaline earth aluminate. II. On the thermal decomposition of $3CaO.Al_2O_3,6H_2O$. G. Maekawa. *J. Soc. Chem. Ind. Japan,* 45, 130—133 (1942).—The thermal decompn. of $3CaO.Al_2O_3.6H_2O$ has been examd. by means of its dehydration curve, the detn. of free lime and the X-ray analysis. From the results, it has been confirmed that the compd. is dehydrated at 250—350°C to $3CaO.Al_2O_3$. $1.5H_2O$; at 450—500°C to $3CaO.Al_2O_3.H_2O$; and it is changed at 600—800°C to an unstable adsorptive compd., liberating a part of the original lime in free state; and finally at 800—1000°C to $5CaO.3Al_2O_3$ and CaO. Above 1000°C $5CaO.3Al_2O_3$ and CaO begin to react and at 1400°C completely recombine to $3CaO.Al_2O_3$. **III. On the thermal decomposition of the hydrates of barium aluminate.** *ibid.* 45, 236--238 (1942).—The method of detn. of uncombined BaO in the presence of barium aluminates and their hydrates was studied, and the behaviour of the hydrates of barium aluminates on heating was followed by the liberated free BaO. The three kinds of hydrates are decomposed as follows : $3BaO.Al_2O_3.7H_2O \rightarrow BaO.Al_2O_3 + 2BaO + 7H_2O$, $2BaO.Al_2O_3.5H_2O \rightarrow BaO.Al_2O_3 + BaO + 5H_2O$, $BaO.Al_2O_3.6H_2O \rightarrow BaO.Al_2O_3 + 6H_2O$. Author.

X-ray study of some Japanese minerals. II. Ilmenorutile at Tesirogi, Hukusima Prefecture. R. Ando, I. Nitta. *J. Chem. Soc. Japan,* 62, 978—983 (1941). —The crystal structure of Japanese ilmenorutile is investigated by means of the back-reflection Laue, oscillation, and powd. photographs. As the result it is confirmed that the ilmenorutile has the structure of rutile type $(D^{14}_{4h} - P4/mnm, Z-2)$ and is a kind of mixed-crystal of rutile TiO_2 and mossite Fe $(Nb, Ta)_2O_6$. The cell consts. and the density are somewhat different from each other for the five samples investigated ; viz. $a = 4.59 \sim 4.66A.$, $c = 2.94 \sim 2.99A.$, $c/a = 0.639 \sim 0.648$ and $\rho = 4.83 \sim 5.06$. Everyone of these five samples is found to embrace rhombic columbite. Authors.

Molecular structures and the dielectric constants of gases. 1. Dielectric constant of 1, w-dichloroethane and intramolecular rotation. I. Watanabe. *Bull. Inst. Phys. Chem, Research,* 20, 581— 594 (1941).—An apparatus for the measurement of dielectric consts. of gases was constructed. The dielectric const. of 1, 2-dichloroethane in the gaseous state was measured, the results being in good agreement with those of Zahn. The dipole moments thus obtained are 1.18D at 307.3°K, 1.21D at 337.4°K, 1.25D at 353.2°K, 1.34D at 384.8°K, and 1.38D at 411.6°K. These results are discussed in detail by considering the co-existence of the trans and the gauche forms. Author.

Molecular structures and the dielectric constants of gases. II. Dielectric

constants of ethylene chlorhydrin and sulphur monochloride and their molecular structures. I. Watanabe. *Bull. Inst. Phys. Chem, Research*, **20**, 838—847 (1941). —1. The dielectric consts. of the vapour of ethylene chlorhydrin were measured and used to calc. the dipole moment. The moment found (1.88D) can be accounted for by the coexistence of the trans and the chelated forms, if we assume that the latter form is deviated considerably from the cis form. 2. The dielectric consts. of the vapour of sulphur monochloride were measured. The moments cald. from them are 1.07D at 337.8°K, 1.06D at 353.5°K and 1.02D at 386.2°K. The conclusion obtained is that the molecule has the single bond structure, and not the semipolar double bond structure.   Author.

Der Stromdruck der Leitungselektronen und die elektrische Leitfähigkeit der Metalle. Eine Theorie der elektrischen Leitung. M. Satô. *Sci. Rep.*, **30**, 14 (1941).— In dieser Arbeit wird gastheoretisch untersucht, dass die Leitungselektronen auf die zur Stromrichtung senkrecht stehende Ebene einen Druck ausüben, wenn ein stromdurchflossener Leiter angenommen wird. Dabei wird gezeigt, dass dieser Druck der elektrischen Feldstärke oder der Stromdichte proportional ist, wenn der Strom durch ein und dasselbe Metall fliesst. Dadurch wird die elektrische Leitung im Metall diskutiert und es bewiesen, dass die auf diese Weise abgeleitete elektrische Leitfähigkeit mit der Sommerfeldschen ganz übereinstimmt, falls sich das Elektronengas in einem vollständigen Entartungszustand befindet.   Verf.

Some physical properties of sodium lactate, as a glycerine substitute. S. Teramoto and R. Shiota. *Journ. Brew., Japan*, **20**, 209—218 (1942).—With respect to its physical properties.—specific gravity, viscosity, hygroscopic power, moisture retaining power-sodium lactate, as one of glycerine substitutes, is compared with glycerine (G), ethylene glycol (E), glucose (S), changing its concn. on water soln. Specific gravity ; 2.5 mol % of Na-lactate (L) indicates 1.12 (vies 100% E) and 5 mol % indicates over 1.24 (vies 100% G). Viscosity ; its ascending degree against mol arranges $L > S > G > E$, but Na-lactate indicates not so high viscosity as glycerine in its allowable range. Hygroscopic power : measuring ranges (mol % G 5.37~91.34, L 0.99~4.99, E 7.02~100.0, S 1.06~6.97). At relative humidity 100%, hygroscopicity indicates $E > G > L$, and S shows no power. Moisture retaining power ; L 5 mol % vies with G 30~40 mol % and E 40~50 mol %, but S has no power. 4~5 mol % of Na- lactate soln. substitutes 20~40 mol % of glycerine soln.   Authors.

On the approximate formula for the determination of viscosity by the torsional vibration. T. Okaya. *Proc. Phys.-Math. Soc. Japan*, III, **23**, 1031—1037 (1941).— Take a circular cylinder (inner radius : a, inner height : 2h) filled with a certain liquid (density : ρ, viscosity : μ, kinematic viscosity $\nu = \mu/\rho$). If it is suspended vertically at the center of its upper face by an elastic string and the torsional vibration is applied on it, one is able to measure the period T and the logarithmic decrement δ of the vibration and thence he is able to deduce the value of viscosity. The author describes the mathematical treatment to obtain the approximation formula to find the viscosity with an exptl. example. By denoting by I the moment of inertia of the cylinder with respect to the rotating axis and by setting $\eta = \delta/2\pi$,

$$(3) = 4 I_\eta, \quad (2) = (a^4 + 4a^3h)(B - A_\eta),$$

$$(1) = \frac{a^3 h}{\rho} \left[\frac{8 C_{3/2}}{\sqrt{8h}} + \frac{6}{\pi a} \right],$$

$$(0) = \frac{6 a^3 h A}{\rho^2} \left[\frac{1}{8(\pi a)^2} + \frac{C_2}{\sqrt{8h}\pi a} \right]$$

where

$$C_{3/2} = 0.5732, \quad C_2 = 0.6752,$$

$$A = 1 + \frac{1}{2}\eta + \frac{1}{8}\eta^2, \quad B = 1 - \frac{1}{2}\eta + \frac{1}{8}\eta^2,$$

and thence

$$\xi = \frac{(2)}{2(1)}\left[1 - \sqrt{1 - 4\frac{(1)(3)}{(2)^2}}\right],$$

$$\epsilon = (0)\xi^3/[-(2) + 2(1)\xi - 3(0)\xi^2]$$

The viscosity μ of the liquid can be calcd. by

$$\mu = (\xi + \epsilon)^2/(\pi\rho T).$$

<div align="right">Author.</div>

Application of the theory of the rate of chemical reaction to the process of destruction. K. Omori. *Tech. Repts. Kyushu Imp. Univ.*, 16, 6, 238—247 (1942). —Eyring's theory of the activated complex is applicable to the elementary process of destruction as well as to the chem. elementary reaction. The author assumes the former as follows: the state of an atom in solid is a normal configuration with the normal partition function. Obtaining the sufficient external energy this state changes to the complete dissocg. one which corresponds to the macroscopic destruction. On the way of the atomic destruction it becomes an activated state probably at the tip of crack. We can recognize the individuality of its behaviour, calling it "atom of destruction". The transition of the activated complex releases energy of activation and is always associd. by the "wave of destruction", a kind of an elastic wave in solid, its frequency ranges from 10^9 to 10^{11} hertz. Its transition probability calcd. by Eyring's method gives the velocity of destruction from the atomic distance. Two varieties, the form of potential curve of interatomic energy and the kind of external action, produce the macroscopic complexity of destruction.   Author.

Studies on the resinification. III. IV. K. Kaneko. *J. Soc. Chem. Ind. Japan*, 45, 61—66 (1942).—In these reports the author describes a method of detn. of the molecular wts. of phenolic resins. In previous papers (Reports I—II) it was suggested that in acetone soln. the resin particles should be spheres from viscosity data and their specific

volume was calcd. from the author's viscosity formula. The molecular wts. of spherical molecules would be detd. from their specific volumes and diffusion consts. by Einstein's formula $D = RT/(N \cdot 6\pi\eta r)$ and $M = \frac{4}{3}\pi r^3 \cdot N/\varphi$. Diffusion consts. of phenolic resins were detd. by O. Lamm's refractometric method. For the purpose of calcg. diffusion const. the uniformity of the sample was assured and the adaptability of drawing ln $dn/dx - x^2$ curve was suggested. The results of several expts. indicated that diffusion const. decreased at first from that curve, and there was not any definite relation between the molecular wts. and the time of heating or the volume of ammonia added. The author supposes that those resulted from the existence of such low molecular substances as split by the resinification.   Author.

Studies on the resinification. V. Analysis of diffusion curve. K. Kaneko. *J. Soc. Chem. Ind., Japan*, 45, 2, 174—176 (1942).—A convenient method of analysis of diffusion curve is proposed. As previously reported, ln dn/dx and X^2 will be a "curve" when the sample is not uniform. In this case, diffusion curve is considered as a sum of normal distribution curves. Therefore, ln $dn/dx - x^2$ must be a straight line where x^2 is large enough. From the inclination of this straight line the diffusion consts. and curve of the lowest molecular component should be detd. and subtracted. Such operation will be repeated, and we shall obtain diffusion consts. and concns. of all components in the sample, because concn. of one component will be capable of calcn. from its area of the diffusion curve. Thus, the author found that the resin could be separated to the lower and higher molecular components. Under some assumptions, their concns. and molecular wts. are calcd., too.   Author.

The mechanism of the tautomeric change of nitroanilino-d-methylenecamphor. T. Hayashi. *Sc. P.*, 39, 195—207

(1941).—From p- and m-nitroanilino-d-methyl-enecamphor (mp 196~197° and 190~191°) (E) which were resp. obtained by the condensation of d-oxymethylenecamphor with p- and m-nitroaniline, isomeric compds. (mp 156~157° and 131~132°) (K) were resp. isolated from the soln. after the mutarotation. From o-nitroanilino-d-methylenecamphor (mp 157~158°) which exhibits no mutarotation, no isomeric compds. was obtained. By the ozonized oxygen, the E forms of the p- and m-nitroaniline compds. and the o-nitroaniline compd. gave the compds. contg. nitrogen which yielded camphoric acid anhydride when fused and the K forms of the p- and m-compds. gave camphorquinone. From these results it was decided that the E forms of the p- and m-compds. and the o-compd. were the enolic form (I) and the K forms the ketonic form (II) and the tautomeric change

$$(I)$$

$$(II)$$
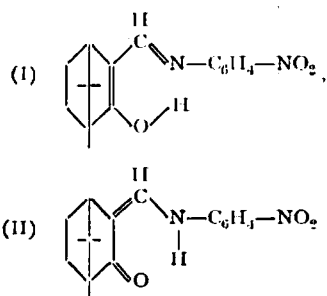
which occurred during the mutarotation proceeded from (I) to (II). Such a tautomeric change is considered easily probable if the chelation between hydrogen of the enolic group and nitrogen of the amino group in (I) exists. The fact that o-nitroanilino-d-methylenecamphor exhibits no mutarotation may be explained by the existence of the stable chelation between hydrogen and oxygen of the nitro group.   Author.

A simple procedure for decolourisation of organic compounds. K. Ishimura. *Bull. C. S. J.*, **16**, 443 (1941).—In the course of the investigation on the molecular rearrangement of disubstituted acetaldehydes into the corresponding ketones, the author has prepared a number of aromatic compds., namely, diaryl ketones, alkyl aryl ketones, their oximes and semicarbazones and benzoyl derivatives of diaryl ethylene glycols and of alkylaryl ethylene glycols. They have usually been purified by recrystallisation from dilute alcohol, but in every case faintly yellowish or brownish colour could not be removed from the substances by the usual methods, such as changing the solvents, adding animal charcoal or dissolving them in hot alcohol and adding hot water to the soln. till it becomes faintly turbid and subsequently leaving it to cool down. In such cases the purification was accomplished with unexpected good results in the following way :— the substance to be purified is dissolved in hot alcohol, into which a large quantity of hot water is poured at a time. An almost colourless flocky ppt. is obtained. It is filtered and recrystallised from dilute alcohol in the usual way and thus a completely colourless substance with a well defined crystalline form is easily obtained. The colouring matters may be some polymerisation or condensation products, possibly with large molecular wts., formed by the side reactions when the above-mentioned substances are synthesised. They are soluble in hot alcohol, but not in cold alcohol and water. When hot water is poured into the hot alcoholic soln. they are probably peptized, forming colloidal solns., whereas the substances to be purified are pptd., which are likewise insoluble in water but with much smaller molecular wts. and existing in relatively large amt., and thus difficult to form colloidal solns.   Author.

Manufacturing process of the single crystal of Rochelle salt. K. Sakamoto. *Research Report of Aichi Tokei Denki K. K.* **5**, 233—237 (1941).—Small crystals of Rochelle salt are pptd. from slightly super-satd. aqueous soln.; the pptn. being greatly facilitated by throwing small fragments of the salt in the soln. The crystal thus obtained is suspended by means of a long hair in a considerable amt. of the satd.

soln. placed in a thermostat. The suspended crystal is allowed to grow either by adding suitable amt. of super-satd. soln. to the mother liquor day after day keeping the temp. const., or by carefully cooling the thermostat at the rate of 0.1—$0.25 °C$ per day. In order to obtain a perfect crystal, great care should be taken not to grow the crystal too rapidly, or else cracks in the crystal are very liable to result.   Author.

Johachidolite—A new mineral of hydrous fluoborate of sodium, calcium and aluminium. E. Iwase and N. Saito. *Sc. P.*, **39**, 300—304 (1942).—The authors have found a new mineral species in the niphelite blocks from Johachido at Kankyohokudo in Chosen. It was named johachidolite after the name of the locality. Under the ultra-violet excitation it shows remarkably intense blue fluorescence, which gives a clue to this new finding. The spectra of ultraviolet-fluorescence as well as of cathodeluminescence were investigated. Its chemical constitution may be regarded as a hydrous fluoborate of sodium, calcium and aluminium. Some explanations are given as to the mode of occurrence of johachidolite. Authors.

Geochemical investigations of hot springs in west Japan. II. The Radon content of hot springs in Yamaguti Prefecture. S. Matuura, R. Hukusima and I. Iwasaki. *J. Chem. Soc. Japan*, **62**, 1163—1166 (1941).—The Radon content of 18 hot springs in Yamaguti prefecture is found to be 29.55—0.05 mache units. Discussing these values, the authors suggest that the Radon content of spring water is mainly due to the nature of its passage through rocks near the surface of the earth.   Authors.

Geochemical investigations of hot springs in west Japan. III. The radon content of some hot springs in Hukuoka and Ōita prefecture. I. Iwasaki, I. Ukimoto, M. Hosika. *J. Chem. Soc. Japan*, **63**, 19—22 (1942).—The radon contents of 22 hot springs in Hukuoka and Ōita Prefectures were measured by the present writers in 1941, ranging from 0.34 to 1.6 mache. The mineral springs issuing from granitie rocks show a very much higher radon content compared with that of other springs issuing from metamorphic rocks and sedimentary rocks. Hot springs issuing from sedimentary rocks show the lowest radon content.   Authors.

Geochemical investigations of hot springs in west Japan. IV. The radon content of hot springs in Sambeyama District. 2 I. Iwasaki, I. Ukimoto, M. Hosika. *J. Chem. Soc. Japan*, **63**, 139—142 (1942).—In May, 1941, the present writers measured again the radon content of many strong radioactive mineral springs at Ikeda, Yugakai and Sigaku in the vicinity of volcano Sambeyama in Simane Prefecture. Although the measurement was done after a heavy rain, the radon content of these mineral springs was generally larger in quantity in May, 1941 than in October, 1939. The radon content of a certain hot spring at Yugakai is four time as large as the former value. Even where the orifices are situated close together within a narrow place in the same hot spring, the effects of external conditions such as abundant rain or drought on the hot springs are not always the same.
                          Authors.

2—SUB-ATOMICS, RADIOCHEMISTRY AND PHOTOCHEMISTRY

On the resonance capture of slow neutrons and emission of gamma-rays. III. Resonance groups of silver. I. Nonaka. *Proc. Phys.-Math. Soc. Japan*, 24, 33—39. (1942) ; *Matuda Kenkyujiho* 17, 185—188 (1942).—Burhop and others (*Proc. Roy. Soc.* 165 (1938), 116) have reported that the slow neutrons which produce gamma-rays in Ag contain a group of 0.5 eV in energy, which is far smaller than that of the neutrons which make Ag radioactive. In the present expt. the energy of the gamma-ray producing neutrons was compared with that of the radioactivity producing neutrons by the boron absorption method. There was no evidence that both neutrons differ in their energies, contrary to the result of Burhop and others.
                                          Author.

Pair production by gamma rays from fluorine bombarded with protons. III. M. Hatoyama, Z. Yuhara and T. Maeyama. *Sc. P.*, 39, 1—7 (1941).—Pairs produced in the gas filling the cloud chamber by the gamma rays from fluorine bombarded with protons were studied. A value of 6.25 ±0.05 MeV for the gamma ray energy was obtained. The probability of division of energy between positive and negative electrons was studied ; the results obtained in the authors' former expt. were confirmed. The angular distribution of the emitted electrons was studied and compared with the theoretical calcns. The results agreed well with the theory.   Authors.

Pair production by gamma rays from fluorine bombarded with protons. IV.—Pair production in the field of an electron. K. Shinohara, M. Hatoyama and J. Yuhara. *Sc. P.* 39, 8—13 (1941).—Photographs are shown in which three electron tracks, two negative and one positive, start from a point in the gas filling the cloud chamber bombarded with the F+p gamma rays. They are analyzed and are explained by pair production in the field of an electron. The probability of observing such phenomena is discussed.   Authors.

Excitation of gamma-rays by fast neutrons of different energies. I. Nonaka. *Proc. Phy. Math. Soc. Japan*, 23, 11, 925—938. (1941.—Atomic cross sections of Al, Si, Fe, Co, Cu, Ag, Cd and Pb for gamma-ray excitation by fast neutrons of different energies from 2.25 to 2.90 MeV were detd. The neutron energy was varied by changing the angle φ between the paths of the neutrons and deuterons in a D-D neutron source, and the emitted gamma-rays were measured by a thin Geiger-Müller counter surrounded by a sheet of lead 1 mm in thickness. In most cases anomalies were observed in the cross section energy curves. The absolute magnitude of the cross section σ_τ of Cu at $\varphi = 90°$ ($E_n = 2.52$ MeV) was estimated to be 2×10^{-24} cm^2. From this result it can be said that for nuclei of medium wt., such as Fe, Co, Cu, Ag or Cd, a considerable part of the scattering of D-D neutrons is inelastic. The positions of anomalies observed in σ_τ lie near those of the total cross sections σ_t observed by Aoki or MacPhail, and the magnitudes of the variations are almost equal in both cases : especially for Pb the variations of σ_τ and σ_t are very similar in the positions of max. and min. and in magnitude. At any rate, the anomalies observed in σ_t cannot be considered to be entirely due to elastic scattering.
                                          Author.

On the scattering of mesons by the electrostatic field with spherical well potential. S. Ozaki. *Sc. P.* 39.,

223—246 (1941).—It is well known that in the problems which contain the interaction of vector mesons with the electromagnetic field, such as the collisions of mesons with electrons, the scattering in a Coulomb field, Bremsstrahlung radiated by mesons etc., this interaction becomes much greater than that of electrons. In the case of the scattering of mesons by a Coulomb field the term representing the spin effect thus exceeds the ordinary Rutherford term when meson energies involved become high, as was shown by Laporte, Massey and Corben, and Sakata and Taketani. This seems to be in contradiction with exptl. evidences. The theory which gives these behaviours of mesons may be in error at high energies in two ways. Either the theory itself, namely the form of interaction used for the emission and absorption matrix elements is not correct or the perturbation method used for dealing with the problem breaks down. The origin of the difficulty would be clarified if it were possible to solve the problem of the scattering of mesons by a scalar electromagnetic field using an exact soln. of the meson field equation for this case. Comparison of the exact soln. with the result obtained by means of the perturbation method would then show whether this method fails. Corben and Schwinger tried thus to solve the vector meson field equations for this case (in a Coulomb field). But the result was rather more serious, than was expected, since according to the theory no regular solns. can exist in all cases except some special one. This result, however, may not directly be compared with expts., since the scattering is not, in reality, due to the ideal Coulomb field. The finite radius of the scattering nucleus must be taken into account. Now in order to estimate the effects of spin on the scattering of mesons by such a field of finite radius, it was attempted here to solve the problem of the scattering of mesons by the electrostatic field with spherical well potential by solving the wave eq. exactly. Since the ratio of the spin correction term in the scattering formula and

the square of the absolute value of the matrix element of the scattering potential is, according to the perturbation theory, independent of the form of the potential, the behaviour of the spin term in the simplified model may give insight into the matter. As the result obtained from the exact solution is, however, too complicated to be compared with the result of the perturbation method, the caln. is done approximately for high energy regions alone. The result qualitatively shows that the spin correction term does not exceed the ordinary Rutherford term. It is further shown that if we expand the exact soln. in powers of the potential, which is small as compared with the energy of the incident meson, the first term agrees with the result of the perturbation method, which of course ought to be the case.　　　　　　　　　　Author.

X-ray absorption spectra of the ordered and disordered alloys of nickel-aluminum and nickel-manganese. T. Fukuroi.

Bull. Inst. Phys. Chem. Research, 20, 818—22 (1941).—X-ray K-absorption spectra of nickel, aluminum, two nickel-aluminum alloys corresponding to Ni_3 Al and Ni Al, and a nickel-manganese alloy Ni_3 Mn were investigated photographically. Especially, the absorption spectra of the alloys possessing ordered and disordered arrangements of constituent atoms in the cases of Ni_3 Al and Ni_3 Mn were compared.　　　　Author.

On the energy states of the valency electrons in some metals. I, 13. The nature of the X-ray lines appearing at the lower and upper limits of absorption edges of Zn and other elements. M. Sato,

Sci. Rep. Tôhoku Imperial University, 30, 2, 267—286 (1942).—The assertion stated in the previous paper concerning the nature of $K\beta_2$, Zn is further confirmed by the result of precise measurement of Beeman and Friedman [*Phys. Rev.* 56 392, (1939)], and that line, as well as the analogous, is to be called appropriately as the "lower limit line" of the absorption edge. It is inferred that

the lines, $K\beta_2$ for Ge (32)~Cu (29), $K\beta_5$ for Ni (28)~K (19) and $K\beta_x$ for Cl (17)~Mg(12) are of the same nature. From the exptl. result of Bearden and Friedman [*Phys. Rev.*, 58 387, (1940)] who studied the line $K\beta_2$ in Zu—Cu alloys, the mech. of the emission of this line is greatly clarified. It is confirmed that the lines, λ 150.5Å, Zn measured by Osgood [*Phys. Rev.*, 30 567, (1927)], and L'''_α, Zn due to Gwinner [*Zeits. Phys.* 108 523. (1937—8)] are the lower limit lines of M_{111} and L_{111} absorption edges of Zn, resp., and the mech. of their emission is explained similarly as $K\beta_2$. From the exptl. result due to Bearden and Snyder [*Phys. Rev.*, 59 162 (1941)], it is confirmed that L_{I^-}, L_{11}- and L_{111} -absorption edges of W are also associated by the lower limit lines, resp. On the other hand it is confirmed that the emission lines of Zn, the long wave length end of K_3''' due to Bearden and Shaw [*Phys. Rev.*, 48 18, (1936)], L_α''' observed by Gwinner (*loc. cit.*) and that, λ 133.5Å, by Osgood (*loc. cit.*) are situated at the short wave length limits of K, L_{111} and M_{111} absorption edges resp. It is proposed to call them as the "upper limit line" of the resp. absorption edge, and the mech. of their emsssions is explained.

Author.

Raman spectrum of gaseous carbon tetrachloride. Y. Morino, I. Watanabe and S. Mizushima. *J. Chem. Soc. Japan.* **63**, 377—382 ; *Sc. P.*, **39**, 348—356 (1942). — The Raman spectrum of gaseous carbon tetrachloride were photographed. The lines were found to have smaller wave numbers and to be more diffuse than those observed in the liquid state. Furthermore the intensity ratio of the two components of the doublet at ca. 770 cm^{-1} was found to behave quite differently in these two states of aggregation. This was due to the change in the Fermi resonance. The force consts. of the free molecule were calcd. by using the Raman frequencies observed in the gaseous state. Of these consts. those corresponding to the steric repulsion between chlorine atoms are discussed

in detail.   Authors.

Molecular theoretical investigation on the cyclohexane-methylcyclopentane equilibrium. S. Mizushima, Y. Morino and R. Fujisiro. *J. Chem. Soc. Japan*, **62**, 1066 —1067 (1941).—It is shown by the measurement of Raman spectra that in the presence of aluminium chloride and water cyclohexane is isomerized to give an equil. mixt. of cyclohexane and methylcyclopentane. The percentage of methylcyclopentane in the equil. mixt. increases as the temp. is raised (12% at 25°C—23% at 70°C). From this result the entropy change is calcd. and it is compared with that obtained by the statistical method, using the molecular data of these two substances. The agreement of these two values of entropy is satisfactory.

Authors.

The spectrum of the potassium deuteride molecule. S. Imanishi. *Sc. P.*, **39**, 45—75 (1941).—1) The spectra of a potassium arc in deuterium as well as in hydrogen were photographed in the first order of a 15 ft. concave grating, and wave lengths of more than 6000 lines were detd. 2) Nearly all of the stronger lines in the KD "many lined" spectrum were arranged into 34 bands of the simple P and R branch type, corresponding to a $'\Sigma \rightarrow '\Sigma$ electronic transition in the $^{39}K^2D$ molecule, as expected. 3) Besides the well-known anomaly in the upper vibrational function G'(v) a peculiarly anomalous behaviour of all the rotational functions involved in the spectrum in relation to J is found, which makes it difficult to evaluate reliable rotational consts. 4) Avoiding this difficulty, molecular consts. for the two electronic states are calcd. by the conventional procedure using only high J lines. The consts. may be read as coeffs. in the least square equations given in the text. 5) Isotope effect for the KH and KD spectra are briefly examd., using published results for the former molecule. The vibrational consts.

w_e's give the ratios which are in good agreement with the simple-theoretical ρ.

Author.

Studies on optical and electrical properties of solids. 1. Optical absorption and electronic energy levels of the M^+X^- type crystals.

Y. Uehara. *Mazda Research Bull.*, **17**, 130—138 (1942): *J. Chem. Soc. Japan.* **63**, 587—596 (1942). —A theory explaining the absorption bands of M^+X^- type crystal is proposed. In the present theory, the Slater- Schockley method is refined by considering the polarisation- and sharing-energy caused by the absorption of light in the crystals. The relations between optical absorption and electronic energy levels of the M^+X^- type crystals are investigated.   Author.

Studies on optical and electrical properties of solids. Theory of absorption spectra of the alkali halide crystals in the ultraviolet region.

Y. Uehara. *Mazda. Research Bull.*, **17**, 210—219 (1942); *Bull. Chem. Soc. Japan*, **63**. 597—604 (1942). — The positions of the absorption bands and the electronic energy levels of the alkali halide crystals are calcd. by the formula proposed by the author. The results obtained are compared with expts.

Author.

Electric explosion spectra of metals.

T. Futagami. *Tech. Repts. Kyushu Imp. Univ.*, **16**, **6**, 248—254 (1942).—The electric explosion spectra of wires in water were investigated. The spectra of Mg, Al, Cu, Sn and Pb were photographed. Their characteristic features are (1) they consist of strong continuous spectra with reversed arc lines, and (2) no ionized line appears. The physical nature of the emitting vapour is considered and the effective press. (35 atms.), effective temp. (9000°C), are estimated.   Author.

Further contribution to the theory of hydrogen molecule.

T. Inui. *Proc.* *Phys.-Math. Soc. Japan*, **23**, **12**, 992—999. (1941).—In a previous paper, (*Proc. Phys.-Math. Soc. Japan*, **20**, (1938)), the energy for the ground state of the hydrogen molecule has been calcd. by the variation method by use of the wave function involving two parameters a and β. The chosen orbital function for the ground state has the form:
$\Psi(1, 2) = \psi_a(1)\psi_b(2) + \psi_a(2)\psi_b(1)$ where $\psi_a(i) = e^{-a\xi i - \beta\eta i}$ and $\psi_b(i) = e^{-a\xi i + \beta\eta i}$ ($i = 1, 2$), ξ and η being the spheroidal coordinates defined by the relations $\xi = (r_a + r_b)/R$, $\eta = (r_a - r_b)/R$ where R denotes the internuclear distance and r_a and r_b are the distances of an electron from the nuclei a and b. The energy expression is reduced to a rather simple form $E = 2a(a, \beta)(1/R)^2 - b(a, \beta)(1/R)$. In actual procedure employed in I for the detn. of the energy-distance curve, a Morse curve has been assumed. In this paper, it is redetd. directly without such arbitrary assumption.

Author.

Mean square angular momentum, rotational magnetic moment and diamagnetic susceptibility of the hydrogen molecule.

T. Inui.—*Proc. Phys.-Math. Soc. Japan*, **23**, **12**, 999—1010 (1941). — Mean square angular momentum $< L^2 >$ of the normal hydrogen molecule and rotational magnetic moment μR have been calcd. by use of the simple wave function of form $\Psi(1,2) = 2e^{-a(\xi_1 + \xi_2)} \cosh \beta(\eta_1 - \eta_2)$, where ξi, ηi are spheroidal coordinates of the i-th electron ($i = 1, 2$), and a, β are variation parameters, which was proposed by the writer in a previous paper. The results obtained are as follows: $< L^2 > = 0.390$ a.u., $\mu R = 0.81$ nuclear magneton, while corresponding new exptl. value by Ramsey is 0.8787. The relation of rotational magnetic moment and diamagnetic susceptibility is discussed. In this connection, the numerical value $< r^2 >$ has been calcd. by use of the same wave function yielding a value $\chi_{mol} = -3.805 \times 10^{-6}$ c.g.s. Corresponding numerical values of several expts. lie in the range -3.94—5.8×10^{-6} c.g.s.   Author.

3—ELECTROCHEMISTRY AND THERMOCHEMISTRY
(THERMODYNAMICS)

A study of the manganese dioxide for dry cells. II. The relation between the size of single crystal and the electromotive force. S. Matsuno. *J. Soc. Chem. Ind., Japan*, 44, 909~912 (1941).— It was suggested in the first report that the complex properties of manganese dioxide depend on the physical conditions in which the lattice const. and the size of single crystal are variable. In this paper, X-ray photographs of various kinds of manganese dioxide ores are taken by the powder method and the size of a single crystal is calcd. from the density of lines measured by the microphotometer, and the shape of the single crystal of psilomelane (Hartmanganerz) is discussed. Besides, it is shown that there is a relation between the size of a single crystal or the lattice const. and the e.m.f. of manganese dioxide used for dry cells. (1) The shape of single crystal of psilomelane is shown as a prism crystal growing perpendicularly to the (111) plane. (2) The finer the size of the single crystal, the higher is the voltage. (3) The larger the expansion of the lattice const. of "a_0", the higher is the voltage. (4) The expansion of the lattice const. is in close connection with the fineness of the single crystal.   Author.

On the mean ionic diameters in buffer solutions. H. Nukada. *J. of the Pharmaceutical Soc. of Japan*, 61, 440—442 (1941).—Applying to buffer solns. the activity coeff. of the Debye-Hückel equation $-\log f = \dfrac{1}{2.3026} \dfrac{c^2 Z^2}{2DKT} \dfrac{x}{1+xa}$, the author calcd. the mean ionic diameters in the mixtures of acetic acid-Na. acetate and primary-secondary phosphate resp., using the dissocn. consts. at 18°C. In acetate buffer 3.924×10^{-8} cm (4×10^{-8} cm by Kolthoff), and in phosphate soln. 4.982×10^{-8} cm (5×10^{-8} cm by Cohn) are obtained. Further calcns. are carried on solns. of 5 times and 10 times dilution.   Author.

Dissociation constant of methylorange. H. Nukada. *J. of the Pharmaceutical Society of Nippon*, 62, 1, 24—26 (1942).—Thiel measured two colour-ratios of acidic and alkaline forms of methylorange, using a spectro-photometer, in the interval of pH 2.40—4.68. Applying these data to the equil. of amphoteric dissocn. for the soln. of methylorange, the author obtained the basic dissocn. const. $K_b = 1.416 \times 10^{-11}$.   Author.

A method for measuring potential fluctuation between two metals. M. Kawakami and K. Furuzawa. *Kokubyo-Gakkai-Zassi*, 16, 1, 73—76 (1942).—For measuring potential difference between two metals the Poggendorff method was in use up to this time. It, however, fails to sound an unknown potential difference swiftly and exactly and it is difficult to measure exactly a swiftly changing potential. A method is here described which can always be adopted with regard to any potential fluctuation. Its principle is as follows : When a quick connection is made, the condenser is charged with the potential and then it is discharged to a ballistic galvanometer. In this way one can measure the ballistic sensibility of galvanometer by help of another connection, in which the condenser c μF is charged with a potential of v volt, and then discharged through the meter. By reading the deflection of the meter, its sensibility $q = \dfrac{cv}{a} \times 10^{-6}$ coulomb is found. When a condenser is charged with an unkown potential and then discharged through the meter, with a view to reading b mm for the deflection of meter, the potential difference $v_1 = \dfrac{b}{c} q \times 10^6$ volt can be obtained.   Authors.

Preparation of quinone by the anodic oxidation of benzene. Y. Isomura. *J. Chem. Soc. Japan*, 62, 1167—1177 (1941).—Arranging the systematic observation of the expts. carried out by many pioneers, the author scrutinized the reasons for the diminishing of the yield of quinone by the anodic oxidation of benzene. As the result, max. yield (75% theoretical) was obtained by the following electrolytic cell : +Pb—PbO₂ benzene, 2% Na₂SO₄, 0.5 g CH₃COONa per 100 cc Na₂SO₄ aq. 25% H₂SO₄ Pb—. Together with the catalyic effect of sodium-acetate to promote the formation of quinone, the reaction mech. and the effect of concn. of sulphuric acid are discussed.   Author.

Heat of vaporization and surface energy of several liquids. A. Harasima. *Proc. Phys.-Math. Soc. Japan*, 23, 977—983 (1941).—Heats of vaporization of several simple liquids, i.e., helium, hydrogen, deuterium, neon, nitrogen and argon are calcd. by using the same data by which the writer calcd. surface energies in a previous paper. If we use the intermolecular potential

$$\phi(r) = \phi_0\{(r_0/r)^{12} - 2(r_0/r)^6\}, \quad \phi_0, r_0: \text{constants},$$

the heat of vaporization for liquids with face-centred cubic type molecular arrangement is given by

$$Q = \frac{N}{2}\phi_0\{28.9(r_0/a)^6 - 12.1(r_0/a)^{12}\} - \frac{1}{2}RT,$$

where N is the Avogadro number, a the distance between neighboring molecules and R the universal gas const. By comparing this expression with the expression for the surface energy which the writer calcd. in a previous paper,

$$U = \frac{2}{a^2}\phi_0\{3.0(r_0/a)^6 - 1.08(r_0/a)^{12}\},$$

we find

$$\frac{Q + \frac{1}{2}RT}{UV^{2/3}} = 2^{1/6}N^{1/3}\frac{7.2 - 3.03(r_0/a)^6}{3.0 - 1.08(r_0/a)^6}$$
$$= 2.3 \times 10^8,$$

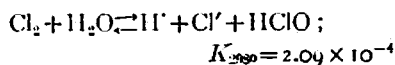which is near the ratio calcd. from observed values. The relation of this formula with the law of Stefan is also discussed.   Author.
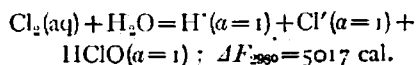
Thermodynamic consideration on the Volta effect. S. Kaneko. *Bull. Electrotechn. Lab.*, 6, 31—32 (1942).—The relation between the Volta and the Peltier effects is considered from thermodynamic standpoint.   Author.

A study on the hydrolysis of chlorine water by means of a glass electrode. H. Hagisawa. *Bull. Inst. Phys. Chem. Research*, 20, 999—1007 (1941).—The pH-values of chlorine water can approximately be detd. with accuracy of about ±0.1 by means of a glass electrode in the usual mode of procedure. Accurate values were obtained by allowing the chlorine water to flow directly upon a glass membrane. On the basis of these values the hydrolysis const. expressed in activity units was found as follows :

$$Cl_2 + H_2O \rightleftarrows H^{\cdot} + Cl' + HClO;$$
$$K_{290} = 2.09 \times 10^{-4}$$

and

$$Cl_2(aq) + H_2O = H^{\cdot}(a=1) + Cl'(a=1) +$$
$$HClO(a=1) ; \quad \Delta F_{290} = 5017 \text{ cal.}$$

By combining the above pH values and the results of the writer's expts. on the distribution of chlorine between water and carbontetrachloride at 25°, the distribution coeff. was accurately detd. as follows : $K = C_2/C_1 = 25.7$ where C_1, C_2 are the concn. of Cl₂ in H₂O and CCl₄ layers resp. It was shown that Henry's law is very closely obeyed for the solubility of chlorine in water. By combining the above results and those of Whitney and Vivian who measured the solubilities under various partial pressures of chlorine, Henry's const. was found as follows : $K_{290} = C_{Cl_2}/f = 0.0665$ in which C_{Cl_2} is the concn. of Cl₂ in water and f is the fugacity of chlorine. Therefore, $Cl_2(g. p=1) = Cl_2(aq, a=1)$, $\Delta F_{290} = 1605$ cal.   Author.

4—COLLOID CHEMISTRY AND SURFACE CHEMISTRY
(CONTACT CATALYSIS)

Surface tension of liquids. A. Harasima. *Proc. Phys.-Math Soc. Japan*, **23**, 983 —991 (1941).—Surface tension of liquids is treated by the method of statistical mech. By assuming that molecules, which are on the first and second layers from the surface, share free volume while no sharing of free volume exists for inner molecules, temp. dependence of surface tension is calcd. theoretically and a formula very similar to that of Eötvös is derived. The formula here derived is

$$\sigma = U - \frac{2.10}{V^{\frac{2}{3}}} T,$$

where σ is the surface tension measured in dynes/cm, U the surface energy in ergs/cm^2 and V the volume in cm^3. Calcd. values of surface tensions of several simple liquids are in fairly good agreement with expt.

Author.

Titanium compounds. XVII. Titania gel. S. Suzuki. *J. J. Ceramic Assoc.*, **49**, 409—415 (1941).—In the case of hydrolysis of 1~20 cc of TiCl$_4$ added to 500 cc of water at room temp., titania sols are obtained which are converted into gel at 85°, by addition of 5—10% of CaCl$_2$·6 H$_2$O, MgCl$_2$· 4H$_2$O, AlCl$_3$·6H$_2$O, FeCl$_3$·6H$_2$O or MnCl$_2$· 2H$_2$O. The hydration of the samples thus obtained was examd. by means of Honda's heat balance. The dehydration curves of mixed gels are of a complicated shape. Some of the gels formed with Mn$^{..}$ contain 90% of water.

J. C. L.

On the sedimentation velocity of the catalyst during the washing process of adsorbed ions in the preparation of the catalyst. S. Hamai. *Science (Iwanami)* **11**, 518—519 (1941).— In the prepn. of the catalyst used for synthesizing oil, especially in the pptn. method, the washing off of adsorbed ions has been known

to be of paramount importance, and its degree of thoroughness affects very sensitively the quality as well as the activity of the catalyst. Hence, when we wish to prep. a large amt. of the catalyst, we have to perform the washing manipulation as thoroughly and quickly as the situation can allow. The results of the present investigation are briefly mentioned and graphically presented. The material used was of cobalt type catalyst with some promoters and Kieselguhr as carrier. The main theme of this investigation is to measure the sedimentation velocity in the decantation process during the washing off manipulation, and the effect of temp. of the washing water and of the amt. of the catalyst.

Author.

Electrosmosis through layer of oxide of metal. H. Muraoka, T. Ômori and B. Wakaume. *Bull. Electrotech. Lab.* **6**, 96— 102 (1942).—Electrosmotic velocities of water through the layer of the powder of the oxides of metals, Hg, Ni, Cu and Cr were studied. The oxides were prepd. by the following methods: (1) their nitrates were ignited, and also the ppts. from other salts by NaOH or NH$_4$OH at different temps. were ignited. The apparatus was the modified Brigg's one. Most of the oxides were charged positively, but their mixts. were frequently charged negatively. Electrosmotic velocities increased with the lapse of time (days) after the apparatus had been settled, but in some cases they passed through the max. and then decreased or changed the kind of charge: in every case the velocity became constant after 7 or 15 days. These changes gave account of the electrostatic reaction between water and the surface of the oxide, namely the reconstruction of the surface-structure of the oxide. Reduction of ethylalcohol by the reduced copper indicated the accordance between the

catalytic action and electrosmosis.

Authors.

On the energy states of the valency electrons in some metals. I, 12. The Mechanism of the catalytic action of zinc in the preparation of unsaturated higher alcohol by hydrogenation of vegetable oil. M. Satô. *Sci. Rep. Tôhoku Imp. Univ.*, 30, 2, 137—153 (1942).—In the light of the results of previous investigations the author's conception concerning the mech. of the catalytic action of metal is described. According to this conception, the experimental result obtained by Y. Sinozaki and S. Sumi, who studied the catalytic action of zinc in the preparation of unsatd. alcohol by hydrogenation of an oil extracted from the seed of *Perilla frutescens*, is explained satisfactorily.

Author.

Physico-chemical investigations on catalytic mechanism. III. On the desorption of various gases from the catalyst used in the Fischer-Tropsch synthesis of hydrocarbons. S. Hamai, S. Hayashi and K. Shimamura. *J. Ind. Chem. Japan*, 45, 313—318 (1942); *J. Ind. Chem. Japan, Supp. Binding*, 45, 120—126 B (1942).—The desorption expts. were carried out for the gases involved in the reaction and nitrogen on the catalyst under the similar conditions to those of the Fischer—Tropsch reaction so as to acquire some knowledge of the behaviours of these gases on the catalyst surface as well as the real nature of the catalyst surface in use. The relative desorption rates in % of typical runs are graphically presented and some results tabulated. The exptl. results are considered and correlated in connection with the proposed mech. of the Fischer—Tropsch reaction (*Bull. Chem. Soc. Japan*, 16, 213 (1941), *J. Chem. Soc. Japan*, 62, 516 (1941)).

Authors.

Physicochemical investigation of synthesis of benzin. VII—IX. On the

velocities of adsorption of hydrogen on reduced iron, iron-diatomaceous earth catalyst and iron-diatomaceous earth-copper-manganese oxide catalyst. S. Kodama, S. Matsumura, K. Tarama, T. Ando and K. Yoshimori. *J. Soc. Chem. Ind. Japan*, 44, 254—258 (1942).—Velocities of adsorption of hydrogen on reduced iron, iron-diatomaceous earth catalyst and iron-diatomaceous earth-copper-manganese oxide catalyst are detd. In these cases the value x, volume of hydrogen adsorbed during t sec., is also given by the relation derived under the assumption of dissociative adsorption

$$\frac{t}{x} = \frac{t}{A} + \frac{1}{A^2K},$$

just as in the case of cobalt catalyst. The values of the consts. A and K calcd. from the above relation were scattered over a wide range, which led the authors to the conclusion similar to the case of cobalt catalysts. Moreover, the addn. of the diatomaceous earth to the reduced iron causes the number of active centers to increase on catalyst surface.

Authors.

Catalytic reduction of furfural with reduced copper under high pressure and temperature. (Catalytic hydrogenation of cyclic compounds with reduced copper (Part 4)). (Studies on the decomposition products of pentosan (Part 1)). K. Sugino and M. Furumi. *J. Chem. Soc. Japan*, 62, 1057—1065 (1941).—Reduction of furfural with a specially prepared reduced copper (Komatsu, Sugino and Hagiwara : *Proc. Imp. Acad.*, 6, 194 (1930), Komatsu and Sugino : *J. Chem. Soc. Japan*, 51, 585 (1930), Sugino and Suzuki : *Ibid*, 59, 687 (1938) under 104 atm. H. (17°C) and at 140°C gave furfuryl alcohol with a theoretical yield. Further hydrogenation of furfuryl alcohol with the same catalyst under 60—90 atm. H. (the initial press.) and at 170—250°C also proceeded well. Methylfurane (I), tetrahydrofurfurylalcohol (II) and pentanediols were found in the reaction

product. Table I shows the yield of (I) and (II).

Table I

Reac. temp. (°C)	170°	200°	250°
Methylfurane fraction (%)	8.9	17.1	26.1
Tetrahydrofurfurylalcohol fraction (%)	58.4	37.9	13.8

Furan was also hydrogenated to tetrahydrofurane with the same catalyst under 70 atm. H. (the initial press.) and at 200°C.

Authors.

The high pressure hydrogenation of phenol and naphthalene. I. N. Tanaka. *J. Chem. Soc. Japan*, 63, 2. 134—138 (1942).—The hydrogenation of phenol, using nickel as catalyst under 100 atm. and 200° hydrogen atm., begins at 50° and it is reduced to cyclohexanol; hydrogenation of naphthalene under the same conditions begins at 75° and it is reduced to decalin. On the other hand. the hydrogenation of the mixt. of phenol and naphthalene begins at 75° and here naphthalene only is reduced to tetralin and no change is observed on phenol. When the reaction temp. is raised to 270°, both naphthalene and phenol are reduced to tetralin and cyclohexanol resp. **II.** N. Tanaka. *ibid.*, 63, 4. 307—314 (1942). When the mixt. of phenol and naphthalene is hydrogenated under the high press. of hydrogen using Ni as catalyst, at first naphthalene alone is reduced to tetralin; phenol is then reduced to cyclohexanol, and then the reduction of tetralin to decalin begins. The velocity of the reduction of phenol is retarded by the presence of naphthalene. and the reduction of naphthalene is somewhat accelerated by the presence of phenol; but by the reduction of the mixt. it is difficult to reduce naphthalene to decalin. This is strikingly different from the reduction of naphthalene alone, which is easily reduced to decalin.

Author.

On the catalytic dehydrogenation of cyclohexane. II. Dehydrogenation

activity of MoS₂ catalysts and various catalyst carriers. K. Tanaka, S. Yabuki and M. Satô. *Bull. Inst. Phys. Chem. Res.*, 21, 2, 190—196 (1942).—The catalytic dehydrogenation of cyclohexane with MoS₂ catalysts and various catalyst carriers at about 450° and 500°C. by the flow method was studied. Among the MoS₂ catalysts carried on active charcoal (I), bauxite (Johor) (II), bauxite (Bintang), silica-gel and alumina-silica-gel, I was the most effective in the dehydrogenation activity and II was the most superior in the activity duration. The isomerization activity of these catalysts was not so high except I. Among the various catalyst carriers such as active charcoal (III), bauxite (Johor), bauxite (Bintang), silica-gel (IV), alumina-gel, active acid-earth (V) and Kanuma earth, III was the most active and IV ranked the second in the dehydrogenation activity, and the others had little activity. Of the activity of isomerization of cyclohexane to methylcyclopentane. III was the greatest where methylcyclopentane content in the satd. hydrocarbon was about 12% (reaction temp. 500°C) by III and about 7% (reaction temp. 450°C) by V. V was less active in dehydrogenation, but it had some isomerization activity. The pptd. alumina-gel had little dehydrogenation activity, but the co-pptd. Al₂O₃-Fe₂O₃-catalyst (about 2:1) manifested a remarkably high activity and activity duration.

Authors.

The effects of aldehydes on the addition of hydrogen bromide to undecenoic acid and the influences of aldehydes on the effects of oxygen and of reduced nickel. M. Takebayashi. *J. Chem. Soc. Japan*, 62, 1261—1263 (1941). —While HBr adds to undecenoic acid in benzene or toluene soln. under the normal conditions to yield nearly pure 10- bromoundecanoic acid, oxygen and reduced Ni reverse the direction of addn. to give rise to the formation of more or less 11-bromoundecanoic acid. The author has examd.

the influences of some aldehydes and hydro-xyaldehydes, with a view to seeing if there could be a substance capable of exhibiting opposite influences on the effects of oxygen and of reduced Ni, but without finding any. The effects of some aldehydes alone on the addn. were first examd. Propylaldehyde, benzaldehyde, and salicylaldehyde, which were practically free from peroxides, exhibited but a small influence, if any, on the addn. of HBr to undecenoic acid. On the other hand, the crotonaldehyde used contained peroxide, and accordingly the direction of addn. was reversed to some extent. The influences of aldehydes and hydroxyaldehydes on the effects of oxygen and reduced Ni were then examd. Benzaldehyde and salicyl-aldehyde exhibited negligibly small influences on the actions of oxygen and of reduced Ni. Protocatechualdehyde and vanillin exerted weak but noticeable inhibiting influences on the actions of both oxygen and reduced Ni. Their inhibiting actions, however, were found far smaller than those of catechol and hydro-quinone.   Author.

The effect of reduced nickel on the addition of hydrogen bromide to un-decenoic acid and the influences of solvents on the effect of reduced nickel. M. Takebayashi. *J. Chem. Soc.*

Japan, **62,** 1257—1260 (1941).—The addn. of HBr to undecenoic acid CH_2 CH $(CH_2)_8$ COOH was carried out in presence and in absence of reduced Ni in various solvents and the addn. product was examd. The reaction was always complete. The propor-tion of 10- and 11-bromoundecanoic acids in the reaction product was detd. by observing the melting (clearing) point. In absence of reduced Ni or air, the addn. product was nearly pure 10-bromoundecanoic acid, the normal addn. product, in any solvents. In presence of reduced Ni, the result was as follows: In benzene, ligroin, and CCl_4, reduced Ni suffered no change during the reaction, and the effect of the metal, giving rise to the formation of 11-bromoundecanoic acid, the abnormal product, was as marked as previously observed in toluene (11-bromo-acid about 33%). On the other hand, in acetic acid, chloroform, and ether, reduced Ni was attacked by HBr, and the effect of the catalyst was found very weak. These results appear to be in parallelism with those of the expts. in presence of air or oxygen. It is considered that the normal addn. is chiefly carried out in polar solvents, such as acetic acid and ether, even in presence of reduced Ni or oxygen, while the abnormal addn. is promoted by the catalyst in nonpolar solvents, such as benzene and CCl_4.   Author.