Critical Phenomena and Fluctuations Sov/5469

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Roshchina, G. P. [Laboratoriya molekulyarnoy fiziki, Fizicheskiy fakul'tet, Kiyevskiy gosudarstvennyy universitet im. T. G. Shevchenko -- Laboratory of Molecular Physics, Division of Physics, Kiyev State University imeni T. G. Shevchenko] Investigation of Fluctuations in Solutions by the Method of Light Scattering 109

Skripov, V. P. [Laboratoriya molekulyarnoy fiziki, Ural'skiy politekhnicheskiy institut im. S. M. Kirova -- Laboratory of Molecular Physics, Ural Polytechnic Institute imeni S. M. Kirov]. Special Structural Features of Matter in the Vicinity of the Critical Point and Transfer Phenomena 117

Skripov, V. P., and Yu. D. Kolpakov [Laboratory of Molecular Physics, Ural Polytechnic Institute imeni S. M. Kirov, and the Laboratoriya teplofiziki, Ural'skiy filial AN SSSR -- Thermophysics Laboratory, Ural Branch, AS USSR]. Light Scattering in Carbon Dioxide along Pre- and Post-Critical Isotherms 126

Smirnov, B. A. [Institut neftekhimicheskogo sinteza AN SSSR --

3c

Critical Phenomena and Fluctuations SOV/5469

Shimanskaya, Ye. T., Yu. I. Shimanskiy, and A. Z. Golik [Laboratory of Molecular Physics, Division of Physics, Kiyev State University imeni T. G. Shevchenko]. Investigation of the Critical State of Pure Substances by Tepler's Method 171

Resolution of the Conference on Critical Phenomena and Fluctuations in Solutions 189

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JP/dfk/jw
10-28-61

Card 9/9

S/189/60/000/003/006/013/XX
B004/B067

AUTHORS: Lomova, N. N., Shakhparonov, M. I.

TITLE: Dielectric Constant and Molecular Structure of the Solutions of Nitrobenzene in Hexane and Cyclohexane

PERIODICAL: Vestnik Moskovskogo universiteta. Seriya 2, khimiya, 1960, No. 3, pp. 11-17

TEXT: In an earlier paper (Ref. 1) Shakhparonov showed that in the case of strong deviations of the solutions from the ideality, their experimentally determined macroscopic dielectric constant must be smaller than the local dielectric constant measured in a smaller unit volume of the solution. The present paper deals with the examination of this concept in nitrobenzene solutions in nonpolar solvents (n-hexane, cyclohexane). The dielectric constant ε was measured at approximately 700 kc/sec by means of a ИИЕВ-1 (IIYeV-1) apparatus. Furthermore, the authors determined the density ρ_4^t and the refractive index n_D. The experimentally found negative deviation of ε from the additivity was caused by the con-

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Dielectric Constant and Molecular Structure of the Solutions of Nitrobenzene in Hexane and Cyclohexane

S/189/60/000/003/006/013/XX
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centration fluctuations. In the region of the separation of the solution into two layers with a volume portion φ of nitrobenzene of 0.26 to 0.45 (in n-hexane) no maximum of ε was found in contrast to the observations made by other scientists (Ref. 3). The curve $\varepsilon = f(t)$ is almost linear and changes its direction only near the disintegration temperature. In Fig. 4 $\overline{\varepsilon_{loc}} - \varepsilon$, the intensity I_k of the Rayleigh scattering at $\lambda = 5780$ A, and the fluctuation $\overline{(\Delta\varphi)^2}$ of the concentration are represented as a function of the nitrobenzene content in n-hexane at 40°C. $\overline{\varepsilon_{loc}} - \varepsilon$ and $\overline{(\Delta\varphi)^2}$ are only little temperature-dependent. For the different position of the maxima of I_k and $\overline{(\Delta\varphi)^2}$ the following explanation is given: while I_k is mainly due to fluctuations whose linear dimensions are more than 1/20 of the wavelength of light, i.e., at least 20-30 A, $\overline{(\Delta\varphi)^2}$ depends on the fluctuations which are not greater than twice or three times the diameter of a molecule. A calculation of the function $\overline{(\Delta\varphi)^2} = f(\varphi)$ on the basis of the statistical theory of the fluctuation confirmed this conclusion. The data for nitrobenzene in cyclohexane led to the same

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Dielectric Constant and Molecular Structure
of the Solutions of Nitrobenzene in Hexane
and Cyclohexane

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conclusions. There are 4 figures, 3 tables, and 5 references: 4 Soviet and 1 US.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M.V. Lomonosova kafedra fizicheskoy khimii (Moscow State University imeni M. V. Lomonosov, Chair of Physical Chemistry)

SUBMITTED: August 28, 1959

Legend to Fig. 4: $\overline{\varepsilon}_{loc} - \varepsilon$, I_k and $\overline{(\Delta\varepsilon)^2}$ as function of the concentration of nitrobenzene in n-hexane at 40°C.

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B004/B067

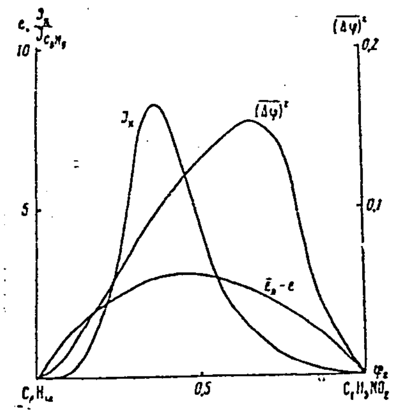

Fig
Рис. 4.

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S/030/60/000/05/38/056
B015/B008

AUTHORS: Krichevskiy, I. R., Doctor of Chemical Sciences,
Shakhparonov, M. I., Doctor of Chemical Sciences

TITLE: Critical Phenomena and Fluctuations in Solutions

PERIODICAL: Vestnik Akademii nauk SSSR, 1960, No. 5, pp. 96-99

TEXT: A Conference on the above mentioned problems, which was convened by the Otdeleniye khimicheskikh nauk Akademii nauk SSSR (Department of Chemical Sciences of the Academy of Sciences USSR) and the khimicheskiy fakul'tet Moskovskogo universiteta (Chemical Department of Moscow University), was held from January 26 to 28, 1960. It was attended by approximately 150 physicists and physicochemists from various cities of the Soviet Union. The reports dealt with the thermodynamics of critical phenomena, the statistical theory of the solutions in the critical range, the thermodynamics of irreversible processes in the critical range, the fluctuations in solutions, and other problems. A. Z. Golik, Yu. I. Shimanskiy, and Ye. T. Shimanskaya (Kiyev) reported on investigations of the critical state of pure materials and solutions according to Tepler's method. ✓

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Critical Phenomena and Fluctuations in Solutions

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B015/B008

I. R. Krichevskiy, N. Ye. Khazanova, and L. R. Linshits investigated the dependence of the chemical potentials of the components of binary and ternary systems of compound and temperature. V. P. Skripov and Yu. D. Kolpakov (Sverdlovsk) reported on the investigation results of light dispersion in the supercritical region of carbon dioxide. I. R. Krichevskiy and N. Ye. Khazanova referred to problems of the diffusion in liquid and gas solutions near the critical point. L. A. Rott (Minsk) reported on the theory of diffusion near the critical point of separation into layers. V. P. Skripov explained the course of viscosity near the critical point on the basis of a "Colloid Model". I. R. Krichevskiy and Yu. V. Tsekhanskaya reported on the investigation of convective diffusion. D. K. Beridze described the investigation results of light dispersion in the range of the critical point of the separation into layers of the solutions nitrobenzene - hexane, nitrobenzene - heptane and methyl alcohol - cyclohexane. V. F. Nozdrev reported on investigations with ultrasonics in liquids near the critical point. After a discussion on the critical state, the Conference came to the conclusion that there is no reason at present to reject the classic thermodynamic theory of the critical phenomena, developed by Gibbs, A. G. Stoletov, and other authors. M. I. Shakhparonov reported

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Critical Phenomena and Fluctuations in Solutions

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on the main results of his investigations in the field of the theory of fine-structure fluctuations with a small particle content. N. N. Lomova, M. I. Shakhparonov, R. M. Kasimov, and Ya. Yu. Akhadov reported on the results of experimental investigations of dielectric properties of solutions. L. V. Lanshina mentioned measurement results of the fine structure of light dispersion in acetone - water- and water - methyl alcohol solutions. M. F. Vuks and L. I. Lisnyanskiy (Leningrad) conducted investigations of fluctuation phenomena in the solutions of pyridine and α-picoline in water, as well as of pyridine in alcohols. G. P. Roshchina (Kiyev) mentioned data of experimental investigations of light dispersion in solutions, as well as of the conclusions on the dependence of fluctuations on composition, temperature and type of the molecules of the solution components. L. P. Zatsepina reported on the light dispersion in individual liquids and solutions with photoelectric measurements, and established in this connection the conformance with the theory by Einstein-Smolukhovskiy. N. V. Mokhov, Ya. M. Labkovskiy, and I. V. Kirsh (Dnepropetrovsk) reported on their investigations of fluctuations of density in ether and benzene, as well as of fluctuations of concentration in carbon bisulfide - methyl alcohol solutions. The Conference confirmed

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the importance of the theoretical and experimental investigation of the molecular structure of the material in the range of the critical point. Organizational measures were decided upon for the further development of the scientific studies in the field of critical phenomena and fluctuations in solutions, as well as for their application to scientific-economic problems. It was decided further to conduct periodic seminars in Moscow on problems of the theory of the liquid state and the theory of solutions. The 2nd All-Union Conference on the Theory of Solutions is to be convened in 1962.

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S/058/61/000/010/056/100
A001/A101

AUTHORS: Beridze, D.K., Shakhparonov, M.I.

TITLE: Rayleigh scattering of light in nitrobenzene-hexane solutions

PERIODICAL: Referativnyy zhurnal. Fizika, no. 10, 1961, 180, abstract 10G37 ("Uch. zap. Mosk. obl. ped. in-ta", 1960, v. 92, 49 - 71)

TEXT: The authors describe the equipment and results of measuring relative intensity and depolarization degree of individual liquids (nitrobenzene, hexane and their solutions at various mutual concentrations). The values of scattering radiation components I_p, I_a and I_k are calculated. The relationships are studied between each component and depolarization degree on one hand and solution temperature on the other hand, including the temperature of the critical point, at fixed concentrations. It was discovered that intensity of scattered radiation passes through a thin maximum near the demixing point; in this case deviation from the Rayleigh law of light scattering and an increase of depolarization degree are observed.

N. Voyshvillo

[Abstracter's note: Complete translation]

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ZATSEPINA, L.P.; SHAKHPARONOV, M.I.

Investigating the degree of depolarization and intensity of Rayleigh scattering in methyl alcohol - benzene and methyl alcohol - o-xylene solutions. Vest.Mosk.un.Ser.3:Fiz.,astron. 15 no.4:9-17 Jl-Ag '60.
(MIRA 13:9)

1. Kafedra fizicheskoy khimii Moskovskogo universiteta.
(Organic compounds--Optical properties)
(Light--Scattering)

25053
S/080/60/033/012/007/024
D209/D305

5 3700

AUTHORS: Shakhparonov, M.I., Lel'chuk, S.L., Korchemskaya, K.M., Martynova, M.Ye., Baburina, I.I. and Voronina, R.D.

TITLE: Investigation of pressure and vapor density in binary systems methyldichlorosilane - trimethylchlorosilane and silicochloroform - benzene

PERIODICAL: Zhurnal prikladnoy khimii, v. 33, no. 12, 1960, 2699 - 2703

TEXT: The authors studied pressure and vapor density of liquid systems CH_3SiHCl_2 - $(CH_3)_3SiCl$ and $SiHCl_3$ - C_6H_6 in order to obtain data necessary for determining the conditions for rectifying haloalkylsilanes. The measurements were carried out in an apparatus described in an earlier work (Ref. 1: ZhFKh 5, 1734, 1960). Throughout the experiment the composition of liquids was controlled by measuring their densities at 20°C with the use of a pycnometer. The accuracy of P and γ measurements for individual li-

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quids was within 0.1 %. The molecular weight of vapors was calculated from the equation $M = \gamma RT/P$. Liquids used in the experiments were obtained by chemical purification and fractionation. The constants of Antuan's equation $P = A - [B/(C + t)]$ and the values of enthalpy and entropy at $P = 760$ mm Hg are given in tabulated form. Vapor composition and partial vapor pressures of components may be calculated from the equation $M = M_1 x_1 + M_2 (1 - x_1)$. Fig. 2 gives the relation of total and partial vapor pressures against the composition of methyldichlorosilane - trimethylchlorosilane solutions at 30 and 40°C. The relation between total and partial pressures and concentrations of silicochloroform - benzene at 30°C is also presented graphically. The graphs show that at 30-40°C CH_3SiHCl_2 - $(CH_3)_3SiCl$ solutions are characterized by slight deviations from the ideal solutions. In C_6H_6 - $SiHCl_3$ solution at 30°C similar deviations from Raoult's law are observed. The authors calculated concentrations of components in vapors in equilibrium with the li-

Investigation of pressure ...

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D209/D305

quid phase at 760 mm Hg and the results are given in tabulated form. There are 6 tables, 3 figures and 1 Soviet-bloc reference.

SUBMITTED: October 26, 1959

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25554
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D209/D305

5 3700

AUTHORS: Korchemskaya, K.M., Shakhparonov, M.I., Lel'chuk, S.L., Martynova, M.Ye., ~~Baburina, I.I. and~~ Voronina, R.D.

TITLE: Investigating pressure and vapor density of binary solutions of silane chloro-derivatives

PERIODICAL: Zhurnal prikladnoy khimii, v. 33, no. 12, 1960, 2703 - 2708

TEXT: In the present work, carried out to obtain the necessary data for determining conditions for the rectification of haloalkylsilanes, the authors submit the results of investigations concerning pressure and vapor density under pressures of 150 - 800 mm Hg. The measurements were concerned with determining pressure P, density γ, and the molecular weight of saturated vapor pressure of individual liquids and solutions. The values of Antuan's equation constants and the enthalpy and entropy values for liquid vaporization at 760 mm are given in tabulated form. Graphically, the au-

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Investigating pressure and ..

thors give the isotherms of total and partial vapor pressures of liquids at 30, 40, 50 and 56°C. Total pressures were calculated from the vapor composition data obtained from $\bar{M}$ values derived from the equation $\bar{M} = \Sigma x_i M_i$. The average molecular weight of saturated vapors $\bar{M}$, used for partial vapor pressures determinations were chosen such that the deviations from Raoult's law corresponded to the Gibbs - Duhem equation. In all cases, values of $\bar{M}$ used in calculations differed by not more than 1 - 1.5 % from the experiment values. In this manner the values of partial vapor pressures and vapor compositions were controlled by the conditions of thermodynamics and the experimental data, with sufficient accuracy. Other tables represent the contents of vapor components in equilibrium with liquid phase at 760 mm Hg and the activity coefficients of the components of various temperatures. The results submitted show that the solutions of methyldichlorosilane - tetrachlorosilane are characterized by only slight positive deviations from the ideal solution, and in many cases may be considered as such. Solu-

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tions of chlorosilane solutions at 40, 50 and 56°C. There are 3 figures, 7 tables and 2 Soviet-bloc references.

SUBMITTED: October 26, 1959

X

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S/076/60/034/007/017/042/XX
B004/B068

AUTHOR: Shakhparonov, M. I.

TITLE: Theory of Solutions. X. Effect of Fluctuations on the Dielectric Constant of Homogeneous Isotropic Systems

PERIODICAL: Zhurnal fizicheskoy khimii, 1960, Vol. 34, No. 7, pp. 1478-1487

TEXT: The aim of this work was to establish the reasons for the deviation of the experimental values found for the dielectric constant from those calculated from Onsager's theory. Possible causes are: a) change of the state of the molecules in the solution as a result of interaction of the components (e.g., hydrogen-bond formation); b) fluctuation of the dielectric constant as a result of variations of concentration, orientation, density, etc; c) change of the short-range order when the composition of the solution is varied. In this paper, only the effect of fluctuations on the average macroscopic value of ε of the solution is investigated. The average value of the local dielectric constant ε' is calculated on the basis of Onsager's theory. The starting point is the function $\varepsilon_{loc}(x,y,z)$ as the

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Theory of Solutions. X. Effect of Fluctuations on the Dielectric Constant of Homogeneous Isotropic Systems

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thermodynamic function of a volume element dV on the assumption of Gauss' probability distribution of the fluctuations: $dW_k = n_k dV_k / V$ (11), with dW_k being the probability of the value ε_k, and n_k the number of volume elements in which the local dielectric constant equals ε_k.
$\varepsilon / \varepsilon' = 1 - \overline{(\Delta\varepsilon')^2} / 3\varepsilon\varepsilon' \approx 1 - \overline{(\Delta\varepsilon')^2} / 3(\varepsilon')^2$ (36) is found for the relation between the macroscopic value ε of the dielectric constant and the mean local dielectric constant ε'. The fluctuation of ε' is due to the variation of concentration c, temperature T, density ϱ, and orientation:
$\Delta\varepsilon' = \sum_{j=2}^{M} (\partial\varepsilon'/\partial c_j)\Delta c_j + (\partial\varepsilon'/\partial T)\Delta T + (\partial\varepsilon'/\partial\varrho)\Delta\varrho + (\Delta\varepsilon')_{or}$ (41). For the statistical mean square of fluctuation, the relation $\overline{(\Delta\varepsilon'_{\infty})^2} = \chi / dV$ (43) is obtained, where χ is a function of concentration, temperature, density, and orientation. In a two-component solution and at a great distance from the critical temperature, however, only the effect of concentration has to be considered:

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Theory of Solutions. X. Effect of Fluctuations on the Dielectric Constant of Homogeneous Isotropic Systems

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$\overline{(\Delta\varepsilon')^2} = (\partial \varepsilon'/\partial c)^2\overline{(\Delta c)^2}$ (47). Thus, $\overline{(\Delta\varepsilon')^2}$ is a function of the mean local dielectric constant. There are 11 references: 3 Soviet, 5 US, 1 British, 1 Dutch, and 3 German.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University imeni M. V. Lomonosov)

SUBMITTED: November 11, 1953

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S/076/60/034/008/007/014
B015/B054

AUTHORS: Shakhparonov, M. I., Balamutova, E. A., Lel'chuk, S. L., Mikheyev, Ye. P., Shutova, L. V., Glushkova, L. F. and Martynova, M. Ye. (Moscow)

TITLE: Investigation of Pressure and Density of the Vapor in Systems Containing Organosilicon Compounds. I. The System Benzene - Methyl-dichlorosilane - Methyl-phenyl Dichlorosilane

PERIODICAL: Zhurnal fizicheskoy khimii, 1960, Vol. 34, No. 8, pp. 1734-1740

TEXT: The authors determined pressure and density of the vapor of a number of halogen alkyl silanes and -aryl silanes since these substances readily react with water vapor or metals, dissolve in lubricants, and easily polymerize. In the present paper, they report on the system benzene - methyl-dichlorosilane - methyl-phenyl dichlorosilane. The experimental arrangement (Fig. 1) described in Ref. 2 is based on the

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Investigation of Pressure and Density of the
Vapor in Systems Containing Organosilicon
Compounds. I. The System Benzene - Methyl-
dichlorosilane - Methyl-phenyl Dichlorosilane

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B015/B054

principle of hydrostatic weighing, and is thoroughly explained. The apparatus includes a quartz balance which is installed in a glass balloon in a thermostat. In another thermostat there is the evaporator connected with an Hg manometer. Balloon and evaporator are joined by a thermally insulated, heated pipe. A quartz ball is suspended from the quartz spiral of the balance; as the vapor of the substance investigated enters the balloon, the quartz ball loses in weight, and the vapor density can be determined from the decrease in length of the spiral. The method of operation, the calibration of the instrument, and an estimation of the errors of measurement are indicated. The latter are about 1% in the pressure-, and about ± 2.5% in the density determination. The molecular weight of the liquid vapors was calculated by the Mendeleyev-Clapeyron equation, and compared with data of publications (Table 1); pressure and density values of methyl-dichlorosilane and methyl-phenyl dichlorosilane, as well as their solutions, are given in Table 2. The results show that the vapors represent associate complexes. The Trouton

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Investigation of Pressure and Density of the Vapor in Systems Containing Organosilicon Compounds. I. The System Benzene - Methyl-dichlorosilane - Methyl-phenyl Dichlorosilane

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constant for the vapors was calculated, and given in Tables 2 and 3. It is found that at 40° - 100°C the vapor composition of the solutions benzene - methyl-dichlorosilane - methyl-phenyl dichlorosilane is practically equal to the vapor of the corresponding binary mixture benzene - methyl-dichlorosilane. The heats of vaporization and the entropies were calculated. There are 5 figures, 3 tables, and 4 references: 3 Soviet and 1 US.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University imeni M. V. Lomonosov)

SUBMITTED: October 30, 1958

Card 3/3

84245

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S/076/60/034/009/003/022
B015/B056

AUTHORS: Balamutova, E. A., Shakhparonov, M. I., Lel'chuk, S. L., Lomov, A. L., Mal'kova, G. N., Martynova, M. Ye., and Glushkova, L. F.

TITLE: Investigation of the Pressure and Density of Vapor in Systems Containing Organosilicon Compounds. II. The Systems: Methyldichlorosilane - Methyltrichlorosilane - Methylphenyldichlorosilane, and Methylphenyldichlorosilane - Methylchlorophenyldichlorosilane - Methyldichlorophenyldichlorosilane

PERIODICAL: Zhurnal fizicheskoy khimii, 1960, Vol. 34, No. 9, pp. 1916-1919

TEXT: The working method and the measuring technique of the investigations mentioned in the title have already been described in a previous paper (Ref. 1). The pressure and density of the saturated vapor phase over the systems mentioned in the title were measured in a broad concentration and temperature range. The constants of the Antoine equations,

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Investigation of the Pressure and Density of Vapor in Systems Containing Organosilicon Compounds. II. The Systems: Methyldichlorosilane - Methyltrichlorosilane - Methylphenyldichlorosilane, and Methylphenyldichlorosilane - Methylchlorophenyldichlorosilane - Methyldichlorophenyldichlorosilane

as well as the values of the evaporation heats and evaporation entropies for the individual components (Table 1), and the two- and three-component solutions at normal boiling temperature were calculated (Table 2). The values obtained show that the vapors of methyltrichlorosilane and methylchlorophenyldichlorosilane contain associated molecules, whereas the vapors of methyldichlorophenyldichlorosilane do not associate. At 100°C and about 900 torr the vapor (in equilibrium) over a solution of 50 mole% CH_3SiHCl_2 + 50 mole% CH_3SiCl_3 consists nearly entirely of methyldichlorosilane. At temperatures from 40°C to 100°C, the vapor composition of the three-component solutions CH_3SiHCl_2 - CH_3SiCl_3 - $CH_3C_6H_5SiCl_2$ is slightly different from that of the binary system CH_3SiHCl_2 - CH_3SiCl_3 at the same molar ratio of the latter components. Calculations carried

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Investigation of the Pressure and Density of Vapor in Systems Containing Organosilicon Compounds. II. The Systems: Methyldichlorosilane - Methyltrichlorosilane - Methylphenyldichlorosilane, and Methylphenyldichlorosilane - Methylchlorophenyldichlorosilane - Methyldichlorophenyldichlorosilane

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out on the basis of the Antoine equation show that above 100°C no change in the $CH_3C_6H_5SiCl_2$ content in the vapor phase takes place, i.e., the content remains low with the exception of solutions in which the molar ratio of $CH_3C_6H_5SiCl_2$ is near unity. There are 2 figures, 2 tables, and 2 references: 1 Soviet and 1 US.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University imeni M. V. Lomonosov)

SUBMITTED: October 30, 1958

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S/076/60/034/010/001/022
B015/B064

AUTHORS: Balamutova, E. A., Shakhparonov, M. I., Lel'chuk, S. L., Lomov, A. L., Mikheyev, Ye. P., Martynova, M. Ye., and Glushkova, L. F.

TITLE: Investigation of the Vapor Pressure and Density in Systems Containing Organo-silicon Compounds. III. The Systems Dimethyldichlorosilane - Methylchloromethyldichlorosilane and Trimethylchlorosilane - Dimethylchloromethylchlorosilane - Dimethyl Dichloromethylchlorosilane

PERIODICAL: Zhurnal fizicheskoy khimii, 1960, Vol. 34, No. 10, pp. 2156-2159

TEXT: Pressure and density of the saturated vapor of the systems $(CH_3)_2SiCl_2$ - $CH_3CH_2ClSiCl_2$ - $CH_3CHCl_2SiCl_2$ and $(CH_3)_3SiCl$ - $(CH_3)_2CH_2ClSiCl$ - $(CH_3)_2CHCl_2SiCl$ were investigated in the wide range

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Investigation of the Vapor Pressure and Density in Systems Containing Organo - - silicon Compounds. III. The Systems Dimethyldichlorosilane - Methylchloromethyldichlorosilane and Trimethylchlorosilane - Dimethylchloromethylchlorosilane - Dimethyl Dichloromethylchlorosilane

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B015/B064

of concentration and for temperatures of from 0° to 150°C. The same method of measurement was used as in a previous paper (Ref. 1), and pressure and density of the individual components were determined. The curves obtained on the temperature dependence of pressure and density show that pressure and density of the systems investigated rise exponentially with temperature. Table 1 gives the values of the refractive indices, the density, the boiling points of the components at 760 mm Hg, the molecular weight of vapor at this pressure, the values of the constants of the Antoine equation as well as the values of the evaporation heat and evaporation entropy at the normal boiling point.

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Table 1

1 Вещество	n_D^{20}	d_4^{20}	2 Т. кип. при 760 *мм*	3 *M* пара при 760 *мм*	4 *M* теор	*A*	*B*	*C*	ΔH	ΔS
$(CH_3)_2SiCl_2$	1,4052	1,0715	70,1	129,0	129,0	9,572	3110	345	7450	21,7
$CH_3CH_2ClSiCl_2$	1,4494	1,2832	119,5	171,0	163,6	6,930	1265	194	9150	22,6
$CH_3CHCl_2SiCl_2$	1,4690	1,4107	149,0	198,2	198,0	6,306	123,0	203	7940	18,8
$(CH_3)_3SiCl$	1,3888	0,8581	57,7	112,3	108,65	7,0096	1184	229	7560	22,8
$(CH_3)_2CH_2ClSiCl$	1,4372	1,0844	114,9	152	143,1	9,035	2635	314	8460	21,8

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Table 2 Таблица 2

Solution Раствор	n_D^{20}	d_4^{20}	A	B	C	ΔH	ΔS	T. кип., °C
50% $(CH_2)_2SiCl_2$ + 50% $CH_3CH_2ClSiCl_2$	1,4309	1,1842	5,826	732	159	6960	19,2	89,4
50% $(CH_3)_2SiCl_2$ + 50% $CH_3CHCl_2SiCl_2$	1,4450	1,252	6,535	1130	216	7250	19,8	93,5
50% $CH_3CH_2ClSiCl_2$ + + 50% $CH_3CHCl_2SiCl_2$	1,4619	1,344	7,054	1435	124	10800	26,8	130,9
33% $(CH_3)_2SiCl_2$ + 33% $CH_3CH_2ClSiCl_2$ + + 34% $CH_3CHCl_2SiCl_2$	1,4469	1,2679	—	—	—	9500	25,2	103,0
50% $(CH_3)_3SiCl$ + 50% $(CH_3)_2$ × × $CH_2ClSiCl$	4,4158	0,6197	14,763	10550	810	7540	21,4	78,8
50% $(CH_3)_3SiCl$ + 50% $(CH_3)_2$ × × $CHCl_2SiCl$	1,4304	1,05121	6,923	1426	264	830	18,9	88,5
50% $(CH_3)_2CH_2ClSiCl$ + 50% $(CH_3)_2$ × × $CHCl_2SiCl$	—	1,1585	—	—	—	5480	13,8	124,0
33% $CHCl_2(CH_3)_2SiCl$ + 34% $(CH_3)_3$ × × $SiCl$ + 33% $CH_3CH_2ClSiCl$	1,4321	1,0670	—	—	—	7600	19,9	108,0

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S/076/60/034/010/001/022
B015/B064

Table 2 (continued) Таблица 2 (*продолжение*)

Solution Раствор	M	$x'_{(CH_3)_2SiCl_2}$	$x'_{CH_3CH_2\times ClSiCl_2}$	$x'_{(CH_3)_3SiCl}$	$x'_{(CH_3)_2CH_2\times ClSiCl}$
50% $(CH_2)_2SiCl_2$+50% $CH_3CH_2ClSiCl_2$	142,3	0,68	0,32	—	—
50% $(CH_3)_2SiCl_2$+50% $CH_3CHCl_2SiCl_2$	139,7	0,845	—	—	—
50% $CH_3CH_2ClSiCl_2$+ +50% $CH_3CHCl_2SiCl_2$	180,0	—	0,605	—	—
33% $(CH_3)_2SiCl_2$+33% $CH_3CH_2ClSiCl_2$+ +34% $CH_3CHCl_2SiCl_2$	142,5	0,70	0,18	—	—
50% $(CH_3)_3SiCl$+50% $(CH_3)_2\times$ $\times CH_2ClSiCl$	113,0	—	—	0,90	0,10
50% $(CH_3)_3SiCl$+50% $(CH_3)_2\times$ $\times CHCl_2SiCl$	114,0	—	—	—	—
50% $(CH_3)_2CH_2ClSiCl$ + 50% $(CH_3)_2\times$ $\times CHCl_2SiCl$	147,5	—	—	—	0,860
33% $CHCl_2(CH_3)_2SiCl$ + 34% $(CH_3)_3\times$ $\times SiCl$+33 $CH_3CH_2ClSiCl$	135,6	—	—	≈0,855	≈0,132

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S/076/60/034/010/001/022
B015/B064

Legend to Tables 1, 2: In Table 1, 1 denotes the substance, 2 = boiling point at 760 mm Hg, 3= molecular weight M at 760 mm Hg, 3 = M theoretical. 1 = boiling point in °C in Table 2. There are 4 figures, 2 tables and 2 Soviet references.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University imeni M. V. Lomonosov)

SUBMITTED: October 30, 1959

Card 6/6

BERIDZE, D.K.; SHAKHPARONOV, M.I.

Rayleigh scattering of light in nitrobenzene - hexane solutions.
Uch. zap. MOPI 92:49-71 '60. (MIRA 14:9)
(Light--Scattering) (Nitrobenzene--Optical properties)
(Hexane--Optical properties)

85524

S/020/60/133/003/029/C31/XX
B004/B064

6.8000 (3201, 1099, 1162)

AUTHORS: Lanshina, L. V., and Shakhparonov, M. I. 21

TITLE: The Fine Structure of the Rayleigh Dispersion of Light in Solutions and the Dispersion of Hyperacoustic Vibrations 21

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 133, No. 3, pp. 624 - 626

TEXT: The apparatus used by the authors to photograph the fine structure of
the Rayleigh line of dispersed light has already been described in Ref. 1.
The authors investigated mixtures of acetone and water at 25°C with a molar
ratio of acetone of 0.0; 0.06; 0.2; 0.4; 0.7, or 1.0, and mixtures of water
and methanol with a molar ratio of the latter amounting to 0.15; 0.36; 0.6;
or 1.0. Measurements were made by means of the Hg line λ = 4358 A, and for
pure water also with λ = 4046 A. The photographs were photometrically
treated with an MΦ-4 (MF-4) microphotometer. Fig. 1 shows the propagation
velocity of hyperacoustic vibrations in acetone - water ($\omega \approx 0.6 \cdot 10^{10}$ sec^{-1},
$\Lambda \approx 22 \cdot 10^{-6}$ cm) and methanol - water mixtures ($\omega \approx 0.5 \cdot 10^{10}$ sec^{-1},

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85524

The Fine Structure of the Rayleigh Dispersion of Light in Solutions and the Dispersion of Hyperacoustic Vibrations

S/020/60/133/003/029/031/XX
B004/B064

$\Lambda \approx 22.0 \cdot 10^{-6}$ cm) as computed from the equation $\Delta\nu/\nu = 2n(v/c)\sin(\theta/2)$. The data of Refs. 4, 5 on the propagation velocity of ultra-acoustic vibrations ($\omega \simeq 56 \cdot 10^{-5}$ sec^{-1}, $\Lambda \approx 24 \cdot 10^{-3}$ cm) are added for comparison. A considerable negative dispersion of hyperacoustic vibrations was found to exist; $\Delta\nu/\nu$ reached about 5%, while the root mean square of deviation was only about 1.4%. The negative dispersion vanishes with falling water concentration x_1, i.e., for acetone - water at $x_1 = 0.65$ and for methanol - water at $x_1 = 0.5$. This negative dispersion is explained by the structural relaxation of water, and corresponds to the well-known anomalies of water. Moreover, the integral intensity I_c of the central component and the intensity I_{tr} of the translational component by Mandel'shtam and Brillouin were compared, and the refractive index n_λ was represented as a function of concentration (Fig. 2). Considerable positive deviations from the Raoult law were observed in the acetone - water mixture. The fluctuations of concentration attain their

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Card 2/3

84707

5.4700 2209 only

S/020/60/133/006/015/016
B004/B064

AUTHORS: Shakhparonov, M. I., Lel'chuk, S. L., and Korchemskaya, K.M.

TITLE: The Thermodynamic Properties of the Solutions of Chlorine Derivatives of Silane

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 133, No. 6, pp. 1388-1390

TEXT: The authors report on measurements of the pressure P and density γ of the saturated vapor of the following systems: CH_3SiHCl_2 - $SiCl_4$; $SiHCl_3$ - C_6H_6; CH_3SiCl_3 - $SiCl_4$; $(CH_3)_3SiCl$ - CH_3SiHCl_2; $(CH_3)_3SiCl$ - CH_3SiCl_3, as well as solutions of CH_3SiHCl_2 and CH_3SiCl_3 in the azeotropic mixture of 45.93 mole% $(CH_3)_3SiCl$ and 54.07 mole% $SiCl_4$. Ref. 1 describes the methods of P and γ measurement. Table 1 gives the values of the constants A,B,C of the Antoine equation $\log P = A - B(C+T)$ for the systems investigated, as calculated from the experimental data of P. The molecular weight of the saturated vapor was calculated from the

X

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84707

The Thermodynamic Properties of the Solutions of Chlorine Derivatives of Silane

S/020/60/133/006/015/016
B004/B064

equation $\overline{M} = \gamma RT/P$, and its composition from the equation $\overline{M} = \sum_i M_i x_i^!$. Fig. 1 shows the total and partial pressures in the system $SiHCl_3$ - C_6H_6 at 30°C as a function of the composition. The isothermal lines P and P_i of the system CH_3SiHCl_2 - $SiCl_4$ at 40°C, and of the system CH_3SiCl_3 - $SiCl_4$ at 50°C are given in Fig. 2. The systems mentioned show little positive deviations from the ideal case. The systems $(CH_3)_3SiCl$ - CH_3SiCl_3; CH_3SiHCl_2 - $(CH_3)_3SiCl$; azeotropic mixture - CH_3SiCl_3; and azeotropic mixture - CH_3SiHCl_2 follow the Raoult law. The isobaric lines of these systems at P = 760 torr are shown in Fig. 3. There are 3 figures, 1 table, and 1 Soviet reference.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M.V. Lomonosova (Moscow State University imeni M. V. Lomonosov)

PRESENTED: April 4, 1960, by V. I. Spitsyn, Academician

SUBMITTED: April 2, 1960

Card 2/2

03905

S/020/60/134/003/019/020
B004/B067

5.4600(1273)
11.1260

AUTHORS: Lomova, N. N., and Shakhparonov, M. I.

TITLE: The Dielectric Constant and the Molecular Structure of Solutions Having a Critical Dissociation Range

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 134, No. 3, pp. 632-635

TEXT: In an earlier paper (Ref. 1) M. I. Shakhparonov obtained the following results: For solutions whose thermodynamical properties show large positive deviations from ideality, i.e., large fluctuations of concentration, the experimentally measurable dielectric constant ε is smaller than the average local dielectric constant $\bar{\varepsilon}_{loc}$: $\varepsilon = \bar{\varepsilon}_{loc} - \left[(\partial\bar{\varepsilon}_{loc}/\partial\varphi)^2\overline{(\Delta\varphi)^2}\right]/\left[2 + (\partial\bar{\varepsilon}_{loc}/\partial\varphi)/(\partial\varepsilon/\partial\varphi)\right]\varepsilon$ (1). To study the influence exerted by the fluctuation $\overline{(\Delta\varphi)^2}$ of concentration on ε, the authors measured ε, the density ρ_4^t, and the refractive index n_D of solutions of nitrobenzene (NB) in cyclohexane, n-hexane, n-heptane, and

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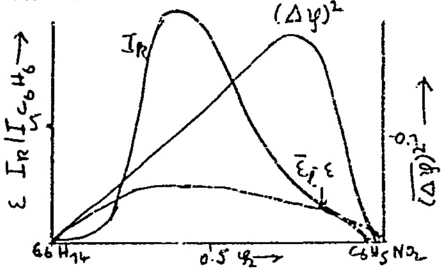
83905

The Dielectric Constant and the Molecular Structure of Solutions Having a Critical Dissociation Range

S/020/60/134/003/019/020
B004/B067

n-octane. The critical dissociation temperature of these solutions was found at 40°C for 48.0 mole% NB in cyclohexane; at 20.0°C for 43.15 mole% NB in n-C_6H_{14}; at 19.3°C for 47.5 mole% NB in n-C_7H_{14}; and at 19.1°C for 51.0 mole% NB in n-C_8H_{18}. On the strength of experimental data the isothermal lines for ε were drawn (Fig. 1), and the isothermal lines for $\bar{\varepsilon}_{loc}$ were calculated by Onsager's method (Ref. 2). On the basis of data obtained for ε, $\bar{\varepsilon}_{loc}$, $\partial\bar{\varepsilon}_{loc}/\partial\varphi$, and $\partial\varepsilon/\partial\varphi\overline{(\Delta\varphi)^2}$ was calculated. The dependence of $\overline{(\Delta\varphi)^2}$ on t and φ was analogous in all four systems. The values depended little on the type of hydrocarbon used.

Fig. 2: dependence of $\bar{\varepsilon}_{loc}$ - ε, I_k, and $\overline{(\Delta\varphi)^2}$ on the concentration φ_2 of nitrobenzene in the system nitrobenzene - n-hexane at 40°C



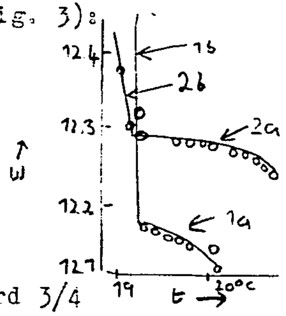
Card 2/4

83905

The Dielectric Constant and the Molecular Structure of Solutions Having a Critical Dissociation Range

S/020/60/134/003/019/020
B004/B067

Fig. 2 shows the course of $\bar{\varepsilon}_{loc} - \varepsilon$, $\overline{(\Delta \psi)^2}$ and of the intensity I_k of the Rayleigh scattering for λ = 5780 A in the system nitrobenzene - n-hexane. The authors discuss the result on the basis of the statistical theory of fluctuations and of the interaction of neighboring molecules. By differentiating equation (1) they obtain equation (5) for $(\partial \varepsilon/\partial t)_\psi$, and they conclude that the value of $(\partial \varepsilon/\partial t)_\psi$ is reduced near the critical point. This was confirmed by measurements of ε in the system nitrobenzene - - n-heptane and nitrobenzene - n-octane near the point of dissociation (Fig. 3):



$\varepsilon = f(t)$ near the critical point of dissociation. 1 - solution of nitrobenzene in n-heptane, $x_{C_6H_5NO_2}$ = 0.489; 2 - solution of nitrobenzene in n-octane, $x_{C_6H_5NO_2}$ = 0.514. 1a, 2a before dissociation, 1b, 2b after dissociation.

4

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83905

The Dielectric Constant and the Molecular Structure of Solutions Having a Critical Dissociation Range

S/020/60/134/003/019/020
B004/B067

These results are contradictory to the data of Ref. 5 according to which ε has maxima in the critical range. The authors refer to Gibbs (Ref. 6) according to which relations of the form $(\partial X_i/\partial x_i)_{xj} = 0$; $(\partial^2 X_i/\partial x_i^2)_{xj} = 0$ are thermodynamically not generally and exactly valid in the critical range. Hence, the validity of such relations must be experimentally or theoretically proved for each case by means of a molecule model. There are 3 figures and 6 references: 5 Soviet and 1 US.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University imeni M. V. Lomonosov)

PRESENTED: April 4, 1960, by V. I. Spitsyn, Academician

SUBMITTED: April 2, 1960

Card 4/4

SHAKHPARONOV, M.I. (Moskva)

Some aspects of the theory of metal alloys. Izv. AN. SSSR. Otd. tekh. nauk. Met. i topl. no.3:118-120 My-Je '61. (MIRA 14:7)
(Liquid metals) (Alloys)

KASIMOV, R.M.; SHAKHPARONOV, M.I.; AKHMADOV, Ya.Yu.

Influence of fluctuations on the dielectric properties of solutions in ultrahigh frequency electromagnetic fields. Zhur. strukt. khim. 2 no. 1:13-19 Ja-F '61. (MIRA 14:2)

1. Moskovskiy gosudarstvennyy universitet im. M.V. Lomonosova.
(Dielectric constants) (Electromagnetic waves)

KASIMOV, R. M.; SHAKHPARONOV, M. I.

Dielectric properties of nitrobenzene - hexane solutions in a millimeter range of radio waves. Azerb.khim.zhur. no.4:101-108 '61. (MIRA 14:11)

(Nitrobenzene--Electric properties)
(Hexane--Electric properties)

KORCHEMSKAYA, K.M.; SHAKHPARONOV, M.I.; LEL'CHUK,S.L.; MARTYNOVA, M.Ye.;
BABURINA, I.I.; BORONINA, R.D.

Pressure and density of vapors from solutions of chlorine derivatives of silane. Part 4. Izv.vys.ucheb.zav.;khim.i khim.tekh. 4 no.4:584-587 '61. (MIRA 15:1)

1. Moskovskiy gosudarstvennyy universitet imeni Lomonosova, kafedra fizicheskoy khimii.

(Silane) (Vapor pressure)

BERIDZE, D.K.; SHAKHPARONOV, M.I.

Rayleigh light scattering by solutions of nitrobenzene in hexane.
Opt. i spektr. 10 no.2:240-248 F '61. (MIRA 14:2)
(Benzene) (Hexane) (Light—Scattering)

BERIDZE, D.K.; SHAKHPARONOV, M.I.

Remarks on Krishnan's phenomenon. Opt. i spektr. 11 no.2:282-284 Ag '61. (MIRA 14:8)

(Light--Scattering)
(Photometry)

S/058/62/000/012/030/048
A160/A101

AUTHORS: Shakhparonov, M. I., Tunin, M. S.

TITLE: The hyperacoustic properties of liquids and the structure of molecules

PERIODICAL: Referativnyy zhurnal, Fizika, no. 12, 1962, 13, abstract 12D96 (In collection: "Primeneniye ul'traakust. k issled. veshchestva". M., no. 15, 1961, 19 - 28)

TEXT: To investigate the hyperacoustic properties of liquids, a study was carried out of the fine structure of Rayleigh's scattering lines in liquid pyridine, thiophene, furan, quinoline, naphthalene, and also in heptane. The absorption of ultrasound was measured for these substances, except for the latter two ones. The selction of the substances is based upon the consideration that a strong sound absorption must take place in those liquids whose molecules are compact, easily polarizable, and have a comparatively large number of mobile electrons and a "rigid" framework of atomic nuclei. In all investigated substances, except for heptane, a considerable positive dispersion of the velocity of hypersound was observed. In heptane, whose molecules do not have "rigid"

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The hyperacoustic properties of liquids and... S/058/62/000/012/030/048
A160/A101

atomic framework, the speed of the hypersound coincided with the speed of ultrasound within the error limits of the experiment. The relaxation times yielded by the experimental data are close to those calculated by Hertzfeld's formula. This is in conformity with the assumption that the dispersion of sound in the investigated liquids is due to intramolecular processes.

L. Filippov

[Abstracter's note: Complete translation]

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S/058/62/000/012/031/048
A160/A101

AUTHORS: Akhadov, Ya. Yu., Shakhparonov, M. I., Kasimov, R. M.

TITLE: Investigations of the molecular structure of individual liquids and of their solutions by radiophysical methods

PERIODICAL: Referativnyy zhurnal, Fizika, no. 12, 1962, 16, abstract 12D112 (In collection: "Primeneniye ul'traakust. k issled. veshchestva". M., no. 15, 1961, 29 - 39)

TEXT: Investigations were carried out of the permeability and losses of the following solutions: acetone-benzene, acetone-carbon tetrachloride, acetone-nitrobenzene, nitrobenzene-hexane, acetone-methyl alcohol, and acetone-water within a wide concentration and temperature range and on radio-wave lengths of 8.15 mm and 3.21 cm. An analysis of the results indicates that the molecules in the mentioned first four solutions did not tend to association. It appears that there are deviations from a chaotic distribution of polar-molecule orientations in the acetone-nitrobenzene solutions. In the acetone-methyl alcohol and acetone-water solutions it seems that there are associated complexes of water and methyl

Card 1/2

Investigations of the molecular structure of... S/058/62/000/012/031/048
A160/A101

alcohol molecules. It may be assumed that when adding small amounts of acetone to water, the associated groups of water molecules increase.

[Abstracter's note: Complete translation]

Card 2/2

LOMOVA, N.M.; SHAKHPARONOV, M.I.

Dielectric constant and molecular structure of nitrobenzene solutions in heptane and octane. Vest.Mosk.un.Ser.2:khim. 16 no.3:33-37 My-Je '61. (MIRA 14:10)

1. Kafedra fizicheskoy khimii Moskovskogo gosudarstvennogo universiteta.
(Nitrobenzene--Electric properties)

SHAKHPARONOV, M.I.

Theory of the dielectric properties and molecular structure of concentrated solutions of polar molecules. Vest. Mosk.Un.Ser.2: Khim. 16 no.5:69-80 S-O '61. (MIRA 14:9)

1. Kafedra fizicheskoy khimii Moskovskogo universiteta.
(Solution (Chemistry)—Electric properties)
(Molecular association)

KASIMOV, R.M.; AKHADOV, Ya.Yu.; SHAKHPARONOV, M.I.

Dielectric properties of acetone - carbon tetrachloride solutions in superhigh-frequency electromagnetic fields and fluctuations in concentration. Dokl. AN Azerb. SSR 17 no. 3:207-211 '61.
(MIRA 14:5)

1. Institut neftekhimicheskikh protsessov AN AzerbSSR.
(Acetone—Electric properties)
(Carbon tetrachloride—Electric properties)

KASIMOV, R.M.; AKHMADOV, Ya.Yu.; SHAKHPARONOV, M.I.

Dielectric properties and molecular structure of acetone solutions of nitrobenzene, methyl alcohol, and water. Dokl. AN Azerb. SSR 17 no.8:687-690 '61. (MIRA 14:10)

1. Institut neftekhimicheskikh protsessov AN AzerbSSR. Predstavleno akademikom AN Azerbaydzhanskoy SSR M.F. Nagiyevym.
(Dielectrics)
(Systems(Chemistry))

SHAKHPARONOV, M.I.

Theory of solutions. Part 12: Dielectric polarization and molecular structure of nitrobenzene and acetone solutions. Zhur. fiz.khim. 35 no.6:1177-1185 Je '61. (MIRA 14:7)

1. Moskovskiy gosudarstvennyy universitet imeni M.V.Lomonosova.
(Polarization (Electricity)) (Benzene) (Acetone)

31187
S/076/61/035/012/007/008
B101/B138

5.4120

AUTHORS: Tunin, M. S., and Shakhparonov, M. I.

TITLE: Investigation of the "hypersonic" and ultrasonic properties of pyridine benzene solutions

PERIODICAL: Zhurnal fizicheskoy khimii, v. 35, no. 12, 1961, 2783 - 2784

TEXT: The authors seek to explain the molecular nature of relaxation in the $10^{10} - 10^{14}$ cps field ("hypersonic") by studying the dependencies between these processes and the composition of the solutions. The propagation of hypersonic and ultrasonic waves, viscosity, and absorption coefficient in benzene pyridine mixtures were measured at 25°C. Propagation velocity of hypersonic waves was optically determined from the fine structure of the Rayleigh line ($\lambda = 4358$ Å) of scattered light, using the method described by M. I. Shakhparonov, M. S. Tunin (Primeneniye ul'traakustiki k issledovaniyu veshchestva (Application of ultrasonics for the investigation of a substance), Trudy 9-y konferentsii, no. 14, Izd. Mosk. ped. in-ta, 1961) and L. V. Lanshina, M. I. Shakhparonov (Dokl. AN SSSR, 137, 830, 1961). Velocity of ultrasonic propagation, v_0, and absorption

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coefficient α were measured for f = 20.6 - 34.4 Mcps. The meter wave generator had an output voltage of 5 μv - 50 mv. The values were calculated according to the equations: $\alpha^h_\eta = 4\omega^2\eta/6\varrho v_o^3$ (1), $\alpha^h_{\eta'} = \omega^2\tau(v^2 - v_o^2)/2v_o^3(1 + \omega^2\tau^2)$ (2); $\mu = \alpha^h_{\eta'\max}\Lambda_c = \left[\pi(v - v_o)\right]/v$, where $\alpha^h_{\eta'\max}$ is the maximum value of the relaxing part of the absorption coefficient, and Λ_c the length of the sound wave in the maximum of $\alpha^h_{\eta'}$. Results are shown in Figs. 1 - 4. There are 4 figures and 2 Soviet references.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University imeni M. V. Lomonosov)

SUBMITTED: May 7, 1961

SHAKHPARONOV, M.I.

Rayleigh scattering of light and the ordered orinetation of molecules.
Dokl.AN SSSR 136 no.5:1162-1164 F '61. (MIRA 14:5)

1. Moskovskiy gos. universitet im. M.V.Lomonosova. Predstavleno akad.
V.V.Shuleykinym.
(Light—Scattering) (Molecules)

SHAKHPARONOV, M.I.; [illegible], D.K.

Rayleigh light scattering by acetone solutions in carbon tetrachloride. Dokl. AN SSSR 137 no.2: [illegible] '61. (MIRA 14:2)

1. Moskovskiy gosudarstvennyy universitet im. M.V.Lomonosova. Predstavleno akademikom V.V.Shuleykinym.
(Acetone) (Carbon tetrachloride)

LANSHINA, L.V.; SHAKHPARONOV, M.I.

Fine structure of the Rayleigh line of scattered light, and the propagation velocity of hyperacoustic oscillations in water. Dokl. AN SSSR 137 no.4:830-832 Ap '61. (MIRA 14:3)

1. Moskovskiy gosudarstvennyy universitet im. M.V. Lomonosova. Predstavleno akademikom V.V. Shuleykinym.

(Underwater acoustics)
(Light--Scattering)

SHAKHPARONOV, Mikhail Ivanovich, doktor khim. nauk, prof.; KNYAZEVA, L., red.; KLIMOVA, T., tekhn. red.

[Chemistry and philosophy] Khimiia i filosofiia. Moskva, Gos. izd-vo polit. lit-ry, 1962. 135 p. (MIRA 15:3)
(Chemistry, Physical and theoretical)

S/843/62/000/000/001/010
D207/D308

AUTHOR: Shakhparonov, M.I.

TITLE: Permittivity and molecular structure of solutions

SOURCE: Stroyeniye i fizicheskiye svoystva veshchestva v zhidkom sostoyanii; materialy IV soveshch. po probl. zhidkogo sost. veshchestva, v Kiyeve 1959 g. Kiev, Izd-vo Kiev. univ., 1962, 4-10

TEXT: The following formula is derived for the difference between the experimentally determined macroscopic permittivity (ε) and the local average permittivity ($\bar{\varepsilon}$) of a solution:

$$\bar{\varepsilon} - \varepsilon = (\bar{\varepsilon}_{\infty} - \varepsilon_{\infty}) \frac{\varepsilon_{\infty}}{\varepsilon} \left(\frac{\frac{\partial \bar{\varepsilon}}{\partial c_i}}{\frac{\partial \bar{\varepsilon}_{\infty}}{\partial c_i}} \right)^2 \left(\frac{2 + \delta_{\varepsilon\infty}}{2 + \delta_{\varepsilon}} \right) \quad (5)$$

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where

$$\delta_{\varepsilon\infty} = \frac{\frac{\partial\bar{\varepsilon}_{\infty}}{\partial c_i}}{\frac{\partial\varepsilon_{\infty}}{\partial c_i}} \tag{6}$$

and

$$\delta_{\varepsilon} = \frac{\frac{\partial\bar{\varepsilon}}{\partial c_i}}{\frac{\partial\varepsilon}{\partial c_i}} \tag{7}$$

The subscript ∞ denotes the permittivity values at optical frequencies; c_i is the concentration of the component i in the solution. Similar formulas for (1) the electrical conductivity σ, or (2) the permeability μ can be obtained from the above permittivity formula by substituting σ for ε in the case of conductivity, c/μ for ε in the case of permeability (c is the velocity of light). Comparison with the experimental data for solutions of nitrobenzene and acetone in nonpolar solvents showed fairly satisfactory agree-

KORCHEMSKAYA, K.M.; SHAKHPARONOV, M.I.; LEL'CHUK, S.L.; KORABLINA, T.P.;
BABURINA, I.I.; VORONINA, R.D.

Investigation of the vapor pressure and vapor density of binary solutions of silane chloro derivatives. Part 4. Izv.vys.ucheb. zav.; khim.i khim.tekh. 5 no.1:65-69 '62. (MIRA 15:4)

1. Moskovskiy gosudarstvennyy universitet imeni Lomonosova, kafedra fizicheskoy khimii.
(Silane) (Vapor pressure) (Vapor density)

BERIDZE, D.K.; SHAKHPARONOV, M.I.

Some results of studies of Rayleigh scattering of light in the critical region of stratification of solutions. Ukr.fiz.zhur. 7 no.7:771-778 Jl '62. (MIRA 15:12)

1. Moskovskiy universitet.
(Light--Scattering) (Solution (Chemistry))

[illegible]

S/185/62/007/007/009/010
I048/I248

[illegible]

AUTHOR: Shakhparonov, M.I.

TITLE: The theory of Rayleigh scattering of light and the distribution of molecular orientation in liquids

PERIODICAL: Ukrains'kyy fizychnyy zhurnal, v.7, no.7, 1962, 782-786

TEXT: The author challenges the validity of the mathematical methods used for the calculation of the term $(\partial\varepsilon/\partial\rho)_T$ in the equation for the Rayleigh scattering of light. The value of the coefficient of scattering R calculated by the Einstein method is ~ 20% heigher than R experimental. R calculated by the other

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The theory of Rayleigh scattering....

two methods is lower by ~ 30% than the experimental value. Better agreement is obtained with the equation ($\frac{n^2-1}{n+0.4} = \rho \cdot const$) (2). An equation is derived for the coefficient of scattering caused by fluctuations in the orientation of the molecules (R_{or}) in a multi-component system: $R_{or} = Q N_1 \sum_{l=1}^{M} x_l \gamma_l^2$, (10)
where x_l is the mole fraction of component l, δ_l is the optical anisotropy, M is the number of components in the solution, N_1 is the number of molecules of component l in one ml. of the system, and $Q = \frac{13}{45}\left(\frac{2\pi}{\lambda}\right)^4\left(\frac{n^2+2}{3}\right)^4\left(1+\frac{1}{13}\cos^2\Theta\right)$. There are 4 figures.

ASSOCIATION: Moskovskiy universitet (The University of Moscow)

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S/185/62/007/007/010/010
I048/I248

AUTHORS: Shakhparonov, M.I., Tunin, M.S., Lanshina, L.V., and Sikhotina, G.G.

TITLE: The hyperacoustic properties of liquids and the structure of molecules

PERIODICAL: Ukrains'kyy fizychnyy zhurnal, v.7, no.7, 1962, 792-796

TEXT: The dispersion of sound velocities in the hyper-acoustic range was studied in a number of pure liquids, using the technique described by I.L. Fabelinskiy in UNF 63, 355, 1957. The experiments were carried out at 20-85°C and were based on the examination of the fine structure of the 4538 Å Rayleigh line. The

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S/185/62/007/007/010/010
I048/I248

The hyperacoustic properties of...

having π-electrons, i.e., in all whose molecules are compact and possess a relatively large number of mobile electrons. The mechanism of the acoustic dispersion in non-dissociated liquids is discussed, and a certain analogy is discovered between the structure of a molecule and its tendency towards fluorescence and acoustic relaxation. There are 2 tables.

ASSOCIATION: Moskovskiy universitet (The University of Moscow)

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S/185/62/007/008/004/008
D234/D308

AUTHORS: Shakhparonov, M.I., Kasimov, R.M., and Akhadov, Ya.Yu.

TITLE: Dielectric properties and molecular structure of concentrated liquid solutions

PERIODICAL: Ukrayins'kyy fizychnyy zhurnal, v. 7, no. 8, 1962, 874 - 882

TEXT: The authors give some of the results of a study of relaxation of the dielectric polarization of the following solutions: acetone-benzene, acetone-CCl_4, nitrobenzene-hexane, acetone-nitrobenzene, acetone-methyl alcohol and acetone-water. Dielectric constant and losses of these solutions were measured at 3.21 cm and 8.15 mm wavelengths by Poley's waveguide method. The experimental values were used for calculating the macroscopic relaxation times. Enthalpy and entropy of the activation of molecular reorientation in an external electric field were also determined. It is concluded that the solutions of nitrobenzene in hexane and of acetone in benzene and CCl_4 have random distribution of molecular orientation.

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Dielectric properties and ... S/185/62/007/008/004/008
D234/D308

The process of relaxation of polarization in acetone-nitrobenzene solutions can be approximately represented as a superposition of two independent processes. There are associated complexes of molecules of the solvents in solutions of acetone in water and methyl alcohol. There are 7 figures and 1 table.

ASSOCIATION: Moskovskiy universitet (Moscow University)

Card 2/2

KORCHEMSKAYA, K. M.; SHAKHPARONOV, M. I.

Thermodynamic properties of solutions of acetone-nitrobenzene. Vest. Mosk. un. Ser. 2: Khim. 16 [i.e.17], no.6:76-77 N-D '62. (MIRA 16:1)

1. Kafedra fizicheskoy khimii Moskovskogo universiteta.

(Acetone) (Nitrobenzene) (Solution(Chemistry))

40734

S/076/62/036/009/007/011
B101/B102

AUTHOR: Shakhparonov, M. I.

TITLE: Some problems in the theory of molecular light scattering in liquids

PERIODICAL: Zhurnal fizicheskoy khimii, v. 36, no. 9, 1962, 2030 - 2035

TEXT: The calculation of $(\partial \varepsilon/\partial \rho)_T$ is analyzed. A comparison of the calculated values with experimental data shows that the calculation according to K. Ramanathan and I.Rockard gives values for the scattering factor, which are too low and which deviate from the experimental value by an average of 33%. The calculation of the Lorentz-Lorenz equation according to Einstein is correct. Those values which are too high by an average of 20% with respect to the experiment are explained by the inaccuracy of the Lorentz-Lorenz equation, in which the isothermal polarizability is put equal to zero. The calculation according to Einstein - Smoluchowsky gives true values if corrections are made for the refractive index and the scattering volume. The best results are given by the calculation according to Eickmann, whereby the deviations from experiment do not exceed 1%. By

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Some problems in the theory ... S/076/62/036/009/007/011
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comparison with experimental data the calculation of the anisotropic scattering factor R_a for chaotically oriented molecules according to $R_a = (13/45)(2\pi/\lambda)^4 \left[(n^2+2)/3\right]^4 N_1\gamma^2$; $\gamma^2 = 0.5\left[(a_x-a_y)^2 + (a_x-a_z)^2 + (a_y-a_z)^2\right]$, where N_0 = number of molecules per cm³, a_x, a_y, a_z = tensors of polarizability, gives good agreement for nonassociated liquids. The deviation for ethanol and propanol is caused by association. The accuracy of calculation for R_a depends on possible errors in determining γ^2, for which no satisfactory method has yet been developed. New measurements in vapor are considered necessary. There is 1 table. The most important English-language references are: C. G. Le Févre, R. J. Le Févre et al., Chem. Soc., 4041, 1953; 1577, 1954; 3644, 1957; 1465, 1958; 123, 1825, 2161, 1960; A. D. Buckingham, Trans. Faraday Soc., 52, 611, 1956.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University imeni M. V. Lomonosov)

SUBMITTED: March 20, 1961

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S/

AM4017346

BOOK EXPLOITATION

Shakhparonov, Mikhail Ivanovich

Methods of investigating molecular thermal motion and the structure of liquids (Metody* issledovaniya teplovogo dvizheniya molekul i stroyeniya zhidkostey), [Moscow], Izd-vo Mosk. univ., 1963, illus., biblio., index. 4,750 copies printed.

TOPIC TAGS: physics, liquid, molecular thermal motion, molecular structure, dielectric property, dielectric permeability, polarization, light diffusion, nonelectrolyte, radiophysical methods, optical methods,

PURPOSE AND COVERAGE: This book examines the experimental and theoretical bases of a number of radiophysical and optical methods of studying the molecular thermal motion and structure of certain liquids and solutions of nonelectrolytes. The results of investigations of liquid systems without an intermolecular hydrogen bond conducted by the author and his associates in the Laboratory of Solutions of the Chemistry Faculty of MGU are given. A number of problems of molecular theory of the liquid state are analyzed on the basis of these results. The author tried to write the book not only for specialists in the theory of liquids, but also for researchers in related fields, advanced students and graduate students of physics

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and chemistry who are interested in the theory of the liquid state. Therefore, relatively complex or long mathematical analyses and also many tables are placed in the appendix, at the end of the book. The author gratefully notes that section 1 was written with the help of R. M. Kasimov, Ya. Yu, Akhadov, and I. A. Vakalov; D. K. Beridze participated in section 9; R. M. Kasimov wrote Appendix D. The author is grateful to professors V. M. Tatevskiy and K. V. Topchiyev and Candidate of Technical Sciences B. D. Zaloga for assistance in organization of the research and to professors A. Ye. Glauberman and G. M. Panchenkov for reading the manuscript, the editor, Candidate of Physical-Mathematical Sciences K. P. Gurov,and associates of the Laboratory of Solutions M. Ye. Martynova and K. M. Korchemskaya for assistance in preparing the manuscript for publication.

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SUB CODE: PH SUBMITTED: 21 Aug 63 NR REF SOV: 113

OTHER: 090 DATE ACQ: 12 Mar 64

Card 3/3

SHAKHPARONOV, M.I.

Thermodynamics of dielectrics. Vest.Mosk.un. Ser.2:Khim. 18
no.6:11-13 N-D '63. (MIRA 17:4)

1. Kafedra fizicheskoy khimii Moskovskogo universiteta.

S/189/63/000/002/004/010
A057/A126

AUTHORS: Vakalov, I.A., Shakhparonov, M.I.

TITLE: Low-frequency dielectric permeability and the structure of acetone - nitrobenzene solutions

PERIODICAL: Vestnik Moskovskogo universiteta, Seriya II, Khimiya, no. 2, 1963, 22 - 23

TEXT: The mean macroscopic dielectric permeability ε_s measured in low-frequency fields has to be smaller than the mean local dielectric permeability $\bar{\varepsilon}_{se}$ in solutions, where the vapor pressure shows a positive deviation from Raoult's law according to earlier papers of the author (Shakhparonov, ZhFKh, v. 32, 1958, 1,414; v. 34, 1960, 977, 1,478; v. 35, 1961, 1,177). Investigations by F.M. Skirrov (Z. Phys. Chem., v. 41, 1902, 139) and W. Graffunder and E. Heymann (Z. Phys., 1931, 744) indicate that the vapor pressure of acetone - nitrobenzene solutions (25°C) obeys Raoult's law. This is in disagreement with results obtained by K.M. Korchemskaya, and M.I. Shakhparonov in a previous work (Vestn. Mosk. un-ta, ser. khimii, no. 6, 1962, 76), i.e., considerable deviations

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Low-frequency dielectric permeability and S/189/63/000/002/004/010
A057/A126

from Raoult's law were observed, thus proving fine-structure fluctuations of the concentration. These experiments were repeated in the present work for an approval. The measurements were carried out with 8 · 10^5 cps on a Czech "Tesla" BM-271 device based on the change of the reactive conductivity of the resonance circuit. The accuracy was 0.2 - 0.5% and the obtained results demonstrate deviations from linearity in correspondence with the equation for $\bar{\varepsilon}_{se} - \varepsilon_s$. This deviation from linearity, which can be approximately deduced from the theory of Onsager, is apparently caused by the effect of fine-structural fluctuations of the concentration. It can be assumed, in relation to Onsager's theory, that in acetone - nitrobenzene solutions the mutual orientation of molecules is distributed chaotically. Hence, any mutual orientations of molecules of acetone and nitrobenzene can be considered with sufficient accuracy energetically equal in the temperature range of 10 to 40°C. There is 1 table.

ASSOCIATION: Kafedra fizicheskoy khimii (Department of Physcial Chemistry)

SUBMITTED: July 4, 1962

Card 2/2

SHAKHPARONOV, M.I.

Theory of solutions. Part 11: Effect of fluctuations on the dielectric constant, permeability, and electric conductivity of solutions. Zhur. fiz. khim. 35 no.5:977-983 My '61.
(MIRA 16:7)

1. Moskovskiy gosudarstvennyy universitet imeni Lomonosova.
(Electrolyte solutions)

SHAKHPARONOV, M.I.

Thermodynamics of dielectrics and the molecular structure of liquids. Zhur. fiz. khim. 37 no.5:1169-1172 My '63. (MIRA 17:1)

1. Moskovskiy gosudarstvennyy universitet imeni Lomonosova.

YEREMIN, Ye.N., prof.; KISELEV, A.V., prof.; KOBOZEV, N.I., prof.; PANCHENKOV, G.M., prof.; POLTORAK, O.M., prof.; SKURATOV, S.M., prof.; TATEVSKIY, V.M., prof.; TOPCHIYEVA, K.V., prof.; FIGUROVSKIY, N.A., prof.; FILIPPOV, Yu.V., prof.; SHAKHPARONOV, M.I., prof.

IAkov Ivanovich Gerasimov; on his sixtieth birthday. Zhur. fiz. khim. 37 no.12:2803-2804 D '63. (MIRA 17:1)

1. Kafedra fizicheskoy khimii Moskovskogo gosudarstvennogo universiteta.

S/020/63/149/002/028/028
B101/B144

AUTHOR: Shakhparonov, M. I.

TITLE: Nature of substances with intermolecular hydrogen bond

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 149, no. 2, 1963, 374-377

TEXT: The usual concept that the high stationary dielectric constant of water and alcohols is due to dipole polarization and association runs contradictory to the experimental fact that in water and alcohols ε is a linear function of 1/T and the Debye equation is valid. This is explained by formation of proton energy bands similar to the electron bands of semiconductors. Valency bands and conduction bands are assumed separated by a very wide forbidden band which can be overcome by the protons in the tunnel effect only in the presence of O, N, F, Cl, or S atoms creating an intermediary band similar to the impurity band of semiconductors. When a weak electric field is applied, a redistribution of the protons sets in between the "proton gas" and the intermediary band. This entails the electric polarization which is otherwise explained by orientation of the dipoles. Since the energy of this redistribution is almost zero, ε is linear function of 1/T. Equally, the proton relaxation time is indepen-

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Nature of substances with ... S/020/63/149/002/028/028
B101/B144

dent of the orientation of the molecules, but is a function of the difference between the energy levels of the conduction band and the intermediary band. With the exception of the critical region, this difference is the same for all protons of the liquid and therefore the Debye equation is valid. Owing to the anomalous mobility of the protons in substances with intermolecular H bonds, the deformation polarization of these substances also is abnormally high. Water, alcohols and other substances with intermolecular H bonds are, so to speak, proton semiconductors. In analogy to the metal binding of electrons, it is here the case of a metal binding of protons. There is 1 figure.

PRESENTED: December 22, 1962, by A. N. Frumkin, Academician

SUBMITTED: December 21, 1962

Card 2/2

PETRUSHEVSKIY, S.A., otv. red.; KOLBANOVSKIY, V.N., red.; PLATONOV G.V., red.; SHAKHPARONOV, M.I., red.; SHIROKOV, M.F., red.; VIGDOROVICH, M.I., red.

[Dialectical materialism and present-day natural science; materials of the All-Russian Seminar of Lecturers in Social Sciences on philosophy problems of present-day natural science] Dialekticheskii materializm i sovremennoe estestvoznanie; sbornik materialov Vserossiiskogo seminara prepodavatelei obshchestvennykh nauk po filosofskim voprosam sovremennogo estestvoznaniia. Moskva, Izd-vo Mosk. univ., 1964. 403 p. (MIRA 17:7)

1. Moscow. Institut povysheniya kvalifikatsii prepodavateley obshchestvennykh nauk. Kafedra dialekticheskogo i istoricheskogo materializma.

[illegible]

Dielectric constant and the molecular structure of acetone-pyridine solutions. Zhur. strukt. khim. 5 no.4:620-621 Ag '64.
(MIRA 18:3)

1. Moskovskiy gosudarstvennyy universitet imeni Lomonosova.

SHAKHPARONOV, M.I.

Properties of a liquid having intermolecular hydrogen bonds. Ukr. fiz. zhur. 9 no.4:444-453 Ap '64. (MIRA 17:8)

SHAKHPARONOV, M.I.; BENE, D.

Rayleigh scattering of light and the molecular structure of acetone and ethyl ether solutions in chloroform. Opt. i spektr. 17 no.3:391-396 S '64.
(MIRA 17:10)

PSEHKOVA, V.M.; KHROMOV, S.I.; SHAKHPARONOV, M.I.

December Plenum of the Central Committee of the CPSU and the
chemical science at Moscow university. Vest. Mosk. un. Ser. 2:
Khim. 19 no.1:3-19 Ja-F '64. (MIRA 17:6)

GOREMYKINA, V.V.; VAKALOV, I.A.; SHAKHPARONOV, M.I.

Dielectric constant and molecular structure of pyridine-chloroform solutions. Vest. Mosk. un. Ser. 2:Khim. 19 no.1: 33-34 Ja-F '64. (MIRA 17:6)

1. Kafedra fizicheskoy khimii Moskovskogo universiteta.

VAKALOV, I.A.; SHAKHPARONOV, M.I.

Dielectric properties and molecular structure of acetone-n-hexane solutions. Vest. Mosk. un. Ser. 2 Khim. 19 no.2:16-19 Mr-Ap'64 (MIRA 17:6)

1. Kafedra fizicheskoy khimii Moskovskogo universiteta.

[illegible], [illegible].: NORMATOV, A.; [illegible]

Velocity and absorption of ultrasound in pyridine-paraxylene solutions. Vest. Mosk. un. Ser. 2: Khim. 20 no.1:71-72 Ja-F 1965. (MIRA 18:3)

1. Kafedra fizicheskoy khimii i laboratoriya molekulyarnoy akustiki Moskovskogo oblastnogo pedagogicheskogo instituta.

ACCESSION NR: AP4019511 S/0076/64/038/002/0252/0265

AUTHOR: Shakhparonov, M. I.

TITLE: Substances with intermolecular hydrogen bond as proton semiconductors

SOURCE: Zhurnal fizicheskoy khimii, v. 38, no. 2, 1964, 252-265

TOPIC TAGS: proton semiconductor, proton exciton; proton defect, hydrogen intermolecular bond, proton conductivity level

ABSTRACT: The author assumes that protons, like electrons, in condensed media have a conductivity zone separated by the zone of forbidden states in addition to the valence zone. Normally (for instance in saturated hydrocarbons) the width of the forbidden zone is great and practically no protons reach the conductivity zone. But in certain cases, for instance, when the substance is capable of forming intermolecular hydrogen bonds, the forbidden interval narrows and the transition of protons from the valency zone into the conduction zone becomes possible. A diagram of energy levels in proton semiconductors is given, show-

ACCESSION NR: AP4019511

ing proton exciton levels (exciprotons) and an intermediary level which is similar to the admixture level in electron semiconductors. After a detailed discussion of topics such as dependence of dielectric constants on temperature, and on frequency, on proton mobility in semiconductors and on the theory of proton defect mobility and comparisons of theoretical premises with experimental data, the author arrives at the following conclusions: substances with intermolecular hydrogen bonds can be proton semiconductors and proton dielectrics. Dielectric polarization of water, of a number of low-molecular alcohols, of acetone-chloroform solutions and other substances with intermolecular hydrogen bonds in a wide spectrum of frequencies can be explained with the aid of the concept of proton excitons (exciprotons). The anomalous mobility of protons and defects can be explained by the theory of proton semiconductors. Orig. art. has: 6 figures, 14 formulas, 1 table.

ASSOCIATION: Moskovskiy gosudarstvenny*y universitet im. M. V. Lomonosova (Moscow State University)

SUBMITTED: 03May63 DATE ACQ: 31Mar64 ENCL: 00

SUB CODE: CH NO REF SOV: 015 OTHER: 036

Card 2/2

SHAKHPARONOV, M. I.; [illegible]

Dielectric properties and molecular structure of acetone-chloroform solutions. Zhur.fiz.khim. 34 no.8 1978-1983 Ag '60.

(MIRA 13:8)

1. Moskovskiy gosudarstvennyy universitet imeni M.V.Lomonosova.

SHAKHPARONOV, M.I.

Theory of liquids with intermolecular hydrogen bonds. Zhur. fiz. khim. 38 no.10:2478-2483 O '64. (MIRA 18:2)

1. Khimicheskiy fakul'tet Moskovskogo gosudarstvennogo universiteta imeni M.V. Lomonosova.