

SUMMARY

1. A method has been proposed for the measurement of the solubility of sparingly soluble gases in liquids.
2. Henry's constant for the solubility of tetrafluoroethylene in water has been measured at pressures below 1 atm in the temperature range 0–70°.

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THE SIXTH UKRAINIAN REPUBLIC CONFERENCE ON PHYSICAL CHEMISTRY DEDICATED TO THE NINETIETH ANNIVERSARY OF THE BIRTH OF ACADEMICIAN L. V. PISARZHEVSKII

The Conference on Physical Chemistry, dedicated to the 90th anniversary of the birth of Academician L. V. Pisarzhevskii, took place in Kiev from 23rd to 26th November, 1964. The Conference showed the successful development in the Ukraine of Pisarzhevskii's ideas concerning electrode processes and chemical reaction mechanisms. About three hundred physical chemists from various Ukrainian towns took part in the Conference; the topics discussed included the work carried out in the Ukrainian SSR in the field of electrochemistry, reaction mechanisms and reactivity, photochemistry, radiation chemistry, and quantum chemistry.

The first plenary meeting included papers by Yu. K. Delimarskii, K. B. Yatsimirskii, and L. I. Antropov.

Yu. K. Delimarskii (Kiev) gave an account of the recent advances in the investigation of the kinetics and polarography of electrode processes in molten salts. K. B. Yatsimirskii (Kiev) considered the mechanism of the action of catalysts in oxidation-reduction reactions, including the formation of a complex with charge transfer. In his view, substances which facilitate the orientation of the orbitals of the atoms of the catalyst and the reagent, necessary for the charge transfer, accelerate oxidation-reduction reactions of this type. L. I. Antropov (Kiev) devoted his paper to the examination of the role of the metal surface charge and the use of his reduced φ -scale of potentials in electrochemical kinetics.

At the secondary plenary session Yu. A. Kruglyak (Kiev) described briefly the main developments in modern quantum chemistry, indicating also the prospects of its development in the Ukraine. At the same session K. B. Tolpygo

(Kiev) gave a paper on physicochemical problems of molecular biology.

Fourteen papers were given on the subject of "The Properties of Electrolyte Solutions". G. I. Mikulin (Kharkov) applied the modern theory of crystal lattices to electrolyte dissolution processes and concluded that in most cases the heats of solution of the individual ions of the electrolyte differ from each other not only in value but also in sign. V. V. Aleksandrov and V. I. Lebed (Kharkov) studied the methods of calculating the entropies of ion solvation from experimental data and calculated the entropies of solvation of HCl in various water-non-aqueous solvent mixtures as a function of temperature. K. P. Mishchenko, L. A. Zhilina, M. L. Klyueva, S. M. Osinskaya, G. M. Poltoratskii, N. V. Sokolov, V. P. Tungusov, and S. V. Shadskii (Leningrad) compared the thermodynamics and the structure of aqueous and non-aqueous solutions of electrolytes and demonstrated the dominant role of the chemical nature of the medium. Papers by E. F. Ivanova and G. P. Kotlyarova (Kharkov) and by A. M. Golub and V. I. Golovorushkin (Kiev) dealt with the determination of the thermodynamic parameters of the dissolution of a number of salts in non-aqueous solvents.

Yu. Ya. Fialkov, O. V. Bogmat, Yu. A. Tarasenko, and G. N. Fenerli (Kiev) put forward bond equations which make it possible to determine the yield of the addition product in binary systems with an acid-base interaction. F. K. Andryushchenko and V. V. Orekhova (Kharkov) determined the composition of the pyrophosphate complex of silver and determined its instability constant. A. P. Gavrish (Kharkov) showed that the nature of the alkyl radical has little effect on the strength and rate of decomposition of alkyl-xanthogenic acids, but that both parameters were greatly affected by the solvent. S. P. Miskidzh'yan, S. S. Kirilyuk, F. N. Kozlenko, and A. A. Korsunskaya (Lvov) showed that, when allyl isothiocyanate reacts with amines the dual reactivity of the former leads to the simultaneous formation both of non-electrolytes and conducting compounds. S. V. Tsukerman, A. A. Kutulya, Yu. N. Surov, V. F. Lavrushin (Kharkov) reported on the influence of various substituents on the basicity of $\alpha\beta$ -unsaturated ketones.

L. P. Sadovnichaya (Kharkov) studied the electrical conductivity of bases in acid solvents with low dielectric constants which permitted, in particular, the separate titration of mixtures of bases in acetic acid. A. Ya. Gel'fman and R. G. Luzan (Kharkov) found, while investigating polyvinyl alcohol films, a linear dependence of electrical conductivity on temperature, characteristic of semiconductors. Yu. A. Petrenko, L. A. Petrenko, and V. K. Tkach (Kharkov), using ultrasonic data, made calculations which showed that in the vicinity of the ions of the dissolved substance there must be pressures of the order found earlier by Debye, and rather lower ones within the solvate. E. A. Gorenbein and G. G. Rusin (Kiev) investigated the viscosity of electrolyte solutions.

At the sectional meeting on "Electrode Potentials", V. A. Kremer and E. I. Veil (Kharkov) reported on the method which they developed for the measurement of ionic activities, applicable to continuous control of technological processes involving sulphide sulphur. E. M. Skobets, E. V. Galinker, and A. I. Karnaukhov (Kiev) proposed an absolute electrochemical method for the determination of electrolyte diffusion coefficients in highly concentrated solutions under conditions of non-stationary linear diffusion. L. I. Gromik and M. A. Loshkarev (Dnepropetrovsk) studied polarographically the electrochemical reduction

of cadmium in electrolytes with Trilon B and found considerable irreversibility of the electrode process. Investigation of the temperature dependence of the normal potentials of the $\text{Pt-H}_2/\text{HCl}/\text{AgCl}/\text{Ag}$ cell in a series of alcohols formed the subject of S. A. Krikht's (Kharkov) paper. V. I. Minenko, N. S. Ivanova, and I. K. Fal'ko (Kharkov) found that partitions of refractory oxide material, used in some galvanic cells, are in fact membrane electrodes. L. L. Spivak and A. A. Grigor'eva (Kharkov) studied the strength of a series of mono- and di-basic phosphoric and thiophosphoric acids in different solvents and demonstrated that they were strongest in water. A. M. Shkodin, T. N. Sogoyan, L. I. Karkuzaki, and L. I. Kozinyuk (Kharkov) reported the results of studies on the standard potentials of hydrogen chloride in mixed non-aqueous solvents.

B. E. Limin and V. P. Galushko (Dnepropetrovsk) showed that electrodynamic analogies could be extended to some electrochemical processes, simplifying their investigation. N. A. Loshkarev, V. I. Chernenko, and Zh. N. Levitin (Dnepropetrovsk) studied analytically and experimentally the dependence of the mean value of polarisation (during the period of application of current) on the relative strength of the direct and alternating (sinusoidal) currents. Automatic equipment for the study of the kinetics of electrode processes was described in the paper given by A. I. Petrenko, A. A. Kazarov, G. F. Afanas'ev, O. A. Raisov, and L. M. Shklyar (Dnepropetrovsk). I. A. Tsisar, A. I. Lopushanskaya, and A. V. Pamfilov (Chernovtsy) showed that the degree of irreversibility of the electrode process could be altered by changing the composition and concentration of the indifferent component. L. B. Tsvetkova, A. I. Lopushanskaya, and A. V. Pamfilov (Chernovtsy) reported the results of using the thermodynamics of irreversible processes for the quantitative evaluation of the effect of mutual superposition during concurrent electrochemical reactions. N. F. Shevchenko, Yu. F. Rybkin, and V. V. Aleksandrov (Kharkov) showed that the method of Volta potential differences could be used for comparing the acidity of solutions. M. S. Gladshtein and L. I. Kadaner (Kharkov) described an experimental technique for modelling electrochemical systems.

At the sectional meeting devoted to "The Kinetics of Electrode Processes" D. I. Gritsan and G. L. Shatrovskii (Kharkov) described a technique for measuring temperature effects during electrolysis. E. P. Kovsman, E. A. Karaeva, and Yu. M. Tyurin (Severodonetsk) studied the kinetics of formaldehyde formation in the anodic compartment during electrolysis of the monoesters of succinic, glutaric, and adipic acids in methanol and aqueous methanol solutions. The kinetics of joint precipitation (and dissolution) of sodium and zinc on an amalgam electrode were investigated by L. I. Antropov and V. P. Chviruk (Kiev). This work has led to a number of recommendations for the technology of the preparation of very pure caustic alkalis. Recommendations concerning the electrochemical separation of highly dispersed powders and finely crystalline solid precipitates of some metals stem from the work of G. A. Emel'yanenko, G. G. Simulin, and E. N. Baibarova (Dnepropetrovsk). While investigating the reactivity of unsaturated ketones during their reduction at a dropping mercury electrode, F. V. Lavrushin, V. D. Bezuglyi, and G. G. Belous (Kharkov) found that the change of the half-wave potential was determined by the inductive effect of the substituent. According to the data of A. I. Tsinman, V. S. Kuzub, and L. A. Sokolova (Severodonetsk), the addition of NaF to solutions of sulphuric acid destroys the passive state of steels, and in oxidising media (in the region

of over passivation) the F^- ion becomes an effective inhibitor of corrosion. G. V. Shilina and Yu. K. Delimarskii (Kiev) studied the polarographic behaviour of a series of halides dissolved in a molten nitrate mixture.

The studies on electrodeposition of metals were considered at a special sectional meeting. Scientists from the Kiev Polytechnic Institute used tracer atoms to investigate the laws of electrodeposition of ultra-small amounts of indium (V. G. Prikhodchenko, E. V. Leontovich) and electrochemical separation of Pb-Sb and Cd-Zn alloys (V. S. Galinker, A. I. Saprykin); by changing the electrode polarisation, the special features of the cathodic electrodeposition of copper from solutions containing the disodium salt of ethylenediaminetetracetic acid as a complexing agent were elucidated (O. K. Kudra, V. P. Milovzorov). A. S. Afanas'ev, L. A. Belyaeva, A. I. Burmistrova, T. V. Malysheva, G. M. Khvedchenya, and E. N. Chankova (Dnepropetrovsk) developed a gravimetric technique for studying the acid etching of low-carbon steel covered with clinker.

At the sectional meeting on "The Mechanism of Chemical Reactions", E. A. Shilov (Kiev) showed that heterolytic addition reactions involving cyclic intermediate complexes are much faster than those reactions in which the intermediate compounds have an open-chain structure. B. V. Chizhov and I. P. Gragerov (Kiev) demonstrated by mass-spectrometry a free-radical mechanism for some reactions of a homolytic type. A. F. Rekasheva, L. A. Kiprianova, I. P. Samchenko, and L. F. Kulish (Kiev) showed that the hydrolysis of vinyl esters proceeds by two different mechanisms during catalysis by protons or mercury ions. The high catalytic activity of the latter is explained by their coordination to the vinyl group of the esters. I. G. Ryss and L. P. Bogdanov (Dnepropetrovsk) studied the kinetics of the alkaline hydrolysis of trimethylaminesulphotrioxide and triethylaminesulphotrioxide. I. Ya. Lubyanskii, T. N. Livke, and O. V. Kochergina (Severodonetsk) found that when 1-methylcyclohexanone, ^{14}C -labelled in the methyl group, is oxidised with nitric acid, dicarboxylic acids containing ^{14}C are formed. N. A. Vysotskaya and L. G. Shevchuk (Kiev) studied the photochemical and catalytic oxidation of aqueous emulsions of benzene and its homologues with hydrogen peroxide. V. A. Lunenok-Burmakina and A. P. Potemskaya (Kiev) used the heavy isotope of oxygen to investigate the mechanism of the decomposition of peroxosulphuric acids, their reaction with hydrogen peroxide, and also the anodic and cathodic decomposition of peroxomonosulphuric acid.

At the meeting on "Chemical Structure and Reactivity" A. I. Yurzhenko, Yu. N. Anisimov, and S. S. Ivanchev (Odessa) gave an account of the use of infrared spectroscopy for the quantitative determination of diacyl peroxides in the presence of the monomer, styrene, polystyrene, and some other compounds. The chemiluminescence of the luminol-copper ammine-hydrogen peroxide system is quenched in a different way by different organic compounds and A. A. Ponomarenko, B. I. Popov, L. M. Amelina, L. V. Gritsenko, and R. E. Shindel (Lvov) made use of this for quantitative determination of organic compounds in mixtures. B. G. Boldyrev et al. (Lvov) established a parallel between the reactivity and antibacterial activity of esters of thio-sulphonic acids. L. M. Litvinenko and N. M. Oleinik (Kharkov) discovered that sulphur-containing analogues of carboxylic acids were inferior as catalysts to the carboxylic acids themselves in the acylation of aromatic amines in benzene. M. O. Tereshkevich, T. S. Kuratova,

E. Yu. Pozhidaeva, and O. K. Skarre (Dnepropetrovsk) studied the oxygen-water interchange for a series of inorganic and organic salts and acids. V. Ya. Yanchevskii, A. P. Grekov, and K. A. Kornev investigated the reaction of hydrazides and dihydrazides of carboxylic acids with carboxylic acids in *m*-cresol.

A new method of calculating the magnetic characteristics of molecules, applicable to all molecules and based on the use of the law of weighted averages, was proposed by P. G. Maslov (Leningrad). V. A. Pokrovskii, I. V. Goldenfel'd, and A. A. Nazarenko (Kiev) reported the first results obtained with the help of the mass-spectrometer of their own construction using point electric field ionisation.

At the sectional meeting on "The Spectroscopy of Molecules" A. E. Lutsii (Kharkov) reported a series of interesting regularities in the electronic-vibrational spectra of mono-substituted benzenes. According to the data obtained by E. V. Titov and M. V. Shavinskaya (Kharkov), the differences in the reactivity, the spectroscopic parameters, and the basicity of amines are determined by the same factor — a difference in the density of the electron shell of the nitrogen atom. N. T. Storchai, L. V. Belyavskaya, and V. P. Morozov (Dnepropetrovsk) made calculations refining the spectra and the thermodynamic functions of the isotopic modifications of hydrogen peroxide and formaldehyde molecules. V. A. Grin, R. S. Lebedev, and Yu. N. Forostyan (Zaporozh'e) investigated the dependence of the molecular spectra of the phenyl and pyridine radicals on the nature of the substituents, while L. A. Kotorlenko, A. P. Gardenina, A. F. Rekasheva, and L. A. Kiprianova (Kiev) measured the frequencies and intensities of the characteristic absorption bands of a series of vinyl esters. The refraction of a series of carboxylic acids in an inert solvent and in water was studied by T. M. Khimchenko (Kharkov).

M. S. Ashkinazi, V. E. Karpitskaya, I. A. Dolidze, and B. Ya. Dain (Kiev) showed that radicals were formed when aromatic amines (diphenylamine, *p*-phenylenediamine, and others) were subjected to photo-oxidation in the presence of sensitizers (chlorophyll, phaeophytin). The nature of these radicals was established by a study of their spectra and behaviour under various conditions, as well as an analysis of the ESR spectra. G. I. Kovalenko and E. B. Dol'berg (Kharkov) found that direct photochemical liquid-phase oxidation of tri- and tetra-chloroethylenes with oxygen could give high yields of the acid chlorides of di- and tri-chloroacetic acids, the method thus being suitable for industrial use. A spectroscopic study of the influence of the solvent on the absorption spectra and fluorescence of 1,3,5-triphenylpyrazolone was described by L. M. Kutsyna (Kharkov). I. I. Dilung and I. N. Chernyuk (Kiev) studied the fluorescence of chlorophyll and discovered and interpreted the fluorescence quenching effect. N. P. Gnyp, K. A. Kornev, A. A. Kachan, and L. L. Chervyatsova (Kiev) prepared graft copolymers practically free from homopolymer by photochemical graft copolymerisation of vinyl monomers on polyamide fibres.

The effect of radiation on polymer materials was the subject of a considerable number of papers given at the section dealing with "Radiation Chemistry". Zh. V. Sklyarenko, A. P. Meleshevich, N. A. Ryndich, and E. A. Ivanova found that the density and viscosity of unhardened epoxy-di(hydroxyphenyl)propane resins was considerably increased after γ -irradiation with ^{60}Co . The introduction of colloidal copper and lead into unhardened epoxy-di(hydroxyphenyl)propane resin and subsequent irradiation

lead to a sharp decrease in the number of epoxy-groups and an increased degree of crystallinity (Yu. N. Khimchenko et al., Kiev). Yu. N. Nizel'skii, K. A. Kornev, A. A. Kachan, and L. L. Chervyatsova (Kiev) studied the radiation-induced copolymerisation of Kapron [synthetic fibre similar to nylon (Ed. of Translation)] and vinyl acetate with subsequent saponification of the latter to vinyl alcohol. A. M. Kabakchi and coworkers (Kiev) found that, when polyethylene is irradiated in the presence of atmospheric oxygen, the dose required for the formation of a three-dimensional structure changes regularly with increasing dose rate.

A. S. Fomenko et al. (Kiev) showed that, during radiation-induced oxidative degradation of poly- ϵ -caproamide, radicals of the type $-\text{CH}_2\text{CONHCH}_2\text{CH}_2-$ are formed, the C-H, C-N, and C-C bonds are ruptured with evolution of H_2 and CO, there is a drop in viscosity and a change in the number of amino- and carboxylend-groups. L. L. Nagornaya (Kharkov) discovered that the radiation damage of plastic scintillators by γ -radiation was determined by the total radiation dose and could be reduced by introduction of two phosphors. According to the same author and her coworkers, the degree of damage to the phosphors in various scintillating compositions depends substantially on the type of radiation causing the damage.

O. P. Verkhgradskii, V. N. Doroshenko, K. A. Suprunenko, and I. N. Chervetsova (Kiev) showed that it was possible, theoretically, to determine experimentally the energy absorbed by an adsorbed substance during radiolysis.

In the section on "Electron Spin Resonance and Free Radicals" L. S. Degtyarev, S. P. Karpus', and A. I. Brodskii (Kiev) showed that the introduction of a second benzene ring between the NO_2 and X groups in $\text{NO}_2\text{C}_6\text{H}_4\text{X}$ ($\text{NO}_2\text{C}_6\text{H}_4\text{C}_6\text{H}_4\text{X}$ as compared with $\text{NO}_2\text{C}_6\text{H}_4\text{X}$) consistently decreases the effect of the substituent on the splitting of the electron density at the nitrogen atom in the nitro-group. Quantum-mechanical calculations confirmed the interpretation of the ESR spectra. V. D. Pokhodenko, V. A. Khizhnyi, and G. A. Nikiforov (Kiev) succeeded in establishing the causes responsible for the appearance of paramagnetism in a series of quinoxalines. V. V. Pen'kovskii and V. S. Kuts (Kiev) postulated the existence of charge-transfer complexes in the polyphenylacetylene-oxygen or iodine systems in order to explain the appearance of intense singlet ESR signals observed at 20°C under vacuum in these systems.

Yu. A. Kruglyak and V. I. Lutoshkin (Kiev) carried out quantum-mechanical calculations for several radicals of sterically hindered phenols, the results being in good agreement with experimental data.

I. F. Franchuk (Kiev) used the ESR method to distinguish between true peroxides and peroxy-compounds.

V. A. Vil'shanskii and A. T. Yurzhenko (Odessa) established that compounds with a pyridinium ring can be converted into radicals in aqueous solutions.

At the symposium on quantum chemistry Yu. A. Kruglyak reported on the computer programs devised by the Quantum Chemistry Group at the Institute of Physical Chemistry, some new methods of calculating certain integrals of the theory of ligand fields, and a new formula proposed for the calculation of the overall energy of a series of systems. Yu. A. Kruglyak, N. A. Dolgushin, and S. P. Karpus' (Kiev) put forward a new variational wave function for the $1s$ state of heliumlike structures and

discussed the method of devising such functions for more complex atomic and molecular structures. M. G. Dolgushin (Kiev) obtained an approximation to the potential function in diatomic molecules of copper, silver, and gold and suggested that the bond in these molecules is strong because not only the outer electrons but also those in the preceding shells take part in this bond.

V. A. Kuprievich (Kiev) put forward a generalised self-consistent field method which is intermediate between the valence bond method and the molecular orbital method. G. G. Dyadyusha (Kiev) derived a formula for evaluating the dependence of the position of the first absorption bands of extremely long polymethine dye-stuffs on the chemical structure of their nuclei. G. F. Kventsel' (Kiev) considered polymers with semiconductor properties, calculated the electron mobility during the "jumps" between two Tamm energy states, and compared it with the mobility in the usual jump mechanism.

At the meeting of the section on "The Physicochemical Problems of Molecular Biology" V. M. Gaidai and V. I. Danilov (Kiev) showed that the protein synthesising code is not economical; it is a highly degenerate triplet possessing the property of error correction. Nevertheless, from time to time such a code permits mutations to take place, which may serve as a basis of evolution. Yu. A. Kruglyak, V. I. Danilov, and O. V. Shramko (Kiev) discussed a scheme of "unusual" pairing of bases, according to which the purine base makes its imidazole ring available for the formation of hydrogen bonds. Yu. N. Levchuk and N. V. Nesterova (Kiev) used infrared spectroscopy to determine the content of methylated bases in transfer (soluble) ribonucleic acid.

The resolution adopted by the Conference suggested a series of measures designed to further the development in the Ukraine of quantum and radiation chemistry, electrochemistry, and quantum biology. The resolution notes the need for future regular conferences at Republic level

on specialised aspects of physical chemistry, as well as symposia and meetings on specific problems and summer schools on the theory and practice of the most advanced physical techniques.

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THE UNIVERSAL DECIMAL CLASSIFICATION AND ITS USE IN THE SYSTEMATIC ARRANGEMENT OF SCIENTIFIC AND TECHNICAL INFORMATION

According to the decree of the Council of Ministers of the USSR dated 11th May 1962 and entitled "Measures Designed to Improve the Organisation of Scientific and Technical Information in the Soviet Union", it has become obligatory for scientific and technical publishing houses, editorial offices of scientific and technical journals, scientific and technical information organisations, and scientific and technical libraries to classify all publications according to the Universal Decimal Classification (UDC). Consequently all publications dealing with technological and natural sciences which have appeared since 1963 are given a UDC index. This index is usually placed by the author's name and the title of the paper, or on the reverse of the title page in the case of books. [The description of the UDC index which follows at this point in the Russian original has been omitted from the translation (Ed. of Translation).]