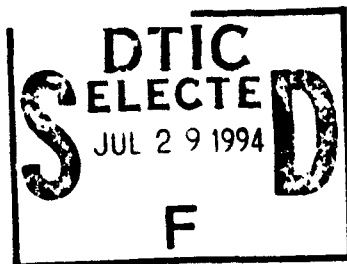


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PROBLEMS OF THE KINETICS AND MECHANISM OF
RADIATION-CHEMICAL REACTIONS

(SECOND ALL-UNION CONFERENCE ON RADIATION
CHEMISTRY)

by Yu. A. Kolbanovskiy

- USSR -

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PROBLEMS OF THE KINETICS AND MECHANISM OF
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- USSR -

Following is the translation of an article
by Yu. A. Kolbanovskiy in Kinetika i kataliz
(Kinetics and Catalysis), Vol II, No 1, Mos-
cow, January/February 1961, pages 154-159.

The Second All-Union Conference on Radiation Chem-
istry, organized by the Division of Chemical Sciences of
the AN SSSR /Akademiya nauk SSSR -- Academy of Sciences
USSR/ and the State Committee of the Council of Ministers
USSR for Chemistry, was held in Moscow 10-14 October 1960.

In the four years since the time of the First Con-
ference on Radiation Chemistry Soviet scientists have con-
tinued intensive theoretical and experimental studies in
this new field of chemical science. Along with scientific
establishments in which radiation-chemical studies have been
conducted in the past years the conference saw the partici-
pation of young scientific collectives from various cities
and republics of the Soviet Union. It was especially en-
couraging to notice the development of radiation-chemical
studies in Uzbekistan and Georgia.

The accounting of results of the development of rad-
iation chemistry in the USSR in the past years figured as
a problem of the Second Radiation-Chemical Conference,
along with a broad discussion of various scientific pro-
blems, and, finally, the determination of the basic direc-
tions for scientific studies and prospects of the use of
radiation-chemical processes.

The work of the conference was organized so that
theoretical questions of a general character were discussed
at inter-section sessions and all remaining studies were

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reported on in their appropriate sections. The first section discussed studies touching on the action of radiation on aqueous solution; in the second -- the action of radiation on organic substances; in the third -- radiation polymerization and the action of radiation on polymers; in the fourth -- the action of radiation on the solid state; and in the fifth -- methodological questions of radiation-chemical studies.

According to our information the arrangement of the material will be structured basically, corresponding to that adopted at the conference on organic structure. Thus, we will limit the examination only to those papers in which problems of kinetics and of the mechanism of radiation-chemical reactions are discussed.

Inter-section Sessions

The conference was opened with a paper by V. L. Tal'roze and S. Ya. Pshezhetskiy, "Primary Acts and the Mechanism of Several Radiation-Chemical Reactions." In the paper a very interesting attempt was made to utilize data obtained in mass spectral studies at low pressures for an interpretation of several results of radiation-chemical reactions in the gaseous phase at high pressures and also, several possibilities were evaluating for the projection to liquid phase reactions in media with weak interaction.

In a paper by M. V. Gur'yev the so-called "local" theory of mass spectra (with application to normal alkanes) is proposed and a comparison is made between the distribution of charged and neutral fragments in the mass spectrum for the radiolysis of the same alkane. A close correspondence is noted between experimental data in radiolysis and calculated data from the mass spectrum obtained by the proposed method.

G. K. Lavrovskaya, M. I. Markin, and V. L. Tal'roze discussed a study of the process of over-charging slow ions in multi-atom molecules, which, as is proposed, is one of the two basic types that are possible of ion-molecular elementary reactions in radiation chemistry. This reaction evidently is an important secondary elementary reaction in gaseous phase radiation-chemical processes, especially for complicated molecules which have a large number of mutually intersecting energy levels.

A more partial [chastichnyy] was touched upon in a paper by V. V. Boldyrev, "Mechanism of the Effect of Preliminary Irradiation on the Rate of the Subsequent Thermal Decomposition of a Solid Substance." According to the

author's opinion a basic role in this effect is played by the formation of ionization defects.

The survey paper of Kh. S. Bagdasar'yan was concerned with a discussion of the problem of the transmission, based primarily on studies of radiation-chemical reactions in organic systems. It was emphasized in the paper that the transfer of energy during radiation-chemical reactions is one of the important processes which are often the determining influence on the direction of the reaction and the product yield. Kh. S. Bagdasar'yan showed increasingly heightened interest in a scheme based on ideas of the formation of a complex with the transfer of charge in reactions of the excited and unexcited molecules.

In a paper by Yu. A. Kolbanovskiy and L. S. Polak a semi-empirical formula was suggested for a study of the inhibition effect as a function of the concentration of an admixture, and it was found that the reversible radiation-chemical yield of the inhibition process is linearly dependent on the square of the average value of the reversible dimensionless distance between the inhibitor molecules in the solution.

The problem of the migration of energy during radiolysis of alkylbenzenes was examined in a paper by Kh. S. Bagdasar'yan, N. S. Izrailevich, and V. A. Krongauz. Using for the determination of the yield of the radicals of the admixture, iodine to the concentration of $10^{-3} - 10^{-4}$ mole/liter, the authors established that the radiation-chemical yield of radicals in alkylbenzenes lies in the interval of 0.7 - 1.2, which indicates a protective action of phenyl rings in regard to side chains. Considerations of the protective action of aromatic impurities in the solid phase (-196°) during the radiolysis of normal hexane from data of EPR [energiya pri radiolize -- energy during radiolysis] were presented in a paper by L. S. Polak and A. S. Shcherbakovaya. Especially interesting is the action of dibenzylsulfide, in which at concentrations of 10^{-3} mole/l, one of the components in the spectrum of EPR of the irradiated hexane actually disappears.

V. I. Gusynin and V. L. Tal'roze studied the quenching of luminescence which was excited by gamma-radiation of Co^{60} in a system of dioxane (solvent)-terphenyl (activator)-normal alcohols $\text{C}_1 - \text{C}_9$ (quenching agents). It was experimentally shown that the quenching cross-section is linearly proportional to the length of the alkyl chain of the alcohol. How clearly the results of this experiment can be related to transfer of energy in the chain $-\text{CH}_2-$ is not yet clear at the present time.

Thematically contiguous to this cycle of studies is a paper by V. V. Voyevodskiy, "Mechanism of Radiolysis of Water," presented in the first section. Analyzing the radical mechanism of Weiss-Allen adopted at the present time, V. V. Voyevodskiy indicated the principal difficulties which arise from an attempt to explain experimental results in the framework of the afore-mentioned mechanism. It was suggested to supplement the radical theory of the radiolysis of water by considerations of the migration of excitation which can proceed, in particular, in the hydrogen bond system of water. Upon adopting such considerations, all the conclusions of the radical mechanism are maintained, but those difficulties and contradictions fall aside, which arise when, in place of the rapid process of migration of excitation, a relatively slow process of the diffusion of radicals is proposed.

Thus, the basic question submitted to discussion in the inter-section sessions is the problem of the transmission of excitation in radiation-chemical processes and the effects of inhibition and sensibilization related thereto. This is borne out not only by the fact that the problem was the subject of a majority of the papers, but also by the large number of related questions and the lively discussion and exchange of views which were aired in the lobbies of the conference. It is necessary to state that at the present time there is not a single viewpoint related to problems associated with the transmission of excitation holding the field, and so the conference has played a positive role in clarifying the existing views and their critical discussion.

Action of Radiation on Aqueous Solutions

In the survey paper of P. I. Dolin and B. V. Ershler dealing with the mechanism of radiation-chemical changes in aqueous solutions considerable attention was directed to an analysis of the biradical model which was developed by Dienes and Kennedy (1958).

Basically, the calculation in this case is grounded on the assumption that radiation with a low ionization density forms in liquid water individual groups of radicals having a spherical form. The numerical solutions of the corresponding equations obtained from a computer and the consequent calculations for a number of examples have given values for yields that are close to the experimental.

At the same time, the postulated hypothesis of the uniform distribution of the H and OH radical needs a more precise re-statement.

Large difficulties, as noted also in a paper by V. V. Voyevodskiy, have arisen in the analysis of data in experiments with low amounts of admixtures, since in order to explain the mechanism of the processes arising in the radiolysis of aqueous solutions, further experimental and theoretical development of the problem is necessary.

B. V. Ershler and G. G. Myasishchev investigated the radiolysis of diluted (10^{-2} mole/liter) solutions of H_2 , O_2 , and H_2O_2 in water. At the basis of the investigation there was assumed the model of an irradiated solution consisting of equally dispersed radicals and molecules. The authors assume the utilization of such an approximation model for the calculation of radiation-chemical yields in dilute aqueous solutions.

V. A. Sharpatyy and M. A. Proskurnin, analyzing the results of experiments on the radiolysis of alkaline, nitrogen-saturated, aqueous solutions of nitrates arrived at the conclusion that 12 excited water molecules forming in the absorption of 100 ev are of three different types (roughly four moles for each type).

V. N. Shubin, P. I. Dolin, and Z. L. Krylov, studying the radiolysis of aqueous solutions saturated by nitrogen under pressure, came to the conclusion that the experimentally observed yields of F^{+2} and Fe^{+3} are related to the reaction $H + H^+ \rightleftharpoons H_2^+$.

V. S. Lapik, Z. I. Fedorovich, and A. M. Kabakchi presented a proposal to the effect that in the radiolysis of solutions of sodium nitrate (1 mole/liter greater than the concentrated solutions) the increase in yields of nitrate and molecular hydrogen are related to "direct" action of radiation. L. G. Bugayenko also came to an analogous conclusion upon the study of the reduction of the perchlorate ion in aqueous solutions.

This point of view was subsequently also revealed in a survey paper by M. A. Proskurnin concerning radiation-chemical changes of organic components in aqueous solutions. Among other facts contained in this paper considerable interest was shown by V. A. Sharpatyy and Yu. N. Molin to the uniting of the OH radical with the nitrate ion, with the formation of an ion-radical (in the frozen-in /zamorozhenny/ condition).

Evidently, the reaction of the ion with the radical, forming the ion-radical, can proceed without an energy of activation. V. A. Sharpatyy and Yu. N. Molin studied also the formation of radicals in the course of the radiolysis of liquid water by means of an admixture of a water-soluble free radical (forming from potassium peroxyamindisulfonate).

In several cases maxima were detected in the kinetic curves of the accumulation of the free radical, which, as the authors indicate, signifies the important role of reversible reactions in the course of radiolysis.

Ye. V. Barelko, L. I. Kartasheva, and M. A. Proskurnin indicated that the role of the aqueous phase in the radiation-chemical oxidation of benzene is not bound by sensibilization of its process of radiational initiation, but is essential also for the development of the further stages of the process, in particular, the branching of the chain. If in this reaction, the sensibilizing role of water is very considerable, then it is essentially less for the radiolysis of alcohol, as is shown by P. N. Komarov, Ye. V. Barelko, and M. A. Proskurnin. The indicated difference between these reactions is related, in particular, to the fact that the addition of radicals does not take place for alcohols.

In a number of papers (authored by M. A. Proskurnin, V. D. Orekhov, V. V. Sarayeva, A. I. Chernova, A. V. Vannikov, A. A. Zansokhova, S. A. Safarov, and B. F. Bogatnikov) the large role was noted of ion-radicals forming in aqueous solutions in the reactions of H and OH radicals with anions of dissolved substances. Evidently, the role of the ion-radicals in reactions in aqueous solutions has been recognized at the present time by the majority of investigators.

Radiation-Chemical Reactions in Heterogeneous Systems with the Participation of Solid Bodies

Four papers [see note 7] were heard at the conference in this field of radiation chemistry, which is intimately related to several problems in catalysis.

(/Note/ The paper of B. L. Tsetlin and others, devoted to polymerization, is examined in the section "Radiation Polymerization.")

D. M. Shub, V. P. Belokopytov, and V. I. Veselovskiy studied the radiation-chemical decomposition of an oxygen-saturated aqueous solution of potassium oxalate in the presence of a zinc oxide suspension. The radiation-chemical consumption -- $G(K_2C_2O_4)$ is 2.8 in the homogeneous system, and in the heterogeneous system studied at 4.7 mole/100 ev (in the calculation of energy absorption of the entire system). It is assumed that the heterogeneous radiation-chemical process is based upon the transmission of the energy of the electronic excitation of the semiconductor to the solution components. Here two processes are assumed: 1) the capture of the excited electron of

of the ZnO by an oxygen molecule with the formation of an O_2^- ion, and 2) the decomposition of the oxalate ion on the surface of the ZnO with its further decomposition and formation of final reaction products. The authors note that the processes of heterogeneous sensibilization can be one of the main approaches for increased efficiency in the utilization of the energy of nuclear radiation in chemistry.

M. A. Proskurnin, A. S. Baberkin, and N. P. Krushinskaya studied radiation-chemical changes of an aqueous solution of CCl_4 in the presence of Al_2O_3 , Fe_2O_3 , silica gel, activated carbon, and Cu_2O , the activity of which as relates to the formation of the Cl^- ion increases in the order given.

Yu. A. Kolbanovskiy, L. S. Polak, and E. B. Shlikhter studied the radiolysis of a system of oxide catalyst-hydrocarbon adsorbed on its surface. It was established that the reaction rate in heterogeneous radiolysis is increased only upon the attachment of a monolayer substance to the surface, and all the remaining layers account for a uniform rate for the homogeneous process. The authors associate the increase in reaction rate to the transmission of energy absorbed by a solid body that is adsorbed on the surface of the substance. It was indicated that the activity of various catalysts is linearly on the probability of such a transmission. The authors disclosed also a correlation between the spectra of EPR of the systems indicated and their activity in heterogeneous radiolysis.

Action of Radiation on Organic Substances

A. Radiolysis of hydrocarbons. A number of papers in this section were devoted to a study of the radiolysis of hydrocarbons -- a model reaction for the radiation chemistry of organic substances. The achievements and problems of the radiolysis of hydrocarbons were emphasized in an analysis in the introductory paper by L. S. Polak.

Studies of radiolysis at higher temperatures were reported on by A. M. Brodskiy, K. P. Lavrovskiy, V. B. Titov, A. V. Topchiyev, V. Ye. Glushnev, L. S. Polak, V. D. Timofeyev, N. Ya. Chernyak, V. I. Spitsyn, I. V. Vereshchinsk, P. Ya. Glazunov, G. G. Ryabchikovaya, and G. K. Sibirskaya.

At the present time it must be considered as established that the radical reaction of radiolysis at higher temperatures is a radical-chain reaction. Owing to this, the radiation-chemical yield of processes is substantially increased. Inhibition in the liquid phase process is still very effective, and this effect is especially noticeable in

the study of the yield of a heavy radical. In the gases of vapor-phase radiolysis a significant content of unsaturated substances is noted, since the amount of hydrogen sharply diminishes in comparison with low-temperature processes. The basic explanation for the observed regularities is related to the fact that at increased temperature (in this field, when thermal cracking hardly takes place at all) the radiation-regenerated free alkyl radical remain unstable the more shortly, which are already free to react with the original molecules, again forming radicals which again undergo decomposition.

Reports were made on the radiolysis of frozen-in /zamorozhennyye/ and solid hydrocarbons by V. G. Nikol'skiy, N. Ya. Buben, I. M. Kustanovich, L. S. Polak, N. M. Rytova, V. G. Berezkin, V. A. Shakhrai, A. T. Koritskiy, V. N. Shamshev, Yu. N. Molin, I. I. Chkheidze, V. V. Voyevodskiy, V. K. Yermolayev, Ye. L. Frankevich, and V. L. Tal'roze.

During radiolysis in the frozen-in state the concentration of free radicals linearly increases with the amount of absorbed energy up to very high values of integral doses (of the order of 10^8 roentgen).

The yield of radicals in aromatic hydrocarbons with alkyl substituents is significantly decreased in comparison with normal alkanes, which indicates the transfer of energy to the phenyl ring.

In the defrosting of irradiated frozen-in hydrocarbons a glow is observed in the visible portion of the spectrum. Upon investigating the temperature dependence a correlation was found between the glow intensity and the points of release of the blocked motions. The question of the nature of this glow remains unsolved.

A final solution has also not been obtained in the problem of the causes for the appearances of EMF arising in facings of low-temperature irradiated samples of paraffin and polyethylene when heated. In the course of future studies, evidently, it will be clarified whether this effect can be related to ion traps /ionnyye lovushki/. Experiments with admixtures of unsaturated and aromatic hydrocarbons can be regarded as useful for the clarification of the nature of this interesting effect.

B. Radiation Processes in Organic Systems. In the detailed survey paper by N. A. Bakh attention was focussed on problems of radiation, oxidation, and radiational synthesis, noting that a number of processes in the field under study have promising practical utility.

N. A. Slavinskaya, S. A. Kamenetskaya, S. Ya. Pshezhetskiy, and G. F. Zhitneva, studying the kinetics of the oxidation of gaseous-phase butane, under the action of fast

electrons, established that upon irradiation the induction period is shortened, and the effective energy of activation is decreased (as a function of the dosage strength). The authors proposed that although the action of radiation is basically related to the increase in the rate of the freezing-in of active centers (atoms and radicals), a definite effect of radiation is indicated also at the stage of chain branching.

V. S. Sarayeva, N. A. Bakh, and V. I. Dakin established that the decomposition and oxidation of di-isopropyl-ether proceeds by a chain mechanism. Two areas of temperature dependence of the reaction rate were found: a field where the yield of the oxidation products is practically independent of the temperature, and a field where this temperature dependence is very strong. In the second field the rate of formation of peroxides is proportional to the root of the square of the radiation intensity $I^{1/2}$.

Yu. L. Khmel'nitskiy, I. I. Melekhonova, and V. V. Nesterovskiy established that in the oxidation of paraffin under the action of gamma-radiation the induction period disappears and the authors advanced to the conclusion that it is possible to conduct the reaction so that alcohols can be obtained as the basic products.

B. M. Mikhaylov and V. G. Kiselev studied the reaction of the oxidation of ethylene and propylene under the action of fast electrons. The reaction rate, according to the authors' observations, is slightly dependent on the temperature and in glass, aluminum, and steel is practically unchanged. In a brass chamber, the direction of the reaction changes, which is related to the catalytic action of the walls of the reaction volume. The authors assume that in the course of the process oxygen adds to the double bonds.

R. V. Dzbagatspanyan, V. I. Zetkin, and Ye. N. Zykov studied the radiational sulfoxidation of normal alkanes. The sulfoxidation proceeded with sulfur gas and oxygen gas at room temperature and under the action of gamma-radiation. The process of sulfoxidation of normal alkanes takes place according to a chain mechanism with a sufficiently high yield, which fact affords a basis to regard this process as promising of utilization in the chemical industry.

Radiation Polymerization

A study of the kinetics and products of radiation polymerization receives considerable attention in radiation-chemical studies carried out in the USSR.

The group of monomers whose polymerization has been studied has been expanded, and processes of co-polymerization and graft polymerization have been intensively studied. Seeded privityye polymers of acrylonitrile have been obtained on polyvinylchloride (Kh. U. Usmanov, U. N. Musayev, and R. S. Tillayev), acrylonitrile and acrylonitrile in a mixture with styrene -- on natural silk and caproin (S. A. Azimov, N. V. Kordub, S. I. Slepakova, and Kh. U. Usmanov), and styrene -- on polyethylene (R. S. Klimanova, V. I. Serenkov, and N. S. Tikhomirova). Successful seeding also have been achieved for polyvinylchloride, polyacrylonitrile, and polymethylmetacrylate on the surface of such mineral particles as carbon black and the oxides of Mg, Zn, and Be (B. L. Tsetlin, S. R. Rafikov, L. I. Plotnikova, and P. Ya. Glazunov). The authors of this study propose that the initiating polymerization of the active centers occurs at the surface under the action of the radiation of ion-radicals. A radical mechanism for polymerization is suggested which corresponds to the experimentally disclosed function of the yield in dependence on $I^{1/2}$.

I. P. Barkalov, A. A. Berlin, V. I. Gol'danskiy, B. G. Dzantiyev, L. M. Kotova, and S. S. Kuz'mina reported on an investigation of the polymerization of acetylenic hydrocarbons.

In contrast to functions characteristic of the polymerization of vinyl compounds the authors note that the rate of polymerization in the liquid phase is proportional to the rate of initiation, and also that in the presence of oxygen the rate of polymerization of phenylacetylene is increased. The authors found that the energy of activation for radiation polymerization of acetylenic derivatives is low and stands at 0.7 - 1.0 kcal/mole. It is proposed that instead of sharply bounded processes of "opening up" and "chain extension", there takes place a single process of "attenuation" for acetylenic compounds.

In the polymerization of tetrafluoroethylene under the action of gamma-radiation in an aqueous medium, there was noted an after-effect, which is caused by long-lived macro-radicals of polytetrafluoroethylene (Ye. V. Volkova, A. V. Fokin, and V. M. Belikov).

In the study of the polymerization and co-polymerization of allylsilanes it was discovered that the structures of the polymers (according to infra-red spectra) and a number of other data made possible the assumption of a radical mechanism in these instances (A. B. Topchiyev, I. A. Lyashenko, N. S. Nametkin, L. S. Iolak, M. F. Teterina, A. S. Fel'dman, and T. I. Chernysheva).

Action of Radiation on Polymers

The problems of this field of radiation chemistry, which include a study of the modification and stability of polymeric materials in a nuclear radiation field, were treated in a paper by V. L. Karpov and Yu. S. Lazurkin.

In the study of the properties of the irradiated polymers, considerable prominence was shown to the EPR method, by means of which a large portion of investigations can be accomplished.

Yu. D. Tsvetkov, Ya. S. Lebedev, and V. V. Voyevodskiy studied the recombination fluoroalkyl and peroxide radicals in gamma-irradiated teflon, in vacuum and in the presence of oxygen, respectively. The peroxide radicals recombine at a lower temperature than do the fluoroalkyl radicals.

From the kinetic curves two areas were clearly seen having different rates of recombination, which correspond to recombination in the crystalline and to recombination in the amorphous phases.

With the aid of these data it was possible to evaluate the degree of crystallinity of the sample. The constants of the recombination rates of peroxide radicals in the crystalline and in the amorphous phases were determined, along with those for the fluoroalkyl radicals in the crystalline phase.

In a study of the spectra of EPR of oriented irradiated polyethylene (A. G. Kiselev, M. A. Mokul'skiy, and Yu. S. Lazurkin) ten components were discovered instead of the six components of an isotropic sample. Upon irradiating the oriented polyethylene at 40 - 50°, there was established in the spectrum of EPR the formation of an alkyl radical. These data signify the large differences in the behavior of oriented as contrasted to isotropic polymers.

Studying infra-red spectra of polyethylene, irradiated by fast electrons at low temperature, N. A. Slovo-khotova, A. T. Koritskiy, N. Ya. Buben, V. V. Bibikov, and G. V. Rudnaya arrived at the conclusion that the origin of the double bonds of the type $-\text{CH}=\text{CH}_2$ and $\text{C}=\text{CH}_2$ is related to the migration of energy along the polymeric chain.

An original method for bonding teflon and other polymeric materials was discussed by I. M. Barkalov, V. I. Gol'danskiy, B. G. Dzantiyev, and Ye. V. Yegorov. The method is based on the localization of the action of irradiation on a surface which is treated by boron compounds. Then a (n, alpha)-reaction proceeds on the surface until a large radiation density occurs in a layer with a thickness of the order of 10^{-3} cm, which secures an effective radia-

tional bonding not accompanied by destruction of the polymeric bulk.

Action of Radiation on the Solid State

V. I. Snitsyn, I. Ye. Nikhaylenko, and V. V. Gromov discussed changes in the sorption capacity and rate of isotopic exchange for several sulfates upon introducing into their composition radioactive isotopes.

V. B. Kazanskiy, G. B. Pariyskiy, and V. V. Voyevodskiy detected on the surface of irradiated silica gel, from a spectrum of EPR, atomic hydrogen and studied its vaporization [otzhig] at -120 - -150° . It was established that in an atmosphere of oxygen and ethylene the rate of vaporization increases by several times, which witnesses to the fact of its chemical reaction with H atoms on the surface of the silica gel (in an atmosphere of ethylene the formation of the ethyl radical was established).

S. V. Starodubtsev and I. M. Blaunshteyn detected changes in the magnetic properties of BaO and CuCl under the action of gamma-irradiation, which according to the opinion of the authors testifies to the strong effect of the foreign oxygen atoms formed as the result of radiolysis on the electron structure of the semiconductor (BaO) and on the formation of new paramagnetic centers (CuCl_2 , CuOCl , and CuO) in the CuCl.

I. A. Myasnikov made a report on preliminary experiments for the utilization of semiconductor probes for the determination of free radical concentration in a study of radiation-chemical processes. The method is based on the fact that the adsorption of radicals on the surface of the semiconductor changes its electrical conductivity.

S. M. Brekhovskikh, I. D. Tykachinskiy, S. A. Zentsova, I. V. Vereshchinskiy, A. A. Revina, and A. D. Grishina discussed the production of new types of glass which do not give an EPR signal after irradiation and which, because of this, are convenient for a study of radicals formed under the action of irradiation using an EPR method.

These are the basic materials discussed at the Second All-Union Conference on Radiation Chemistry in the field of the mechanism and kinetics of radiation-chemical processes.

The conference indicated that the scope of radiation-chemical studies in the USSR has been expanded both as to geography and as to subject matter, that the investigations are penetrating ever more deeply into the field of elementary processes, and that, finally, a number of achievements of radiation chemistry have promise for technical application.

Along with this, it should not be left unmentioned that the program of the conference was somewhat overburdened (an average of 25 papers per day), which significantly hindered the organization of discussions, though they were conducted with enthusiasm and according to regulations.

A considerable amount of work was carried out by the organizing committee of the conference (chairman: N. A. Bakh), which is readying publication of the conference report at the present time.

In conclusion, we note that three papers were presented by the Institute of Chemical Kinetics and Combustion of the Siberian Division of the Academy of Sciences USSR. We hope that these first reports will be the beginning of great studies which will find development in the Siberian Division of the Academy of Sciences USSR.

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Yu. A. Kolbanovskiy