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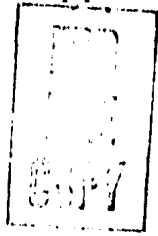
**UNCLASSIFIED- SCIENTIFIC INFORMATION
REPORT**

9 SEPTEMBER 1960

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CENTRAL INTELLIGENCE AGENCY

SCIENTIFIC INFORMATION REPORT



9 September 1960

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PLEASE NOTE

This report presents unevaluated information extracted from recently received publications of the USSR. The information selected is intended to indicate current scientific developments and activities and is disseminated as an aid to research in the United States.

SCIENTIFIC INFORMATION REPORT

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I. BIOLOGY

Phytopathology

1. Typhula Fungi as Plant Disease Agents

"Fungi of the Typhula Genus in the USSR," by Ye. G. Potatosova; Moscow-Leningrad, Botanicheskiy Zhurnal, Vol 45, No 4, Apr 60, pp 576-572

Phytopathologists in the USSR have in recent years discovered a new snow mold which affects winter grain crops, alfalfa, clover, and other crops. The disease, as revealed by investigations, is caused by fungi of the Typhula genus. The article describes the species, growth, morphology, and pathogenic properties of the fungi of the Typhula genus which are a part of the USSR flora.

II. CHEMISTRY

Analytical Chemistry

2. Determination of Ozone at High Concentrations

"Determination of High Concentrations of Ozone," by N. M. Morozov, Physical Chemistry Institute; imeni L. Ya. Karpov; Moscow, Zhurnal Analiticheskoy Khimii, Vol 15, No 3, May-Jan 60, pp 367-368

The use of known methods for the determination of ozone is difficult when its concentrations are high. A method for the determination of high concentrations of ozone is described in this article using the reaction of ozone with KI in the presence of a buffer solution (pH~7), but the absorption is carried out in an evacuated weighed flask. Due to this more favorable conditions for absorption of ozone are created and cutting down of other reactions is secured. The determination of the weight of the mixture analyzed instead of measuring its volume eliminates errors connected with fluctuations of temperature and pressure, effects due to dissolution, etc.

Fuels and Propellants

3. Velocity of the Combustion of Ozone-Oxygen Mixtures

"Velocity of the Combustion of Ozone-Oxygen Mixtures," by N. A. Slavinskaya, V. Ye. Kazakevich, S. A. Kamenetskaya, V. M. Cherednichenko, and S. Ya. Pshezhetskiy, Physical Chemistry Institute imeni L. Ya. Karpov; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 5, May 60, pp 973-976.

In work done by S. A. Kamenetskaya and S. Ya. Pshezhetskiy, it was shown that the critical conditions of the ignition of ozone and of mixtures of ozone with oxygen correspond to the kinetics of the slow reaction of the decomposition of ozone (Zhurnal Fizicheskoy Khimii, Vol 32, 1958, p 1192). The calculated values of the lower limit and of the ignition criterion arrived at on the basis of N. N. Semenov's theory of thermal ignition proved to be in satisfactory agreement with the values corresponding to kinetic data determined by S. Ya. Pshezhetskiy and others (Zhurnal Fizicheskoy Khimii, Vol 33, 1959, p 2306). To determine whether there is also conformity between the velocity of the combustion of ozone and the kinetics of its slow decomposition, the velocity of the combustion of ozone-oxygen mixtures in a horizontal tube was measured by a photoelectric method. Calculations showed that there is a correspondence between the kinetics of the slow decomposition of ozone and the velocity measured by this method.

It was furthermore found that the relationship between the velocity of combustion and the composition, calculated approximately by means of Zel'dovich-Frank-Kamenetskiy-Semenov equations, corresponds to experimental results, the calculated absolute values being somewhat lower than the measured ones.

Data reported by A. V. Grosse and T. Karman are compared with those obtained by the authors.

The paper was submitted for publication on 25 May 1958.

4. Interaction of Ethyl Radicals With Molecular Oxygen

"Kinetics and Mechanism of the Interaction of Ethyl Radicals With Molecular Oxygen," by L. I. Avramenko and R. V. Kolesnikova, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 5, May 60, pp 806-811

The absolute values have been determined of the velocity constants of recombination of ethyl radicals at a constant pressure of 4.2 mm and temperatures in the range of 349-575°K. Furthermore, the absolute values have been determined of the velocity constants of the reaction of ethyl radicals with molecular oxygen at the same pressure and different temperatures in the range of 349-575°K.

5. An Arrangement for Determining Temperatures as a Function of the Height of a Tongue of Flame

"An Arrangement for Determining Temperatures as a Function, of the Height of the Tongue of a Gunpowder Flame," by F. F. Pokhil, V. M. Mal'tsev, and L. N. Gal'perin, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 5, May 60, pp 1131-1132

The design and construction of an arrangement are described by means of which one can determine the true temperature (in the range of 1300-3000°) from the height of the tongue of a gunpowder flame (actually the height of the point of minimum absorption or maximum transparency) as it is affected by the pressure. The temperature relationships are investigated by the method of the blue-red absorption ratio as applied to a flame which emits a continuous spectrum in the visible range. The experimental results obtained are in agreement with new concepts in regard to the combustion of gunpowder (nitroglycerin powder) which had been advanced by the authors in earlier publications (cf., Doklady Akademii Nauk SSSR, Vol 127, 1959, No 1; Vol 132, 1960, No 3).

6. Combustion of the Smoke-Gas Mixture Evolved By Nitroglycerin Powder

"Combustion of the Smoke-Gas Mixture Evolved By Powder," by V. M. Mal'tsev and P. F. Pokhil, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 132, No 3, 21 May 60, pp 646-648

The physical properties of nitroglycerin powder flames were investigated on the arrangement described by A. N. Gal'perin, V. M. Mal'tsev, and P. F. Pokhil in Doklady Akademii Nauk SSSR, Vol 127, 1959, p 131. To determine the concentration by weight of the smoke-gas mixture, the absorption at the wave lengths of 4050, 4950, 6700, and 7710 Å was determined at 0.1 mm intervals along the height of the flame. A powerful xenon lamp was used as the light source. It was established that in the pressure range of 20-50 atmospheres the flame can be subdivided into three zones: (1) from the surface of the flame to point K_0 (the point at which absorption is at a minimum); (2) from point K_0 to point K_1 (the point at which the absorption capacity assumes a constant value); and (3) the zone of maximum temperature. Characteristic for all three zones is reduction of the absorptive capacity of the flame with increasing wave lengths and reduction of the geometric dimensions of the zones with increasing pressures. On the basis of data obtained by measurements of the absorptive capacity, the concentration by weight of the smoke-gas mixture along the height of the flame can be estimated. Curves showing weight concentrations of the smoke-gas mixture along the height of the flame at pressures of 20, 30, 40, and 50 atmospheres are given (Fig 2, p 647).

7. An Improved Method of Blasting

"Control of Explosions," TASS dispatch; Moscow, Ekonomicheskaya Gazeta, No 48 (720), 26 Jul 60, p 4

A new method of applying explosives in blasting (to open up deposits of ores or in connection with the construction of canals) was developed by N. V. Mel'nikov, Corresponding Member, Academy of Sciences USSR, and L. N. Marchenko, Candidate of Technical Sciences, in work done at the Institute of Mining, Academy of Sciences USSR. By employing the method in question, the efficiency of explosives can be increased by 40%.

Up to now, the opinion was held that the charge must completely fill the hole (charge chamber) made in the rock or soil. Mel'nikov and Marchenko proposed that an air cushion be provided between the explosive and the walls of the hole in which the explosive is placed. By using this method, a considerable amount of energy can be saved which was formerly wasted in dispersing the rock in the immediate vicinity of the charge and also the charge itself. When an air cushion is provided, the energy of the explosion is distributed over a greater mass of rock, which is broken up into small pieces that are projected with a great force out of the site of the explosion.

Testing of the new method of blasting showed that conducting the explosion with an air cushion increases the volume of the funnel almost by a factor of 1.4. The depth of the funnel produced by the explosion increases on the average by 40%. The cost of blasting is reduced by approximately 20-30%. The inventors also succeeded in designing a charge which makes it possible to achieve a more uniform size distribution as far as the dimensions of the pieces of ore or coal are concerned. This is very important from the standpoint of facility of transportation and ease of subsequent treatment of useful minerals.

In the work described a method has been developed which increases the efficiency of blasting because of the application of an improved design of the charge. By using different thicknesses of the air space, the explosion can be controlled more perfectly and its efficiency can be improved.

8. New Measures Proposed For the Elimination of Corrosion in Internal Combustion Engines

"An All-Union Conference on the Elimination of Corrosion of Parts of Internal Combustion Engines and Gas Turbine Installations," by M. S. Komskiy; Khimiya i Tekhnologiya Topliv i Masel, Vol 5, No 7, Jul 60, pp 70-72

The All-Union Conference mentioned in the title was held on 22-25 March 1960 at Novokuybyshevsk. It was organized by the All-Union Council of Scientific and Technical Societies (VSNTO), the State Scientific Technical Committee of the USSR (GNTK SSSR), the Central Administration of the Scientific-Technical Society of the Petroleum and Gas Industry (TsP NTO NGP), and the Kuybyshev Sovnarkhoz.

In a report presented at the meeting introduction of gaseous ammonia during the operation of diesel engines running on fuel that has a high sulfur content was recommended.

At meetings of the section on the use in gas turbines of fuels with a high content of vanadium, several papers were presented dealing with the best methods of employing fuel with a high vanadium content and also with the production of fuels having a low vanadium content. The papers dealing with the application in gas turbines of fuels with a high vanadium content discussed problems pertaining to vanadium corrosion and the application of special protective coatings to prevent this type of corrosion. A recommendation was made to introduce on a larger scale thermo-diffusion methods for the application of chromium and silicon coatings to gas turbine parts so that these parts would be protected from vanadium corrosion.

9. The Kinetics and Mechanism of Methane Oxidation

"The Kinetics and Mechanism of Methane Oxidation, II. Kinetics of Accumulation of Intermediate Products," by L. V. Karmilova, N. S. Yenkolopyan and A. B. Nalbandyan; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 5, May, 60, pp990-994

Hydrogen peroxide in addition to formaldehyde has been shown to form in the oxidation of methane in a HF treated quartz vessel at 423-513°C. Formaldehyde has been shown to be a primary intermediate and the peroxide to form from oxidation of the formaldehyde.

The maximum yield of formaldehyde has been found to be a linear function of the initial pressure of the reaction mixture and to be independent of the oxygen concentration in the mixture over a wide range of pressures.

The activation energy of formaldehyde formation has been determined ($E_{\text{CH}_2\text{O}} \sim 7.8$ Kcal/mol). The relative yield of hydrogen peroxide has been shown to fall with increase in temperature.

10. The Thermal Cracking of Methane

"The Thermal Cracking of Methane," by P. S. Shantarovich and B. V. Pavlov, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 5, May, 60, pp 960-965

The kinetics of the initial stages of the thermal cracking of methane have been studied at 1200-1400°C, methane pressures 0.2-3.4 mm Hg and contact times of the order of 10^{-3} - 10^{-2} sec, using a flow method. It has been shown that under such conditions this is a heterogeneous autoaccelerating reaction. The primary product is ethane, the secondary, ethylene. Autoacceleration is due to a monomolecular reaction, presumably the heterogeneous decomposition of methyl radicals.

11. Electrical Theory of Ozonizers

"Electrical Theory of Ozonizers, VII. The Effect of the Formation of Ozone on the Volt-Ampere Characteristics of Ozonizers," by Yu. M. Yemelyanov and Yu. V. Filippov, Moscow State University; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 5, May 60, pp 1083-1087

The effect of the formation of ozone in ozonizers on their volt-ampere characteristics has been investigated oscillographically. The burning potential of the discharge in ozonizers increases linearly with

increase in concentration of the ozone. With increasing voltage a change also takes place in the effective capacitance of the ozonizer barriers found with the aid of the dynamic charge-voltage characteristics.

The change in the effective capacitance of the ozonizer barriers may be explained by the gradual spread of the charge over the surface of the ozonizer electrodes, which also leads to distortion of the static volt-ampere characteristics.

Herbicides

12. N-Phenyl-N-Oxy-N¹, N-Dimethyl Urea To Combat Weeds

"A Method of Controlling Weeds," by N. N. Mel'nikov and Yu. A. Baskakov: Author's Certificate No. 126690; Moscow, Byulleten' Izobreteniy, No 5, 1960, p 54

The Author's Certificate granted to the above named persons states that N-phenyl-N-hydroxy-N¹, N-dimethyl urea, a herbicide, can be used to control weeds either in aqueous solution, suspensions, emulsions, or solutions in organic solvents.

Inorganic Chemistry

13. New Methods For the Synthesis of Nitrosyl Fluoride

"Synthesis of Nitrosyl Fluoride and Some of Its Properties," by G. A. Sokol'skiy and I. L. Knunyants; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 5, May 60, pp 779-783

A new method for the synthesis of nitrosyl fluoride has been developed which consists in the decomposition of a mixture of nitrosonium pyrosulfate and potassium fluoride. Continuous fluorination of nitrogen oxide (NO) in the gas phase was found to be of advantage as a method of synthesizing large quantities of nitrosyl fluoride. The corrosive action of liquid nitrosyl fluoride on some metals and alloys was investigated. It was found that electrolytic nickel and the chromium-nickel steel 1Kh18N9T have the highest corrosion resistance to the action of nitrosyl fluoride.

Nuclear Fuels and Reactor Construction Materials

14. Book on the Conversion of Uranium Concentrates Published

Tekhnologiya Pereabotki Kontsentratov Urana (Technology of the Conversion of the Uranium Concentrates), by N. P Galkin, A. A. Mayorov and Yu.V. Veryatin, (unsigned review); Moscow, Atomnaya Energiya, Vol 8, No 6, Jun 60, p 583.

This book was published by Atomizdat at Moscow in 1960. It has 162 pages and its price is 6 rubles 50 kopecs. A brief review of the development of the uranium industry is given in it. General information is outlined on hydrometallurgical processes for the extraction of uranium from crude ores, the available deposits of uranium ores, and the scope of production and applications of uranium. Particular attention is paid to the technology of conversion of uranium concentrates to pure salts and metallic uranium.

Methods are given for the preparation and production of the most important uranium compounds. Their chemical and physical properties are listed. Technological processes applied in different countries for the production of metallic uranium are discussed. One of the chapters deals with safety procedures to be applied in the purification of chemical uranium concentrates.

The book is to serve the needs of persons active in the uranium industry and at scientific research organizations. It can be used at educational institutions in the training of specialists in these fields.

15. Nonmonotonous Changes in the Chemical Properties of Oxygen-Containing Ions of Pentavalent Actinides With the Increase of the Order Number of Elements

"Concerning the Nonmonotonous Changing of the Chemical Properties of Oxygen-Containing Ions of Pentavalent Actinides With the Growth of the Order Number of the Elements," by Yu. A. Zolotov; Leningrad, Radiokhimiya, Vol 2, No 2, Apr 60, pp 192-196

Comparison of the behavior of ions in the sequence UO_2^{+} - AmO_2^{+} made it possible to establish that there are nonmonotonous changes of some properties of these ions with the growth of the order number of the elements. It was found that there is a noticeable similarity between ions of pentavalent uranium and plutonium, on the one hand, and ions of pentavalent neptunium and americium on the other hand.

16. A Chromatographic Method For the Separation of Niobium From Tantalum

"Separation of Niobium From Tantalum By a Chromatographic Adsorption--Complex Formation Method," by L. S. Aleksandrova and K. V. Chmutov, Institute of Physical Chemistry, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 5, May 60, pp 801-805

Because niobium and tantalum almost always occur together in ores and are present as titanotantaloniobates or niobotantalates of alkali, alkaline earth, or rare earth metals in ore concentrates, the separation of these two metals from each other is of importance. A chromatographic adsorption-precipitation procedure is described for the separation of niobium from tantalum in a column filled with activated carbon that has been saturated with phenylarsonic acid. The initial mixture consisted of niobium and tantalum oxalate complexes contained in a solution in which hydrochloric acid was present. Separation of this mixture at 95° resulted in complete retention of the tantalum in the column, while the niobium went through with the filtrate. Eventual application of this method, possibly with the use of other precipitants, is regarded as promising.

17. Chromatographic Separation of Hafnium and Zirconium and the Determination of Hafnium by the Isotope -Dilution Method

"Chromatographic Separation of Hafnium and Zirconium and the Determination of Hafnium by the Isotope-Dilution Method," by G. M. Kolosova, Ch'eng Yuan-p'ang, and M. M. Senyavin, Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Academy of Sciences USSR; Moscow, Zhurnal Analiticheskoy Khimii, Vol 15, No 3, May-Jun 60, pp 364-366

A method is proposed for the determination of hafnium in the presence of zirconium involving their separation with a cation-exchange resin and the use of the isotope-dilution method.

The results for various mixtures are in good agreement with the data of X-ray spectral analysis. The mean experimental error is 5-7% (relative).

18. Analysis of Certain Zirconium-Base Alloys

"Analysis of Certain Zirconium-Base Alloys," by S. V. Yelinson, L. I. Pobedina and N. A. Mirzoyan; Moscow, Zhurnal Analiticheskoy Khimii, Vol 15, No 3, May-Jun 60 pp 334-338

Extraction of zirconium from 1 N sulphuric acid with a chloroform solution of nitrosophenylhydroxylamic acid is proposed. It has been shown that by two-fold extraction, the quantitative transfer of zirconium into chloroform can be achieved, whereas the total quantity of aluminum, beryllium, magnesium and other elements remains in aqueous solution.

The method can be applied for the determination of aluminum, beryllium, uranium, magnesium and zinc in zirconium and in zirconium-base alloys.

19. Spectrographic Determination of Uranium by the Method of Isotope Additions

"Spectrographic Determination of Uranium by the Method of Isotope Additions," by N. P. Ivanov; Moscow, Zhurnal Analiticheskoy Khimii, Vol 15, No 3, May-Jun 60, pp 315-320

Precision-increasing modifications are described of the optical spectral method of isotope additions which is used for the determination of uranium in ores and by-products.

It has been shown that in carrying out the analysis by the equal blackening method there is no necessity to take into consideration the background, the properties of the photo-emulsion, and the effects of re-absorption. The latter gives the possibility to determine uranium in ores with the accuracy of $\pm 1 - 2\%$ irrespective of the type of their uranium mineralization and the composition of the enclosing rocks.

A method of two isotopes is discussed in detail. It has been shown that by using this method it is possible to analyze samples containing large quantities of calcium, tungsten, and certain elements which have multiline spectra (thorium, rare-earths, etc). The method is rapid and sufficiently accurate.

20. Photometric Determination of Micro-Quantities of Uranium With Arsenazo III

"Photometric Determination of Micro-Quantities of Uranium With Arsenazo III," by V. F. Lukyanov, S. B. Savvin and I. V. Nikol'skaya; Moscow, Zhurnal Analiticheskoy Khimii, Vol 15, No 3, May-Jun 60, pp 311-314

A rapid method for the determination of microquantities of uranium has been developed. The method is based on the formation of colored compounds of tetravalent uranium with arsenazo III in a 4 N HCl medium. The reduction of uranium is carried out by means of granulated zinc in the presence of ascorbic acid. The sensitivity of the method is 0.04 μ /ml of uranium. The limiting concentration of uranium which can be determined in the test material is 0.002%. Most accompanying elements do not interfere (thorium is an exception). Zirconium can be selectively masked by means of oxalic acid.

21. Photometric Determination of Small Amounts of Thorium With Arsenazo

"Photometric Determination of Small Amounts of Thorium With Arsenazo," by V. I. Kuznetsov and I. V. Nikol'skaya, Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Academy of Sciences USSR; Moscow, Zhurnal Analiticheskoy Khimii, Vol 15, No 3, May-Jun 60 pp 299-305

A method has been developed for the determination of 1×10^{-4} to 1×10^{-2} % of thorium in 0.5 - 1.0 g samples.

A solution of rare-earth nitrates is added to the sample which is then decomposed with a mixture of HF + HNO₃. The dry residue is dissolved in 6 M HCl, diluted with water to 75 ml, and thorium is coprecipitated with rare-earth oxalates by adding oxalic acid. The procedure is repeated twice. The oxalates are decomposed by means of a mixture of HClO₄, HNO₃ and HCl, arsenazo is added, and the photometric measurement is carried out at a pH of 1.9 with the use of a spectrophotometer at 580 m μ or visually by the method of standard series.

It is possible to determine 1 to 175 μ of thorium without using an aliquot.

22. Photometric Determination of Yttrium With Stilbazo

"Photometric Determination of Yttrium With Stilbazo," by L. S. Serdyuk and G. P. Fedorova, Dnepropetrovsk State University; Moscow, Zhurnal Analiticheskoy Khimii, Vol 15, No 3, May-Jun 60, pp 287-290

The reaction of yttrium with stilbazo has been investigated at pH 7.0. The composition of the complex formed during the reaction has been established by the method of isomolar series. The effect of some foreign ions and masking substances on this reaction has been studied. The possibility has been shown of using this reaction for the colorimetric determination of yttrium in the absence and in the presence of lanthanum.

23. Radioactivation Method for Determining Beryllium in Mineral Raw Materials and Hydrometallurgy Products

"Radioactivation Method for Determining Beryllium in Mineral Raw Materials and Hydrometallurgy Products," by Kh. B. Mezhiborskaya; Moscow, Zhurnal Analiticheskoy Khimii, Vol 15, No 3, May-Jun 60, pp 281-286

A design of the installation and gamma-source for determining beryllium by the radioactivation method is described.

The influence of some effects distorting the results of the analysis (such as self-absorption of photoneutrons, absorption of gamma-rays) is considered and recommendations are given as to the elimination of errors caused by these effects.

24. Separation Factors of Boron Isotopes in the Equilibrium Vaporization of BF₃

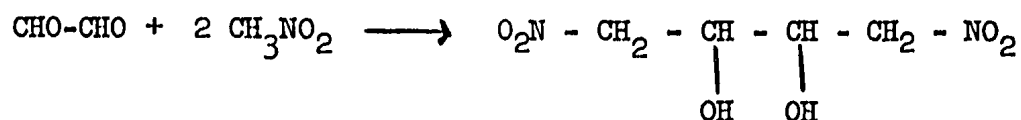
"Separation Factors of Boron Isotopes in the Equilibrium Vaporization of BF₃," by N. N. Sevryugova, O. V. Uvarov and N. M. Zhavoronkov; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 5, May 60, pp 1004-1008

The temperature dependence of the isotope separation factor of boron in the equilibrium vaporization of BF₃ has been determined at 157 to 168° by the Raleigh distillation method. The following equation for this dependence is given: $\alpha = 1.0488e^{-6.17/T}$. Within the above range of temperatures the volatile component is B¹¹F₃.

Organic Chemistry25. A Method For the Preparation of 1,4-Dinitrobutadiene-1,3

"A Synthesis of 1,4-Dinitrobutadiene-1,3," by S. S. Novikov, N. S. Korsakova, and K. K. Babiyeviskiy, Institute of Organic Chemistry, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 5, May 60, pp 944-945

In earlier work done by the authors (Doklady Akademii Nauk SSSR, Vol. 125, 1959, p 560, and Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, 1959, p 1480; 1959, p 1847) the reactivity of 1- and 2-nitroalkenes in Michael's condensation was investigated. It appeared of interest to investigate reactions of this type using nitrodienes. Published information on the synthesis of nitrodienes is very meager. For this reason, a procedure for the synthesis of 1,4-dinitrobutadiene-1,3 was developed. Glyoxal was condensed with two molecules of nitromethane to form 1,4-dinitrobutanediol-2,3, as shown in the following equation:



The total yield of 1,4-dinitrobutanediol-2,3 was improved, as compared with published data. Furthermore, the two diastereoisomers of this dinitrodiol were separated, with the result that a product melting at 134° was obtained in a quantity corresponding to 40.5% of the theoretical yield and another product melting at 89.5 - 90° in a quantity corresponding to 40% of the theoretical yield. The two isomers were acetylated separately with acetyl chloride to the corresponding diacetates. Boiling of 1,4-dinitro-2,3 - diacetoxybutane in dry chloroform in the presence of anhydrous potassium bicarbonate resulted in the formation of 1,4-dinitrobutadiene-1,3 (m. pt. 146.5-147°). The conversion to 1,4-dinitrobutadiene - 1,3 was quantitative.

26. Nitrocompounds in Diene Syntheses

"Nitrocompounds in Diene Synthesis," by S. S. Novikov, G. A. Shvekhgemyer, and A. A. Dudinskaya, Institute of Organic Chemistry, Academy of Sciences USSR; Moscow, Uspekhi Khimii, Vol 29, No 2, Feb 60, pp 187-219

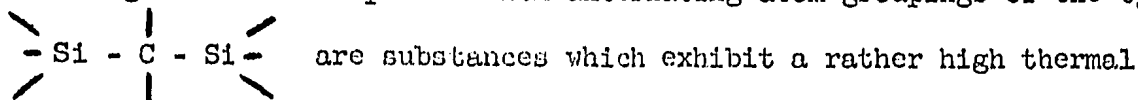
The mechanism of the Diels-Alder reaction, nitrodienes in diene syntheses, nitrodiolenes in diene syntheses, and methods for the hydrogenation and reduction of addition products obtained in this type of syntheses are discussed. Work in this general field is reviewed, mainly

on the basis of non-USSR publications. A paper by S. S. Novikov, G. A. Shvekhgemyer, and A. A. Dudinskaya to be published in Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk is mentioned, in which the synthesis of compounds exhibiting insecticidal activity is described. These compounds were prepared by the addition of nitroethylene, 2-nitroethyl ester of acrylic acid, 2,2-dinitropropyl ester of acrylic acid, 2,2,2-trinitroethyl ester of acrylic acid, and 2,4,6-trinitrophenyl ester of acrylic acid to hexachlorocyclopentadiene.

27. Organosilicon Compounds Containing Phenylene

"Organosilicon Compounds Containing Phenylene," by V. S. Chugunov, Institute of Silicate Chemistry, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 5, May 60, pp 942-943

Organosilicon compounds with alternating atom groupings of the type



stability and distill without decomposition at high temperatures. Compounds containing a phenylene group between two silicon atoms have a particularly high heat stability. By the condensation of sodium triphenylsilanolate with symmetrical tetramethyldichlorosilyl-1,4-phenylene, bis-(triphenylsiloxy) tetramethyldisilyl-1,4-phenylene has been synthesized for the first time. This is a crystalline substance with a melting point of 237-238°, which distills without decomposition at 465-475°.

28. Rapid Method for Quantitative Determination of the Total Amount of Isomers of DDT and Hexachlorocyclohexane

"An Accelerated Method for the Quantitative Determination of the Sum-Total of Isomers of DDT and Hexachlorocyclohexane in a Pure Preparation and in Powders," by P. P. Suprun, Director, Konotop Analytical Control Laboratory, Sumy Oblast Pharmaceutical Administration; Moscow, Aptechnoye Delo, Vol 9, No 3, 1960, pp 19-22

An argentometric procedure for the quantitative analysis of the total amount of DDT and hexachlorocyclohexane in undiluted products and dusting powders is proposed. The basis of the method is the splitting off of organically combined chlorine in the above preparations which is effected by zinc dust in a sulfuric acid medium and the subsequent determination of the chloride ions with silver nitrate according to Volhard's method.

When this method is used there apparently occurs, first, a dissociation of DDT into chloral and chlorobenzene with the subsequent splitting off of all three chlorine atoms from chloral. Under the same conditions, in the case of hexachlorocyclohexane splitting off of all six chlorine atoms occurs.

The procedure is recommended as preferable to the method accepted at present because of its speed, convenience, fairly high accuracy and reduced consumption of ethyl alcohol.

Physical Chemistry

29. Effect of Chemical Structure of Alkylbenzenes on Their adsorbability on Silica Gel

"The Effect of the Chemical Structure of Alkylbenzenes on Their Adsorbability on Silica Gel," by Ye. A. Mikhaylova, E. N. Smirnova, V. A. Petukhova and B. A. Kazanskly; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 4, 1960, pp 824-832

Under the conditions of adsorption chromatography the adsorption of the alkylbenzenes investigated has been found to depend upon the chemical structure of the hydrocarbons and upon the nature of the solvent. Alkylbenzenes arrange themselves in a definite order with respect to diminishing adsorption capacities on silica gel, the chromatographic separation of binary mixtures of equal volumes of these compounds being better the farther in the series the components of the mixture are from each other.

It has been suggested that the order of adsorbabilities found for the alkylbenzenes is determined primarily by the adsorption potentials of the sites occupied by the adsorbed molecules, rather than by the donor-acceptor nature of the adsorption process due to the basicity of the aromatic hydrocarbons and acidity of the adsorbent or by the dipole moments of the adsorbate molecules.

30. Equilibrium States of Ti - H and Zr - H Systems at Low Pressures

"Equilibrium States of Ti-H and Zr-H Systems at Low Pressures," by V. V. Sof'ina and N. G. Pavlovskaya; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 5, May 60, pp 1104-1109

Equilibrium states of the systems Ti-H and Zr-H have been investigated over the pressure range 10^{-3} to 10^{-7} mm Hg. Isotheres, isotherms and isobars have been obtained for both systems. From these it follows that equilibrium states in the Zr-H system are 130-160°C higher or the pressures by 3-4 orders of magnitude lower than in the system Ti-H.

The heats of formation of titanium and zirconium hydrides have been calculated. They vary with the temperature, pressure and hydrogen concentration in the hydrides within the following limits: 19 to 44 kcal/mol for Ti-H and 29 to 42 kcal/mol for Zr-H. Curves for the temperature dependence of the heats of reaction for various hydrogen concentrations are presented for both systems.

Data obtained in the work described are of practical importance from the standpoint of understanding the behavior in accelerators of metal targets saturated with hydrogen isotopes. Furthermore, the application of high-vacuum pumps utilizing absorption of gases by powdered or heated titanium requires a knowledge of relationships between the temperature of the titanium layer and the pressure of residual gases.

Radiation Chemistry

31. The Effects of Ionizing Radiation On the Oxidation and Ignition of Butane

"The Effect of Ionizing Radiation On the Kinetics of the Oxidation and Ignition of Butane; Part 1, Formal Kinetics," by N. A. Slavinskaya, S. A. Kamenetskaya, S. Ya. Pshezhetskiy, and L. A. Vasil'yev, Physical Chemistry Institute imeni L. Ya. Karpov; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 6, Jun 60, pp 1169-1175

It was established that irradiation with electrons accelerates the chain reaction of the oxidation of butane, shortens the period of the induction of this reaction, and reduces the effective energy of its activation. Under the experimental conditions described, the effective energy of activation was found to drop from 45 to 15 kilocalories per mol with increasing intensities of irradiation. It is concluded that the observed effect of irradiation on the kinetics of the reaction studied is due to electron-initiated formation of active centers for a chain reaction as a result of direct ionization and excitation of molecules and also because of subsequent reactions of atomic oxygen with the hydrocarbon. Analysis of the results obtained from the standpoint of N. N. Semenov's branched chain reaction theory showed that they are in agreement with that theory. It was found that irradiation decreases the induction period of ignition (under the conditions studied, from 30 sec to 1 sec) according to a relationship which corresponds to that pertaining to the action of the radiation of the kinetics of the oxidation reaction. The ignition temperature was also found to drop (absorption of 4.4×10^{-17} eV/cm³. sec resulted in a decrease of the ignition temperature from 515° to 492°).

In the work described, changes in the reaction velocity were measured by determining the increase of pressure in time. More precise ideas on the kinetics of the reaction can be arrived at on the basis of data in regard to the composition of reaction products as it is affected by time. This data will be reported in a subsequent paper.

32. Gamma Dosimetry on the Basis of Changes in Optical Activity of Carbohydrates as a Result of Irradiation

"Gamma-Radiation Dosimetry on the Basis of Changes in the Optical Activity of Some Carbohydrates" by S. V. Starodubtsev, Sh. Ablyayev, and V. V. Generalova; Moscow, Atomnaya Energiya, Vol 8, No 3, Mar 60, pp 264-265

Measurements which have been carried out indicated that under the action of gamma radiation there is a considerable reduction of the angle of rotation of the plane of polarization in solutions of glucose and saccharose. It is proposed that such solutions be used as dosimetric liquids. Because of their greater stability, glucose solutions are preferable to saccharose solutions for this application.

33. Investigations of Aerosols Formed During Radiochemical Reactions

"Investigations of Aerosols Formed During Radiochemical Reactions," by V. S. Bogdanov; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 5, May 60, pp 1044-1049

The formation and subsequent changes of aerosols arising during the irradiation of gaseous organic substances by fast electrons under various conditions have been investigated by the light beam method. Aerosol particles formed from methane have been found to possess radii several microns long and carry both positive and negative charges from 1 to 11 elementary units, the majority (66%) being charged with from 1 to 3 units. The weight concentration and aerosol yield (molecules CH_4 per 100 eV) with respect to the absorbed energy has been investigated for aerosols obtained from methane. It has been shown that the yield in the case of ethylene is 32 times as high as the maximum achieved in the case of methane.

Information on aerosols of the type investigated is of importance in the radiation chemistry of gases, because radiation-chemical reactions take place not only in the gas phase, but also in aerosol droplets.

Radiochemistry

34. Coprecipitation of Americium and Europium With Lanthanum Oxalate

"Investigation of the Coprecipitation of Am and Eu with Lanthanum Oxalate," by V. I. Grebenshchikova and R. V. Bryzgalova; Leningrad, Radiokhimiya, No 2, Apr 60, pp 152-158

It was established that coprecipitation of Eu with lanthanum oxalate is due to combined crystallization involving the formation of mixed crystals. The magnitude of the crystallization factor does not depend on the acidity of the solution (in the range of 0.1 - 0.5 N HNO₃) and has a value of 3.8. It was observed that there was a reduction of the crystallization factor with increased concentrations of oxalate ions in the solution. The decrease of the factor is due to a reduction of the active concentration of Eu (III) because of the formation of a complex with oxalate ions which presumably takes place under the conditions involved. It follows from the values of the crystallization factors of Am (D = 4.8) and Eu (D = 3.8) which have been determined that separation of Am from Eu by fractional crystallization of lanthanum oxalate is practically impossible.

35. Coprecipitation of Y (III) With Lanthanum Oxalate

"Investigation of the Coprecipitation of Y (III) With Lanthanum Oxalate," by V. I. Grebenshchikova and R. V. Bryzgalova; Leningrad, Radiokhimiya, No 2, Apr 60, pp 159-163

It was established that Y (III) coprecipitates with lanthanum oxalate under formation of mixed crystals. The magnitude of the crystallization factor was found to be independent of the acidity of the solution within the range of 0.1 - 1.5 N HNO₃ and to be equal to 3.7. Reduction of the crystallization factor with increased concentrations of oxalate ions in the solution was observed. This can be ascribed to a reduction of the active concentration of Y (III) because of the formation of a complex with oxalate ions which is rather probable under the conditions involved. The sharp decrease in the crystallization factor of Y with increased concentrations of free oxalate ions indicate that Y has a greater tendency to form complexes than Eu (III) or Am (III).

36. Effect of the Formation of Complexes in Melts on the Crystallization Factor

"Investigation of the Effect of Formation of Complexes in Melts on the Crystallization Factors in the Systems $PbCl_2$ - Th X Cl - KCl and CaCl - CdCl - KCl," by V. R. Klokman, K. G. Myakishev, and V. S. Smirnov; Leningrad, Radiokhimiya, Vol 2, No 2, Apr 60, pp 175-182

By studying the distribution of $ThXCl_2$ and $CdCl_2$ between the melt and crystals of lead chloride and calcium chloride, respectively, it was established that formation of a complex compound with the macrocomponent in the liquid phase leads to an increased magnitude of the crystallization factor.

III. ELECTRONICS

Communications

37. Mechanisms for the Scattering of Waves in Meteor Tracks Examined

"On the Nature of Scattering of Radio Waves in Long-Lived Ionized Meteor Tracks," by V. P. Dokuchayev, Scientific Research Radiophysics Institute under Gor'kiy University; Gor'kiy, Izvestiya Vysshikh Uchebnykh Zavedeniy -- Radiofizika, Vol III, No 2, May 60, pp 199-207

Two different mechanisms for the scattering of radio waves in long-lived (stable) ionized meteor tracks are discussed and compared. The first is that developed by Herlofson, Kaiser, and Closs which proposes that a track with a high electron concentration scatters radio waves in a manner resembling a metallic cylinder. The second mechanism, developed by Booker and Cohen, suggests the presence of small-sized inhomogeneities of electron concentration in the region of the track which appear as a result of turbulent movements in the surrounding medium. Scattering of radio waves in the inhomogeneities has an incoherent character.

The author shows that a comparison of theoretical and experimental data indicates that the mechanism of incoherent scattering does not correspond to experimental data on the distribution of radio reflections in length. It is asserted that, during a large part of the time of their existence, ionized meteor tracks scatter waves according to the theory of Herlofson and Kaiser.

The author also suggests that fading of signals reflected from meteor tracks represents a quasiperiodic change in amplitude of the reflected signals and that the period of these oscillations lies between 0.1 and one second.

The author expresses his thanks to B. N. Gershman for his assistance.

38. Recent Soviet Patents in the Field of Electronics

"Class 21. Electrical Engineering" (unsigned); Moscow, Byulleten' Izobreteniy, No 10, 1960, pp 25-33

Class 21a¹, 32³⁵. No 128492. By V. M. Lyubin and I. K. Malakhov-Kamartan. Device for Transmission of Television Image in Systems of Single-Line Scanning.

Class 21a⁴, 13. No 128499. by V. M. Kandykin and G. M. Mal'ko. Semiconductor Generator of Square-Form Voltage.

Class 21a⁴, 42. No 128500. by G. F. Ignat'yev and I. M. Torgovitskiy. Phase Detector.

Class 21a⁴, 66₀₁. No 128502. by V. N. Uryadko. Vertical Linear Radiator.

Class 21a⁴, 70. No 128503. by S. E. Gorodetskiy, K. B. Norkin, and L. N. Fitsner. Device for Automatic Loading of a Radio Transmitter Output Stage.

Class 21a⁴, 71. No 128504. by N. L. Sosenskiy. Device for Measuring Small and Fast Frequency Deviations of a Frequency-Modulated Voltage with a Background of Slow and Large Frequency Changes.

Class 21e, 36₁₀. No 128535. by A. Ye. Konstantinowskiy. Device for Measuring the Time-Dependent Parameters of Telemetering and Telesignaling Equipment.

Components

39. Silicon Photocells

"Theory of Silicon Photocells," by M. Azizov and G. M. Avak'yants, Physicotechnical Institute, Academy of Sciences Uzbek SSR and Central Asian State University; Tashkent, Izvestiya Akademii Nauk Uzbek SSR, Seriya Fiziko-Matematicheskikh Nauk, No 2, 1960, pp 78-83

The absence of saturation current in silicon photocells under rectifying operating conditions is a phenomenon that has not yet been fully explained. The determination of the causes of this phenomenon is important from the standpoint of finding a means for practical control of silicon photocells.

The authors attribute the absence of saturation current to imperfection of transition at the junction of the electron-type and hole-type silicon. During the diffusion of boron into electron-type silicon, it often segregates in the vicinity of the electron-hole junction. If the concentration of the boron atoms reaches an order of 10^{20} per cu cm, the electron-hole junction becomes very abrupt and the electric field within the junction very high (of the order 10^6 v/cm), which in turn leads to tunnel leakage through the electron zone from the electron-type silicon into the hole-type silicon and vice versa. The volt-ampere characteristics of a silicon photocell were measured experimentally and plotted on a graph.

The authors conclude that, despite the anomalous reverse characteristics of the silicon photocells, a somewhat modified theory of the electron-hole transition can be successfully applied for the study of silicon photocell behavior.

40. Semiconductor Amplifiers With Relay Outputs

"Semiconductor Phase-Sensitive Amplifiers With Relay Output,"
by N. S. Nikolayenko, Leningrad Electrical Engineering Institute imeni V. I. Lenin; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy -- Priborostroyeniye, Vol 2, No 6, 1959, pp 17-22

The circuits and principles of operation of two semiconductor amplifiers with relay outputs are described. The first is a three-stage amplifier with an RP-4 polarized relay at the output and operates from a 50-cycle, 127-volt network in an ambient temperature range of -30° to $+60^{\circ}$ C. The threshold of sensitivity of the amplifier is 0.5 millivolt. The first two stages are ordinary a-c amplifiers with an amplification factor of 55 db and a common point at the emitter, and the third stage is a phase-sensitive circuit. The stages are transformer-coupled and use low power P-13 triodes.

The second amplifier is similar to the first but has two relays at the output. The amplification factor of the first stage is 30 db, and of the second stage, approximately 27 db. The last stage is phase-sensitive and is formally analogous to a phase-sensitive circuit using electron tubes. Efficiency of the circuit is 75%. The amplifier is quite sensitive to temperature, and its threshold of sensitivity decreases by a factor of 2 with a change of ambient temperature from $+20^{\circ}$ C to $+50^{\circ}$ C.

41. Characteristics of New Helical Cathode Investigated

"New Type of Tungsten Cathode for High-Power Oscillator Tubes,"
by M. D. Gurevich, Leningrad Institute of Precision Mechanics and Optics; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy -- Priborostroyeniye, Vol 2, No 6, 1959, pp 54-60

A new helical tungsten cathode, developed at the Chair of Radio Engineering of the Leningrad Institute of Precision Mechanics and Optics, is a combination filament-heater cathode. It consists of a tungsten wire core of designation VAZ on which is tightly wound along its entire length a thorium-tungsten wire VT-10 or VT-15. The diameter of the core wire is three or more times greater than the diameter of the wire wound on it.

The helical cathode offers a greater surface area than other cathodes of identical dimensions (a ratio of approximately $\pi/2$) and requires considerably less filament current. The significance of the latter property led to a comparison and investigation of several sample GU-10B high-power ultrashort-wave tubes, some of whose cathodes were replaced by a helical cathode. Tabular data presented showing improved emission properties for the helical cathode tubes.

Instruments and Equipment

42. High-Speed Switch for Electronic Computers

"High-Speed Semiconductor Switch and Trigger for Electronic Computers," by Ya. N. Bapat and I. L. Kaganov, Moscow Power Engineering Institute; Moscow, Elektrichestvo, No 6, Jun 60, pp 76-81

The speed of operation of electronic computers built with semiconductor switching components depends to a great degree on the rise time of input and output voltage pulses. For saturable transistors, it is difficult to attain a switching rate higher than 2 Mc, since the saturation of the transistor base depends on the dissipation time. To eliminate this undesirable condition of saturation, a circuit with fast responding capacitance has been designed. Such circuits are assembled on the principle of common emitter configuration. Positive- and negative-polarity square pulses are used to trigger the switching circuit. The type P-402 transistors were incorporated in the switching circuit, with a rise-time of $4 \cdot 10^{-9}$ sec. The triggering circuit build on the described principle permits computer switching at a rate of 10 Mc.

43. Infralow Frequency Oscillators

"Sinusoidal Wave Oscillator for a Frequency Range of 10^{-4} to 100 cps," by A. A. Valilov, A. I. Solodovnikov, and F. F. Kotchenko, Leningrad Electrical Engineering Institute; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy, Priborostroyeniye, Vol 3, No 1, 1960, pp 10-17

The article describes a new type of oscillator which generates waves of infralow frequency in a range from 10^{-4} to 100 cps. This two-phase infralow frequency oscillator consists of a power source, oscillatory circuit with attenuator, relay control unit, and feedback proportional to a derivative of the output. Such an arrangement permits oscillations of desired amplitude and frequency.

A generator of infralow frequency can be built with three operational amplifiers having electromagnetic or electronic relay elements. It was found that stability of voltage amplitude depends primarily on the characteristics of the capacitors. Such capacitors should have low polarization and insignificant leakage losses. The switch-over from one frequency range to another is easily accomplished by proper changes in the parameters of aperiodic and integrating circuits. This oscillator can generate two sinusoidal voltages of equal amplitude, but shifted 90° with respect to each other. The maximum output voltage of the oscillator is 100 v.

This new infralow frequency oscillator should find practical application in various measuring arrangements or automation controls.

44. Scintillator for Study of Diesel Engine. Wear

"Scintillation Device of the TsNIDI for Measuring the Radioactivity of Liquids," by O. Ye. Kalinovskiy, Primeneniye radioaktivnykh izotopov pri issledovanii dvigateley vnutrennego sgoraniya. TsNIDI 35 (Use of Radioactive Isotopes in the Study of Internal Combustion Engines. TsNIDI 35), Moscow 1958, pp 28-34 (from Referativnyy Zhurnal -- Elektrotehnika, No 6, 25 Mar 60, Abstract No 4.4964)

After a brief historical survey of the development of scintillation counters, a detailed description is given of a device used by the Central Scientific Research Diesel Institute (TsNIDI) for measuring the radioactivity of the products of wear of engine parts in oil samples. The oil sample is in a vessel located inside a separable lead container. A crystal of NaI (TI) is placed in the center of the oil sample. The counter makes use of a FEU-19 photomultiplier connected to a cathode follower. The impulses from the output of the cathode follower go to a three-stage wide-band amplifier (K-100) and then to a dark background discriminator. The impulse tabulation is done by a PS-64 conversion instrument with an electromechanical computer. The "Fialka" instrument can also be connected to the system. The photomultiplier is fed by a VSE-2500 rectifier. With directed gamma radiation (energy quanta of one million electron volts), the system has an efficiency of 27 percent; the maximum counting rate is 6,000 impulses per minute. Comparative tests have shown that this scintillation counter is seven times as sensitive as an instrument which uses a Geiger-Mueller counter.

45. Characteristics of Logarithmic Instruments

"Graphoanalytical Method of Matching the Characteristics of Logarithmic Instruments," by Yu. M. Pyagin, Nauchn. Tr. Mosk. Vyssh. Tekhn. Uch-shche im. N. E. Baumana (Scientific Works of the Moscow Higher Technical School imeni N. E. Bauman), No 87, 1958, pp 182-191 (from Referativnyy Zhurnal. -- Elektrotekhnika, No 6, 25 Mar 60, Abstract No 4.4597)

Those characteristics of a logometer are investigated which determine the design parameters of the instrument. When these characteristics are considered in conjunction with the stability factor, it is possible to determine what effect is exerted on the characteristic of the indicator scale by a change of the opening angle of the winding, a change of the number of turns of the winding, a change of the parameters of the electrical circuit and of the magnetic system, the choice of stiffness of the conductor, etc. An analysis of the influence of a change of the opening angle of the winding of the logometer on the characteristic scale is given.

46. Thermo-Acoustic Temperature Recorder for Mineral Samples

"Simplified Automatic Thermo-Acoustic Recorder," by A. I. Zakharchenko, N. S. Lazarevich, G. I. Moskalyuk, and A. A. Moskalyuk, Tr. Vses. n.-i. in-ta p'yezooptich. mineral'n. syr'ya (Works of the All-Union Scientific Research Institute of Piezo-optical Mineral Raw Materials), Vol 2, No 2, 1958, pp 33-41 (from Referativnyy Zhurnal -- Elektrotekhnika, No 6, 25 Mar 60, Abstract No 4.4814)

A description is given of a simplified automatic thermo-acoustic recorder for determining the temperature of mineral objects by the bursting of liquid inclusions in the minerals during heating. The pulverized test material in a quartz tube 25-50 millimeters in diameter is inserted into a soundproof furnace at a temperature of 800 deg C. A DEM-type microphone is fastened at the open end of the tube. The decrepitation sounds picked up by the microphone are converted into electric impulses and amplified by a three-cascade amplifier with a passband of 100-3,000 cycles per second and an amplification factor of 30,000. At the output of the amplifier is connected a TG-2050 thyatron, the plate circuit of which is connected to an RP-6 polarized relay which controls a special electromagnetic automatic recording device; the impulses are recorded at a rate not in excess of 4-5 impulses per second.

Results are given of a number of experiments with various mineral specimens.

47. Application of Paramagnetic Resonance in Chemistry.

"Application of Electronic Paramagnetic Resonance in Chemistry," by V. V. Voyevodskiy, Institute of Chemical Kinetics and Combustion, Siberian Branch, Academy of Sciences USSR; Moscow, Kinetika i Kataliz, Vol 1, No 1, May/Jun 60, pp 45-54

The phenomenon of electronic paramagnetic resonance, discovered in 1944 by Ye. K. Zavoytskiy, is that paramagnetic particles located in a steady magnetic field are capable of absorbing energy from a high-frequency field, if these fields are perpendicular to each other and when certain other conditions are observed. The appearance or absence of electronic paramagnetic resonance in an investigated sample provides useful information on its structure.

Research carried out during the past few years has shown that electronic paramagnetic resonance is very useful in studying free radicals in condensed media. The field of application of the paramagnetic resonance method is steadily expanding, and there are good indications that during the next few years great achievements will be attained in this field.

48. Analysis of Differential Cascades

"Analysis of Differential Cascades," by Ye. P. Sogolovskiy, B. I. Shevtskiy, and G. A. Shevtsov, Voprosy Elektronnoy Izmeritel'noy Tekhniki, (Problems of Electronic Measuring Technique), No 1, L'vov, 1958, pp 12-28 (from Referativnyy Zhurnal -- Elektrotekhnika, No 6, 25 Mar 60, Abstract No 4.4588)

The formula expressing the amplification factor and an analysis of the circuit of a push-pull amplifier cascade are given. Its use in measurement technique is defined by a number of examples. The conditions which guarantee minimum interference are discussed, and the suitability of the cascade as an indicator of balance in an AC bridge circuit is pointed out.

49. Electrical Aviation Instruments

"Certain Practical Conclusions From the Theory of Magneto-Electric Electrical Measuring Instruments," by A. V. Povalyayev, Tr. Lening. in-t aviats. priborostr. (Works of the Leningrad Institute of Aviation Instrument Building), No 19, 1958, pp 73-83 (from Referativnyy Zhurnal -- Elektrotehnika, No 6, 25 Mar 60, Abstract No 4.4599)

A new variety of magneto-electric instrument is suggested, which is a provisionally designated instrument with moving pole piece. Both active elements of the instrument, the permanent magnet and the current carrying winding, are immobile. The counterforce is produced either by a spring or by a fixed magnet. The advantages of the new design include: large moment of rotation, low weight and low moment of inertia of the moving system, and the absence of current conductors to the moving part. Results are given of comparative tests on a series logometer with moving magnet and a model of a logometer with a moving pole piece.

50. Stability of Base-Metal Thermocouples

"On Increasing the Stability of Thermocouples Made of Base Metals," by A. K. Mikhaylov, Byul. tekhn.-ekon. inform. Sovnarkhoz L'vovsk. ekon. adm. r-na, (Bulletin of Technical-Economic Information. Sovnarkhoz of the L'vov Economic Administrative Region), No 8, 1958, pp 38-41 (from Referativnyy Zhurnal -- Elektrotehnika, No 6, 25 Mar 60, Abstract No 4.4795)

A test was made of the stability of Chromel-Alumel Thermocouples exposed for periods of 1,580-2,750 hours in an oxidizing air atmosphere (without protective covering) in a temperature range of 300-1,000 deg C and of Chromel-Copel thermocouples in a temperature range of 300-700 deg C. It was found that these thermocouples do not conform with the stability limits proscribed by GOST 3044-45, since a change of chemical composition takes place in the above temperature ranges. Thermocouples which have been stabilized by annealing have better electrode properties, both chemical and structural, and a satisfactory operational stability. It is recommended that the Chromel-Alumel type be annealed for 8-10 hours at 1,100-1,150 deg C or for 6-8 hours at 1,200 deg C and that Copel be annealed for 8-10 hours at 850-900 deg C. The annealing atmosphere for both Chromel and Alumel should be neutral or slightly oxidizing, but should be slightly deoxidizing for Copel.

51. Method of Computing Error of Vacuum-Tube Voltmeter

"On the Influence of the Configuration of the Curve of the Measured Voltage on the Indication of a Vacuum-Tube Class A Voltmeter," by R. S. Kravtsov and R. A. Shevtsov, Vopr. Elektron. izmerit. tekhn. (Problems of Electronic Measurement Techniques), No 1, L'vov, 1958, pp 5-11 (from Referativnyy Zhurnal -- Elektrotehnika, No 6, 25 Mar 60, Abstract No 4.4727)

A method is proposed for estimating the error resulting from the influence of the form of the curve for a vacuum-tube voltmeter with detector operating in class "A" (with 180-degree cutoff angle). The plate voltage increment of the detector is determined by expanding the input voltage into a Taylor series. Coefficients (determined according to the terms of the series expansion, beginning with the third) are introduced which characterize the form of the voltage curve. These coefficients are computed for 11 different curve configurations. The error of the voltmeter, stipulated by the nonsinusoidal character of the measured voltage, is determined according to the coefficient for a particular curve configuration and according to the derived transconductance characteristic of the vacuum tube. A concrete example is demonstrated.

52. Reliability of Thermocouples of Platinum and Platinum-Rhodium Alloy

"Some Data on the Stability of Thermocouples Made of Platinum and a Platinum-Rhodium Alloy," by N. N. Ergardt, Tr. Vses. n.-i. in-ta Metrol. (Works of the All-Union Scientific-Research Institute of Metrology), No 35 (95), 1958, pp 87-91 (from Referativnyy Zhurnal -- Elektrotehnika, No 6, 25 Mar 60, Abstract No 4.4793)

Thermocouples made of platinum and a platinum-rhodium alloy guarantee an error limit of plus-minus 1-2 degrees in the 300-1100-degree range and plus-minus 10-12 degrees in the 1100-1600-degree range. Practice has shown that, with operation, a heterogeneity of the electrodes occurs, followed by a change of the thermoelectric characteristics of the thermocouple and an increase of the measurement error as a result of the effects of high temperatures, ambient media, and impurities. In 1954, the High Temperature Laboratory of VNIIM (All-Union Scientific-Research Institute of Metrology) produced and calibrated 51 first-class standard thermocouples, which were used for a period of 1-3 years. It was found that the change of the calibration characteristic was equal to or less than 6 microvolts at the solidification point of copper (about 1,083.1 degrees), which is within the norm limits. Accordingly, the platinum-rhodium and platinum thermocouple can serve as a standard thermocouple of the first class for the 300-1,100-degree range for a period of 3 years.

53. Testing Crucial Parts of Electrical Measuring Instruments

"Testing and Checking Certain Crucial Parts of Electrical Measuring Instruments," by Z. A. Timofeyeva, Osnovnyye Voprosy Tochnosti, Vzaimozamenyayemosti i Tekhniki Izmereniy v Mashinostroyeni (Basic Questions of Accuracy, Interchangeability, and the Technique of Measurements in Machine Building), Moscow, 1958, pp 347-354 (from Referativnyy Zhurnal -- Elektrotekhnika, No 6, 25 Mar 60, Abstract No 4.4610)

A description is given of the operating principle and design of the U-1119 dynamometer, the moving part of which is tensioned. This affords the possibility of measuring arbitrarily small spring moments with a relative measurement error less than plus-minus one percent. Instruments for determining the elastic properties (residual deformation and elastic aftereffects) of springs and tensioned devices are also treated. They may be used for quality control in production processes and for laboratory tests. The principle of operation of the instruments is mechanical. The elastic properties of the springs and spring devices are characterized by a value of nonreturn to zero position following twisting, which may be determined with an accuracy of 0.01°.

54. Stabilizor With Pre-Heat Resistance

"Stabilizor With Preheat Resistance," by V. S. Popov, Sbornik Rabot po Voprosam Elektromekhaniki. Institut Elektromekhaniki AN SSSR (Collection of Works on Problems of Electromechanics. Institute of Electromechanics, Academy of Sciences USSR), No 2, 1958, pp 52-63 (from Referativnyy Zhurnal -- Elektrotekhnika, No 6, 25 Mar 60, Abstract No 4.4616)

The AC-DC voltage and current stabilizer is based on the use of a preheating resistance made of a tungsten wire 12 microns in diameter wound on a glass form. Inside the form is a nickel-chromium heater wire 20 microns in diameter. The preheat resistance is connected to one of the arms of a bridge circuit, and the heater, to the output diagonal through an amplifier. The bridge is fed by AC. Because of the dependence of the resistance of the tungsten coil on the current in the heater, a negative feedback is produced which guarantees an automatic stabilization of the voltage in the output diagonal of the bridge. The load is applied parallel with the heater (stabilizer voltage) or in series with it (stabilizer current). DC is obtained by the additional application of the load to a rectifier. The stability factor of the system amounts to 400-500 at an amplification factor of 20-25 for the amplifier. The

useful power of the stabilizer is 4-5 watts, which can be increased to 20 watts by hooking up an AC source in series with the output transformer of the amplifier. The stabilizer characteristics remain practically unchanged over long periods of operation; it can be used to supply measuring instruments.

55. On the Electrostatic Field of a System of Flat Diaphragms

"Calculation of the Electrostatic Field of a System of Flat Diaphragms With Circular Openings," by G. A. Grinberg and E. N. Kolesnikova; Moscow-Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 30, No 6, Jun 1960, pp 723-733

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"In the first part of this work, a solution of the electrostatic problem is found for a diaphragm with a circular opening in the presence of a ring coaxial with the opening and equally charged around its periphery; an expression is derived for the surface density of charges induced on the diaphragm. On the basis of obtained results, as well as the known free distribution of surface charges on the diaphragm, a system of integral equations of the second kind is formed for the densities of surface charges in diaphragm systems. The general equations are applied to the calculation of a number of concrete examples.

"The concluding part of the work presents a generalized method for the case in which the system of diaphragms is placed in some kind of external field created by any given axially symmetrical distribution of charges."

56. Transistorized Frequency Meter

"Universal Electronic Tachometer Using Semiconductor Triodes," by V. T. Derevyanchenko and A. A. Kasatkin; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy -- Priborostroyeniye, Vol 3, No 3, 1960, pp 17-22

A description is given of a universal capacitor-type frequency meter with direct reading, having a measuring accuracy on the order of 3% and a frequency range of 5 to 18,000 cycles. The power to the meter is supplied by a separate pocket flashlight battery type KBS-0.5, which facilitates operation under field conditions, as well as in the laboratory and shop. A photoelectric pickup attachment permits the instrument to be used as a tachometer. Dimensions of the frequency meter are 250 x 200 x 100 mm, and its weight is 2.2 kg.

The instrument consists of an input unit, a three-stage amplifier-limiter, an electronic switch, and a measuring unit and is designed exclusively with transistors and semiconductor diodes.

57. Highly Accurate Frequency Meter Developed

"Transistorized Instrument for Highly Accurate Frequency Measurements," by Ya. V. Novosel'tsev [Deceased], Ye. Ye. Afanas'yev, N. A. Smirnov, and Ye. P. Ugryumov; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy -- Priborostroyeniye, Vol 3, No 2, 1960, pp 30-43

The article presents the theory and description of an instrument designed for measuring the frequency of a signal by free nuclear induction, obtained as a result of measuring the intensity of the earth's magnetic field by nuclear-resonance methods. The instrument was designed at the Chair of Computer Engineering of the Leningrad Electrical Engineering Institute imeni V. I. Ul'yanov (Lenin) at the request of the All-Union Institute of Prospecting Methods and Techniques. The instrument uses 195 type P-13 triodes and 165 type D-2V diodes and is designed for measuring frequencies in a range of 1800-2200 cycles with an accuracy of 0.002% and a signal duration of not less than one second.

Basic components of the instrument are an amplifier, frequency converter, time interval shaping unit, an "and" gate circuit, pulse counter, control unit, display unit, and a counter for the ordinal number of the measurement.

Materials

58. Magnetic Characteristics of a Ferromagnetic Examined

"On the Magnetic Characteristics of a Ferromagnetic in an Oscillating Regime," by L. G. Ipatov; Moscow-Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 30, No 6, Jun 1960, pp 685-689

The reason for the discrepancy between the dynamic magnetic characteristics of a ferromagnetic under oscillating conditions and characteristics obtained during damping of oscillations is explained by the reaction of the mechanical system on the magnetic and electrical circuit of the ferromagnetic. Thus, magnetic values are dependent on the mechanical properties of the ferromagnetic material.

Theoretical and experimental relationships are obtained which may be used to determine the dynamic magnetic characteristics of a ferromagnetic. The concept of magnetostrictive permeability is introduced, the value of which should be used in computing magnetostrictive instruments and apparatus. This value takes into account the mechanical, as well as magnetic, characteristics of the material, and must be determined for conditions under which the material will operate. Operating frequency, magnetic parameters and the external load must be considered.

59. Synthetic Mica

"Information About New Materials," by K. Akhtyrskiy; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 5, No 44 (652)
13 Apr 60, p 4

The motion picture "Mica," produced by the Moscow Studio of Popular Science Films (scenario writer, A. Iglitskiy; director, N. Belov), gives information on the properties of synthetic mica and the extensive research that led to the industrial production of this material. Synthetic mica is required because the deposits of natural mica in the world are not extensive. Besides, more effective dielectrics than those found in nature are needed in present-day technology.

Although naturally occurring mica contains as many as 40 elements, only 6 elements (silicon, aluminum, magnesium, oxygen, and hydrogen) are necessary for building up its lattice. Synthetic mica is obtained if hydroxyl in the crystal lattice is replaced with fluorine. Synthetic mica is produced by heating a charge consisting of magnesium fluoride, magnesium oxide, potassium fluoride, aluminum oxide, and quartz sand to a temperature of 1,400°, at which the charge melts. Then the temperature is lowered very gradually (by 1-2 degrees per hour), and the melt is allowed to crystallize. A product corresponding to natural mica results on crystallization.

A film of artificial mica having the same thickness as that of natural mica can stand a potential of 7,000 volts, in contrast to 4,500 volts for natural mica. The dielectric properties of artificial mica are preserved up to a temperature of 600°, while natural mica loses its dielectric properties at 300°.

The availability of synthetic mica made it possible to develop entirely new insulation materials. One of them is novomicalex (novomikaleks), which is a mixture of molded glass and mica. This material does not lose its dielectric properties even at 900°. Another is mica ceramic. This material is not affected by sharp fluctuations of the temperature. If it is heated until it glows and then submerged in water, no destruction takes place. Foam mica is still another new material. Its characteristics comprise stability at high temperatures, a low specific weight, and a capacity to transmit radio waves. Synthetic mica will find the most extensive applications in electronic computers, radio tubes, high-frequency vacuum appliances, capacitors, and radioelectronic equipment. Extensive prospects are being opened up so far as applications of synthetic mica in rocket technology are concerned.

60. Determination of Some Impurities in High-Purity Selenium

"Determination of Some Microimpurities in High-Purity Selenium; Part 3," by O. Ye. Zvyagintsev and V. I. Shamayev, Moscow, Chemico-Technological Institute imeni D. I. Mendeleev; Moscow, Zhurnal Analiticheskoy Khimii, Vol 15, No 3, May/June 60, pp 325-328.

A radioactivation method for determining microquantities of silver, mercury, cobalt, chromium, calcium, and indium in selenium has been developed. The accuracy of the determination of individual elements is 10-30%.

61. Work on the Development of Microcrystalline Glasses With Superior Mechanical Properties

"Vitreous-Crystalline Materials," by S. I. Sil'vestrovich, Candidate of Technical Sciences, and E. M. Rabinovich; Moscow, Zhurnal Vsesoyuznogo Khimicheskogo Obshchestva imeni D. I. Mendeleeva, Vol 5, No 2, May 60, pp 186-191

USSR work on glasses sensitive to ultraviolet radiation is described. It is stated that by using fluorides as microcrystallization promoters (dampeners or quenchers = "glushiteli"), Rumanian investigators developed vitreous-crystalline materials derived from glasses of the composition $\text{SiO}_2 - \text{Al}_2\text{O}_3 - \text{RO} - \text{R}_2\text{O}$. These materials exhibit superior mechanical properties (e.g., a transverse or bending strength of $2,000 \text{ kg/cm}^2$ in contrast to $1,000 \text{ kg/cm}^2$ for glass and 800 kg/cm^2 for porcelain; a tensile strength of $1,500 \text{ kg/cm}^2$ in contrast to $1,000 \text{ kg/cm}^2$ for glass and 700 kg/cm^2 for porcelain; and an impact strength of 8 kg. cm/cm^2 in contrast to 2 kg. cm/cm^2 for glass and porcelain). As a result of crystallization taking place in a material of this type, crystals of muscovite and phlogopite (i.e., mica crystals) are finally formed (see "Fine Ceramic Masses Obtained by the Crystallization of Glass -- Production of Porcelain From Glass" by St. N. Lungu and D. Popescu-Has, Industria Usoara, No 2, 1958, pp 63-65 -- reported in Khimiya i Tekhnologiya Silikatov, Vol 5, No 1, Jan 59, pp 66-71)

The crystallization of three different types of $\text{SiO}_2 - \text{Al}_2\text{O}_3 - \text{MgO} - \text{Na}_2\text{O} (\text{K}_2\text{O})$ glass to which NH_4F had been added was studied by the Russian authors. They describe in detail the results obtained by them, noting different stages of enrichment with muscovite.

62. Recent USSR Work on Seignettelectricity

"New Work on Seignettelectricity (Ferroelectricity)," by L. A. Shuvalov; Moscow, Vestnik Akademii Nauk SSSR, Vol 30, No 5, May 60, pp 92-94

One of the characteristic trends in the development of technology after World War II is increased application of new crystalline materials, including semiconductors, ferrites, seignettelectrics, piezoelectrics, and artificial crystals exhibiting either a high degree of hardness, a capacity to luminesce, or specific optical properties. Results obtained in research on solid state physics and crystal physics are being introduced into technology on an extensive scale.

The discovery by B. M. Vul of the seignettelectric properties of barium titanate ceramic induced a rapid expansion of research in this field of physics. At present, the study of seignettelectricity and antiseignettelectricity has advanced considerably; the number of known seignettelectrics and antiseignettelectrics amounts to many scores and continues to increase.

Neither the common nature of the phenomena studied (as in the case of the physics of dielectric substances) nor that of research methods applied (as in the case of electronography), but rather the uniform nature of the subject of investigation forms the distinguishing characteristic of the science of seignettelectricity as a discipline: a definite class of solid dielectrics and the diverse specific properties of these dielectrics are being investigated. The science of seignettelectricity involves research on solid state physics and crystal chemistry, the physics of dielectrics and crystal physics, the theory of transducers and oscillations, etc. All of these individual lines of research are closely intertwined and stimulate each other in research on seignettelectricity.

At the present stage of development, it is difficult to overestimate the practical value of seignettelectric materials that have found numerous applications in radio engineering, electronics, hydroacoustics, electroacoustics, automatics, and measurement techniques. There can be no doubt that the importance of seignettelectrics from the standpoint of practical applications will increase still further in the future and that the field of their application will expand.

The Third Conference on Seignettelectricity, which was held in Moscow on 26-30 January 1960, illustrated the increased scope of USSR work on the production, investigation, and application of seignettelectrics. It also demonstrated that the number of organizations which are engaged in work in this field has increased significantly. The

conference was organized by the Institute of Crystallography and the Physics Institute imeni P. N. Lebedev. About 300 representatives of academic institutions, higher educational institutions, and specialized branch scientific research institutes located in various parts of the country participated in the conference.

Interest was evinced toward work done by G. A. Smolenskiy, V. A. Bokov, I. G. Ismailzade, and others which dealt with newly discovered seignettoelectrics and antiseignettoelectrics with a structure of the perovskite type or a more complex structure of the layer type. These substances ($\text{PbMg}_{1/3}\text{Nb}_{2/3}\text{O}_3$, $\text{PbNi}_{1/3}\text{Nb}_{2/3}\text{O}_3$, $\text{PbCo}_{1/3}\text{Ta}_{2/3}\text{O}_3$, $\text{PbMg}_{1/2}\text{W}_{1/2}\text{O}_3$, $\text{PbBi}_2\text{Nb}_2\text{O}_9$, $\text{PbBi}_2\text{Ta}_2\text{O}_9$, and others) were investigated both in the form of single crystals and in a polycrystalline form. For some of these compounds, the diffusion of phase transition boundaries and the simultaneous occurrence of seignettoelectric and relaxation phenomena are typical.

An extensive group of reports (those by V. A. Koptsik, V. P. Konstantivanova, and others) dealt with the growing of crystals of new water-soluble seignettoelectrics and the investigation of the domain structure and properties of these seignettoelectrics. The substances in question included ammonium sulfate, ammonium fluoroberyllate, sodium nitrite, lithium hydroselenite, ordinary triglycine sulfate, and triglycine sulfate containing deuterium. Particular attention was paid to triglycine sulfate crystals in connection with the possibilities of their application in memory devices and selector switches (I. S. Zheludov, Ye. I. Mamonov, I. S. Rez, and others). Work was reported that dealt with the pulse reversal of the polarity of triglycine sulfate (ordinary and deuterized), construction and testing at model installations of seignettoelectric matrices for information storage, and the development of equipment for the investigation of polarity reversal characteristics of seignettoelectrics.

Several reports (by A. L. Khodakov, O. P. Kramarov, and others) described methods for the production of single crystals of perovskite seignettoelectrics and results of the investigation of their properties.

The conference demonstrated that work is not being conducted to a sufficient extent in a number of important fields. This refers, above all, to the theory of seignettoelectricity, a subject on which only a few papers were presented. Among these papers, one must note those on the microscopic and general thermodynamic theory of seignettoelectrics and antiseignettoelectrics presented by V. L. Ginzburg, V. L. Indenbom, and others. These papers initiated lively discussion.

The papers on X-ray investigations (G. S. Zhdanov, Yu. N. Venevtsev, A. I. Agranovskaya, and others) were concerned principally with seignettoelectrics and solid solutions formed by these seignettoelectrics. Results of the investigation of a number of organic seignettoelectrics by the nuclear magnetic resonance method, the electronographic investigation of the structure of thiorea, and other subjects were also discussed in a number of papers.

In two reports (by N. N. Kraynik and T. S. Zhdanov et al.), a theoretical calculation was made of the inner fields in perovskite seignettoelectrics and antiseignettoelectrics. Results were also reported of the experimental investigation of the inner fields in these substances on the basis of their luminescence and absorption spectra upon introduction of impurity ions. Reports on the electrical conductivity of BaTiO_3 , $\text{Pb}_2\text{Nb}_2\text{O}_6$ and solid solutions based on BaTiO_3 (S. V. Bogdanov, Ye. V. Sinyakov, and others) reflected the recent increase of interest in the semiconductor characteristics of seignettoelectrics.

In several reports (by E. V. Stauer, L. A. Shuvalov, V. A. Yurin, and others), problems were discussed that are related to the study of different phenomena taking place in seignettoelectrics and being newly investigated at present. This refers to the electroluminescence of BaTiO_3 and the anomalous damping of the oscillations of seignettoelectric piezoresonators, the swinging of dielectric pendulums, the creation of stable monodomain and polydomain states by exposure to radiation emitted by radioactive substances and by the introduction of impurities added during the growing of crystals, modification of the properties of triglycine sulfate by the action of ultraviolet radiation, etc.

At present, seignettoelectrics of the ceramic type are used most extensively in technology. Under the circumstances, it is not surprising that many reports (those by V. M. Vul, S. V. Bogdanov, T. N. Verbitskaya, R. Ye. Pasyukov, and others) dealt with the investigation of the properties of new two-component and three-component solid solutions based on BaTiO_3 , $\text{Pb}_2\text{Nb}_2\text{O}_6$, PbTiO_3 , PbZrO_3 and other seignettoelectrics with a structure of the perovskite type and also with the study of effects produced by additives, different oxides, and salts introduced into these seignettoelectrics for the purpose of producing new ceramic materials capable of being manufactured industrially and exhibiting improved and more stable characteristics so far as dielectric, nonlinear, piezoelectric, and electroacoustic properties are concerned. Some papers by Ye. T. Smazhevskaya, P. L. Strelets, and others reflected progress in the industrial production of new seignettoelectric ceramics and shed light on a number of technological problems. Work was discussed that is related to the preparation and investigation of the properties of thin seignettoelectric films (with a thickness of 2-4 microns) and also the practical application of new seignettoceramics in the capacitor industry, as nonlinear components, in wide-band filters, in acceleration data units, and in stereophonic pick-up units.

The conference passed a resolution requesting the Presidium of the Academy of Sciences USSR to organize a section of seignettelectrics attached to the Commission on Semiconductors. It is planned to hold the next conference on seignettelectricity at Leningrad in the beginning of 1962.

63. Use of Ca SO₄. Mn in Luminescence Dosimeters

"Luminescence Dosimeters of α -Radiation, β -Particles, and Neutrons Employing Ca SO₄. Mn Phosphor," by V. A.

Arkhangel'skaya; V. I. Lyubberg, V. M. Kodyukov, and T. K. Razumova; Moscow, Atomnaya Energiya, Vol 8, No 6, Jun 60, pp 559-561

The capacity of Ca SO₄. Mn to accumulate energy supplied by the α -radiation of radium has been known since 1951; however, the quantitative characteristics of this phosphor had not been investigated. This was done in the work described at present. It was established that in addition to being suitable for the dosimetry of α -radiation, the Ca SO₄. Mn phosphor can be applied for the recording of β -radiation and of thermal, as well as fast, neutrons. Techniques for growing single crystals of this phosphor have been described by the authors of the article in 1958. As distinguished from the SrSEu.Sm phosphor, Ca SO₄. Mn is resistant to the action of moisture.

64. Radioactivation Analysis of Semiconductor Silicon by Means of a Multichannel Gamma-Spectrometer

"Radioactivation Analysis of Semiconductor Silicon by Means of a Multichannel Gamma-Spectrometer," by I. Ye. Makasheva, I. A. Maslov, and A. P. Obukhov, Institute of Technical Physics, Academy of Sciences USSR, Leningrad; Moscow, Zhurnal Analiticheskoy Khimii, Vol 15, No 3, May-Jun 60, pp 329-333

A method for the radioactivation analysis of silicon after chemical treatment of the sample has been developed.

The use of a gamma-spectrometer for measuring the activity of impurities makes unnecessary the radiochemical purification of the precipitates separated and permits identification of most of the impurities by a single measurement of their activity.

Ultrasonics

65. Diffraction of Light by Ultrasonic Waves

"Use of Piezoelectric Barium Titanate for Ultrasonic Radiation in Diffraction Modulators of Light," by I. I. Adrianova, Yu. V. Panov, and B. A. Rotenberg, State Optics Institute, Leningrad; Moscow, Akusticheskiy Zhurnal, Vol 6, No 2, 1960, pp 162-170

Barium titanate ultrasonic radiators operating in the frequency range of 3-15 Mc were studied in conjunction with their use in the high-frequency diffraction light modulators. The ultrasonic radiators examined were in the form of 35 X 22 mm, 25 X 22 mm rectangular plates having thickness from 0.28 to 1.5 mm. Commercial grade barium titanate material (95% BaTiO₃ + 5% Pb₃O₄) was used in preparation of these plates.

A series of tests has shown that barium titanate was the best material available for ultrasonic radiators in the frequency range of 3-15 Mc. To obtain wide-band radiators with high piezoelectric constant, it is advisable to polarize them in succession at a field intensity of 12 kw/cm and at 16 kw/cm for 20 min. It was also found that a considerable change in frequency response occurs during the first 4 days after polarization; however, after this, it remains constant for more than a year. Ultrasonic fields of piezoelectric radiators have high uniformity within the limits of frequency response about each resonant frequency.

The author thanks V. G. Vafiadi for his valuable assistance.

Wave Propagation

66. Helical Wave Guide With Anisotropic Dielectric Studied

"Electromagnetic Waves in a Helical Wave Guide With Anisotropic Dielectric," by V. P. Shestopalov, V. A. Slyusarskiy, S. D. Andrenko, and E. I. Chernyakov; Moscow-Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 30, No 6, Jun 1960, pp 644-652

Propagation of symmetrical and nonsymmetrical waves in a helical wave guide with an isotropic dielectric tube, within which is an anisotropic dielectric, is examined. Dispersion equations necessary for determining the conditions of space resonance of the system are derived and studied.

A method of probe-graphing the standing wave field is used to make experimental measurements of dispersion of the system. A comparison of theoretical and experimental characteristics shows that the formulas describing the system are sufficiently accurate to compute the phase velocity of waves in them.

IV. ENGINEERING

Automatic Control Engineering

67. Self-Adjusting Automation Systems

"Self-Adjusting Systems," by A. Lerner; Moscow, Ekonomicheskaya Gazeta, 22 Jul 60

Application of self-adjusting automation systems to industrial processes has only just begun; therefore, the extent of such application at present is still rather limited. There is a great need for self-adjusting automation systems in various fields of industry. The purpose of such a system is to attain highest possible efficiency of the controlled process under changing operating conditions. Such an automatic control is adaptable to processes occurring continuously, periodically, or sporadically.

The multichannel optimizer designed at the Institute of Automatics and Telemechanics, Academy of Sciences USSR, utilizes the principles of combined search. These combined systems which perform the calculation of optimal conditions and carry out the automatic search are the most promising self-adjusting systems at the present time. Here the optimal operating conditions are very speedily determined in their first approximation by a computer on the basis of information describing the conditions which are subject to positive control. Other, less accurate information about the characteristics of the controlled process is introduced into the system beforehand or is stored in the system permanently.

At the Institute of Automatics and Telemechanics, Academy of Sciences USSR, a self-adjusting system was designed for automatic control of the tube welding process. Application of self-adjusting and self-organizing systems permits complete automation of such industrial processes as rolling of metal, smelting of pig iron and steel, and various chemical processes.

The multichannel automatic optimizer of the Institute of Automatics and Telemechanics is also capable of solving the problems concerning the choice of the best control system for servodrives with two control responses.

Soviet scientists and engineers are working with great success in the field of designing new systems of automatic controls which may completely transform the character of human labor.

68. Measurement of Random Errors in Automatic Control Systems

"Instrument for Measuring Errors of Automatic Control Systems," by O. P. Sitnikov, Yu. A. Perminov, And V. A. Gubin, Ural Polytechnic Institute imeni S. M. Kirov; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy -- Priborostroyeniye, Vol. 2, No 6, 1959, pp 23-28

The problem of determining the basic characteristics of random functions (assembly average, dispersion, and correlation functions) in automatic control systems arises, for example, in the study of servo systems operating in the presence of noises from the measuring device. In this case, the system error is examined as the sum of the systematic error, depending mainly on the useful signal, and the random error, which arises as a result of the action of noise. The first may be quantitatively evaluated as the mean value of the fluctuating error; and the second, as the root-mean-square value of the random error of the system, caused by noises.

For measuring the systematic error, the authors propose and describe a simple, low frequency decoupling amplifier with a comparatively wide dynamic range.

The instrument used to measure the rms value of error is based on the same mathematical principles as the first and contains a preamplifier, detector, squarer, operational amplifier, and integrating amplifier.

Random error caused by noise was determined by simultaneously recording the systematic and rms errors. Accuracy of the instruments was checked by comparing computed and measured values of the functions.

69. Automation of AC Compensators

"Problems of Automating Alternating-Current Compensating Devices," by A. M. Melik-Shakhnazarov, Tr. Azerb. industr. in-ta (Works of the Azerbaydzhan Industrial Institute), No 20, 1958, pp 59-68 (from Referativnyy Zhurnal -- Elektrotekhnika, No 6, 25 Mar 60, Abstract No 4.4663)

The principles of design for automatic AC compensators are discussed, and a description is given of the rectangular coordinates of an automatic compensator with phase-sensitive amplifiers and asynchronous-type actuator motors (astatic system), an autocompensator with induction-type transformer (static system), and an autocompensator designed on the basis of a purely electronic circuit. A compensator in which the phase and amplitude of the compensating voltage are changed simultaneously is considered as a system which operates on the principle of dynamic equilibrium.

70. Multistage Filters for Corrections in Reproduction Systems

Korreksiya Vozproizvodyashchikh System Pri Pomoshchi Stupenchatnykh Fil'trov (Correction of Reproduction Systems by Means of Multistage Filters), by V. I. Gukov (author's abstract of dissertation for the degree of Candidate of Technical Sciences, Institute of Automatics and Telemechanics, Academy of Sciences USSR), Moscow, 1958 (from Referativnyy Zhurnal -- Elektromekhanika, No 6, 25 Mar 60, Abstract No 4.5027 D.)

A correction method was devised using multistage filters designed on the basis of delay units. The multistage filters afford the possibility of carrying out processes of finite duration which cannot be done with any other correction methods. It is necessary to determine the structure and parameters of the multistage filter, i.e., its coefficients of transfer functions X_k and Y_k , which may be represented in the following form;

$$Z(p) = \sum_{k=0}^n X_k e^{-pk\tau} / \sum_{k=0}^m Y_k e^{-pk\tau},$$

where τ is the delay time of the filter elements. These coefficients can be determined by various methods, depending on which characteristic (time, frequency, or transfer function) is recorded by the correction system. These methods are analyzed and compared, and their areas of application are specified.

The effectiveness of the multistage-filter correction system is illustrated by a number of examples, such as the correction of a shaky oscillograph, the correction of aperture distortions, etc. The discussion also considers the problems involved in the designing of the multistage filters on the basis of existing delay elements.

71. Accuracy of Remote Control Mechanisms Analyzed

"Analysis of the Accuracy of Remote Control Mechanisms for Radio Stations on Moving Objects," by A. I. Pimenov, Moscow Order of Lenin and Order of the Red Banner of Labor Higher Technical School imeni N. E. Bauman; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy -- Priborostroyeniye, Vol. 2, No 6, 1959, pp 29-37

The article examines the remote control mechanisms of radio stations and their basic components and presents formulas for computing the angular errors of such components. Recommendations are made for designing mechanisms with consideration for their accuracy characteristics.

Basic principles of operation are given for the four general types of remote control mechanisms used in multichannel radio stations: (1) line or rack and pinion drive, where no more than 6 communication channels are required, (2) mechanisms with a presetting roller, used where no more than 6 channels are required, (3) a revolving type mechanism, where no more than 12 channels are required, and (4) a mechanism with a commutating memory device.

The accuracy in the operation of each element is examined, and recommendations are made on the design of remote control mechanisms. These recommendations include the need to decrease the number of elements and decrease the errors caused by each element, the need to eliminate manual tuning and setting of adjustable elements, and the advantage of making parts of mechanisms from materials having identical or similar coefficients of expansion in order to reduce the effects of temperature on accuracy.

72. US Book on Automation Reviewed

Handbook of Electronic Control Circuits, by J. Marcus, McGraw-Hill, 1959, 347 pp, reviewed by V. A. Ivanov; Moscow, Novyye Knigi Za Rubezhom, Seriya B, Tekhnika, No 7, Jul 60, pp 71-73

CPYRGHT

This review contains the following passages:

"The book contains extensive and valuable material covering a wide variety of problems. The book may serve as a useful guide to technical-engineering personnel engaged in various fields of industry and working on the development and application of electronic automation systems. It greatly facilitates the search for required circuits or else for circuits that might serve as a basis for the design of some other practical device....

"In conclusion, we must state that the translation of this book into Russian, after some abridgement and certain additions to the description of individual circuits, is to be considered as quite expedient."

73. MD-322 Temperature Control Modified

"Modification of the MD-322 Temperature Control," by V. S. Nikonov, Byul. tekhn. inform. Sovnarkhoz Kurskogo ekon. adm. r-na, (Bulletin of Technical Information. Sovnarkhoz of the Kursk Economic Administrative Region), No 6, 1958, pp 47-48 (from Referativnyy Zhurnal -- Elektrotehnika, No 6, 25 Mar 60, Abstract No 4.5212)

The MD-322 temperature controls designed for the automatic regulation of temperature in fermentation tanks used in the alcohol industry function poorly. Their design characteristics prevent the attainment of the required temperature control. A description is given of changes made in the fundamental design of the instrument. The [vertical-tube] constant-pressure thermometer was replaced by an inclined-tube constant-pressure thermometer with electrical indicator. A diagram and description of the operating principles of the modified control are given. The short period (2 months) the modified system had been in use at the time of the report already showed clearly its advantage over the MD-322.

Electrical Engineering

74. High-Voltage DC Instruments

"Some Features of Measuring Instruments for DC Transmission Lines," by A. M. Ryvkin; Moscow, Vestnik Elektropromyshlennosti, No 4, Apr 60, pp 22-28

The reliable exploitation of dc transmission lines calls for precise control of a number of electrical quantities which are not encountered at substations of conventional ac power lines. At the rectifier substation, it is necessary to measure dc high voltage with a high degree of accuracy.

In connection with the construction of the dc transmission line from Stalingrad Hydroelectric Power Plant to Donbass, the design of various new instruments for measurement of high-voltage dc current are now in progress.

The article discusses in detail the features of high-voltage dc instruments installed at the rectifying substations of the experimental Kashira-Moscow high-voltage dc transmission line. High-voltage dc instrument transformers are the basic elements of the instrumentation that ensures the reliable exploitation of such power lines. The dc instrument transformer consists of a magnetic amplifier with its ac windings connected in series in such a manner that the ac current is proportional to the dc bias. The performance of other high-voltage dc instruments used on the Kashira-Moscow experimental power line is described and evaluated.

75. Investigation of Current Distribution in Electric Furnace

"Distribution of Electric Current in the Metal Bath as Displayed by a Three-Dimensional Model of a Furnace," by A. I. Lenshin, Kuybyshev Industrial Institute, Minsk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Energetika, No 5, May 60, pp 70-79

In modern, large-capacity, electric-arc, steel-melting furnaces, stirring of molten metal is accomplished by a rotating magnetic field which induces eddy current in the bath. Efforts are now being made to apply electro-magnetic stirring to installations other than electric furnaces.

Determination of current distribution in the molten-metal bath, for the purpose of utilizing the electrode current in stirring the bath, is of great practical importance. Such a determination of current distribution cannot be made by calculation alone, since no satisfactory theory of current distribution in a molten bath has yet been developed. The only practical method for determining the distribution of current in a bath is by utilizing the principle of the electrical analog.

At the institute, two grid-type, three-dimensional models of the metal bath were built with the aid of 2.5-mm copper wires. An oval-shaped model has 1,008 simulating cells, and a round model has 660 simulating cell. The three-dimensional models were built with nine layers of horizontal grids. The ac electric power supply to the grid analog was applied at the points corresponding to the actual position of the electrodes in the furnace.

This three-dimensional grid-type model permits determination of the distribution of current in the furnace bath for various systems of electrode connection and for various depths of electrode immersion.

Engineering Instruments

76. Report on GD-300 Light Range Finder

Testing of the GD-300 Light Range Finder," by V. A. Voronin, L. I. Pik, and S. S. Plonskiy; Moscow, Geodeziya i Kartografiya, No 6, Jun 60, pp 14-23

Geodetic testing of the GD-300 model light range finder conducted by the Hidroproyekt of the Ministry of Electric Power Station Construction in the fall of 1959 is described. A description of the apparatus, the test program, and results is given. Based on the test results, recommendations for design improvements are made. Effective use of the instrument is foreseen for topographic surveys made as a basis for designs of hydroengineering installations and for surveys in the construction of such installations. Photographs of various components of the apparatus are included.

77. Electromechanical Profilometer Calibrator

"Electromechanical Equivalent Surface Finish Used for the Absolute Calibration of Profilometers," by A. S. Kruglov, Tr. Leningr. in-t aviats. priborostr. (Works of the Leningrad Institute of Aviation Instrument Building), No 27, 1958, pp 15-24 (from Referativnyy Zhurnal -- Elektrotehnika, No 6, 25 Mar 60, Abstract No 4.4837)

A description is given of a profilometer calibrating instrument consisting of a vibrator, sound generator, and device for measuring the amplitude of the vibrations of the vibrator armature. The vibrator, which is fed by the sound generator, imparts to the needle of the profilometer vibrations which can be changed in amplitude and frequency. The distinguishing feature of this instrument, by comparison with others of similar purpose, is the electromechanical device for measuring the amplitude of the vibrations of the armature of the vibrator (contact hammer method). This device is made up of a half-frame spanned by a wire attached to the hammer which is in contact with the vibrator armature, a micrometer screw with which the semiframe can be turned, and an indicator which shows the contact disruptions of the hammer and armature (a telephone connected to the plate circuit of the tube, the grid circuit of which is connected with the contact hammer and armature). It is shown that this method can be used to obtain amplitude measurements in hundredths of a micron with an error of about 3.5 percent.

V. MATHEMATICS

78. Approximation of Differentiable Functions

"Concerning the Approximation of Differentiable Functions by Linear Means of Their Fourier Series," by S. A. Telyakovskiy, Mathematics Institute imeni V. A. Steklov, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR Seriya Matematicheskaya, Vol 24, No 2, Mar/Apr 60, pp 213-242

Certain asymptotic formulas are obtained for the upper bounds of the deviations of a function from the means of its Fourier series, where the upper bounds are distributed in the W^r and \bar{W}^r , $r = 1, 2, \dots$ classes.

With the help of these formulas, the asymptotic behavior of the corresponding upper bounds during approximation by Vallee Poussin sums is studied.

79. Approximation of Bounded Functions

"Concerning Several Estimates for the Coefficients of Bounded Functions," by Ya. L. Geronimus; Moscow, Izvestiya Akademii Nauk SSSR Seriya Matematicheskaya, Vol 24, No 2, Mar/Apr 60, pp 203-212

Inequalities are considered in the work for coefficients of a function, regular, and not exceeding a modulus one in a unit circle. The class of functions

$$f(z) = \sum_{k=0}^{\infty} \alpha_k z^k,$$

is considered in the region $|z| < 1$ which are regular and satisfy the inequality

$$|f(z)| < 1.$$

The estimate for the coefficients

$$|\alpha_n| \leq 1 - |\alpha_m|^2, \quad |\alpha_m| \leq \sqrt{1 - |\alpha_n|},$$

is well known to be justified for the condition $n > 2m$; in the present work, an estimate α_m is found through $|\alpha_n|$ for the condition $\frac{3}{2}m < n \leq 2m$.

80. Continuous Periodic Functions Approximated by Fourier Sums

"Approximation of Continuous Periodic Functions by Fourier Sums," by A. V. Yefimov; Moscow, Izvestiya Akademii Nauk SSSR Seriya Matematicheskaya, Vol 24, No 2, Mar/Apr 60, pp 243-296

Asymptotic exact equations are given for the upper bounds, distributed in the W_{β}^{r, H_1} and W_{β}^{r, H_2} classes, of the deviations of the function from its Fourier sum.

81. Concepts in the Theory of Markoff Processes

"Characteristic Correlation Functions and Their Application in the Theory of Stationary Markoff Processes," by O. V. Sarmanov, Mathematics Institute imeni V. A. Steklov, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 132, No 4, Jun 60, pp 769-772

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"A stationary real process is considered having a continuous parameter $\sqrt{x_t}$; $-\infty < t < \infty$, and it is assumed that the random quantities x_t have a mean equal to zero and a dispersion equal to one. We denote x_{t_1} by x , and $x_{t_1 + t}$ by y ; on the strength of the stationariness, x and y have identical a priori distributions.

"Definition 1. $r_1(t)$ is called a maximal correlation function of the process x_{t_1} if for $t \neq 0$

$$|r_1(t)| = \sup_{f, g} |M(f(x)g(y))| \quad (1)$$

in the class of functions f, g , satisfying the conditions

$$Mf(x) = Mg(y) = 0; \quad Mf^2(x) = Mg^2(y) = 1, \quad (2)$$

where M designates the mathematical expectation. (For $t = 0$ $r_1(t)$ is defined by the condition $r_1(0) = 1$.)

"Note. If the functions f_1 and g_1 which reach the upper bound of (1) are linear, then $r_1(t)$ coincides with the ordinary correlation function $r(t)$, where

$$r(t) = M(xy), \quad t \neq 0. \quad (3)$$

"The properties of $r_1(t)$ are analogous to the properties of the maximal coefficient of correlation (see O. V. Sarmanov, DAN, Vol 120, No 4, 1958, and O. V. Sarmanov, DAN, Vol 121, No 1, 1958).

CPYRGHT "The class of considered processes is now significantly constructed, assuming that the joint distribution law of x and y possesses a density $p(t, x, y)$, that this density is symmetric

$$p(t, x, y) = p(t, y, x) \quad (4)$$

in the region $\Omega = [a \leq x; y \leq b]$, and that it satisfies the restriction

$$\int_{(\Omega)} \int \frac{p^2(t, x, y)}{p(x) p(y)} dx dy \leq \infty, \quad (5)$$

where

$$p(x) = \int_a^b p(t, x, y) dy, \quad p(y) = \int_a^b p(t, x, y) dx \quad (6)$$

for $t \neq 0$.

"On the strength of (4) and (5), the upper bound of (1) is reached on identical functions, i.e., $g_1(y) = f_1(y)$.

"Definition 2. The sequence of eigen numbers $r_k(t)$, $k = 1, 2, \dots$, of kernel

$$\frac{p(t, x, y)}{\sqrt{p(x) p(y)}} \quad (7)$$

is called the sequence of eigen correlation functions of the process x_{t_1} , $t \neq 0$.

"Definition 3. If the eigen functions with kernel (7) $\sqrt{\varphi_k(x)}$, $\varphi_k(y)$ do not depend on t , then the process is called maximally stationary.

"Definition 4. The process x_t is called C-continuous if all $r_k(t)$ are continuous, in particular¹

$$\lim_{t \rightarrow 0} r_k(t) = 1, \quad k = 1, 2, \dots \quad (8)$$

"It is assumed that $p(t, x, y)$ satisfies the Markoff condition

$$p(t_1 + t_2, x, y) = \int_a^b \frac{p(t_1, x, z) p(t_2, z, y)}{p(z)} dz, \quad (9)$$

except for the conditions of symmetry (4) and boundedness (5); then that plane entirely determines a stationary Markoff process.

"The consequence of the introduced definitions and equation (9) is the theorem:

"In order that the symmetric two-dimensional plane $p(t, x, y)$, satisfying limitation (5), may give a continuous Markoff process, it is necessary and sufficient that the following conditions are satisfied:

a. the joint functions of nucleus (7) do not depend on t , that is, the process is maximally stationary;

b. the joint correlation functions have the form

$$r_k(t) = e^{-k^t}, t = 0, 1, 2, \dots$$
 for $k = 1, 2, \dots$."

82. Dirichlet Problem for One Class of Elliptic Systems

"The Dirichlet Problem for One Class of Elliptic Systems," by Ye. V. Zolotaryeva, Mathematics Institute imeni V. A. Steklov, Academy of Sciences, USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 132, No 4, Jun 60, pp 751-753

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"It is known that a Dirichlet problem (first boundary-value problem) for linear systems of the elliptic type in the sense of I. G. Petrovskiy, generally speaking, is not a problem of the Fredholm type (see A. V. Bitsadze, UMN, Vol 3, No 6(28), 1948, p 211). The Fredholm alternatives for the indicated problem always hold if the ordinary requirement of ellipticity is strengthened by the condition of strong ellipticity (M. I. Vishik, Matem. sborn. Vol 29, No 3, 1951, p 615). Study of the Dirichlet problem for elliptic systems without the requirement of the condition of strong ellipticity is of interest.

"Let there be given a system of linear differential equations with partial derivatives of the second order having the form

$$Au_{xx} + 2Bu_{xy} + Cu_{yy} = 0, \quad (1)$$

where $A = \parallel A_{ik} \parallel$, $B = \parallel B_{ik} \parallel$, $C = \parallel C_{ik} \parallel$ are given real constant square matrices of order n ; $u = (u_1, u_2, \dots, u_n)$ is the vector sought for.

"The system (1) is elliptic in the I. G. Petrovskiy sense if all $2n$ roots of the characteristic equation

$$\det |A + 2B\lambda + C\lambda^2| = 0 \quad (2)$$

are complex (not real).

"We denote by $\lambda_1, \dots, \lambda_\mu, \bar{\lambda}_1, \dots, \bar{\lambda}_\mu$ the roots of equation (2), and by k_1, \dots, k_μ , the squares of these roots.

"The ordinary representation of the regular solutions of systems (1) in a finite simply connected D has the form

$$u = \operatorname{Re} \sum_{j=1}^{\mu} \sum_{\ell=1}^k \sum_{m=0}^{\ell-1} C_m^{(j)} \bar{z}^m \varphi_{j\ell}^{(m)}(z_j), \quad (3)$$

where $\varphi_{j\ell}$ are arbitrary holomorphic functions in the region D of the variables $z_j = x + \lambda_j y$ respectively, the upper index m of the function $\varphi_{j\ell}^{(m)}$ indicates the order of the derivative with respect to z_j , and $C_m^{(j)}$ are completely defined constant vectors, which are expressed exclusively in terms of the coefficients of system (1); moreover, for finding $C_m^{(j)}$ the solution is required of linear algebraic systems, the coefficients of which are expressed with the help of the coefficients of system (1).

"The Dirichlet problem for system (1) is contained in the determination of a regular solution of this system in the region D, continuous up to the contour Γ of the region D and satisfying the condition

$$u = f \quad \text{on } \Gamma,$$

where $f = (f_1, \dots, f_n)$ is the given vector.

"In the present work, investigation is limited to the Dirichlet problem for system (1) in the case for $n=2$ in a circular region for a squared root of equation (2)."

83. Ruled Hypersurfaces in R_4 Considered

"Differential Geometry of the Ruled Hypersurfaces V_3 in R_4 ", by Yu. G. Lumiste; Moscow, Matematicheskii Sbornik, Vol 50, (92), No 2, Feb 60, pp 203-220

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"The ruled hypersurfaces V_3 (i.e., two-parameter families of straight lines) are important, but still insufficiently studied objects of the ruled differential geometry of the four-dimensional Euclidean space R_4 . Our work is devoted to their metric theory which has, as is to be expected, many general metric theories of congruency for straight lines in R_3 . Thus the moving datum mark method applied by us (see the book of S. P. Finikov, Metod vneshnikh form Kartana v differentsial'noy geometrii /Method of the Exterior Cartan Forms in Differential Geometry/, Moscow-Leningrad, 1948) reduced in the case of a holonomic datum mark to ordinary tensor methods which obliges us to repeatedly allude to the known tensor exposition of the metric theory of congruencies by Ya. S. Dubnov, Die Differentialgeometrie der Strahlenkongruenzen in tensorieller

Darstellung (The Differential Geometry of Ray Congruences in Tensor Representation), printed in Trudy seminara po vekt. i tenz. analizu, Vol 1, 1933, pp 223-303." For example, a tensor playing the same role as the Sannia tensor in the theory of congruencies is introduced in the work. This tensor also satisfies a certain equation, generalizing the equation of Sannia, but it, of course, does not define our family of straight lines for a given angular metric. The corresponding result is obtained in the work only because of the introduction of new tensors. Essentially the focal theory is modified.

"It is necessary to note, however, that the two-parametric family of straight lines $\infty^2 R_1$ in R_4 give more rich material for investigation than the congruencies in R_3 . If congruence requires consideration only as the family $\infty^2 R_1$ in R_3 , then the family $\infty^2 R_1$ in R_4 may be considered as a hypersurface or, from the viewpoint of interior geometry, as a Riemannian manifold V_3 . However, these problems are not touched in the present work. Only those problems are considered which are associated with the cones of directions normal to V_3 along the generatrix.

"Finally, we note that in the work only a general theorem is given. The special ruled hypersurfaces in R_4 remain yet to be considered."

VI. MEDICINE

Aerospace Medicine

84. Survival in Interplanetary Space

"Astronauts Are Donning Helmets," by A. Nikolayev, Candidate of Medical Sciences; Moscow, Sovetskaya Rossiya, 19 May 60, p 4

This article deals with the medical and biological problems which must yet be solved before a human astronaut can be sent into interplanetary space. The unusual conditions of interplanetary travel and their effects on the human organism must be ascertained precisely. Researchers in space medicine are directing their efforts toward man's survival under these conditions.

The principal factor which adversely affects the organisms of humans and animals at high altitudes is oxygen insufficiency. The human oxygen requirement is not constant. A human being at rest needs between 200 and 300 cubic centimeters of oxygen per minute; during intensive muscular exertion, he needs between 2,000 and 3,000 cubic centimeters of oxygen per minute. Oxygen starvation begins at an altitude above 5,000 meters.

Scientists believe that the hermetically sealed cabin of a space vehicle should be filled with a mixture of oxygen and helium. It is unrealistic to assume that life in a hermetic cabin, during a long voyage in interplanetary space, can be sustained by taking along some of the earth's atmosphere and substances that absorb carbon dioxide. K. E. Tsiolkovski proposed to create an artificial atmosphere in an interplanetary vehicle by installing a greenhouse. Plants which give off oxygen profusely must be selected. Experiments in selecting the best plants for this purpose have already been initiated. A genus of green algae, *Chlorella*, has been attracting the attention of scientists.

A great propelling force will be needed at take-off for a space vehicle to overcome the gravitational pull of the earth. A living organism will be subjected to forces of gravity at take-off which are many times greater than its weight. A passenger in a rocket, escaping the gravitational pull of the earth experiences a pull of 9 G within 2 minutes. This causes a number of disturbances within an organism and, above all, seriously affects blood circulation. Special garments for protection against G forces are now available.

Weightlessness is the third important problem that will be encountered beyond the earth's gravitational pull. After the motors stop and the rocket is in free flight through space, all crew members and all articles in the hermetic cabin will be in a state of weightlessness. Everyone and everything not held down in some fashion will float freely. All liquids that are not enclosed in a container will become spherical and will float through the air. Whether humans can withstand weightlessness is unknown because it is difficult to reproduce this condition on earth.

Tsiolkovskiy's idea has aided the development of a device for artificially changing the force of gravity. His method which produced weightlessness for a period of 14 seconds involved the free flight of a specially devised cabin within a horseshoe-shaped shaft from an altitude of 240 meters. Air had been pumped out of the shaft to eliminate air resistance. This device was recommended for use in training future travelers in outer space.

Lomonako, an Italian scientist, suggested a device called the "Roman tower of weightlessness." A chair is suspended at an altitude of 14 meters. This chair is tossed up with the aid of elastic traction and is allowed to drop. The body becomes three times its original weight. Weightlessness occurs in definite parts of the trajectory, and lasts 2 or 3 seconds. Such a brief period of weightlessness may be simulated in high-speed elevators of high buildings, such as the one in Moscow State University. Weightlessness lasting 50 seconds can be achieved in airplanes. A longer period of weightlessness can be attained with altitude rockets.

It has been discovered in the past few years that the absence of gravitational pull is beneficial to the heart, because heart muscles have less work to do when the force of gravity is absent. Respiration and the function of the gastrointestinal tract change substantially in outer space. Disruption in muscular coordination and disorientation have been noted during the period of weightlessness. Such simple and ordinary activities as walking, grasping, holding, and writing may undergo considerable changes. Physical exercise and conditioning are necessary for space travelers to avert atrophy.

Supplying the crew of a space vehicle with food and water is a difficult problem. One human being requires one liter of water per day. If it takes a month to go to the moon and back, a crew of three to five people will need a ton of food, water, and oxygen. The difficulties with which conquerors of space are confronted are understandable if it is considered that with 100 kilograms of food, drink, and oxygen, the rocket's weight will equal 90 tons to convey it to a height of several hundred kilometers.

The first steps in interplanetary travel have been taken; however, a number of difficulties remain. The progress made by Soviet science and technology offer a sufficient basis for believing that the medical problems involved in interplanetary travel will be solved. Figuratively speaking, space travelers are already putting on helmets, and it is not long until the prediction made by K. E. Tsiolkovskiy will become a reality.

85. Studies on Adenosinetriphosphatase and Pyrophosphatase Activity of E. Coli

"Studies on the Adenosinetriphosphatase and Pyrophosphatase Activity of E. Coli," by M. F. Khanina, Institute of Microbiology and Epidemiology imeni N. F. Gamaleya; Moscow, Voprosy Meditsinskoy Khimii, Vol 6, No 3, 1960, pp 244-248

Adenosinetriphosphatase and pyrophosphatase activity was determined in extracts obtained either from fresh bacterial cells by trituration with glass powder, or from acetone-dried bacteria. In the absence of activating ions, the ATP-ase and pyrosphosphatase activity was similar in both types of extracts, but in the presence of divalent ions (especially Co^{++}) the ATP-ase activity of extracts obtained from dried bacterial cells was 4-times that in those prepared from fresh cells. In the presence of Co^{++} and Mg^{++} both the labile phosphate groups of ATP are released. The pH-curves of activation by divalent ions are different for ATP-ase and for pyrophosphatase activity. On fractionation of the extracts with ammonium sulfate, pyrophosphate activity is greatest in the fraction precipitated at 0.8 saturation; the ATP-ase activity is evenly distributed between the fractions obtained at 0.6 and 0.8 saturation.

In the crude bacterial extracts, at least two closely related enzymes involved in the splitting of ATP and of pyrophosphate are apparently present.

Biochemistry

86. Biochemistry of Aging Process

"The Role of Disulfide and Methyl Groups in the Processes of Aging," by K. I. Parkhon and S. Oeriu, Institute of Endocrinology imeni K. I. Parkhon and Chemotherapeutical Division of Academy of Sciences of Rumanian People's Republic, Bucharest; Moscow, Biokhimiya, Vol 25, No 1, Jan/Feb 60, pp 61-67

Investigations conducted on rats, guinea pigs, rabbits, and dogs established that the animal organism in the process of aging loses methionine and accumulates disulfide groups, such as cystine and oxidized glutathion. It was also established that the administration of substances containing sulfhydryl groups -- cysteine -- to the animals led to the re-establishment of the biochemical equilibrium observed in young animals.

87. Aerosol Immunization Tested on Large Groups

"Aerosol Immunization With Dry Live Vaccines and Anatoxins. Report I: Theoretical and Experimental Grounds for the Development of an Aerosol Vaccination Method," by N. I. Aleksandrov and N. Ye. Gefen; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 131, No 6, Jun 60, pp 7-11

This article introduces a series which will appear in this journal and which will present a heretofore unpublished accumulation of factual material concerning experimental and practical testing of aerosol immunization with powdered vaccines.

A brief report is presented on the All-Union Conference on the Eradication and Reduction of Infectious Diseases, which was held in January 1960 and at which the problem of the specific, active prophylaxis of a number of diseases was discussed. It was pointed out at the conference that the presence of effective vaccines against diphtheria, poliomyelitis, tetanus, anthrax, tularemia, and botulism makes it possible to consider the complete eradication of these infections by means of mass immunization of huge groups; the problem of whooping cough, brucellosis, tuberculosis, gas gangrene, etc. are of the same order of importance. The authors regret that theory is far ahead of practice in this field.

Among the shortcomings of the parenteral method of immunization (subcutaneous, intracutaneous, and cutaneous inoculation) discussed at the conference were reactogenicity, the possibility of transmitting viral infections (encephalitis, infectious hepatitis, lymphogranulomatosis, etc.), and the difficulty of inoculating large groups. N. V. Sergeyev reported on this subject, and L. V. Gromashevskiy and G. P. Rudnev participated in subsequent discussions of dangers and postvaccinal complications of this method. No recommendations for preventing these complications were proposed. The desire for intensified development of associated and depot vaccines was expressed by I. I. Rogozin and others.

The development in the US of a "needleless injector" and its testing in the USSR in 1959 is noted. According to all reports, the apparatus is effective in mass immunization and affords protection against a number of very dangerous postvaccination complications.

Physiological methods of vaccination, defined as the introduction of vaccine preparations through unbroken membranes (enteral, intranasal, conjunctival, and aerosol administration), are considered by the authors to be far superior to the present parenteral methods. The advantages of these various physiological methods are discussed individually.

The authors note that auspicious results have been obtained by numerous investigators in aerosol immunization against plague, tularemia, tuberculosis, influenza, typhoid, dysentery, diphtheria, etc. The fact that this method is still not used more extensively for mass immunization is attributed to the lack of economical vaccine preparations designated especially for aerosol adaptation. A recent publication of the authors in which they demonstrated that the best form for vaccine preparations to be used in aerosol immunization is a dry, powdered form with polydispersed fractions is cited. Several advantages of this type of vaccine are listed.

The authors reveal that they have been testing dry, powdered vaccines against plague, anthrax, brucellosis, tularemia, tetanus, botulism, and diphtheria on a group of coworkers for more than 6 years. The harmlessness, reactogenicity, and immunogenic effectiveness of these preparations had been established in aerosol experiments on mice, rabbits, sheep, and monkeys. The favorable results obtained led to a study (1957-1960) of a new method for vaccinating humans, in which the complete harmlessness, low reactogenicity, and high effectiveness of the vaccines for humans was demonstrated.

In accordance with a resolution of the Vaccine-Serum Committee of the Ministry of Health USSR, the method of aerosol immunization with powdered anthrax and brucellosis vaccines is being studied on large groups of people. Extensive experimental investigations are also being continued.

88. Brucella Vaccine Strains Compared

"Comparative Characteristics of Three Brucella Vaccine Strains (19-BA, 19 and M) in Experiments on Subcutaneous and Cutaneous Administration," by M. F. Shmuter, L. G. Lopatukhina, A. N. Sosunova, and Ye. N. Yastrebova, Central Asiatic Antiplague Institute; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 31, No 6, Jun 60, pp 12-16

The authors briefly describe the following three vaccines which have been proposed in the USSR for the protection of humans against brucellosis: (1) strain 19, obtained from Canada in 1943, the harmlessness of which was verified for cattle by Yuskovets (1944-1947), and for humans, by Vershilova in 1947; (2) strain 19-BA, prepared by Vershilova from strain 19 and having, according to his data (1950), less residual virulence than the initial strain; and (3) strain M, proposed by Kotlyarova and providing, according to his data (1950), immunity against *Br. melitensis* in smaller doses than strain 19-BA.

In response to a suggestion of the Ministry of Health USSR, the authors tested the properties of the three strains by administering them subcutaneously and cutaneously to guinea pigs to simplify the inoculation method. The nature of the pathological-anatomical changes, the seedability of Brucella from different organs and tissues, and immunological reconstruction in pigs sacrificed one, 5, 15, 30, 45, 60, 90, and 180 days after the subcutaneous and cutaneous introduction of the vaccine strains were studied. In addition, the immunity conferred was challenged with a highly virulent Br. melitensis strain.

The results of these experiments are shown in two tables, and the following conclusions are presented.

1. Of the three Brucella vaccine strains used for vaccination in the USSR, strain M had the highest residual virulence in comparison with strains 19-BA and 19. Strain M produced more pronounced pathological-anatomical changes in the internal organs, appeared in the largest number of organs over a longer period, and caused greater seeding of the organs and tissues than strains 19-BA and 19.
2. There were no essential differences in residual virulence between strains 19-BA and 19. Both these strains caused identical changes in the internal organs, adapted similarly to the organs of the vaccinated animals, and produced identical immunological reconstruction.
3. The immunological reconstruction produced by strain M was maintained for a much longer period, and its intensity was higher than the reconstruction caused by strains 19-BA and 19.
4. The high immunogenicity of all three vaccine strains was noted in the experiments.
5. Cutaneous vaccination, which caused somewhat fewer changes in the organs of the inoculated pigs, guarantees immunity no less pronounced than that conferred by subcutaneous vaccination.
6. In view of these findings, we can unconditionally recommend cutaneous inoculation against brucellosis with strain 19. When strain M is used to vaccinate humans, its high residual virulence should be considered, and the dosage for both subcutaneous and cutaneous inoculation should be calculated precisely in advance.

89. Ultrasound Treatment of Inflamed Tissues

"The Effect of Ultrasound on Thermal Inflammation," by M. M. Smyk and Ye. M. Skublevskiy, Chair of Pathological Physiology, Lugansk Medical Institute, and Chair of Physics of Stanislav Medical Institute; Moscow, Patologicheskaya Fiziologiya i Eksperimental'naya Terapiya, Vol 4, No 3, May/Jun 60, pp 27-31

The authors attempted to trace the effect of ultrasound on the fundamental components of thermal inflammation. Fourteen rabbits were subjected to thermal inflammation (produced by placing both ear lobes in water at 53° for one minute), and then treated by ultrasound with a frequency of 1,430 kilocycles and an intensity of 0.5 watts/cm² for 15 minutes over a 3-day period.

Results showed that during the first period of inflammation the skin temperature fell, and the number of leukocytes in the blood leaving the inflamed ear lobes decreased. Later, at the sites exposed to ultrasound, there was increased hyperemia, edema, and increased tissue infiltration by cells of the mononuclear type.

The authors discussed the effect of ultrasound treatment of inflamed tissues and compared it to the behavior of desympathized inflamed tissues.

90. Use of Ultrasound Vibrations for Crushing Stones in Urinary System

"The Problem of Ultrasound Lithotripsy," by Yu. G. Yedinyy and O. G. Balayev, Urological Clinic imeni Chayka and Urological Department of Kiev Clinical Hospital imeni Oktyabr'skaya Revolutsiya; Moscow, Urologiya, No 3, May/Jun 60, pp 45-52

The purpose of the research described was to explain the possibility of using ultrasound for crushing stones formed in the urinary system. Tests were run in vitro on laboratory models, and in vivo on the tongue of a frog. The authors describe an instrument which generates ultrasonic vibrations and transmits them to the urinary system, where the stones are crushed.

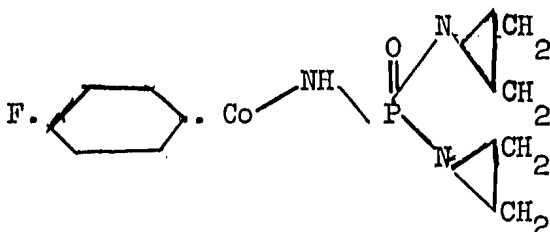
Results of both in vitro and in vivo tests prove that the problem of using ultrasonic vibrations for lithotripsy merits attention and requires further study.

Oncology

91. A-23, Antitumor Preparation

"Antiblastic Properties of the Fluorobenzoyldiethylene Triamide of Phosphoric Acid (A-23)," by I. M. Peysakhovich, Ukrainian Sanitary-Chemical Institute; Moscow-Leningrad, Voprosy Onkologii, Vol 6, No 5, May 60, pp 47-51

Mice, rats, and rabbits were used in experiments carried out to determine the effectiveness of the fluorobenzoyldiethylene triamide of phosphoric acid when used in tumor therapy. The preparation was synthesized by L. D. Protsenko at the K. A. Kornev laboratory. It has the following structural formula:



A-23 is a white crystalline powder, odorless, and readily soluble in alcohol, water, acetone, and benzene. It decomposes at a temperature of 240 degrees.

The experiments established that A-23, when administered to the animals per os, subcutaneously, or intravenously, inhibited the growth of mesenchyma and epithelial tumors. Its high therapeutic index and the fact that it does not affect the hemopoietic organs provides a basis for its testing under clinical conditions.

92. Virus Etiology of Tumors in Man and Animals

"Electron-Microscopic Investigations of Some Human and Animal Tumors," by T. G. Gasanov; Baku, Azerbaydzhanskiy Meditsinskiy Zhurnal, No 4, Apr 60, p 120

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"The study of cancer from a virological viewpoint is a highly important problem, for such study may to a considerable degree determine, our practical activities in connection with the therapy and prophylaxis of oncological diseases. This viewpoint has been receiving considerably greater attention in recent years. More than 100 electronoscopic investigations are now being made; these furnish evidence of the existence of virus-like bodies in tumors of man and animals. The investigations which we have been conducting in the L. A. Zilber laboratory revealed that extracts of

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gastric polyps and papillomas of the urinary bladder contain submicroscopic bodies which are very close to viruses. The disposition of these bodies in paired figures, short chains, or small clusters can be observed on the screen of an electron microscope. Their sizes vary within narrow limits and average about 100 m. μ , although bodies of smaller dimensions have been observed in some of the preparations. An analogous picture was noted in the study of tumors induced in rats. The data obtained point to the necessity for the further investigation of tumors by utilizing complex methods which combine morphological (electronoscopic) and serological investigations."

93. Chemotherapy of Cancer

"Principles of Chemotherapy in Oncology," by Prof L. F. Larionov, Corresponding Member of Academy of Medical Sciences USSR, Institute of Experimental and Clinical Oncology, Academy of Medical Sciences USSR; Moscow, Vestnik Akademii Meditsinskikh Nauk USSR, Vol 15, No 4, Apr 60, pp 29-36

Two basic theoretical principles govern the search for chemotherapeutic preparations effective in the therapy of tumors: (1) the principle of selective action, that is, action on tumorous cells without affecting the normal cells, and (2) the principle of the differential effect on different tumors. Some degree of success has been attained in the search for such preparations. Mentioned are novoembichin, sarcolysin, phenylalanine, asalin peptide-N-acetyl-sarcolysin in combination with valine), nicosin (amide of nicotinic acid with sarcolysin), phenesterin (cholesterin ester of bis-beta-chloroethylaminophenylacetic acid), and phenesthesin (compound of bis-beta-chloroethylaminophenylacetic acid and anesthesin). However, the author warns, chemotherapy is not a substitute for surgery, but to the contrary, either supplements or makes possible surgery in cases which heretofore were considered as being inoperable.

Pharmacology and Toxicology

94. Synthesis and Pharmacology of Atropine Ascorbate

"Derivation of Atropine Ascorbate and the Investigation of Its Pharmacological Properties. Report I. Synthesis of Atropine Ascorbate and the Investigations of its Physico-chemical Properties. Report II. Investigation of the Toxicity of Atropine Ascorbate. Report III. Effect of Atropine Ascorbate on the Blood Pressure and Respiration of a Rabbit," by A. N. Pomaskina, Sb. Nauchn. Tr. Krasnoyarskiy Med. In-t (Collection of Scientific Works, Krasnoyarsk Medical Institute), 1958, No 5, 90-91, 91-92, 92-93 (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 10, 25 May 60, Abstract No 14474, by I. El'man)

CPYRGHT

"Absolute ethyl alcohol is poured into a flask equipped with a reflux condenser and heated on a water bath until it boils; a corresponding quantity of ascorbic acid is then added to the alcohol and is dissolved by stirring. An alcohol solution of atropine is added to the alcohol solution of ascorbic acid. The solution is shaken vigorously and then rapidly cooled. No precipitation forms when the solution is cooled. Dehydrated ether is used to precipitate the atropine ascorbate which is a double salt of ascorbic acid and atropine. Atropine ascorbate in the form of a homogenous white precipitate is formed in the ether. The upper layer of the ether is poured off, the precipitate is again washed in ether, and then dried in a vacuum-exsiccator. Atropine ascorbate is a white crystalline substance with a melting point of 62 degrees. Its solubility in water and alcohol is somewhat greater than that of atropine sulfate in the same solvents.

"II. Atropine ascorbate, when administered subcutaneously to mice in doses of 5 milligrams, was found to be less toxic than atropine sulfate. The lethal doses of both preparations are similar: 10 milligrams when administered to mice.

"III. Atropine ascorbate, when administered in doses of 25 milligrams per kilogram of body weight to rabbits, was not toxic. It caused a slight temporary decrease in the blood pressure of the animals. Atropine ascorbate stimulated respiration in the animals with greater intensity than did atropine sulfate."

95. Valuable Source for Cholinolytic Preparations

"On the Possibility of Using the Above-Ground Portion of *Scopolia tangutica* as a Medicinal Raw Material," by S. A. Minina, Tr. Leningr. Khim.-Far-matseut. In-ta (Works of the Leningrad Chemical Pharmaceutical Institute), 1959, No 8, 153-157 (from Referativnyy Zhurnal--Khimiya, No 11, 10 Jun 60, Abstract No 43778 by A. Vavilova)

Investigation of the toxicity and cholinolytic activity [on the basis of the effect on acetylcholine hypotension, on secretion of the gastrointestinal tract, and also on the pupil of the eye (the mydriatic effect)] of a preparation made from the above-ground portion of *Scopolia tangutica* Maxim. indicated that this preparation exhibits an action very close to atropine and scopolamine in character and strength. Its toxicity, though, was somewhat lower than that of atropine. The preparation produced from the rhizomes was more toxic and had a weak cholinolytic action. The assumption was made that the above-ground portion of *Scopolia* is a highly effective raw material for the production of various medicinal products possessing cholinolytic activity.

96. Prevention of Spasmodic Attacks

"New Data on the Possibility of Preventing Spasmodic Attacks by the Intravenous Administration of a Solution Affecting Carbohydrate Metabolism, and Hemodynamics, and Modifying Synaptic Transmission," by I. I. Fedorov, V. P. Bezuglov, and M. A. Gorin', Fiziol. Mekhanizmy Kompensatorn. Reaktsiy i Vosstanovit, Protsesov (Physiological Mechanisms of Compensatory Reactions and Restoration Processes), Part 2, Lvov, 1958, 60-66 (from Referativnyy Zhurnal--Biologiya, No 11, 10 Jun 60, Abstract No 53050, by S. Skorodelov)

CPYRGHT

"Experiments on rabbits revealed that the intravenous administration of a 10-percent solution of sodium lactate in a dose of 10 milliliters, 10 minutes before the administration of a spasm inducing dose of pyramidon (2.1 milliliters per kilogram of body weight of a 4-percent solution), or corazol (one milliliter of a one-percent solution) either prevented the development of a spasmodic attack or reduced its intensity to a considerable degree. It is assumed that in the mechanism of the antispasmodic action of sodium lactate, active parts are played, first, by the modifications in the metabolism of the central nervous system which substantially modifies the correlation between stimulation and inhibition; second changes in the blood supply to the cerebrum; and, third, possible changes in the sensitivity of nervous reception; the participation of the latter in the mechanism of the development of the spasmodic attack should not be excluded."

97. Effect of Plague Toxin on Transamination Reactions

"The Effect of Plague Toxin on Transamination Reactions,"
by I. V. Domaradsky, I. M. Klimova, and L. G. Perevalova,
State Antiplague Research Institute of Siberia and the
Far East, Irkutsk; Moscow, Voprosy Meditsinskoy Khimii,
Vol 6, No 3, 1960, pp 288-290

The toxin of the plague microbe, when administered to albino mice, inhibits the transamination reaction between glutamate and pyruvate in the liver; the utilization of glutamate is decreased by 29.5%, and alanine formation, by 31.2%.

98. Comparative Evaluation of Belladonna Varieties

"Comparative Pharmacognostical Evaluation of *Atropa belladonna* L. and *Atropa belladonna* L. var. *lutea* Doll.," by J. Tucakov and M. Soldatovic, Acta Pharmac. Jugosl. (Yugoslvia), 1959, 9, No 3, 135-142 (from Referativnyy Zhurnal--Khimiya, No 9, 10 May 60, Abstract No 35863, by S. Okun')

CPYRGHT

"A comparative evaluation of the violet and yellow varieties of belladonna, grown under natural conditions and experimentally, was made. Chemical and phytopathological analyses of the samples were made. It was established that the yellow belladonna which grows near the Bulgarian frontier acclimatizes easily at altitudes of 80-100 meters and contains more alkaloids than the violet variety of the plant. Its seeds were found to germinate easier than the seeds of the violet belladonna. It is recommended that the yellow variety of belladonna be cultivated in fertile, light, and well-plowed soil, in localities, with a mild climate. Tables which illustrate the properties of the seed and the alkaloid content in parts of both varieties of belladonna are provided."

99. Sulfamide Preparations

"Determination of Sulfamide Preparations Possessing Hypoglycemic Action," by R. Simionovici and I. Conu, Rev. chim. (Rumania), 1959, 10, No 2, 107-108 (from Referativnyy Zhurnal--Khimiya, No 9, 10 May 60, Abstract No 35886, by the author)

CPYRGHT

"Two methods for the determination of sulfamide preparations, N-(4-methylbenzenesulfonyl)-N'-butylurea and N-(4-methylbenzenesulfonyl)-N'-cyclohexylurea, are described: (1) The alkalimetric method in which the substance is titrated with a 1 n solution of NaOH (indicator, red cresol) in an acetone medium; (2) and the thermal decomposition of the amine at a temperature of 120 to 130 degrees in ethyleneglycol in the presence of HCl. The butylamine which is obtained (cyclohexylamine) is distilled in a 0.1 n solution of HCl; the excess acid is titrated with a 0.1 n solution of NaOH. The results obtained by the two methods are presented."

100. Dinesin-Antihistamine Preparation

CPYRGHT

"Dinesin" (unsigned article); Moscow, Meditsinskiy Rabotnik, Vol 23, No 56 (1908), 12 Jul 60, p 4

"Dinesin [the hydrochloride of N-2 (2-diethylaminoethyl)-pheno-, thiazine, Lekarstvennyye Sredstva, by M. D. Meshkovskiy, Moscow, 1957, pp 77-78] is a new preparation possessing antihistamine properties. It has a depressing effect on the ganglia of the parasympathetic system and reduces or completely eliminates hyperkinesia and spasms induced by nicotine and arecoline. Dinesin is applied in cases of postencephalitic parkinsonism, torso dystonia, etc. It is manufactured in the form of tablets each containing 0.05, 0.1, and 0.2 grams of the preparation. It is administered internally beginning with doses of 0.15-0.5 grams in 24 hours. The dose is gradually increased to one gram in 24 hours. The drug is taken after meals. The course of treatment continues for a period of 3-4 weeks. After a 2-3-week interval, the treatment may be repeated, with doses individually prescribed. It is advisable to carry out the first course of treatment under hospital conditions."

101. Concentration of Antibiotics in Lymphatic System

CPYRGHT

"Problems of the Directed Penetration of Antibiotics Into the Lymphatic System. Report 1," by P. Malek, M. Herold, J. Hoffman, J. Lole, J. Capkova, and M. Vondracek, Casop Lek. Cesk (Czechoslovakia), 1959, 31, 961-965 (from Meditsinskiy Referativnyy Zhurnal, Section 3, No 4, Apr 60, Abstract No 1448, by B. M. Nemirovskaya

"It was established that a high concentration of antibiotics in the lymphatic system may be achieved by the following methods: (1) administration of antibiotics having an affinity for some organ as well as for the lymphatic system of the organ; (2) the use of antibiotics which possess a high capacity for penetration into all tissues, and therefore into the lymphatic nodes; and (3) directed overloading of the lymphatic system, beginning with the site where the antibiotics are administered. The third method is discussed in detail by the authors."

102. Detoxication of Organism in Lead Poisoning

"Role of Ascorbic Acid and Cysteine in the Detoxication of the Organism in Lead Intoxication," by G. A. Uzbekov, Chair of Biochemistry Ryazan Medical Institute imeni I. P. Pavlov; Moscow, Voprosy Meditsinskoy Khimii, Vol 6, No 2, Mar/Apr 60, pp 183-187

Male rabbits were used in experiments conducted to determine the effectiveness of ascorbic acid and cysteine when used as detoxicating agents in lead intoxication. By means of amperometric titration it was determined that lead intoxication causes modifications of the blood serum content of protein and nonprotein sulfhydryl groups, and these modifications may be utilized to determine the degree of intoxication and detoxication of the organism. The experiments established that in lead intoxication the administration of ascorbic acid and cysteine helps in neutralizing the toxic effects of the lead. The preparations hasten the excretion of the poison from the organism via the feces and urine. Further investigations established that ascorbic acid and cysteine may also be utilized as prophylactic agents against lead poisoning.

103. Effect of Uranium on Organism

"Some Data on the Effect of Uranium and Its Compounds on the Human Organism," by O. S. Andreyeva, Candidate of Medical Sciences; Moscow, Gigiyena i Sanitariya, Vol 25, No 5, May 60, pp 77-82

The article briefly reviews the literary data already available on the effect of uranium on the human organism. A summation of this data reveals that uranium is a toxic chemical substance as well as a source of irradiating action. In the early periods of poisoning, symptoms of acute or sub-acute intoxication are in evidence. These may be accompanied by a pathological renal condition and other manifestations of poisoning already thoroughly covered in medical literature. In later periods following the intoxication, as well as in cases of prolonged intoxication with small doses of the metal, the character of the diseases is similar to that caused by ionizing radiation, and is accompanied by such disturbances as a dynamic decrease in the number of leukocytes, neutropenia, lymphopenia, qualitative morphological blood modifications, and changes in the neuro and neuro-endocrine systems. At the same time, the toxic effects of the metal are also apparent (nephropathy, chronic hepatitis, gastritis, etc.) Dosimetric control and sanitary-hygienic measures should be exercised as prophylactic measures.

104. Effect of Certain Drugs on Circulation

"On the Comparative Pharmacological Effect of Papaverine, Sinomenine, Tiphén, and Dibazol on Circulation," by A. A. Pykhtina, Uch. Zap. 2-y Mosk. Med. In-t (Scientific Notes of the Second Moscow Medical Institute), 1958, 13- 61-68 (from Referativnyy Zhurnal-Biologiya, No 11, 10 Jun 60, Abstract No 53091, by N. Kudryavina)

CPYRGHT

"Cats, rabbits, and rats were used in experiments which were conducted to determine the effect of sinomenine (0.5 milligram per kilogram of body weight), papaverine, tiphén, and dibazole in doses of one milligram per kilogram of body weight and their combinations on blood pressure, blood coagulation, and adenosine triphosphatase activity. Sinomenine displayed the greatest activity in cases of normal or pituitary hypertonia. Papaverine and tiphén, when combined, potentiated the hypotensive effect of each other. Tiphén increased blood coagulation, while sinomenine, papaverine, and dibazole decreased it. Depression of adenosine triphosphatase activity in smooth muscular tissue was noted in most of the cases; the activity of the enzyme in other organs changed less regularly."

105. Effect of Aminazine on Some Functions of the Organism

"Modification of Nitrogen Metabolism and Oxidation Processes in Psychic Patients Treated With Aminazine," by E. Ya. Skuin', Khimiya i Meditsina, (Chemistry and Medicine), No 9, 1959, pp 195-205 (from Referativnyy Zhurnal--Biologiya, No 11, Jun 60, Abstract No 53012, by G. Izmaylova)

CPYRGHT

"Biochemical investigations were conducted on 36 patients who were being treated with aminazine. An improvement in the general clinical symptoms, reduction of the ammonium coefficient in the urine, restoration to normal of the ratio of amine nitrogen to the total content of nitrogen in the urine, and a decrease in the Buscaine-Kimbarovskiy reaction were observed. All of these manifestations indicated the elimination of toxic effects and a deficiency of oxygen in the urine. A single administration of aminazine in a dose of 50-75 milligrams to the patients produced modification in the metabolic indexes: the amount of sugar and oxygen deficiency in the blood increased, the quantity of residual nitrogen decreased, and the amount of total nitrogen in the blood increased. The restoration of metabolism to normal produced by aminazine is better manifested in presenile patients."

106. Aminorastin, New Hydrolysate

"Aminorastin -- a New Solution for Parenteral Protein Nutrition," by M. Ye. Denn, Senior Scientific Worker, and T. V. Znamenskaya, Candidate of Biological Sciences, Laboratory of Blood Substitutes and Surgical Clinic, Leningrad Order of Red Banner Institute of Blood Transfusion; Moscow-Leningrad, Vestnik Khirurgii, Vol 84, No 5, May 60, pp 64-67

Aminorastin is a hydrolysate of vegetable origin prepared at the Laboratory of Blood Substitutes of the Leningrad Institute of Blood Transfusion. It contains peptides, salt, glucose, and all the essential amino acids. Chemically it is similar to the hydrolysates of animal origin: hydrolysin and aminokrovin. Clinical tests established that aminorastin is well tolerated by the patients, produces no toxic and antigenic reactions, and has no effect on blood coagulation. When administered intravenously or subcutaneously it creates a positive nitrogen balance in the organism. Amino acids are not excreted in the urine following the infusion of aminorastin. Its use for parenteral nutrition along with other hydrolysates is recommended.

107. Planting of Seeds of Rauwolfia serpentina

"On the Problem of the Introduction of Rauwolfia serpentina Benth," by I. M. Rabinovich; Moscow-Leningrad, Botanicheskiy Zhurnal, Vol 45, No 4, Apr 60, pp 592-595

Seeds of Rauwolfia serpentina have been brought to the USSR from India by an expedition of the All-Union Scientific Research Institute of Medicinal and Aromatic Plants, and planted along the coast of the Black Sea in the humid subtropical area of the Caucasus, and the Transcaucasia Zonal Experimental Station of the Institute in the City of Kobuleti, Adzharskaya ASSR. Positive results which indicate the possibility of cultivating the plant in the USSR were attained.

Physiology

108. Effect of Neurotropics on Adrenal Functions

"The Effect of Neurotropic Substances on the Adrenal Cortex, Report No 1," by Ya. M. Miloslavskiy, L. I. Miloslavskaya, V. Leonova, and V. Kazhin, Chair of the Faculty of Therapy and Pharmacology, Ryazan Medical Institute imeni I. P. Pavlov; Moscow, Problemy Endokrinologii i Gormonoterapii, No 3, 1960, pp 12-15

The authors studied the effect of stimulating neurotropic substances (ephedrine, strychnine, and caffeine) on the adrenal cortex. Experiments were conducted on white rats. These substances were administered twice a day for a period of 6 days. Then the weight of adrenal glands and the content of ascorbic acid and cholesterol therein were determined.

The data obtained show intensified function of the adrenal cortex, more marked following the administration of ephedrine, and slightly less, of strychnine. The stimulating effect of caffeine on the adrenal cortex is insignificant.

109. Effect of Hormones on Adrenal Secretion

"The Effect of Somatotropic Hormone on Adrenal Glands in Rats," by T. S. Sakhatskaya, Section of Biochemistry, All-Union Institute of Experimental Endocrinology; Moscow, Problemy Endokrinologii i Gormonoterapii, No 3, 1960, pp 9-11

It was shown by experiments in vivo that somatotropic hormone has no effect on the qualitative and quantitative composition of corticosteroids in the blood flowing from the adrenal glands in rats and does not restore the sensitivity of adrenal glands to ACTH in hypophysectomized rats.

110. Effect of Some Glands on Blood Pressure

"The Role of the Hypophysis and Adrenal Glands in Systolic Blood Pressure Regulation in Irradiated Rats," by A. A. Grafov, Moscow, Problemy Endokrinologii i Gormonoterapii, No 3, 1960, pp 22-26

The purpose of the paper was to study the role of the hormones of the hypophysis and adrenal glands in the development of the hypotensive syndrome in irradiated rats. It was shown that the hormones of the hypophysis and adrenal glands take part in blood pressure regulation not only under normal conditions but also after irradiation. The hypotensive syndrome provoked by total X-ray irradiation was more pronounced in adrenalectomized and hypophysectomized rats, as distinct from those subjected to irradiation only. The systolic blood pressure reading changed in accordance with general radioresistance, which in hypophysectomized and adrenalectomized animals showed a sharp decrease.

111. Effect of Stress on Functions of the Organism

"The Functional Condition of the Hypophysis and Adrenal Cortex Under 'Stress' in Young and Old Rats," by I. A. Eskin and N. V. Mikhailova, Section of Experimental Biology, All-Union Institute of Experimental Endocrinology; Moscow, Problemy Endokrinologii i Gormonoterapii, No 3, 1960, pp 3-8

The authors compared the ability of old and young rats to respond by eosinopenic reaction and reduction of ascorbic acid content in adrenal glands to cold ($-2 \pm 2^{\circ}\text{C}$) and pain induced by electric stimuli (20 discharges of alternating current every 30 seconds with a voltage of 100 v). Following the action of low temperature and pain stimulation, the eosinopenic reaction in the old rats was found to be much weaker, and the change in ascorbic acid concentration was less pronounced than in the young ones. Experimental analysis demonstrated that in the old rats the weakened reaction of the hypophysis-adrenal cortex system to the mentioned factors, with the resultant condition of "stress," is not associated with a reduced functioning of these glands in old rats. Thus, adrenalin injection (5-10 ug per 100 gm of body weight) induces a similar eosinopenic reaction in the young and the old rats. Injection of exogenic ACTH (2 units per 100 gm of body weight) provokes a normal eosinopenic reaction in old rats. The ACTH content in the hypophysis is approximately equal in the old and the young rats. This points to the fact that in the old animals the ACTH production in the hypophysis and the reaction of adrenals to the exogenic and endogenic ACTH is normal.

In the old rats, the weakened reaction of the hypophysis-adrenal cortex system to cold and pain is attributed by the authors to probable age changes in the nervous structure (hypothalamic area), controlling the ACTH secretion under "stress."

112. Disturbed Higher Nervous Activity Affects Antibiotic Therapy

"The Effect of a Disturbance in Higher Nervous Activity on the Effectiveness of Antibiotic Therapy," by V. S. Nevstruyeva. Tr. In-ta Normal'n. Patol. Fiziol. AMN USSR (Works of the Institute of Normal and Pathological Physiology, Academy of Medical Sciences USSR), No 1, 1958, pp 170-174 (From Referativnyy Zhurnal--Biologiya, No 10, 25 May 60, Abstract No 47280, by S. Chesnokova)

CPYRGHT

"Conditioned reflexes were established in 24 rats, after which disturbances of the central nervous system were produced in 12 of them. All rats were infected with *Staphylococcus aureus*, and then treated with ekmonovocillin. Inflammation was rapidly arrested and the conditioned reflex was normalized in the control rats. The inflammation proceeded severely in the rats with disturbed central nervous systems despite the high concentration of ekmonovocillin in the blood, the conditioned reflexes were inhibited, and the phagocytic properties of the blood were curtailed and were not increased due to the effect of ekmonovocillin."

113. Review of Book on Diseases of Nervous System

Neotlozhnaya Pomoshch Pri Ostrykh Zabolevaniyakh Nervnoy Sistemy (First Aid in Acute Affections of the Nervous System), by N. S. Misyuk, reviewed by V. E. Levi; Moscow, Sovetskaya Meditsina, Vol 24, No 5, May 60, p 154

The book written by Doctor of Medical Sciences N. S. Misyuk, head of the Chair of Nervous Diseases of the Arkhangel'sk Medical Institute, deals with the important problem of providing first aid in cases of acute affections of the nervous system. The book is intended for practicing physicians and is very timely. It consists of the following chapters: "Comatose Conditions," "Spasmodic Conditions," "Disturbances of Cerebral Circulation," "Acute Neuroinfections," "The Pain Syndrome," "Closed Cranial Traumas," "Certain Other Pathological Conditions," and "Examples of Therapy." The clinical forms of nervous diseases, and certain symptoms of diseases less frequently encountered are described. Although the book has a number of shortcomings, it does provide essential information on first aid in cases of acute mental disturbances and can be recommended as a handbook for neuropathologists as well as for practicing physicians in other special fields of medicine.

114. Chlorophos as a Fly-Controlling Agent

"Dry Fly-Poisoning Paper With Chlorophos as an Active Substance in Combating Fly Nuisance," by V. A. Lineva, U. Z. Abergau, and A. I. Ionova Institute of Medical Parasitology and Tropical Medicine imeni Ye. I. Marysinovskiy, Ministry of Health USSR and Central Control Research Laboratory, Moscow Municipal Disinfection Station; Moscow, Meditsinskaya Parazitologiya i Parazitarnyye Bolezni, No 3, 1960, pp 330-334

Chlorophos, as an organophosphorus preparation intended to control flies, proved to be effective both against imago and larvae. In addition, it has an odor capable of attracting the flies. Hence, paper-sheets soaked in chlorophos do not need any admixtures for bait.

115. Nets for Protection From Blood-Sucking Flies

"Hygienic Evaluation of Nets Manufactured From Synthetic Materials and Intended for Mechanical Protection From Blood-Sucking Flies," by Ya. S. Kon' Central Scientific Research Laboratory of Hygiene and Epidemiology, Ministry of Communications USSR; Moscow, Meditsinskaya Parazitologiya i Parazitarnyye Bolezni, No 3, 1960, pp 326-329

To prevent the penetration of blood-sucking insects into premises, it is possible to use nets made of plastics and kapron, instead of metal-wire nettings. A netting made of vinyl plastic meets basic hygienic demands. A capron net is much stronger than gauze, offers less resistance to wind pressure, and may be recommended as a proper netting. Varnished kapron nettings are not advisable because of their inflammability, high resistance to wind pressure, and high cost.

116. Problem of Elimination of Dysentery

"Basic Tasks in Connection With Scientific and Practical Efforts to Reduce the Morbidity of Dysentery," by Prof A. F. Bilibin, Active Members of Academy of Medical Sciences (Moscow); Moscow, Sovetskaya Meditsina, Vol 24, No 5, May 60, pp 3-7

Indicating that the problem of the incidence of dysentery as well as a number of other intestinal diseases is not a "small" one, Prof Bilibin suggests that the following measures be taken in the effort to control and eliminate these diseases:

Create a central point for the study of dysentery and other intestinal diseases; such study to cover the clinical, pathogenic, microbiological, epidemiological, hygienic, immunological, and all other aspects of the diseases.

Expand laboratory facilities for exact diagnosis of the different intestinal diseases.

Develop and adopt a unified system of nomenclature and classification of intestinal diseases.

Create a special service to deal with intestinal diseases, and to staff such service not only with sanitary-epidemiological but clinical-therapeutic personnel as well.

117. Effect of Severe Temperature Changes on the Organism

"On the Hygienic Significance of Temperature Changes of the Air," by Prof. G. Kh. Shakhbazyan, Corresponding Member of the Academy of Medical Sciences USSR; F. M. Shleyfman, Candidate of Medical Sciences; and I. G. Veksler, Kiev Medical Institute and Institute of Labor Hygiene and Occupational Diseases; Moscow, Vestnik Akademii Meditsinskikh Nauk SSSR, Vol 15, No 5, 1960, pp 62-66

Investigations were conducted to determine the pathogenic effect of severe changes in the air temperature in certain industries on the organism. The investigations established that acute catarrhal conditions and influenza were prevalent in workers subject to severe fluctuations in temperature throughout all seasons, while in most workers the incidence of these diseases dropped sharply during the summer months; deep and stable changes were observed also in the blood as well as in the entire organism. The data which were obtained point to the hygienic significance of severe temperature fluctuations, and indicate the need to normalize temperatures in those industries in which such severe temperature variations prevail.

Radiology

118. Slowing of Reflex Reactions Due to Chronic Exposure to Small Doses of Ionizing Radiations

"The Condition of the Nervous System in People Working With Radioactive Substances," by A. A. Danilin, N. I. Lukash, T. Ya. Malinovskaya, K. B. Skvirskaya, V. D. Serebryannikov, and G. A.

Sheshina, Central Scientific Research Institute of Medical Radiology, Ministry of Health USSR, and Institute of Radiation Hygiene, Ministry of Health RSFSR; Moscow, Meditsinskaya Radiologiya, Vol 5, No 5, May 60, pp 37-42

Periodic tests over a period of 5 years on 437 people engaged in work with sources of ionizing radiations not exceeding 0.2 r per week, and on 210 people having no occasion for contact with sources of ionizing radiations, revealed definite nervous disturbances in the members of the first group. The rheobase values were higher, and the chronaxie required for the flexion and extension of the fingers was longer in the members of the first group. Analogous results were obtained for optic analysors. Hypotonia was frequent in the group exposed to radiation. These functional changes in the central and peripheral nervous systems indicate the predominance of inhibition, which is manifested by a retarded reaction and decreased sensitivity; the changes are associated with certain occupational hazards.

119. Effect of Radiation on the Organism

"The Effect of Ionizing Radiation on the Adrenocorticotropic Activity of the Peripheral Blood in Rats," by E. R. Bagramyan; Radiation Laboratory, All-Union Institute of Experimental Endocrinology; Moscow, Problemy Endokrinologii i Gormonoterapii, No 3, 1960, pp 27-31

Cross blood transfusion was effected in hypophysectomized and experimental rats. A decreased ascorbic acid content was noted in the right adrenal gland of the hypophysectomized rat which had been removed 20-30 minutes after the discontinuation of the cross transfusion, as compared with that in the left one, excised previous to cross transfusion. This pointed to adrenocorticotropic activity in the blood of the experimental animal. ACTH in the blood of a normal rat provoked a 12.8% average reduction of the ascorbic acid concentration in the right adrenal gland of the hypophysectomized rat. Acute blood loss or electric stimulation of the nerve provoked an even greater decrease (15.2 and 21.8%). Three hours after irradiation there was a considerable decrease in blood adrenocorticotropic activity, which disappeared almost completely 5 hours after the irradiation. This explains one of the mechanisms giving rise to the disturbance of hormone formation in the adrenal cortex following irradiation.

120. Efficacy of Levomycetin in Treating Infected Wounds During Radiation Sickness

"The Use of Levomycetin in the Prophylaxis and Therapy of Non-penetrating Infected Wounds of the Cornea With a Background of Radiation Sickness," by V. P. Zhokhov, Chair of Ophthalmology, Military Medical Academy imeni S. M. Kirov; Moscow, Vestnik Oftal'mologii, No 3, May/Jun 60, pp 48-49

The therapeutic efficacy of levomycetin in cases of suppurative eye infections against a background of radiation sickness was tested on rabbits. The animals were subjected to a single whole-body X-irradiation by 400 or 600 r, and developed radiation sickness of various degrees. Wounds were inflicted on the cornea by a lancet immediately after the irradiation, and infection was caused by a one-day-old culture of type II pneumococcus, which is sensitive to levomycetin.

A 5% levomycetin suspension was administered, to irradiated infected and nonirradiated infected animals 2 or 6 hours after infection.

Results show that the efficacy of the action of a 5% levomycetin suspension decreases to a certain extent, depending on the severity of radiation sickness and the time elapsed before treatment is started.

121. Radioactivity for Labeling Ticks

"Radioactive Isotopes for the Labeling Ticks," by L. V. Babenko, Entomological Section, Institute of Medical Parasitology and Tropical Medicine imeni Ye. I. Martsinobskiy, Ministry of Health USSR; Moscow, Meditinskaya Parazitologiya i Parazitarnyye Bolezni, No 3, 1960, pp 320-324

To solve certain problems concerning the field ecology of Ixodidae with a development-cycle involving several years, it is sometimes necessary to label them at one stage and record them at the next one. To do this, neither the staining of the tick's integument nor their treatment with the ordinarily employed radioactive isotopes is possible.

The article carries the results of an experience involving the use for this purpose of the radioactive carbon C^{14} , whose half-life period extends over 5,000 years. This carbon was introduced intraperitoneally as a glycine constituent (amino acid with C^{14} in the carboxyl group) to a rabbit and to mice at the time when the Ixodes ricinus larvae and nymphs fed on them. The radioactive label could be discovered later not only in satiated ticks, but also following their molting at the next stage, and in the cast-off larval skins. Replete larvae and nymphs with a relatively

stable radioactive label managed to survive very well in the laboratory and their molting occurred at normal dates. No rise could be noted in the mortality of fasting nymphs and imagoes developing from them (observation time stretched over 7 months).

Virology

122. Mechanism of Infection of Mice With Encephalitis

"Experimental Studies on the Pathogenesis of Tick-Borne Encephalitis After Alimentary Infection, Report I, Distribution of Virus in the White Mouse Body," by V. V. Pogodina, Institute of Virology imeni D. I. Ivanovskiy, Academy of Medical Sciences USSR; Moscow, Voprosy Virusologii, No 3, 1960, pp 273-279

The mechanism of alimentary infection of white mice with tick-borne encephalitis virus, the localization of the pathogen, and its route through the body were studied.

Typical paralytic illness or immunity was shown to develop in animals no matter into which section of the alimentary tract the virus was introduced (mouth, esophagus, intestine). In the author's opinion, the principal stages in the development of the pathological process are: the primary multiplication of virus in alimentary tract tissues (mainly in the intestine), viremia and multiplication in the CNS. The virus reaches the CNS via circulation or by a neutral route. During the acute phase of the disease virus titres increase in all organs, the highest concentration of virus being in the central and sympathetic nervous system (LD₅₀ 10^{-8.5} - 10^{8.0}), somewhat lower (10^{-5.75} - 10^{-2.81}) in alimentary tract tissues and regional lymph nodes, and the lowest (10⁻² - 10^{-1.75}) in the blood and spleen.

123. Ixodes Ticks as Vectors of Encephalitis Virus

"Some Data From a Study of the Infection of Ixodes Ticks With Encephalitis Virus in the Southern Parts of the Khabarovsk Territory," by L. A. Vereta and L. M. Sushkina, Khabarovsk Scientific Research Institute of Epidemiology and Hygiene; Moscow, Voprosy Virusologii, No 3, 1960, pp 292-297

In the Khabarovsk region, cases of infection with tick-borne encephalitis occur not only in the virgin taiga, on the territories where Ixodes persulcatus ticks have their habitats, but in residential areas as well where often the prevalence of Haemaphysalis concinna ticks is noted.

Various genera of ticks belonging to the subfamily of Ixodidae, collected in the area of a tick encephalitis focus, were investigated to determine the degree of their infection with encephalitis virus. The results of 2 years observations made it possible to establish a high degree of contamination of Ixodes persulcatus and Haemaphysalis concinna ticks with the virus. A strain of the virus was isolated from Haemaphysalis japonica ticks collected in the taiga in the Khekhtzir forest region the first time.

124. Virus Excretion From the Organism in Cases of Encephalitis

"Experimental Studies on the Pathogenesis of Tick-Borne Encephalitis After Alimentary Infection, Report II, The Excretion of Virus From the White Mouse Body," by V. V. Pogodina, Institute of Virology imeni D.I. Ivanovskiy, Academy of Medical Sciences USSR; Moscow, Voprosy Virusologii, No 3, 1960, pp 279-285

With the alimentary canal as a route of infection, intestinal excretion of tick-borne encephalitis virus is possible owing to its resistance to gastric juice action and multiplication in alimentary tract tissues. The virus was regularly demonstrated in the feces of white mice infected by the alimentary route from the first hour after inoculation and up to 26-30 days. Titers of fecal virus ranged from 10^{-2} to 10^{-5} with the peak during the acute stage of the disease. Virus concentrations in the intestinal wall and feces were always higher than in the kidneys and urine. The virus could be isolated not only from feces obtained from a necropsy but also from those collected in cages. The identity of fecal strains of the virus was confirmed by the neutralization test.

Accumulations of the virus in the intestinal wall and feces have been found to occur after intracerebral and subcutaneous injection as well, but in such cases it begins later and reaches lower concentrations than is the case with the alimentary route of infection.

125. Susceptibility of Some Cultures to Japanese and Tick-Borne Encephalitis Viruses

"Susceptibility of Cultures From Sheep Embryonic Kidney Epithelium to Japanese and Tick-Borne Encephalitis Viruses," by S. Ya. Gaidamovich and V. R. Obukhova, Laboratory of Diagnostics and Indications, Institute of Virology imeni D. I. Ivanovskiy, Academy of Medical Sciences USSR; Moscow, Voprosy Virusologii, No 3, 1960, pp 304-308

The presence of the cytopathogenic effect is a good measure of virus multiplication when tissue cultures are used for the cultivation of viruses. The growth of Japanese and tick-borne encephalitis viruses is

associated with the cytopathogenic effect only in the few types of tissue cultures. This paper presents the results of a study of the cultivation of the above viruses in cultures of renal epithelium of a sheep embryo. The two viruses multiplied readily in the tissue culture, the multiplication of Japanese encephalitis virus being accompanied by marked degeneration of cells within 2-3 days after inoculation. The study was carried out with two strains of Japanese encephalitis virus which had been maintained in mice for a long time. The observations were conducted for 14 passages in tissue cultures. The titer of the viruses was 10^{-6} both in mice and in tissue cultures (according to the cytopathogenic effect).

With four strains of tick-borne encephalitis the virus cytopathogenic effect was seen consistently only in the first passage; in subsequent passages, cell degeneration was irregular and negligible. The observations continued up to the fifth passage. In mice, virus titers were 10^{-5} . Three variants of equine encephalomyelitis virus were also used for the comparison; the strains grew in this tissue culture, causing cytopathogenic effect in 24 hours.

The specificity of the cytopathogenic effect of all strains was verified by the neutralization test with immune sera.

126. Oxygenation in Therapy of Some Infectious Diseases

"The Influence of Oxygen Under Pressure on the Course of Certain Experimental Neurovirus Infections in White Mice," by A. G. Panov and P. I. Remezov, Military-Medical Order of Lenin Academy imeni S. M. Kirov, Leningrad; Moscow, Voprosy Virusologii, No 3, 1960, pp 267-272

The oxygenization of the animal body was found to exert a beneficial effect on the course of experimental lymphocytic choriomeningitis and human, acute encephalomyelitis. The optimal effect was observed after exposure of the animals to oxygen under a positive pressure of one atmosphere in a chamber for 5-10 hours. Treated animals survived more frequently than control ones, the virus was less disseminated in their bodies and was eliminated sooner. At the same time, the degree of immunity in such animals was less marked.

127. Properties of Virus Isolated From Crocethia alba Pall

"A Study of Properties Peculiar to a Virus Isolated From Crocethia alba Pall," N. N. Basova, T. M. Chernikova, Yu. G. Suchkov, and O. N. Lopatkin, Scientific Research Antiplague Institute of Caucasus and Transcaucasus, Stavropol; Moscow, Voprosy Virusologii, No 3, 1960, pp 286-292

A virus was isolated from a bird Crocethia alba Pall in Dagestan in autumn 1957 which caused a fatal illness in inoculated guinea pigs, white rats and mice, chicks, and pigeons. In embryonated eggs the virus caused specific lesions in chorioallantoic membrane. The morphologic picture was that of hemorrhagic toxicosis with the degeneration of main functional cell elements in the liver, lung, spleen, and adrenals. Few surviving animals failed to acquire resistance to reinfection. Sera from convalescent and immunized animals had no neutralizing activity for the homologous strain. No antigenic relation was revealed to other viruses or rickettsia. The virus failed to agglutinate red cells of man, horse, sheep, rabbit, guinea pig, white rat and mouse, pigeon, chick embryo, sparrow, and dog. The virus was partly inactivated when exposed to prolonged action of large doses of streptomycin (20,000 μ /ml).

128. Comparative Study of Possibility of Cell Strains Becoming Malignant

"On the Danger of Continuously Growing Cell Strains Becoming Malignant and Their Application for Virological Purposes," by M. K. Voroshilova, Ye. A. Tol'skaya, I. K. Lavrova, and G. A. Koroleva, Immunological Laboratory of Institute for Study of Poliomyelitis, Academy of Medical Sciences USSR; Moscow, Voprosy Virologii, No 3, 1960, pp 360-376

Tissue culture cell lines were differentiated by their susceptibility to ECHO viruses types 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, and 19. In Hep-2 and HLS cell cultures, the cytopathogenic effect was demonstrated within seven passages; in the KB cell line, after one blind passage; in SCH, HeLa, Detroit-6, and ERK cells most of the viruses induced no cytopathogenic effect. An inconstant cytopathogenic effect was observed in SCH cells exposed to ECHO-6 and 10 viruses, and in HeLa cells exposed to ECHO-6, 10, and 12 viruses. Thus, according to the cytopathogenic effect of enteric viruses, SCH cells bear the greatest similarity to HeLa cells.

Tumorlike formations developing in normal laboratory animals injected subcutaneously with cells from continuous tissue culture cell lines and those in white rats pretreated with X rays and cortisone and injected intraperitoneally with SCH cells were benign and regressed completely. Of the same character were tumorlike formations developing after the subcutaneous inoculation of cells derived from malignant tumors. A poliomyelitis

vaccine was prepared from virus grown in SCH cells. Macaca rhesus and cynomolgus monkeys were inoculated with this vaccine or with SCH cell extract and no local or distant changes were observed during the period of observation over 2 years. It is concluded that there is no reason to exclude the possibility of the use of vaccines from viruses grown in an SCH cell line derived from normal monkey tissue by humans.

129. Method of Preparing Antigens for Poliomyelitis Test

"Precipitin Test for Poliomyelitis, Report I. Preparation of Precipitating Antigens and Use of the Agar Gel Precipitation Microtechnique," by M. S. Balayan, Immunological Laboratory, Institute for Study of Poliomyelitis, Academy of Medical Sciences USSR, Moscow; Moscow, Voprosy Virusologii, No 3, 1960, pp 297-303

A method for preparing antigens to be used in the precipitin test for poliomyelitis is described. The antigens have been concentrated by the evaporation of virus-infected tissue culture fluids from cellophane sacks followed by ultracentrifuge sedimentation. The total concentration was 500-750 times, as against the initial volume. This corresponded to a 2.0-2.5 log titer rise as determined by the plaque method. The concentrates contained 2-4 units of specific precipitinogen in 0.02 ml.

The precipitin test was performed by the double agar-diffusion method using a microtechnique on slides. The antigens prepared by the above method showed well-defined, specific and reproducible results in the precipitin test with hyperimmune monkey sera.

130. Experimental Infection of Rodents With Karaganda Strain AB

"Histopathology of Experimental Infection of Rodents With Karaganda Strain AB (Type IV Poliomyelitis Virus)," by M. P. Frolova and A. P. Savinov, Laboratory of Pathohistology. Institute for Study of Poliomyelitis, Academy of Medical Sciences USSR; Moscow Voprosy Virusologii, No 3, 1960, pp 309-315

Adult and suckling cotton rats and suckling white mice infected intracerebrally with Karaganda AB strain showed, as a rule, flaccid paralysis of the extremities, most often the hind ones. No illness was observed in adult white mice. Microscopic examination of CNS, striated muscles, and viscera has shown that AB strain possess both neurotropic and myotropic properties. Its neurotropism is manifested by marked inflammatory-degenerative lesions in the brain and spinal cord of adult and suckling cotton rats only; in suckling mice, occasional dystrophic changes of nerve cells in the spinal cord are observed. Myotropism of AB strain is revealed in suckling mice and suckling cotton rats which show diffuse and focal parenchymatous-interstitial myositis.

The Karaganda AB strain differs from the type 2 poliomyelitis virus by the absence of pathogenicity for adult white mice and by marked myotropism. In its antigenic properties, pathogenicity for laboratory animals, and the manifestation of tissue tropism, the AB strain is similar to the Coxsackie A-7 virus. It is suggested that these viruses with both neurotropic and muotropic activities may represent a transition form between the poliomyelitis virus and viruses of the Coxsackie group. They occupy a special position among the enteric viruses and should be placed separately as a special group.

131. Susceptibility of Certain Cell Strains to Poliomyelitis Virus

"Characteristics of Certain Cell Strains and Their Susceptibility to Poliomyelitis Virus," by L. G. Stepanova, Moscow Scientific Research Institute of Preparations Against Poliomyelitis; Moscow, Voprosy Virusologii, No 3, 1960, pp 316-321

Continuously cultivated Hep-2, Sch, HeLa, and monkey kidney cell lines were investigated. HeLa and Hep-2 cell lines derived from malignant tissues were found to grow more vigorously than the Sch cell line and monkey kidney cells. The number of cells in Hep-2 and HeLa cell lines increased ten times with every passage, and Sch cells increased 7 times.

Optimal incubation periods and conditions for cultivation of the cell lines have been established. Hep-2 and Sch cells when cultivated in a medium consisting of 0.5% of lactalbumin hydrolyzate in Hanks solution plus 2% bovine serum displayed stable physiological activity and thus can be used for staging the color test. The Hep-2 cell line (50-59 passages) was ten times as sensitive to the poliomyelitis virus as monkey kidney cells. Sch cell line (90-138 passages) was equal to monkey kidney cells by its susceptibility to the poliomyelitis virus. These cultures can be recommended for virological investigations with this virus.

132. Method of Estimating Antibodies in Antimeasles Gamma Globulin

"The Use of Tissue Cultures for Estimating Specific Antibodies in Antimeasles Gamma Globulin," by Yu. N. Mastjukova, and S. L. Khaik, Moscow Institute of Epidemiology, Microbiology, and Hygiene; Moscow, Voprosy Virusologii, No 3, 1960, pp 339-346

A strain of measles virus was isolated from a child during the prodromal period by using continuously cultivated human amniotic cells. In cultures of human amniotic and cancer cells Hep-1, Hep-2, J-96, and Sch cells (monkey heart cells), the virus caused the formation of multinuclear giant cells, with eosinophilic protoplasmic and intranuclear inclusions, and was being accumulated in tissues culture fluid up to 10^8 cytopathogenic

dots per ml. The above tissue cultures were shown to be suitable for titrating the measles neutralizing antibody in sera and gamma globulin. Fifty-one lots of gamma globulin produced by various institutes of the USSR were subjected to investigation: the titers of neutralizing antibody ranged from 1:320 to 1:1,280, being 16-32 times those in natural sera. The phenomenon of the selective adsorption of monkey (rhesus) erythrocytes against cells affected with measles virus was used for the identification of measles virus in tissue cultures.

133. Measles Virus Isolated

"The Experimental Isolation and Study of Measles Virus Strains," by A. A. Smorodintsev, L. M. Boychuk, and Ye. S. Shikina, Tr. In-ta Epidemiol., Mikrobiol. i Gigiyeny im. Pastera (Works of the Institute of Epidemiology, Microbiology and Hygiene imeni Pasteur), No 17, 1958, pp 6-12 (from Referativnyy Zhurnal Biologiya, No 9, 10 May 60, Abstract No 38593, by Yu. N. Mastjukova)

CPYRGHT

"Five virus strains were isolated in epithelial cell cultures from human embryo kidney explantates (four strains) and trypsinized monkey kidney (one strain); the strains were isolated from blood and mucus collected from patients 5-30 hours after the appearance of a rash. The strains isolated underwent 4-20 consecutive passages in the same cultures, which produce cytopathogenic changes in the cells. The time of their first appearance in the infected cultures depended on the degree of adaptation of the strains (in the first infection, within 9-17 days, and in subsequent passages, within 2-6 days after infection) and the amount of virus introduced. The cytopathogenic activity of the strains isolated was neutralized by convalescent sera. The infectivity of the virus increased on passage from 1:25 in the second passage to 16:1,000 in the 16th passage. The infected cell cultures contained specific complement-fixing antigen."

134. Chinese Study Mumps Virus

"Laboratory Methods of Studying the Parotitis Virus, II. Serologic Tests," by Sun Wang-chu; Acta Lab. Clin. Vol 3, No 1, 1959, pp 15-18 (from Meditsinskiy Referativnyy Zhurnal, Section 1, No 5, May 60, p 53)

CPYRGHT

"The complement-fixation reaction, hemagglutination inhibition, neutralization, flocculation, etc. were employed in studying the parotitis virus. The complement-fixation reaction was found to be the best."

Miscellaneous

135. New Microscope

CPYRGHT

"Portable Electron Microscope" (unsigned article); Moscow, Nauka i Zhizn, Vol 27, No 4, Apr 60, pp 70-71

"Most acute vision cannot distinguish objects which are separated by a distance of less than 0.2 millimeter. The electron microscope is in first place in respect to "acuteness" of vision. With its help, it is possible to distinguish the most minute particles separated from each other by a distance equal to fifty millionths of a millimeter. A microscope of this type is in reality an aggregate, although it is called an instrument. It is over 3 meters in height in some cases and weighs several tons. Czech designers succeeded in designing a table model electron microscope. The new electron microscope magnifies objects by 150,000 times. It differs little in size from the usual optical microscope."

136. Shortage of Surgical Instruments

"A Surgeon's Word," by Prof. B. Petrovskiy, Lenin Prize Laureate; Moscow, Meditsinskiy Rabotnik, Vol 23, No 54, 5 Jul 60, p 3

Soviet surgery is still considerably handicapped by a shortage of instruments and equipment, even though designs for the manufacture of the instruments have long since been completed. For instance, there is a shortage of instruments for surgery on bile ducts; there is a lack of Roentgen electrokymographs, endoscopes, photocardiographs, and other equipment. Plastic materials now being used widely in surgery for transplants and for other purposes are still unavailable to the practicing physician, even though facilities for the manufacture of such materials exist in the country. Neither is the quality of the equipment available very satisfactory. Luminescent lamps used in the operating rooms provide nonuniform light, and in many instances change the color of the tissues, making the work of the surgeon more difficult. A suction pump, also used in the operating rooms, is noisy and functions poorly. The poor quality of the equipment places the patient in great jeopardy. Measures must be taken, the author writes in conclusion, to increase the output and improve the quality of the instruments and equipment used by the surgeon.

137. Apparatus for Determining Position of Fetus in Mother's Womb

"Phonoelectrocardiograph," by D. Menitskiy (Leningrad); Moscow, Nauka i Zhizn, Vol 27, No 4, Apr 60, p 68

A new electronic apparatus which makes it possible to determine the position of the fetus in the mother's womb was designed by a group of physicians at the Institute of Obstetrics and Gynecology, Academy of Medical Sciences USSR. It consists of two phonocardiographs with microphones which convert the heart sounds into electric signals, two electrocardiographs which magnify the bioelectric heart potentials, and recording equipment. The phonocardiographic method is more advantageous than the electrocardiographic method, for it makes it possible to record heart sound fluctuations on a tape in the form of curves and to measure their frequency and their range. In addition, it is possible to analyze components of the sound fluctuations which cannot be detected by ear. The apparatus is being clinically tested.

138. Drug Production Failure

"For Closer Ties Between Science and Industry," by V. Timakov, vice-president, Academy of Medical Sciences USSR; Moscow, Meditsinskiy Rabotnik, Vol 23, No 54 (1906), 5 Jul 60, p 3

The author is highly critical of the fact that there is a considerable lapse between the time a new drug is synthesized and approved for production and the time when it actually becomes available to the physician for practical application. No matter how skillful a physician may be, he writes, he is helpless if the drug intended for the therapy of the disease is not available. Thus, of 14 preparations approved for production and application by the Pharmacological Division of the Institute of Experimental Medicine, only two are now in actual production, while of the 16 drugs synthesized at the Institute of Pharmacology, Academy of Medical Sciences USSR, only three are being produced. There was a 7-year lag between the time mycerin, an antibiotic, was synthesized and the time it became available for application. The author calls for closer cooperation between science and industry.

139. Training of Medical Personnel in Azerbaydzhn

"The Forge of Medical Personnel and the Focus of Medical Sciences," by B. A. Eyvazov; Baku, Azerbaydzhanskiy Meditsinskiy Zhurnal, No 4, Apr 60, pp 36-38

The Azerbaydzhn State Medical Institute imeni N. Narimanov is now one of the largest Higher Medical Institutes in the USSR. It comprises five faculties: Therapeutic-Prophylactic, Sanitary-Hygienic, Pharmaceutical,

Pediatric, and Stomatological. Instruction is conducted in the Azerbaydzhani and Russian languages. The institute has 61 chairs with a complement of 300 persons as instructors. The teaching staff has 33 professors, including 27 Azerbaydzhani nationals, and 77 docents, of whom 62 are Azerbaydzhani nationals, including 12 women. In the 40 years of its existence (1919-1959), the institute has graduated 12,658 students, including 259 stomatologists and 800 pharmacists. Of this number, 6,900 were Azerbaydzhani nationals, including 3,578 women. A total of 4,398 scientific works have been published by the institute.

140. Research Problem Plan No 47

"Recommendations for the Compilation of the Plan of Scientific Investigations for 1961-1962 in Connection With Problem No 47," by P. L. Senov, chairman of Problem Commission No 47, Academy of Medical Sciences USSR, and A. K. Mel'nichenko, director of Central Pharmaceutical Scientific Research Institute; Moscow, Aptechnoye Delo, Vol 9, No 2, Mar/Apr 60, pp 6-11

The article outlines the recommendations of Problem Commission No 47 with regard to research work to be done in connection with the special program of the problem: "Investigation of the Medicinal Plant Resources of the USSR." The different scientific research institutes and laboratories which are to undertake work on specific sections of the program are named.

VII. METALLURGY

141. Cermets

"Cermets," by Prof A. I. Avgustinik, Moscow; Zhurnal Vsesoyuznogo Khimicheskogo Obshchestva imeni D. I. Mendeleyeva, Vol 5, No 2, May 60, pp 156-168

The subject of cermets is reviewed with considerable attention to USSR work in this field (a bibliography consisting of 36 USSR references and 43 non-USSR references follows the article). In the introduction to the article, the author points out the importance of cermets in the construction of jet and rocket engines. In the text of the article, metal powders, oxides, carbides, borides, nitrides, silicides, the composition of cermets as it affects the properties of these materials, the preparation of materials for the production of cermets, and the technology of the production of cermets are discussed. In the section on borides, work by G. V. Samsonov and members of his group receives some attention. In the section on the composition of cermets, the role played by interstitial phases in increasing the heat resistance of cermets is discussed.

142. Sintering of Cermets

"The Singering and Diffusion Creep of Cermets," by Prof B. Ya Pines; Moscow, Zhurnal Vsesoyuznogo Khimicheskogo Obshchestva imeni D. I. Mendeleyeva, Vol 5, No 2, May 60, pp 173-180

General relationships pertaining to the sintering of cermets are discussed from the standpoint of Ya. I. Frenkel's theory postulating viscous flow ("creep") of crystalline substances at high temperatures. According to Frenkel', sintering proceeds by diffusion at these temperatures and requires the application of only very small forces to take place. Experimental data and results taken mainly from work done by USSR investigators are discussed in the article (a bibliography consisting of 29 USSR references and 6 non-USSR references is appended).

143. Ternary Intermetallic Compounds

"Ternary Intermetallic Compounds," by B. K. Vul'f, Air Force Engineering Academy imeni N. Ye. Zhukovskiy; Moscow Uspekhi Khimii, Vol 29, No 6, Jun 60 pp 774-797

The subject of ternary intermetallic compounds is reviewed on the basis of USSR and non-USSR publications under the subheadings of general characteristics of ternary intermetallic compounds, Kurnakov ternary

phases, valency ternary intermetallic compounds, electronic ternary intermetallic compounds, ternary Laves phases, ternary nickel arsenide phases, ternary interstitial phases, and the properties and practical applications of ternary intermetallic compounds. In the section on Laves phases, the composition and properties of ternary intermetallic compounds containing boron and of continuous series of solid solutions formed by borides are reviewed, mainly on the basis of Western publications. However, there are also some references to work done in the USSR by P. V. Samsonov and others. In the concluding section of the review, the application of ternary compounds for strengthening aluminum alloys used as construction materials in aviation and aviation alloys in general is discussed in some detail, with references to work done by Yu. A. Bagaryatskiy and the author of the review (B. K. Vul'f) together with his coworkers. The improvement of the thermal resistance of alloys by employing ternary intermetallic compounds and creating an advantageous structure which prevents to a maximum degree plastic deformation on heating is discussed, with particular attention to work done by I.I. Kornilov.

144. Corrosion Resistance of Titanium and Its Alloys

"Titanium and Its Alloys as Construction Materials" by Prof. I. Ya. Klinov, Doctor of Technical Sciences, and V.V. Andreyeva, Candidate of Chemical Sciences; Moscow, Khimicheskoye Mashinostroyeniye, No 4, Jul/Aug 60, pp 5-8.

The corrosion resistance of titanium is discussed from the standpoint of the application of this metal as a material for the construction of chemical industry equipment. The effects of impurities contained in the titanium, methods of the production and fabrication of this metal, coatings which may form on it (e.g., protective coatings consisting of TiO_2 or TiH_2), ions contained in the solution (e.g. Ti^{4+}), and other factors on the corrosion resistance are considered. It is brought out that the presence of oxidizing agents increases the corrosion resistance of titanium and that this metal can withstand the action of nitric acid of all concentrations up to the boiling point of this acid. It is stated that alloys containing 3-5% of Ni have considerably greater corrosion resistance than unalloyed titanium. According to the authors, presence of Mo, Ta, Nb, Zr, and Cu as alloying components also has a favorable effect on the stability of titanium towards corrosion.

VIII. PHYSICS

Nuclear Physics

145. Pion Proton Interaction

"Formation of Charge-Carrying Mesons by 290-Mev Negative Pions on Hydrogen," by Yu. Batusov, N. P. Bogachev, S. A. Bunyatov, V. M. Sidorov, and V. A. Yarba, Joint Institute for Nuclear Research; Moscow, Doklady Akademii Nauk SSSR, Vol 133, No 1, Jul 60, pp 52-55

The study of angular and energy characteristics of secondary particles in the reaction: $\pi^- + p \rightarrow \pi^- + \pi^+ + n$ at a primary π^- meson energy of 290 Mev was carried out on the synchrocyclotron of the Laboratory of Nuclear Problems of the Joint Institute for Nuclear Research. The obtained angular and momentum distributions were compared with the expectations of the statistical Fermi theory and the isobar model by S.J. Lindenbaum and R.M. Sternheimer (Phys. Rev. 106, 5, 1107 (1957)). The analysis of experimental data showed that the sum of all angles of the center-of-mass momentum spectra do not contradict the statistical theory or the isobar model. However, the angular distributions are in contradiction with the assumption of the statistical Fermi theory of isotropic distribution of the reaction products in the center-of-mass coordinates. For an explanation of the asymmetry of angular distribution of secondary particles within the framework of the Lindenbaum and Sternheimer model, it is necessary to assume an asymmetric angular distribution of "isobars" with a predominating forward flight with respect to the direction of the primary meson.

146. Superfluid Nuclear Model

"A Superfluid Model of the Nucleus," by V.G. Solov'yev, Joint Institute for Nuclear Research; Moscow, Doklady Akademii Nauk SSSR, Vol 133, No 2, Jul 60, pp 325-328

As first step to a superfluid nuclear model, strongly deformed nuclei of rare earths were studied on the basis of Nilsson's potential in an adiabatic approximation. Computation proved the possibility of expressing properties of strongly deformed nuclei in relation to their internal structure. However, the scheme of Nilsson's level must be improved in such a way that the single particle levels of odd nuclei computed on the superfluid model basis satisfy experimental values. This facilitates the computing of all other parameters.

147. Investigation of Elements 102 and 104 Bombardment with Heavy Ions On New Dubna Accelerator

"What Is Hidden in Elements With a Very Short Half-life," by L. Markelova and M. Lebedenko (Dubna); Moscow, Promyshlennno-Ekonomicheskaya Gazeta, Vol 5, No 44 (652), 13 Apr 60, p 4

At the new cyclotron in Dubna, research on nuclear reactions will be conducted by bombarding targets with multicharge heavy ions (viz., those of oxygen, nitrogen, carbon, and neon). One of the tasks tackled with the aid of the new accelerator will be the synthesis of new transuranium elements. There is much that requires clarification with regard to element 102, which was discovered by the USSR physicist G.N. Flerov and his co-workers. Two months later, the same element was synthesized by a team of American physicists headed by G. Seaborg. It is of interest to find out how element 102 will behave on being bombarded with multicharge ions. The Soviet scientists who will conduct experiments on this will be joined by the Polish physicists Pomorski, Tys, and Wojtkowska, who have already arrived at Dubna. German scientist Bredel and others will also participate in the work in question and are already at Dubna. A group of Czechoslovak chemists headed by Jaromir Maly is expected; they will make preparations for experiments on transuranium elements.

Investigation of element 104, which also has a very short half-life, is of interest from the standpoint of the distribution in the periodic system of elements similar to each other in their chemical properties. It is not out of the question that beginning with element 104, the similar properties of elements, which recur in the periodic system, become lost and a new set of properties appears. Experiments conducted by means of the new accelerator will solve the problem in regard to these new properties and also many other problems in nuclear physics and chemistry that must be solved.

148. Annihilation Gammas

"Investigation of the Angular Correlation of Gamma-Quanta Produced by the Annihilation of Positrons and Electrons in Bismuth," by I. Ya. Dekhtyar and V.S. Mikhalekov, Institute of Metal Physics, Academy of Sciences Ukrainian SSR; Moscow, Doklady Akademii Nauk SSSR, Vol 133, No 1, Jul 60, pp 60-63

For the study of angular distribution of gamma quanta produced by the annihilation of positrons and electrons, a special device was assembled for determining the surface shape of maximum energies by measuring the coinciding photon pulses at various angles. Polar diagrams were plotted of mean maxima of electron momenta in a plane perpendicular to the main axis. The diagrams clearly showed an asymmetry in the Bi crystal exhibited

in the shape of curves of angular correlation of gamma quanta from the annihilation of positrons and electrons in Bi in various directions. analysis of these results proved that the polar diagrams reflect the surface shape of filled energy levels for values characterizing the shape of distribution curves of electron states as well as for magnitudes, characterizing their mean maximum momenta.

149. Neutron Radiation of Earth Measured

"Neutron Radiation of the Earth," by V.V. Cherdyntsev, L.I. Shmonin, V.F. Ostapenko, O.D. Khaldeyev, and L.L. Kashkarov, Kazakh State University imeni S.M. Kirov; Moscow, Geokhimiya, No 3, 1960, pp 261-267

The neutron flux of the Earth was studied by field settings and logging stations. Secondary neutrons of cosmic rays predominate near the earth surface. The ratio of the amount of fast neutrons to slow ones decreases with the transition from native rocks to alluvia and farther to water surface. According to log measurings in native rocks of ore deposits, the average neutron flux is 4 neutrons/cm²hour, and in the areas enriched with radioactive and light elements (F, Be, Li) increases up to 52 neutrons/cm²hour, wing to the (α ;n)-reaction of light elements.

150. Progress of Construction of New Research Reactor at Minsk

"News Items -- USSR" (unsigned item); Moscow, Atomnaya Energiya, Vol 8, No 6, Jun 60, p 578

The principal building to house a nuclear research reactor with a thermal capacity of 2,000 kilowatts has been completed at Minsk. The reactor will be used in connection with work done at the Academy of Sciences Belorussian SSR. The assembly of the core of the reactor is progressing and the channels for irradiation experiments are being constructed. Electrical equipment, control instruments, and equipment for automatic control are being installed.

The reactor will be used for biological and other research, the production of radioactive isotopes, and the investigation of the behavior of different materials subjected to gamma-irradiation and irradiation with neutrons.

151. Rotating Magnetic Field Effect on Heat Transfer in Mercury

"Concerning the Effect of a Rotating Magnetic Field on Turbulent Heat Transfer in Mercury," by A. Veze and Ya. Klavin'sh; Riga, Izvestiya Akademii Nauk Latvyskoy SSR, No 5, 1960 pp 67-70

An experimental investigation was made of the effect of a rotating magnetic field on the temperature boundary layer (thin layer directly adjacent to the heated body) in the case of turbulent motion of liquid metal. Comparison of Nu criteria determined from the experimental data with calculations using the formula for the case of turbulent motion of liquid metal with the existence of a magnetic field does not provide grounds (in the case of the fields (up to 300 gauss) and Pe numbers (up to 2300) used in this instance) for a conclusion about variation of the relationship $Nu = f(Pe)$ based on action of the magnetic field on the liquid metal flow.

Spectroscopy and Optics

152. Photoluminescence of CdSe-CdS Crystals

"Photoluminescence Within the Fundamental Absorption Edge of Mixed CdSe-CdS Crystals," by Ye. F. Gross and V.V. Sobolev, Physicotechnical Institute, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 133, No 1, Jul 60, pp 56-59

Photoluminescence of large crystalline solid solutions of CdSe-CdS in seven compounds, as well as single crystals of CdSe and large crystalline layers of CdSe and CdS in the range of their self-absorption edge were studied. All considered samples of hexagonal structure. The spectra were recorded at 77.3 and 4.2°K on a spectrograph of 50 and 13 Å/mm dispersion at 7000 Å. It was found that during the heating of CdSe single crystals from 4.2 to 77.3°K a complex interchange of intensities between terms of equidistant band groups occurs with enhancement of longer waves in each band group and higher maxima intensities of the short-wave system of equidistant bands with respect to the second band system. The luminescence intensity drops, the bands broaden, and at 77.3°K only one group of widely equidistant bands may be observed instead of the previous two.

152. Photoconductivity of CdS Crystals

"The Role of Contacts in Phenomena of Photoactivation and Infrared Quenching of Photoconductivity in CdS Single Crystals," by Ye. A. Salkov, G.A. Fedorus, and M.K. Sheynman, Physics Institute, Academy of Sciences Ukrainian SSR; Kiev, Ukrainskiy Fizichniy Zhurnal, Vol 15, No 2, Mar/Apr 60, pp 149-155

It was attempted to clarify whether the above properties pertain to the semiconductor or are related to the contact of the semiconductor with another metal. Experimental results showed that the law of lux-ampere relations, the photocurrent kinetics, and the phenomena of photoactivation and infrared quenching are not related to contact properties, but are processes intrinsic to the semiconductor.

154. Forthcoming Conference Announced

"Conferences and Congresses" (unsigned article); Kiev,
Dopovidi Akademii Nauk Ukrain's'koi RSR, No 5, 1960 p 697

The Presidium of the Academy of Sciences Ukrainian SSR has adopted... a number of resolutions to conduct conferences in 1960. These include:
(1) the Third Conference on Electrophysiology of the Nervous System,
(2) a Conference on the Problem of Biophysics and Mechanism of the Action of Nuclear Radiation, (3) a Conference on the Problem of the Glass and Porcelain-China Industry of the Ukrainian SSR (to be held in Kiev), (4) a Republic Conference on Philosophical Problems in the Field of Biology
(5) the Third All-Union Congress of the Astronomic-Geodetic Society (to be held in Kiev), (6) a Conference for Improving Assistance From the Institutes of the Academy of Sciences Ukrainian SSR to Enterprises of the Stalinskiy Sovnarkhoz (to be held in Stalino), and (7) the third Ukrainian Conference of Parasitologists (to be held in October 1960 in Khar'kov).

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