VOROB'YEV, A.A.

Light refraction in crystals and the ionic bond energy. Dokl.AN SSSR 12 no.1:53-54 Ja '57. (MLRA 10:2)

1. Tomskiy politekhnicheskiy institut imeni S.M.Kirova. Predstavleno akademikom A.F.Ioffe.
(Refraction) (Ionic crystals--Optical properties)

Vorob'yev, A.A.

VOROB'YEV, A.A.; KALGANOV, A.F.

Energy relations in the electrical spark-over of gases (with summary in English). Zhur.fiz.khim.31 no.7:1455-1458 Jl '57. (MIRA 10:12)

1. Politekhnicheskiy institut, Tomsk.
(Electric discharges through gases)

VOROB'YEV, A.A.

CARD 1 / 2 PA - 1916

SUBJECT USSR / PHYSICS
AUTHOR VOROB'EV, A.A.
TITLE The Refraction of Light in Crystals and the Energy of the Binding among Ions.
PERIODICAL Dokl.Akad.Nauk, 112, fasc.1, 53-54 (1957)
Issued: 2 / 1957

The amount of the refraction coefficient of the electromagnetic waves of the dielectricum is connected with the excitation of the particle of the dielectricum to oscillations, and therefore with the energy of the binding of these particles in the lattice. The passage of visible light through the crystal causes the electrons to oscillate and the refraction coefficient characterizes the energy of the binding of the electrons in the crystal. If the bimding energy of the electrons in the crystal is increased, their enforced oscillations and also the refraction coefficient become smaller.
Near self-absorption the dispersion curve moves away from the side of the long waves as a result of the rapid increase of the refraction coefficient. The passage of light is accompanied by a weak interaction with the electrons of the dielectricum. If the energy of the light wave is small compared to the energy of electron binding, the refraction coefficient becomes smaller if lattice energy increases on the occasion of transition from KJ to LiF. From the beginning of the halide group (Li) the refraction index n_D of the crystals of the halide compounds diminishes down to the end of the group (Cs). n_D increases with an increase of electron polarization of the anion on the occasion of transi-

tion from the fluorides to the iodides.
A further diagram illustrates the dependence of the refraction index on lattice energy for the monocrystals of the metals of the second group: BeO, MgO and CaO. The refraction index of SrO is unknown. For the monocrystals of BaO the refraction index was determined from the condition $\varepsilon^2 = n^2$.
The dielectricity constant was measured by the displacement method in the interval of up to 60 kc by means of a Q-meter. With an increase of frequency from 1 to 1000 kc the dielectricity constant diminishes from 50 to 34. As this value of the dielectricity constant (if frequency is further increased) does not change any further, the author puts $n = \sqrt{34} = 5,8$. According to experimental data the refraction index of crystals diminishes with an increase of the energy of the lattice. The dependence of the refraction coefficient on chemical composition can be used for the purpose of testing material properties.

INSTITUTION: Polytechnic Institute "S.M.KIROV", Tomsk.

VOROB'YEV A.A

VOROBYEV, ~~B~~ A. A. and SAVINTSEV, P. A.

"Mechanical Properties of Ionic Crystals."

~~Rely~~ paper presented at the Conf. on Mechanical Propetties of Non-Metallic Solids, LEningrad, USSR, 19-26 May 58.

Polytechnical Institute, Tomsk.

VOROB'YEV, A. A.

Vorob'yev, A. A. and G.A. Vorob'yev [Tomsk, Politekhnichskiyy institut (Polytechnical Institute)] On Several Processes in the Electrical Breakdown of Solid Dielectrics

Vorob'yev, A.A. and G.A. Vorob'yev [Tomsk, Politekhnichskiy institut (Polytechnical Institute)] Electrical Disruption of Rock Salt Containing Coloration Nuclei

(The Physics of Dielectrics; Transactions of the All-Union Conference on the Physics of Dielectrics) Moscow, Izd-vo AN SSSR, 1958. 245 p. 3,000 copies printed.

This volume publishes reports presented at the All-Union Conference on the Physics of Dielectrics, held in Dnepropetrovsk in August 1956, sponsored by the "Physics of Dielectrics" Laboratory of the Fizicheskiy institut imeni Lebedeva An SSSR (Physics Institute imeni Lebedev of the AS USSR), and the Electrophysics Department of the Dnepropetrovskiy gosudarstvennyy universitet (Dnepropetrovsk State University).

VOROB'YEV, A.A.; VOROB'YEV, G.A.

Ionization spark-through in solid dielectrics. Izv. vys. ucheb. zav.; Fiz. no.1:120-123 '58. (MIRA 11:6)

1.Tomskiy politekhnicheskiy institut imeni S.M. Kirova.
(Dielectrics)

VOROB'YEV, A.A.

Classification of properties of ionic crystals and lattice energies. Izv. vys. ucheb. zav; Fiz. no.1:160-162 '58. (MIRA 11:6)

1.Tomskiy politekhnicheskiy institut im. S.M. Kirova.
(Ionic crystals)

VOROB'IEV, A.A.

Certain problems in the theory of electron radial accelerators.
Izv. vys. ucheb. zav.; elektromekh. 1 no.5:106-111 '58.
(MIRA 11:8)

(Particle accelerators)

VOROB'YEV, Aleksandr Akimovich, doktor fiz.-mat.nauk, prof.

Certain problems in the design of cyclic accelerators with a closed wave guide. Izv.vys.ucheb.zav.; elektromekh. 1 no.11: 13-19 '58. (MIRA 12:2)

1. Direktor Tomskogo politekhnicheskogo instituta.
(Particle accelerators) (Wave guides)

VOROB'YEV, A.A.

National synchrotron laboratory in Frascatti (Rome). Izv. vys. uchab. zav.; fiz. no.3:144-154 '58. (MIRA 11:9)

1. Tomskiy politekhnicheskiy institut imeni S.M. Kirova.
(Rome--Synchrotron)

SOV/139-58-4-28/30

AUTHOR: Vorob'yev, A. A.

TITLE: Accelerator Laboratory of the Physics Institute of Turin University (Uskoritel'naya laboratoriya fizicheskogo instituta universiteta v Turine)

PERIODICAL: Izvestiya Vysshikh Uchebnykh Zavedeniy, Fizika, 1958, Nr 4, pp 167-171 (USSR)

ABSTRACT: A description is given of the laboratory based on the information gained during a visit by the author. There are 5 figures.

ASSOCIATION: Tomskiy politekhnicheskiy institut imeni S. M. Kirova (Tomsk Polytechnical Institute imeni S. M. Kirov)

SUBMITTED: March 27, 1958

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SOV/139-58-4-29/30

AUTHORS: Vorob'yev, A. A. and Andreyev, G. A.

TITLE: Thermal Breakdown of Ionic Crystals and the Lattice Energy (Teplovoy proboy ionnykh kristallov i energiya reshetki)

PERIODICAL: Izvestiya Vysshikh Uchebnykh Zavedeniy, Fizika, 1958, Nr 4, pp 172-173 (USSR)

ABSTRACT: Paper presented at the Inter-University Conference on Dielectrics and Semiconductors, Tomsk, February, 1958. At room temperature a direct relation exists between the electric properties of the crystals and their lattice energy (Refs 1-4). The authors of this paper investigated the electric strength and the current in strong and pre-breakdown fields in single crystals of NaCl, KCl and KBr inside a uniform field in the temperature range 20 to 440°C. In the temperature range 25 to 440°C the electric strength of NaCl, KCl and KBr increases in proportion to the energy of the crystal lattice, Fig.1. With increasing energy of the crystal lattice, the pre-breakdown current at elevated temperatures decreases according to the linear law, Fig.2; the linear dependence of the current measured at fields equalling 20 to 100% of the breakdown fields on the energy of the crystal lattice

Card1/3

Thermal Breakdown of Ionic Crystals and the Lattice Energy

is conserved in the temperature range 100 to 440°C in NaCl, KCl and KBr. The Volt-Ampere-sec characteristics obtained for each of the specimens of the investigated salts (Ref 6) were used for calculating the electrical energy generated in the specimen during the action of the high voltage, i.e. from the beginning of an increase in the high voltage up to the instant of breakdown of the specimen. In the temperature range 20 to 440°C a decrease of the electric energy was observed with the following sequence NaCl, KCl, KBr. Thus, during a thermal breakdown crystals with lower energies of the crystal lattice have a lower electric strength and require a smaller quantity of electric energy for effecting the breakdown. The relation between the electric strength and the physico-chemical properties of the crystals is maintained in the field of the thermal breakdown. In Fig.1 the dependence is graphed of the electric strength of NaCl, KCl, KBr on the energy of the crystal lattice at the temperatures 25 to 350°C (top graph) and 400 to 440°C (bottom graph). In Fig.2 the dependence of the pre-breakdown current on

the energy of the crystal lattice is graphed for the NaCl,

SOV/139-58-4-29/30

Thermal Breakdown of Ionic Crystals and the Lattice Energy

KCl and KBr at the temperatures of 100 to 250°C (top graph) and 300 to 440°C (bottom graph).
There are 2 figures and 4 references, all of which are Soviet.

(Note: This is a complete translation)

ASSOCIATION: Tomskiy politekhnicheskiy institut imeni S.M.Kirova (Tomsk Polytechnical Institute imeni S. M. Kirov)

SUBMITTED: February 25, 1958

Card 3/3

VOROB'YEV, A.A.

89-3-1/30

AUTHORS: Vorob'yev, A. A. , Moskalev, V. A.

TITLE: The Investigation and the Development of Cyclic Accelerators at the Tomsk Polytechnical Institute(Issledovaniya i razrabotki elektronnykh tsiklicheskikh uskoriteley v Tomskom politekhnicheskom institute)

PERIODICAL: Atomnaya Energiya, 1958, Vol. 4, Nr 3, pp. 229 - 237 (USSR)

ABSTRACT: In 1946 the design and the construction of a betatron was started at Tomsk.
In 1948 a 5 MeV betatron (the electromagnetic windings being supplied by a 500 cycles alternating current) as well as a 7 MeV betatron (the supply being carried out by means of normal alternating current) were finished and put into operation. Within the period from 1949 to 1955 a number of betatrons up to 15 MeV were finished and put into operation. Within this period also a 25 MeV betatron was constructed which has an increased radiation intensity and the single aggregates of which operate considerably more stable. From 1955 to 1956 a few of these apparatus were built. The most important para-

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The Investigation and the Development of Cyclic Accelerators at the Tomsk Polytechnical Institute

meters as well as the details of construction of some betatrons are discussed. Different possibilities are shown to deflect an electron beam out of the betatron. The 25 MeV betatron is partly described more in detail. The authors shortly report on how to use ring-shaped acceleration electrodes in a 30 MeV synchrotron. These electrodes are connected with the external double-resonance line. There are 10 figures, and 12 references, 12 of which are Slavic.

SUBMITTED: September 20, 1957

AVAILABLE: Library of Congress

1. Betatrons-Design

VOROB'YEV, A.A.

AUTHOR: Volkov, M.N., Doctor of Chemical Sciences 3-58-5-26/35

TITLE: Intervuz Conferences on Science and Methods (Mezhvuzovskiye nauchnyye i metodicheskiye konferentsii) Electronic Accelerators (elektronnyye uskoriteli)

PERIODICAL: Vestnik Vysshey Shkoly, 1958, Nr 5, page 80 (USSR)

ABSTRACT: The Nauchno-tekhnicheskiy sovet Ministerstva vysshego obrazovaniya SSSR (Scientific-Technical Council of the USSR Ministry of Higher Education) decided to convene in February 1958 in Tomsk an Intervuz Conference on Electronic Accelerators. Among the delegates were workers of important scientific institutions - the Mezhdunarodnyy ob"yedinennyy institut yadernykh issledovaniy (International Institute of Joint Nuclear Research), Fizicheskiy institut AN SSSR (Physics Institute of the USSR Academy of Sciences), Institut metallurgii AN SSSR (Institute of Metallurgy of the AS USSR Academy of Sciences), Institut biologicheskoy fiziki AN SSSR (Institute of Biological Physics of the AS USSR), Institut eksperimental'noy patologii i terapii raka AMN SSSR (Institute of Experimental Pathology and Therapy of Cancer, USSR Academy of Medical Sciences), Leningradskiy fiziko-tekhnicheskiy in-

Card 1/2

Intervuz Conferences on Science and Methods. Electronic Accelerators

stitut AN SSSR (Leningrad Physico-Technical Institute of the AS USSR), and others. In the Section for Using Electronic Accelerators in Industry, Physics, Medicine and Biology, and in the Theoretical Section, the betatrons issued by the Tomskiy politekhnicheskiy institut (Tomsk Polytechnical Institute) were mentioned as being widely used in detecting of defects in metals, studying the reaction of charged particles on substance, and in medical treatment. The reports of workers of the Tomskiy meditsinskiy institut (Tomsk Medical Institute) Professor I.V. Toroptsev, Dotsent N.V. Sokolova and others on the diseases of animals caused by the radiation of betatrons of 10 and 15 Mev were heard with great interest. In the Theoretical Section, Professor A.A. Vorob'yev delivered a report on a new method of accelerating electrons to very high energies. This method is based on using running waves in closed wave guides. In conclusion the conference indicated ways for a wider use of betatrons in different branches of science and technique and for an improvement in their structure.

AVAILABLE: Library of Congress

Card 2/2

SOV/139-58-5-31/35

AUTHOR: Vorob'yev, A. A.

TITLE: The Effect of Deformation on the Absorption Spectra in Crystals (Vliyaniye deformatsii na spektry pogloshcheniya v kristallakh)

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, fizika, 1958, Nr 5, pp 144-152 (USSR)

ABSTRACT: The paper was presented at the Conference of Higher Education Establishments at Tomsk, February 1958, on Dielectrics and Semiconductors. The change of distribution of particles in a crystal which occurs as a result of elastic or plastic deformation and accompanied by an increase in the lattice energy alters the energy spectrum of the crystal and consequently its absorption spectrum. Since the latent energy of deformation depends on the crystal structure there ought to be a relationship between this energy and the absorption spectra. The author discusses previous investigations (Refs.2-15) of this correlation between deformation and absorption spectra, carried out on alkali -halides, silicon, germanium, etc. Some of the results of Refs.2-15 are reproduced in Figs.1-7.

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The Effect of Deformation on the Absorption Spectra in Crystals

The results are summarised in a table on pp 150-151 and the following conclusions are made. The observed displacement towards longer wavelengths of the short-wavelength edge and tail of the absorption curve in the infra-red region is due to lattice defects and electron transitions caused by plastic deformation in crystals. The displacement of the F-band absorption maximum towards longer wavelengths is also due to lattice defects and electron transitions caused by plastic deformation of crystals. The displacement of the F-band absorption maximum towards short wavelengths, which occurs on uniform (omni-directional) plastic deformation agrees with the theoretical prediction obtained from the increase of energy of interaction between ions on uniform compression of the crystal. The unsystematic nature of the correlation between the ultra-violet spectra and deformation does not yield any clear conclusions about the effect of deformation on ultra-violet absorption. Acknowledgements are made to Prof. Dr. M. A. Bol'shanina and Docent V. A. Zhdanov for their advice.

SOV/139-58-5-31/35

The Effect of Deformation on the Absorption Spectra in Crystals

There are 7 figures, 1 table and 15 references; 5 of the references are Soviet, 5 English, 3 Japanese and 2 German.

ASSOCIATION: Tomskiy politekhnicheskiy institut imeni S. M. Kirova (Tomsk Polytechnical Institute imeni S. M. Kirov.

SUBMITTED: March 3, 1958.

Card 3/3

SOV/139-58-5-33/35

AUTHOR: ~~Vorob'yev, A. A.~~

TITLE: Accelerator Equipment of the Dept. of Sciences of Paris University (Uskoritel'nyye ustanovki fakul'teta nauk Parizhskogo universiteta)

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, fizika, 1958, Nr 5, pp 159-163 (USSR)

ABSTRACT: This is a report of a visit to the Paris University accelerator laboratory at Orsay ("Orsi"), about 25 km from Paris and near the Nuclear Research Centre at Saclay. The laboratory is to include eventually a 1000 MeV linear accelerator, a high voltage section with a 4 MeV accelerator and a 150 MeV proton synchrocyclotron (most of the report deals with the latter instrument). The only section of the laboratory working at the time of the author's visit was the appara-

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SOV/139-58-5-33/35

Accelerator Equipment of the ~ Dept. of Sciences of Paris University.

tus for electromagnetic separation of radioactive isotopes. There are 2 tables.

ASSOCIATION: Tomskiy politekhnicheskiy institut imeni S. M. Kirova. (Tomsk Polytechnical Institute imeni S. M. Kirov.

SUBMITTED: March 27, 1958.

Card 2/2

AUTHOR: Vorob'yev, A.A., Professor 3-58-6-30/34

TITLE: In the Physics Laboratories of Italian Universities (V fizicheskikh laboratoriyakh ital'yanskikh universitetov)

PERIODICAL: Vestnik Vysshey Shkoly, 1958, Nr 6, pp 89 - 90 (USSR)

ABSTRACT: In September 1957 the World Congress of Physicists took place in Italy and examined the results of studies on unindentified particles and mesons.. It was attended by most of the outstanding physicists-tneoreticians of the world. The Soviet delegation consisted of Professor A.I. Alikhanov, V.S. Barashenkov, A.M. Baldin, A.A. Vorob'yev, D.D. Ivanenko, S.M. Korenchenko, S.Ya. Nikitin, I.S. Gurevich, B.P. Nikol'skiy and M.Ye. Seleznev. This delegation delivered 20 reports to the congress. The greatest interest was aroused by information on the theoretical work of Academician N.N. Bogolyubov "Dispersion Relations for Weak Interactions". After the conclusion of the congress, the Soviet scientisits visited many scientific institutions. A part of the delegation also called on the European Center of Scientific Research at Geneva.

ASSOCIATION: Tomskiy politekhnicheskiy institut imeni S.M. Kirova (Tomsk Polytechnical Institute imeni S.M. Kirov)

Card 1/1

SOV/139-58-6-27/29

AUTHOR: Vorob'yev, A. A.

TITLE: The 2.5 MeV Microtron at the Institute of Physics of the Naples University (Mikrotron na 2.5 MeV instituta fiziki Neapolitanskogo universiteta)

PERIODICAL: Izvestiya Vysshikh Uchebnykh Zavedeniy, Fizika, 1958, Nr 6, pp 167-170 (USSR)

ABSTRACT: Professor E. Kayanello (Caianello), Director of the Institute of Physics and Professor F. Porreka (Porreca) invited the author to visit the Institutes of Theoretical and Applied Physics of the Naples University. Professor Caianello is in charge of the Institute of Theoretical Physics where work is going on on the theory of gravitational, meson and electromagnetic fields, electronic computers, etc. The present paper describes the 2.5 MeV microtron at the Institute of Theoretical Physics constructed under the direction of Professor A. Karrelli (Carrelli) and Professor Porreca. There are eight figures.

ASSOCIATION: Tomskiy politekhnicheskiy institut imeni S.M.Kirova (Tomsk Polytechnical Institute imeni S. M. Kirov)

SUBMITTED: March 27, 1958

Card 1/1

SOV/144-58-9-1/18

AUTHORS: Vorob'yev, A. A., Doctor of Physico-Mathematical Sciences, Professor, Director, and Moskalev, V. A., Candidate of Technical Sciences, Docent.

TITLE: Formation of a Beam of Rays from a Betatron (Formirovaniye puchka luchey betatrona)

PERIODICAL: Izvestiya Vysshikh Uchebnykh Zavedeniy, Elektromekhanika, 1958, Nr 9, pp 3-5 (USSR)

ABSTRACT: Using the available data on the distribution of γ-radiation from a 10 MeV betatron, the authors constructed a collimator which had to satisfy certain requirements. Distribution of radiation in the γ-ray beam from the 10 MeV betatron is shown in Fig 1, where 1 is the theoretical curve and 2 is the curve obtained experimentally. The authors calculated the thickness of a lead collimator which was necessary to limit the radiation intensity outside the beam to 0.05% of the intensity on the beam axis. This calculated thickness was found to be 15.5 cm and the actual collimator made by the authors had a thickness of 17 cm. The construction of the collimator is shown in Fig 2. The collimator was placed between the coils of the accelerator electro-

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magnet. The collimator could be adjusted to make the beam and the collimator axes coincide. The cross-section of the collimated beam could be altered by using interchangeable collars (bushings), shown in Fig 2. A copper filter of conical form was used to make the intensity of γ-radiation uniform across the collimated beam. Fig 3 shows the calculated (curve 1) and experimentally adjusted (curves 2,3) profiles of the copper filter used. Fig 4 shows the distribution of radiation across the collimated beam obtained both without (curve 1) and with the copper filter (curve 2). A small displacement (3-4 mm) of the collimator axis with respect to the beam axis causes a considerable change in the distribution of radiation across the beam (curve 3, Fig 4). The authors used the collimated beam to measure the distribution of isodoses in water. They used a special dosimeter with a thimble-type ionisation chamber whose working volume was 1 cm^3 and which had a thin graphite wall. The results of the dosimeter measurements are shown in Fig 5. The maximum dose was obtained at 20 mm below the water

Formation of a Beam of Rays from a Betatron SOV/144-58-9-1/18

surface. Fig 6 gives a schematic representation of the betatron and the collimator assemblies.
There are 6 figures and 2 references, one of which is Soviet, one English.

ASSOCIATION: Tomskiy politekhnicheskiy institut
(Tomsk Polytechnical Institute)

SUBMITTED: September 25, 1958

Card 3/3

SOV-3-58-9-15/36

AUTHOR: Vorob'yev, A.A., Professor, Doctor of Technical Sciences, Institute Director

TITLE: On the Subject of Student Scholarships (Po povodu studencheskikh stipendiy)

PERIODICAL: Vestnik vysshey shkoly, 1958, Nr 9, pp 61-62 (USSR)

ABSTRACT: The author talks of the work of the scholarship commissions. Before the introduction of the new order, all successful students of some faculties of industrial vuzes who passed the examination with a satisfactory mark were granted scholarships. The present number of "scholarship" students has decreased to 35.9% against the 44.6% in 1955/56. The scholarship commissions did not grant scholarships equally to all faculties, and the work of the commissions was not always properly organized. The author enumerates the improvements stemming from a conference which decided that students having only satisfactory examination marks should not be given scholarships. Students from industry and demobilized soldiers can be given grants for the 1st semester. Further scholarships are to be given to them only on equal terms with other students.

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On the Subject of Student Scholarships SOV-3-58-9-15/36

ASSOCIATION: Tomskiy politekhnicheskiy institut imeni S.M. Kirova (Tomsk Polytechnical Institute imeni S.M. Kirov)

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SOV/143-58-10-19/24

9(3)
AUTHORS: Vorob'yev, A.A., Vorob'yev, G.A., Sonchik, K.K.

TITLE: A Case of Lightning Strokes

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Energetika, 1958, Nr 10, pp 145-146 (USSR)

ABSTRACT: A thermal thunderstorm was observed over Tomsk on June 29, 1958, at 1200 hours. Lightnings struck two poplars and a building located on the hill Voskresenskaya gora within the city. Observers saw five lightning strokes. Two strokes hit the lightning arresters of the building. Two strokes hit two poplars which were located within the protection zone of the lightning arresters. The fifth stroke hit in a great distance of the other four. The authors present four photographs showing the destructions of the trees caused by lightnings. One of the poplars was hit at a height of 10 m (the total height was 16 m). There, the lightning went thru a wooden box for starlings having sheet metal top and bottom. The box was split. The rind of both poplars was torn off and a large splinter destroyed

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a window located at a distance of 4 m from the trees. A woman working in the kitchen noticed electrical discharges during the lightning strokes. The water and power mains and the central heating were in the immediate vicinity. A receptacle in the kitchen was destroyed. The plug at the power meters was burnt, and the telephone became defective. The authors assume that the discharges inside the building were caused by the lightning current passing thru the roots of the poplars. The authors point to the danger caused by trees in the immediate vicinity of buildings during thunderstorms. Therefore, lightning arresters are necessary. Further, it is mentioned that some people claimed to have seen a red-colored spherical lightning at a height of some ten meters, disappearing with a loud noise. There are 4 photographs.

VOROB'YEV, A.A., prof., doktor fiz.-mat. nauk; SIPAYLOV, G.A.; SHURYGINA, E.K.

Double stamping of sheet steel for obtaining a given precision of groove dimensions. Izv. vys. ucheb. zav.; mashinostr. no.10: 150 '58. (MIRA 12:11)

1. Tomskiy politekhnicheskiy institut.
(Sheet-metal work)

SOV/144-58-11-2/17

AUTHOR: Vorob'yev, A. A. (Professor, Dr. Technical Sciences, Director)

TITLE: Some Problems in the Construction of Cyclic Accelerators With Closed Waveguides (Nekotoryye voprosy konstruirovaniya tsiklicheskikh uskoriteley s zamknutym volnovodom)

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Elektromekhanika, 1958, Nr 11, pp 13-19 (USSR)

ABSTRACT: The possibility of propagating electro-magnetic waves in closed waveguides and of controlling their speed is demonstrated theoretically and experimentally. The theory of steady motion of particles in a closed waveguide with cyclic acceleration is given. A cyclic electron accelerator with closed waveguides is proposed in which the trajectory is controlled by means of the magnetic field of the co-axial waveguide and the acceleration by the electrical vector of a travelling radio wave. An accelerator with closed waveguide has the following advantages over other cyclic accelerators: the accelerated particles have greater energy increase per revolution; the acceleration time is reduced; there is a reduction in the amplitude of oscillations associated with the quantum nature of radiation; the accelerator

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Some Problems in the Construction of Cyclic Accelerators with Closed Waveguides

is smaller; it is possible to construct the accelerator with soft and hard focussing. In a closed waveguide the length of the mean equilibrium orbit is small and, therefore, damping is small. It is, therefore, possible to excite the waveguide by only two generators of the same initial phase, locating the exciters in the waveguide at a distance that is a multiple of a quarter wavelength. The difficult problem of phasing in a large number of generators does not arise. The ionosphere has waveguide properties including dispersion. The results of observation on the propagation of radio waves around the earth is in agreement with the data given here about the movement of travelling waves in closed waveguides. It is proposed to use the electric field of radio waves circulating round the earth to accelerate electrons. The article opens with a review of developments in the theory and practice of electron accelerators in the last 30 years. The problem of getting better performance from cyclic accelerators is discussed. Previous work on the propagation of electromagnetic waves in closed waveguides and on the motion of electrons in an accelerator with a closed waveguide is

SOV/144-58-11-2/17

Some Problems in the Construction of Cyclic Accelerators with Closed Waveguides

reviewed. Possible types of cyclic waveguide accelerators are considered. There is 1 table and there are 20 Soviet references.

ASSOCIATION: Tomskiy politekhnicheskiy institut (Tomsk Polytechnical Institute)

SUBMITTED: November 12, 1958.

Card 3/3

SOV/3-58-11-32/38

AUTHORS: Vorob'yev, A.A., Professor, and Titov, V.N., Docent

TITLE: This Was Done in a Vuz (Eto sdelano v vuze). The Betatrons of the Tomsk Polytechnical Institute (Betatrony Tomskogo politekhnicheskogo instituta)

PERIODICAL: Vestnik vysshey shkoly, 1958, Nr 11, pp 80 - 81 (USSR)

ABSTRACT: Last year, a betatron, radiating energy to a maximum of 25 Mev, was demonstrated for the first time at the "Higher School's" pavilion of the All-Union Industrial Fair. The device was designed by the Tomsk Polytechnical Institute. The first betatron, radiating energy up to 5 Mev, was started at this institute in 1947. Further work in this direction produced an economical device of versatile application. Docent V.S. Melikhov suggested an original theory of seizing the electrons while speeding up, which was experimentally confirmed. Docent B.N. Rodimov examined problems of interaction of electrons in a pencil at the moment of injection and their first revolutions. Docent V.N. Titov realized an electric process of injecting the electrons. The department's scientific workers Docents A.K. Potuzhnyy, V.N. Titov and M.F. Filippov worked out the economic technology of making electromagnets for betatrons. In 1956, the Can-

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This Was Done in a Vuz. The Betatrons of the Tomsk Polytechnical Institute

didates of Technical Sciences B.A. Kononov and L.A. Sokolov succeeded in leading out a pencil of accelerated electrons from the betatron's chamber by two different methods. From 1948 - 1955, a series of betatrons with a maximum radiation energy of up to 15 Mev was manufactured at the Institute laboratories. From 1955 - 1958, the Institute built several betatrons with a radiation energy of up to 25 Mev. The article contains information on the recipients of these betatrons. Instructor V.I. Gorbunov developed a practical method of detecting defects in steel articles of considerable thickness by means of betatron radiation with an energy of up to 20 - 30 Mev. There are 3 photos.

ASSOCIATION: Tomskiy politekhnicheskiy institut imeni S.M. Kirova (Tomsk Polytechnical Institute imeni S.M. Kirov)

VOROB'YEV, A.A.

48-22-4-7/24

AUTHORS: Vorob'yev, A. A., Vorob'yev, G. A.

TITLE: On Some Processes in the Electric Breakdown of Solid Dielectrics (O nekotorykh protsessakh pri elektricheskom proboye tverdykh dielektrikov)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, 1958 Vol. 22, Nr 4, pp. 392-396 (USSR)

ABSTRACT: The authors here determined by experimental methods the dependence of the dielectric strength of the monocrystals of NaCl, KCl, KBr and KJ on the duration of the application of voltage. (reference 1) If the exposure lasts $1.1 \cdot 10^{-7}$ sec and less an increase of dielectric strength conditioned by the discharge delay is observed. For the purpose of determining the statistical delay period in solid dielectrics breakdown tests were performed on X-ray irradiated common salt. After the value of the dielectric strength at a respective exposure and the value of the statistical dielectric strength were known, the period of development of the discharge was determined by means of a voltage oscillograph. It must be mentioned, that in the case of a noticeable discharge delay a considerably greater spreading of the values of dielectric

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strength exists as is the case with an exposition of from $3.1o^{-7} \div 6.1o^{-6}$ sec (table 1). With an exposition of from $3.1o^{-7} \div 6.1o^{-6}$ sec the spreading of the dielectric strength of the investigated dielectrics is conditioned by structural defects in the samples, mioro-fissures, mechanical stresses and other causes. At an exposure $1,4.1o^{-7}$ sec and below in isolated samples the spread due to the difference of the period of development of discharge is added to this spreading. The diagram in figure 1 shows the dependence of the dielectric strength of KBr on the exposure. The process of breakdown in solid dielectrics can be divided into two stages, as in gaseous ones: the stage of the development of discharge and the stage of the completion of discharge. During the first stage a partial destruction of the structure of the dielectric occurs, which fact explains the occurrence of incomplete breakdown process into the stage of the loss of dielectric strength and in the stage of destruction is of relative character. The principal destruction of the solid dielectric occurs in the stage of the actual discharge. Because of the increase of the dielectric strength of solid dielectrics the probability of mechanical destruction increases with a short duration of

On Some Processes in the Electric Breakdown of Solid Dielectrics 48-22-4-7/24

exposition. There are 2 figures, 2 tables, and 6 references, 3 of which are Soviet.

ASSOCIATION: Tomskiy politekhnicheskiy institut im. S. M. Kirova (Tomsk Polytechnical Institute imeni S. M. Kirov)

AVAILABLE: Library of Congress

1. Single crystals--Dielectric properties 2. Voltage--Applications 3. Dielectrics--Test methods

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VOROB'YEV, A. A.

AUTHORS: Vorob'yev, A. A., Vorob'yev, G. A. 48-22-4-8/24

TITLE: Investigation of the Electric Breakdown of Rock Salt Containing Color Centres (Issledovaniye elektricheskogo proboya kamennoy soli, soderzhashchey tsentry okraski)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, 1958, Vol. 22, Nr 4, pp. 397-400 (USSR)

ABSTRACT: The influence of color centres representing sources of weakly bound electrons on the dielectric strength of alkali-halogen salt crystals was repeatedly investigated (table 1). The authors determined the dependence of electric strength of colored and uncolored crystals of rock salt on the period of posure to voltage. The coloring of the crystals was produced by means of an X-ray irradiation (150 kV, 10 mA) at an exposure of 4 hours' duration. The colored samples were subjected to breakdown partly in brilliant light and partly in darkness. The results are shown in the figure. The values of dielectric strength are referred to the probability of breakdown of $\varphi = 90\%$. Experiments were also conducted concerning the breakdown of colored and uncolored crystals of rock salt in an inhomogeneous field with an exposure of about 10^{-6} sec.

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Investigation of the Electric Breakdown of Rock Salt Containing Color Centres 48-22-4-8/24

In order to exclude the influence of discharges in the surrounding medium, the samples were equipped with conical depressions. Table 2 shows the results of the investigations and, for the sake of comparison, also the values of breakdown in the homogeneous field. If the polarity of the tip is negative, different directions of discharge occur (table 3). The modification of the discharge directions in X-ray irradiated samples is apparently conditioned by the effect of the photoelectrons on the space charge around the tip.

Summary: The values of dielectric strength are lower in colored crystals than in uncolored ones at an exposure to voltage of 4.10^{-7} sec and above. If the exposition is from $2 \div 3.10^{-8}$ sec., about equal values of dielectric strength are obtained. The period of development of the breakdown of colored crystals at an exposition exceeding 10^{-7} sec amounts to about $6,8.10^{-8}$ sec. The photoelectrons in colored crystals modify the discharge direction at a positive polarity. There are 1 figure, 3 tables, and 7 references, 5 of which are Soviet.

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Investigation of the Electric Breakdown of Rock Salt Containing Color Centres 48-22-4-8/24

ASSOCIATION: Tomskiy politekhnicheskiy institut im. S. M. Kirova (Tomsk Polytechnical Institute imeni S. M. Kirov)

AVAILABLE: Library of Congress

1. Crystals--Dielectric properties 2. Dielectrics--Determination
3. Crystals--Colorimetric analysis

Card 3/3

24(6)
AUTHORS: ~~Vorobiyev, A. A.,~~ Nakhodnova, A. P. SOV/57-28-10-11/40

TITLE: High-Frequency Dielectric Losses and the Lattice Energy in Compounds of Second Group Metals (Dielektricheskiye poteri na vysokoy chastote i energiya reshetki dlya soyedineniy metallov vtoroy gruppy)

PERIODICAL: Zhurnal tekhnicheskoy fiziki, Vol 28, Nr 10, pp 2173 - 2174 (USSR)

ABSTRACT: This paper gives an account of the investigation of the temperature and frequency dependence of the tg δ (loss angle) of sintered polycrystalline samples of oxides, fluorides and chlorides of second group metals. BeO, MgO, CaO, SrO, and BaO were investigated in a temperature range of 25÷480°C, Ca-, Sr-, Ba-fluorides and Ca-, Sr-, Ba-chlorides in a temperature range of 25 to 260°C. The samples were produced from chemically pure substances. The density of the samples amounted to 65-70% and 95%, respectively, of the density of the monocrystals, tg δ decreases in all polycrystalline sintered samples of all compounds in the

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total range of frequencies and temperatures employed with an increase of the lattice energy. The growth of the cation radius under otherwise equal conditions is accompanied by a relaxation of the lattice and by a modification of the tg δ which proceeds according to certain regularities. The variation of the tg δ in halide compounds of alkaline earth metals corresponds to the fundamental physical and chemical properties of the substance in porous and in dense samples. It is determined by the energy of the thermochemical interaction of the ions of the crystal lattice. The information gained in the investigation of the frequency dependence of the dielectric losses in the oxides and halide compounds of the elements of the second group indicates that in the range of 450 to 900 kc the losses are reduced, when the frequency rises. The dielectric losses in porous polycrystalline samples of compounds of the second group of elements in air are considerably in excess of those in vacuum. In samples prepared of chemically pure substances the tg δ varies as the cation dimensions, the

polarizability and inversely as the point of fusion of the substance. The smaller the energy of the crystal lattice the higher will be the losses at a given temperature and frequency. G.V.Krivoshchekov, Candidate of Technical Sciences, assisted with the work. There are 2 figures.

SUBMITTED: November 4, 1957

24(6)

AUTHORS: Vorob'yev, A. A., Nakhodnova, A. P. SOV/57-28-10-14/40

TITLE: Electric Conductivity and Lattice Energy of Compounds of the Metals of the Second Group of D.I.Mendeleyev's System (Elektroprovodnost' i energiya reshetki soyedineniy metallov vtoroy gruppy sistemy D.I.Mendeleyeva)

PERIODICAL: Zhurnal tekhnicheskoy fiziki, Vol 28, Nr 10, pp 2192 - 2193 (USSR)

ABSTRACT: This paper gives an account of the study of the problem, whether the laws derived for monocrystals are applicable also to polycrystalline bodies used in engineering. The temperature dependence of the electric conductivity of oxides and halide compounds of the second group elements in the temperature range of 250 to 900°C was measured. The polycrystalline samples were prepared by pressing and subsequent baking in the air. The measurements were carried out in vacuum with direct current in weak fields (2,5 to 75 V/cm) at a pressure of $p = 10^{-5}$ mm of mercury column. Platin electrodes were evaporated onto the samples. It appears that at high temperatures the

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electric conductivity of sintered oxides of second group metals decreases with an increase of the lattice energy, whereas the activation energy increases. Identical phenomena were also observed with other compounds. The specific electric conductivity of the second group metal oxides, of the calcium-, strontium-, and barium fluorides, and of the calcium-, strontium-, and barium chlorides varies as the atomic volume of the metal, the polarizability of the cation, the decrease of the point of fusion of the compound, the dissociation energy and the magnitude of the isobaric potential. Hence the most simple compounds of the second group elements exhibit, besides the modification of the principal thermochemical features, a variation of the specific electric conductivity, which is governed by definite rules. In the range of low temperatures the activation energy of all compounds is considerably deficient of that in the range of high temperatures and lies within the limits of 0.15 to 0.58 eV. The variation of the specific conductivity and of the activation energy in

the range of relatively small temperatures does not show a course which is distinctively governed by definite rules. Hence the activation energy and the specific conductivity in the range of high temperatures are determined by the binding energy of the ions in the lattice and can be used as a characteristic feature of the electrophysical properties of the substances. G.V. Krivoshchekov, Candidate of Technical Sciences, assisted with the work. There are 2 figures.

SUBMITTED: November 4, 1957

SOV/58-59-9-20517

Translation from: Referativnyy Zhurnal Fizika, 1959, Nr 9, p 147 (USSR)

AUTHOR: Vorob'yev, A.A.

TITLE: Experimental Regularities in Electronic Processes in Ionic Crystals: A Need for Theoretical Generalization

PERIODICAL: Izv- Tomskovo politekhn. in-ta, 1958, Vol 94, pp 3-15

ABSTRACT: The author describes experimental data indicating a connection between electronic and ionic processes. He holds that, when elaborating a theory of electronic phenomena in the ionic crystal and, in particular, when working out the kinetic equations for the electrons in the crystal to make allowance for the role of the medium, it is necessary to introduce terms describing the coupling between the energy of the electronic processes and the energy of the lattice. The bibliography contains 25 titles.

M.N. Treskina

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SOV/58-59-9-20518

Translation from: Referativnyy Zhurnal Fizika, 1959, Nr 9, p 147 (USSR)

AUTHORS: Astafurov, A.V., Vorob'yev, A.A., Vorob'yev, G.A., Kevroleva, K.M.

TITLE: The Volt-Second Characteristics of Solid Homogeneous Dielectrics

PERIODICAL: Izv. Tomskovo pilitekhn. in-ta, 1958, Vol 94, pp 16 - 19

ABSTRACT: The authors measured the volt-second characteristics at sparkover in the homogeneous and inhomogeneous (one electrode being in the form of a point) field of a great number of solid dielectrics: single crystals of NaCl, KCl, KBr and KJ, single crystals of Seignette's salt, ice, foliated talc containing water of crystallization, porcelain and others. For the sparking voltage a value was selected at which sparkover occurred with a probability of 90%. In the case of all the dielectrics investigated, when samples having a thickness of 0.15 mm were exposed for $1 \cdot 10^{-7}$ sec or less, an increase in electric resistance was observed. The rise in sparking voltage under short exposures is caused by discharge delay. It is well-known (cf. RZhFiz, 1959, Nr 1, 1174) that, in the case of exposures shorter than $(2 \cdot 3) \cdot 10^{-8}$ sec, the time delay is actually the time of forming the discharge $t_f \cdot t_f$ was ascertained from the voltage oscillogram. The average velocity

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The Volt-Second Characteristics of Solid Homogeneous Dielectrics

of the propagation of the discharge was determined from the values of t_f and the thickness of the samples. The following conclusions were drawn: 1) for solid homogeneous dielectrics with high electric resistance ($\sim 10^6$ V/cm), v_{av} is of the order of 10^6 cm/sec; 2) in the case of a homogeneous field, the value of v_{av} is several times greater for thick samples (0.5 to 1.5 cm) than for thin samples (0.15 to 0.3 mm); 3) v_{av} is significantly greater for the positive than for the negative polarity of the point; and 4) v_{av} increases with an increase in overvoltage.

Yu.S.K.

VOROB'YEV, A.A., prof., doktor; VOROB'YEV, G.A.

Pulse breakdown of solid dielectrics. Izv. TPI 95:3-15 '58. (MIRA 14:9)

(Dielectrics) (Breakdown, Electric)

VOROB'YEV, A.A., prof., doktor

Mechanical destruction of solid dielectrics under the action of short electric pulses. Izv. TPI 95:16-21 '58. (MIRA 14:9)
(Dielectrics) (Breakdown, Electric)

VOROB'YEV, A.A., prof., doktor

Application of electric discharges in dielectrics in blasting operations. Izv. TPI 95:22-25 '58. (MIRA 14:9)
(Blasting) (Electric discharges) (Dielectrics)

SOV/112-60-1-1158

Translation from: Referativnyy zhurnal Elektrotekhnika, 1960, Nr 1, p 15 (USSR)

AUTHORS: Vorob'yev, A.A., Dmitriyevskiy, V.S.

TITLE: Methods and Devices for Equalizing the Voltage Distribution Over the Surface of a Solid Dielectric on Pulses

PERIODICAL: Izv. Tomskogo politekhn. in-ta, 1958, Nr 95, pp 45 - 49

ABSTRACT: General conditions applied to devices equalizing the voltage distribution over the surface of a dielectric and the methods of equalizing are discussed. Semiconducting coatings of dielectric surface, rings and screens of electrodes of long insulator chains do not secure a uniform voltage distribution over the surface on pulses. The VEE method of equalization is applicable at a positive pulse polarity. Considering the above methods inadequate for the cases of pulse voltages, the

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VOROB'YEV, A.A., prof., doktor; DMITREVSKIY, V.S.

Method for flattening the voltage distribution along the surface of a dielectric. Izv. TPI 95:50-53 '58. (MIRA 14:9)
(Dielectrics) (Electric charge and distribution)

VOROB'YEV, A.A.

Experimental study of the relation of the properties of ionic dielectrics to their composition. Izv. TPI 95:92-104 '58. (MIRA 14:9)

(Dielectrics)

VOROB'YEV, A.A.; NAKHODNOVA, A.P.

Dielectric losses in oxides and of elements of the 2d group. Izv. TPI 95:306-313 '58. (MIRA 14:9)
(Halides--Electric properties) (Oxides--Electric properties)

SOV/112-60-1-1156

15.2210
5.4100

Translation from: Referativnyy zhurnal Elektrotekhnika, 1960, Nr 1, p 15 (USSR)

AUTHORS: Vorob'yev, A.A., Nakhodnova, A.P.

TITLE: Electroconductivity of Oxides and Haloid Compounds of the II Group Elements

PERIODICAL: Izv. Tomskogo politekhn. in-ta, 1958, Nr 95, pp 325 - 330

ABSTRACT: The study of specific conductivity σ was carried out on caked polycrystalline disks 10 mm in diameter and 0.35 - 0.8 mm thick. The relative density of samples was 65 - 75%. The samples were ground and platinized. Measurement of temperature dependence of σ was carried out by the residual current at 10^{-5} mm Hg. In the weak field region (E = 2.5 - 75 v/cm) σ of the compounds under study increases with an increase of E. With an increase in the density of samples σ increases. For a given temperature,

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SOV/112-60-1-1156

Electroconductivity of Oxides and Haloid Compounds of the II Group Elements

σ of oxides and haloid compounds increases with a decrease in the energy of the crystalline lattice. The activation energy of charge carriers decreases with a decrease in the energy of the crystalline lattice. 9 references.

A.A.V.

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VOROB'YEV, A.A.

Treatment of materials and destruction of solids by means of electric discharges. Izv. TPI 95:331-339 '58. (MIRA 14:9)
(Electric discharges)

VOROB'YEV, A.A.

Production of opposing electron beams by means of an induction accelerator. Izv. TPI 95:340-342 '58. (MIRA 14:9)
(Electron beams) (Particle accelerators)

VOROB'YEV, A.A.; KISLINA, A.N.

Electric strength of single crystals in solid solutions of alkali metal halides. Izv. TPI 95:343-346 '58. (MIRA 14:9)
(Solutions, Solid) (Alkali metal halides--Electric properties)

VOROB'YEV, A.A.

Research on the physics of dielectrics and electric insulation conducted in the city of Tomsk up to 1957. Izv. TPI 95:354-371 '58. (MIRA 14:9)

(Electric insulators and insulation)

VOROB'YEV, A.A.; TERNOV, I.M.

International conference on high energy particle accelerators and instruments used in nuclear physics, held in Geneva from January 14th to January 19th, 1959. (MIRA 13:12)

1. Moskovskiy gosudarstvennyy universitet imeni M.V. Lomonosova i Tomskiy politekhnicheskiy institut imeni S.M. Kirova.
(Particle accelerators--Congresses)
(Nuclear physics--Congresses)

21(7)

AUTHORS: Vorob'yev A.A., Moskalev V.A. SOV/139-59-1-17/34

TITLE: Some Characteristics of Betatron Target Radiation at 10-25 MeV (Nekotoryye kharakteristiki luchey betatronov na 10-25 Mev)

PERIIDICAL: Izvestiya Vysshikh Uchernykh Zavedeniy, Fizika, 1959, Nr 1, pp 102-106 (USSR)

ABSTRACT: Results of experiments on the spatial distribution of betatron target radiation are reported. It is shown that the experimental data are in good agreement with the theory given by Lowson (Ref 2). The measurements were carried out using a special detector (Ref 3). The detector includes a thimble ionisation chamber with a working volume of 1 cm^2 and a graphite wall whose thickness may be varied from 3 mm to the equilibrium value. The detector could be continuously moved over a 1 m radius circle, the rotation axis of the detector passing through the target. Fig 1 shows the spatial distribution in the plane of the orbit of the radiation in the main beam at 10 MeV. Curve 2 is theoretical (Lowson) and Curve 1 was obtained from experiments. The discrepancy between the theoretical graph and the experimental one (on the right hand side) is due to target edge effects

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Some Characteristics of Betatron Target Radiation at 10-25 MeV.

described in Ref 4. The full width at half height of the intensity curve is 24°. The distribution in the vertical direction (Fig 2) is the more symmetrical and its full width at half height is 17°. Fig 3 gives the spatial distribution of betatron radiation at 10 MeV in the plane of the equilibrium orbit. The curve has a well-defined maximum. The spatial distribution at 25 MeV is also in good agreement with the theory. The "effective" energy was determined experimentally by absorbing the radiation in copper and lead. This energy was found to be equal to 4 MeV in the case of 10 MeV betatron.

Card 2/2 There are 5 figures and 10 references, of which 2 are English and 8 Soviet.

ASSOCIATION: Tomskiy Politekhnicheskiy Institut imeni S.M. Kirova (Tomsk Polytechnical Institute imeni S.M. Kirov)

SUBMITTED: July 16, 1958

66536
SOV/144-59-1-16/21

21,2200

AUTHORS: Anan'yev, L.M., Cand.Tech.Sci., Docent; Volkov, M.N., Dr.Chem.Sci.; Vorob'yev, A.A., Dr.Physico-Mathematical Sci., Professor, Director of Tomsk Polytechnical Inst.; Titov, V.N., Cand.Tech.Sci., Docent; Filippov, M.F., Cand.Tech.Sci., Docent.

TITLE: Development of Electron Accelerators at the Tomsk Polytechnical Institute

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Elektromekhanika, 1959, Nr 1, pp 121-124 (USSR)

ABSTRACT: Work on electron accelerators at the Tomsk Polytechnical Institute was begun in 1946. The aim was to produce an inexpensive betatron installation, simple in manufacture and operation. In spite of the fact that many scientists and engineers maintained that the betatron must be supplied at a highly stable voltage, the authors developed a betatron using a supply derived from the a.c. mains. Changes in frequency and voltage had to be compensated automatically, and experiments have shown that this is possible. The fact that the betatron was supplied from industrial-frequency mains meant that the installation was very inexpensive. The second important

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Development of Electron Accelerators at the Tomsk Polytechnical Institute

contribution to betatron construction was the design and proportioning of parts of the machine and its parameters, which was done bearing in mind both technical and economical considerations. Theories were developed leading to formulae which are extremely convenient and time-saving in the adjustment of betatrons. Efforts were made to reduce the overall dimensions of betatrons. M.F. Filippov has developed a special yoke which ensures high azimuthal phase uniformity of the magnetic field. In 1946 V.N. Titov developed some very simple methods of injection and deflection. A betatron has been constructed, working on 150 c/s, in which both half-periods of the magnetic field are used to accelerate the electrons. At the point of intersection of the beams from two targets of such a betatron the intensity is 300 roentgens per minute at one metre. V.A. Moskalev and Yu.M. Akimov developed a stereo-betatron having a common magnetic circuit with two pairs of poles and two air gaps, giving effectively two accelerating chambers. This stereo-betatron may be used in medicine for deep irradiations and in radiographic

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Development of Electron Accelerators at the Tomsk Polytechnical Institute

flaw-detection in order to obtain stereo-photographs. B.A. Konokov and L.S. Sokolov developed methods for the extraction of the electron beam both by deflecting the electrons by an electric field and by removing the electrons beyond the magnetic field by means of non-magnetic channels. B.N. Rodimov and others have considered the acceleration process from the theoretical point of view. Since 1954 the Institute has been concerned with the development of powerful electron synchrotrons.

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There are no figures, tables or references.

ASSOCIATION: Tomskiy politekhnicheskiy institut (Tomsk Polytechnical Institute)

Dr. Volkov is a Departmental Head at the Ministry of Higher Education, SSSR. (Nachal'nik otdela MVO SSSR)

4

S/155/59/000/02/028/036

AUTHOR: Vorob'yev, A.A.

TITLE: Additional Absorption and Fluorescence in Activated Alkaline-haloidal Phosphors and the Energy of the Grid

PERIODICAL: Nauchnyye doklady vysshey shkoly. Fiziko-matematicheskiye nauki, 1959, No. 2, pp. 149-150

TEXT: Additional absorption bands occur after irradiation of pure alkaline-haloidal crystals with X rays. Further absorption bands arise under introduction of an activator. In the transition to connections with a smaller lattice energy the maximum of the corresponding absorption bands removes in the direction of longer waves. Some further statements partially already published by the author (Ref. 1) and in (Ref. 2) on the considered subject are given.
There are 2 references: 1 Soviet and 1 German.

ASSOCIATION: Tomskiy politekhnicheskiy institut (Tomsk Polytechnic Institute)

SUBMITTED: February 17, 1959

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65728
SOV/139-59-2-27/30

24.6800, 9.9100

AUTHOR: Vorob'yev, A.A.

TITLE: A Note on the Acceleration of Relativistic Electrons in the Ionosphere Using the Earth's Magnetic Field to Control Their Trajectories

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Fizika, 1959, Nr 2, pp 171-172 (USSR)

ABSTRACT: Much attention is being paid at the present time to the design of charged particle accelerators. Wilson, the builder of a 1.2 Bev synchrotron has suggested that various epochs in history have their characteristic major buildings. In the antiquity there were pyramids, in the middle ages cathedrals and in our own time accelerators. The biggest accelerator has been built in Dubna and gives protons with an energy of 10^{10} ev. There are grounds to belive that cosmic rays include particles with energies of 10^{16} ev. The development of methods for the production of high energy particles remains a very topical problem in science. The present author suggests a cyclic accelerator with a closed waveguide in which the acceleration of the particles is carried out with the aid of the electric vector of a travelling wave. In this

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A Note on the Acceleration of Relativistic Electrons in the Ionosphere Using the Earth's Magnetic Field to Control Their Trajectories

connection, the Tomsk Polytechnical Institute is studying the theory of motion of radio waves in closed waveguides. The phase velocity in a waveguide depends on the frequency. Below the critical wavelength, the phase velocity is equal to the velocity of light. Because the cross-section of the waveguide is limited, a critical wavelength and dispersion are present. In the ionosphere, the phase velocity of radio waves also depends on frequency. The directed propagation of radio waves in the ionosphere can be arranged to take place with a velocity smaller than the velocity of light. The dispersion in the ionosphere takes place because radio waves produce electron vibrations and the phase velocity of electromagnetic waves in the ionosphere depends on the wavelength. Observations of propagation of radio waves around the terrestrial globe over closed paths are in agreement with the theory of travelling waves in a closed radio waveguide. At an altitude of 100 km, the concentration of neutral particles is 2.6 x 1013 and at

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an altitude of 200 km it is (5-10) x 10^{10}, ie lower by a factor of 10^9 than at the earth's surface. This reduction in the concentration is sufficient for the acceleration of electrons. The electron concentration at an altitude of 100 to 600 km is 105 - 1.6 x 10^6 electrons/cm^3. It depends on the time of day, the geographical latitude, time of the year and solar activity. It is known that radio waves can travel round the earth to reach the transmitting station. This is known as global echo and is stable. Sometimes a double or even triple global echo is observed. It is suggested that the global echo is propagated as a grazing wave along the lower boundary of the F-layer at an altitude of 204 km, for a time of 0.1365 sec, and with a velocity of 299776 km/sec, or along a zig-zag trajectory at an altitude of 200 to 300 km. In this way, the current density will be 460 amps/cm^2. For electron energies of 10^{12} ev or more, fields of up to 20 volt/cm would be necessary. The problem of maintaining such a high intensity

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wave over the entire path requires a separate solution. It is suggested that this method might be superior to the recently suggested electron accelerator which involves the laying out of a tubular chamber along the earth's equator, in which the trajectories would be controlled by the earth's magnetic field.

ASSOCIATION: Tomskiy politekhnicheskiy institut imeni S.M.Kirova (Tomsk Polytechnical Institute imeni S.M.Kirov)

SUBMITTED: November 12, 1958

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06540
SOV/142-2-2-16/25

9(2,3)
AUTHORS: Vorob'yev, A.A., Solntsev, B.A., and Titov, V.N.

TITLE: The Application of an Electrode Electric Field for Electron Acceleration in a Synchrotron

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiotekhnika, 1959, Vol 2, Nr 2, pp 246-247 (USSR)

ABSTRACT: Coaxial cavity resonators found the most wide-spread application as electron accelerators in electron synchrotrons with annular electromagnets. They were first used by F.K. Goward and D.E. Barnes in 1946. Resonators of this type occupy a part of the pole gap of the electromagnet. Therefore, the outer conductor cannot have sufficiently large dimensions compared to the inner one. Further, bending of the resonator cannot be avoided. These conditions reduce the resonance to a considerable degree. The introduction of high-quality dielectrics into the resonator cavity [Ref 1, 2, 3] does not produce a considerable increase of the parallel resistance. In 1948, at the Tomskiy politekhnicheskiy institut imeni S.M. Kirova (Tomsk Poly-

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The Application of an Electrode Electric Field for Electron Acceleration in a Synchrotron

technic Institute imeni S.M. Kirov) the suggestion was made to use for electron acceleration the electric field created in a gap between conductive coatings inside the chamber, as shown by figure 1. With a sufficient thickness of the conductive layer, the configuration of the electric field will not be different from the shape of the field created in the accelerating gap of a coaxial resonator. In 1955, a 20 mev synchrotron was built at the Tomsk Polytechnic Institute with the application of the aforementioned electrodes. For feeding high frequency power to the accelerating gap two metal rings were used which were placed on the accelerating chamber, as shown by figure 2. The capacitance component of the input impedance of the device was compensated by a parallel-connected inductance, as shown by the equivalent circuit in figure 3. The aforementioned device occupies little space in the pole gap of the accelerating electromagnet and provides optimum operating conditions. The

The Application of an Electrode Electric Field for Electron Acceleration in a Synchrotron

parallel resistance of the accelerating gap may be higher than with coaxial resonators. Frequency adjustments may be easily made. Special matching and balancing systems for the coupling with the HP generator are not required. The manufacture of such an accelerating device is considerably simpler than that of other accelerators. Figure 4 shows a general view of the accelerating device in the chamber. The electromagnet of the 15 mev betatron of the Tomsk Polytechnic Institute provided the magnetic field. The accelerating device was excited by a push-pull generator, composed of metal-ceramic tubes GI-12B, producing approximately 20 watts at a frequency of 350 mc. With such a power, 150 volts were obtained at the accelerating gap. The basic characteristics of the synchrotron with this accelerating device were the same as those obtained with a coaxial resonator. The gamma radiation had an intensity of 2 roentgen at 1 m

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SOV/142-2-2-16/25

The Application of an Electrode Electric Field for Electron Acceleration in a Synchrotron

distance from the target. There are 2 diagrams, 1 photograph, 1 circuit diagram and 3 references, 1 of which is Soviet and 2 English.

This article was recommended by the Nauchno-issledovatel'skiy institut yadernykh issledovaniy, elektroniki i avtomatiki pri Tomskom politekhnicheskom institute imeni S.M. Kirova (Scientific Research Institute for Nuclear Research, Electronics and Automation at the Tomsk Polytechnic Institute imeni S.M. Kirov).

SUBMITTED: July 11, 1958

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VOROB'YEV, A.A., prof., doktor fiz.-matem.nauk; VOROB'YEV, G.A.; MEL'NIKOV, [redacted]

Formation of discharges in solid dielectrics. Izv.vys.ucheb. zav.; energ. 2 no.4:35-37 Ap '59. (MIRA 12:9)

1. Tomskiy ordena Trudovogo Krasnogo Znameni politekhnicheskiy institut imeni S.M.Kirova.
(Electric discharges)

VOROB'YEV, A.A., doktor fiz.-mat.nauk, prof.; IZERGIN, A.P., kand.tekhn. nauk.; KEVROLEV, K.M.

Electric properties of crystal hydrates. Izv.vys.ucheb.zav.: energ. 2 no.5:26-35 My '59. (MIRA 12:10)

1. Tomskiy ordena Trudovogo Krasnogo Znameni politekhnicheskiy institut im. S.M.Kirova.
(Hydrates--Electric properties)

VOROB'YEV, A.A., doktor fiz.-mat.nauk, prof.

Development of the theory concerning the interrelation between the properties of ionic crystals in the research of Tomsk scientists. Izv.vys.ucheb.zav.; energ. 2 no.6:48-54 Je '59. (MIRA 13:2)

1. Tomskiy ordena Trudovogo Krasnogo Znameni politekhnicheskiy institut imeni S.M.Kirova. Predstavlena kafedroy tekhniki vysokikh napryazheniy.
(Ionic crystals)

VOROB'YEV, A.A., doktor fiz. mat. nauk prof.; KISLINA, A.N., kand. tekhn. nauk

Electric strength and microhardness of crystals of solid solutions of the systems which break down in the process of crystal growing from the melt. Izv. vys. ucheb. zav.; energ. 2 no.7:41-42 Jl '59. (MIRA 13:1)

1.Tomskiy ordena Trudovogo Krasnogo politekhnicheskiy institut im. S.M. Kirova. (Alkali metal halide crystals)

VOROB'YEV, A.A., doktor fiz.-mat.nauk nauk prof.; IVANKINA, M.S.; KISLINA, A.N., kand.tekhn.nauk; SAVINTSEV, P.A., kand.fiz.-mat.nauk dots.

Physical and chemical properties of insulating crystals. Izv. vys.ucheb.zav.; energ. 2 no.9:43-47 S '59. (MIRA 13:2)

1. Tomskiy ordena Trudovogo Krasnogo Znameni politekhnicheskiy institut imeni S.M.Kirova.
(Alkali metal halide crystals--Electric properties)

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SOV/143-59-4-6/20

9(3) 24.7800
AUTHORS: Vorob'yev, A.A., Doctor of Physico-Mathematical Sciences, Professor; Vorob'yev, G.A., and Mel'nikov, M.A.

TITLE: Formation of Discharge in Solid Dielectrics

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy - Energetika, 1959, Nr 4, pp 35-37 (USSR)

ABSTRACT: The article deals with the dependency of the electric puncture strength on the duration of the effect of the voltage in alkaline salts (NaCl, KCl, KBr and KJ), halite, muscovite, and some synthetic materials used for insulation purposes (styroflex, polystyrene, teflon, and plexiglass). The duration of the effect of the voltage was between 10^{-6} and 10^{-9} sec. The result of the test is given in tables and graphs. It was found that the electric puncture strength decreased with the duration of the effect of the voltage up to a certain point and then either started to rise again to a small extent (halite) or remained constant (synthetic materials, muscovite). The monocrystals of the alkaline salts showed a constant fall of the electric

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Formation of Discharge in Solid Dielectrics

puncture strength, if the effect of the voltage was extended. The authors explain this phenomenon with formation processes in the dielectric and supply a physical explanation of its mechanism. There are 2 graphs, 2 tables and 4 Soviet references.

ASSOCIATION: Tomskiy ordena Trudovogo Krasnovogo Znameni politekhnicheskiy institut imeni S.M. Kirova (Tomsk Polytechnical Institute of the Order of the "Red Banner of Labor" imeni S.M. Kirov)

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SOV/109-4-8-5/35

AUTHORS: Vorob'yev, A.A., Vorob'yev, G.A., Mesyats, G.A. and Sonchik, K.K.

TITLE: Pulse and Oscillographic Techniques for the Measurement of Discharge Lags in Dielectrics

PERIODICAL: Radiotekhnika i elektronika, 1959, Vol 4, Nr 8, pp 1257 - 1259 (USSR)

ABSTRACT: The discharge lags in dielectrics, subjected to action of rectangular voltage pulses, can be determined by using the circuit of Figure 1. In this, the capacitances C_1 and C_2 are discharged, while the thyratron T is triggered. A voltage pulse is thus produced across the resistance R_1; this can be used for the investigation of dielectrics. The voltage pulse appearing at the capacitance C_n, which is connected in parallel with the vertical plates of the oscillograph, is used as the time base. In this manner, a synchronism is achieved between the investigated phenomenon and the time base so that the pulse always appears at the same spot of the

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Pulse and Oscillographic Techniques for the Measurement of Discharge Lags in Dielectrics

screen. The resistances R_2, R_2' and R_g and capacitance C_n can be determined from the condition of the required writing speed for the tube. The deficiency of the circuit lies in the absence of a horizontal portion in the time base preceding the leading edge of the pulse. The circuit of Figure 1 can produce pulses having a rise time of 3×10^{-8} sec. If it is necessary to obtain faster pulses, having amplitudes of the order of 20 kV, a different technique is used. A suitable pulse generator, which can give rise times of the order of 10^{-9} sec is illustrated in Figure 2. In this, the resistances $R_1, R_2, \ldots, R_n$ divide the voltages over the switching gaps $P_1, P_2, \ldots, P_n$. When the gap P_1 discharges the capacitance C_1, a larger voltage is applied to the gap P_2, which is rapidly broken down. The last gap, P_n, receives the highest over-voltage.

Pulse and Oscillographic Techniques for the Measurement of Discharge Lags in Dielectrics

The rise time of the pulse produced by the circuit of Figure 2 is plotted in Figure 4 as a function of the over-voltage. An application of the circuit of Figure 2 is illustrated in Figure 5; the system is employed for discharging several circuits having different voltages. There are 5 figures and 3 references, of which 1 is Soviet, 1 German and 1 English.

SUBMITTED: March 5, 1959

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VOROBIYEV, A.A.

66702

SOV/109-4-8-22/35

24,2120

AUTHORS: Granovskiy, V.L., Luk'yanov, S.Yu., Spivak, G.V. and Siretenko, I.G.

TITLE: Report on the Second All-Union Conference on Gas Electronics

PERIODICAL: Radiotekhnika i elektronika, 1959, Vol 4, Nr 8, pp 1339 - 1358 (USSR)

ABSTRACT: The conference was organised by the Ac.Sc.USSR, the Ministry of Higher Education and Moscow State University. It was opened by the chairman of the organising committee, M.A. Leontovich, Academician. During the plenary sessions of the conference, a number of survey papers were delivered. L.A. Artsimovich read a paper on "Production of Ultra-high Temperatures in Plasma". A survey of the optical method of measurements was given in the papers by V.A. Fabrikant and S.E. Frish. S. Brown of the Massachusetts Institute of Technology gave a survey of the high-frequency methods of the investigation of stationary and non-stationary plasma (see p 1244 in this issue of the journal). N.V. Fedorenko read a paper entitled "Ionisation and Inelastic Scattering During Atomic Collisions". L.A. Sena and Yu.M. Kagan dealt with "Elementary Processes of Determining the Motion of Ions in Gas". A paper by Ye. Bederau (Rumania) dealt with "The Role of Resonance-recharging in the Kinetics of Ions". I.S. Stekol'nikov considered the initial stages of the development of sparks (corona-leader, main channel and the final channel). B.N. Klyarfel'd gave a survey of the ignition processes of the discharges in highly rarified gases. The mechanism of the breakdown of a high-vacuum gap was elucidated in a paper by V.L. Granovskiy. L. Tonks (USA) expounded a theory of the motion of electrons in a magnetic trap (see p 1316 of this journal). Academician R. Rompe (Eastern Germany) described a number of experiments on non-stationary plasma conducted by himself. M. Steenbeck (Eastern Germany) gave a generalised theory of plasma. The conference was divided into six sections. The first section was presided over by L.A. Sena and was concerned with the elementary processes in gas discharges. The following papers were read in this section:

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Ya.M. Fogel' - "Transformation of Positive Ions Into Negative Ones in Rarified Gases". Ya. M. Fogel' with V.A. Ankudinov and D.V. Pilipenko - "Capture and Loss of Electrons During the Collision of Fast Atoms of Carbon and Hydrogen with the Molecules of Gases". N.V. Fedorenko et al. - "Dissociation of Molecular Ions of Hydrogen During Collisions in Gas". I.P. Flaks and Ye.S. Solov'yev - "Capture Cross-sections of Electrons in Multicharge Ions in Inert Gases". E.M. Kushnir et al. - "Experimental Investigation of the Resonance Recharging in Certain Single-atom Gases and Metal Vapours". O.B. Firsov - "Qualitative Investigation of Inelastic Collisions of Atoms". L.M. Volkova - "Effective Excitation Cross-sections of the Spectral Lines of Potassium and Argon". I.P. Zapesochnyy and S.M. Kishko "Some Results of the Investigation of the Optical Functions of the Excitation Bands of a Negative System". A.A. Vorob'yev and A.G. Vlasov - "Investigation of the Scattering of the Electrons in a Betatron Chamber". The second section was presided over by B.N. Klyarfel'd and was devoted to the problems of the electrical breakdown in rarified gases and in high vacuum. The following papers were read in this section: G.Ya. Makar-Limanov and Yu.A. Metlitskiy - "Electrostatic Control of the Ignition of Glow-discharge Tubes" (see p 1374 of the journal). N.V. Ptitsyn et al. were concerned with the breakdown in a high-voltage mercury rectifier (see p 1378 of the journal). L.G. Guseva "Ignition of the Discharge in Non-uniform Fields at low Gas Pressures" (see p 1260 of the journal). A.S. Soboleva and B.N. Klyarfel'd - "The Discharge Phenomena Between a Point and a Plane at Gas Pressures of 10^{-3} - 1 mm Hg".

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VoRoBIyEV, A.A.

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SOV/109-4-8-22/35

24(2)20

AUTHORS: Granovskiy, V.L., Luk'yanov, S.Yu., Spivak, G.V. and Sirotenko, I.G.

TITLE: Report on the Second All-Union Conference on Gas Electronics

PERIODICAL: Radiotekhnika i elektronika, 1959, Vol 4, Nr 8, pp 1339 - 1358 (USSR)

ABSTRACT: The conference was organised by the Ac.Sc.USSR, the Ministry of Higher Education and Moscow State University.
T.B. Fogel'son - "Methods of Reducing the Energy Lost in the Formation of a Breakdown".
L.I. Pivovar and V.I. Gordiyenko - "Microdischarges and pre-breakdown Currents Between Metal Electrodes in High Vacuum".
V.A. Simonov and G.P. Katukov - "Investigation of the Processes of Initiation and Development of a High-voltage Discharge in Vacuum".
E.M. Raykhrudal and G.V. Smirnitskaya - "The Characteristics of Ignition in Hi -vacuum in Magnetic Fields".
L.V. Tarasova et al. dealt with the transfer of the electrode material during the pre-breakdown stage in vacuum.
N.B. Rozanov et al. - "The Motion of Micro-particles of Substances During Electric Breakdown in Vacuum".
The third section dealt with the problems of electric sparks, corona and their practical applications. It was presided over by I.S. Stekol'nikov. The following papers were read:
V.I. Levitov et al. - "Probe Investigation of the a.c. Corona Fields".
G.N. Aleksandrov - "Elementary Processes in the Ionisation Zone of Corona-type Conductors at Atmospheric Pressures".
Y.A. Burmakin - "Appearance of a Corona Discharge in Hydrogen and Nitrogen"
P.N. Chistyakov et al. - "Some Properties of the Corona Discharge in Hydrogen in Coaxial, Cylindrical System".
A.S. Sobolava and B.N. Klyarfel'd - "Appearance of Discharge Phenomena Between a Point and a Plane at Gas Pressures of 10^{-3} - 1.0 mm Hg".
Ya.Yu. Raymet et al. - "Methods of Unipolar Ionisation of Air By Means of Aero-Ionisers (see p 1335 of the journal).
M.P. Vanyukov et al. - "Time Spectra of the Radiation of a Spark Discharge in Inert Gases" (see p 1284 of the journal).
M.P. Vanyukov and A.A. Mak - "Production of High Temperatures by Means of Spark Discharges".
V.A. Peretyagin - "Influence of the Magnetic Field of the Electric Discharge on the Dividing Surface of Two Media".
I.S. Stekol'nikov - "New Data From the Study of Long Sparks".
M.I. Synoyev - "Properties of the Breakdown of Compressed Air in a Comparatively Uniform Field in the Presence of Localised Non-uniformities".
A.A. Vorob'yev et al. - "Pulse and Oscillographic Techniques for the Measurement of the Discharge Lags in Dielectrics" (see p 1257 of the journal).
A paper by B.N. Zolotykh dealt with the problem of the basic theory of the electric erosion (see p 1330 of the journal).
The fourth section was presided over by S.Yu. Luk'yanov and was concerned with the non-stationary and low-frequency discharges. The following papers were read:
I.G. Nekrashevich and A.A. Labud - "The Nature of the Current Interruption During the Electric Explosion of a Metal Wire".
V.A. Simonov - "Propagation of Plasma From Local Pulse Sources".
G.G. Timofeyev et al. - "Observation of an Electro-dynamically Compressed Arc By Means of an Electron-optical Converter".
M.S. Ioffe and Ye.Ye. Yushmanov - "Investigation of the Radial Electric Field in an Ion Magnetron".
V.A. Belyayev and M.K. Romanovskiy - "Experiments with an Electron Model of a System with Magnetic Samples".
A.M. Andrianov et al. "Distribution of Magnetic and Electric Fields in Powerful Pulse Discharges".
G.N. Harding (England) - "Spectroscopic Determination of the Plasma Temperature in the "Zeta" Equipment" (see p 1326 of the journal).
The paper by Harding aroused a lot of interest and Academician L.A. Artsimovich expressed the opinion that the electrons and ion temperatures in the "Zeta" should be of the same order; instead, according to Harding, the electron temperature is lower by an order than that of the ions.

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~~9(3), 24(3)~~ 24.7100

AUTHORS: Vorob'yev, A.A., Doctor of Physical and Mathematical Sciences, Professor, and Izergin, A.P., Candidate of Technical Sciences, and Kevroleva, K. M.

TITLE: Electrical Properties of Crystal Hydrates

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy - Energetika, 1959, Nr 5, pp 26-34 (USSR)

ABSTRACT: The authors review the research work conducted in the field of electrical properties of crystal hydrates at Tomsk vuzes. The specific inductive capacitance and the dielectric loss angle were discussed in this paper, as well as the electrical strength of crystl hydrates. The investigations were conducted in wide ranges of temperatures and frequencies and different durations of single high-voltage pulses. At the laboratories of the Tomskiy politekhnicheskiy institut (Tomsk Polytechnic Institute) and the Sibirskiy fiziko-tekhnichskogo institut (Siberian Institute of Physics and Technology) investigations were conducted on the dielectric properties of crystal hydrates in

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Electrical Properties of Crystal Hydrates

dependence of temperature, frequency of the electrical field, degree of dehydration, chemical composition and structure of matter. A large number of mice types of the East Siberian deposits were studied. In papers of N.P. Bogoroditskiy and V.N. Malyshev [Ref 1], S. M. Yakimets [Ref 2] and M.M. Mikhaylov [Ref 3] different results were obtained for carious characteristics of mica. In the papers [Ref 4-10] by K.A. Vodop'yanov, A.P. Izergin, I.G. Vorozhtsova, the maxima of curves are shown, representing the temperature dependencies of tg δ and ε in the phlogopite mica, and one frequency maximum of tg δ . The dependence of tg δ and ε in phlogopite mica frequency and temperatures are shown in graphs, Figure 1, 2 and 3. Figure 4 shows a graph of the temperature dependence of ε and tg δ in muscovite, while Figure 5 shows the temperature dependence of muscovite before and after exposure to gamma radiation. Figures 6, 7,8, show graphs of the frequency and temperature dependencies of tg δ and ε in gypsum. At the Laboratoriya TVN Tomskogo politekhnicheskogo instituta -TPI- (Laboratory TVN of the

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Electrical Properties of Crystallohydrates

Tomsk Polytechnic Institute) the electrical strength of some metal sulfates was studied, whereby the amount of water molecules in the crystallohydrates changed. Graph, Figure 9, shows magnitudes of puncturing voltages for $NiSO_4 \cdot nH_2O$ and $CoSO_4 \cdot nH_2O$. Graph, Figure 10 shows the dependence of the electrical strength of laminar crystallohydrates on the lattice energy for muscovite and phlogopite (according to data of V. Bayev and M.I. Mantrov [Ref 1] and talc - according to data of K.M. Kevroleva [Ref 2]). K.M. Kevroleva obtained also volt-second characteristics of Rochelle salt, talc and river ice under the influence of pulse voltages of different duration. Volt-second characteristics of Rochelle salt were also obtained by M.A. Mel'nikov at the Laboratory TVN of TPI using voltage pulses of 10^{-6}-10^{-9} seconds duration. Ye.A. Konorova investigated micas pulses of 10^{-8}-10^{-10} seconds. N.A. Prikhod'ko and B.V. Gorelik investigated the dependence of the electric strength of Rochelle salt on the crystallographic direction. The authors also mention

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Electrical Properties of Crystal Hydrates SOV/143-59-5-4/19

the work of Hackett and A.M. Thomas, IIEE [Ref 24]. The authors state in their conclusions that a rotation of polarized molecules with a low bond energy is possible in crystallohydrates. The position of frequency and temperature maxima of tg δ and ε are determined by the structure of crystallohydrates. When manufacturing electrical insulation materials composed of crystallohydrates it should be noticed that polarized molecules may cause relaxation losses and that crystallohydrates work reliably only to the dehydration temperature. There are 11 graphs, 1 table and 24 references, 23 of which are Soviet and 1 English.

This article was presented by the Kafedra tekhniki vysokikh napryazheniy (Chair of High Voltage Engineering).

ASSOCIATION: Tomskiy ordena Trudovogo Krasnogo Znameni politekhnicheskiy institut imeni S.M. Kirova (Tomsk - Red Labor Banner Order - Polytechnic Institute imeni S. M. Kirov)

SUBMITTED: November 4, 1958

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VOROB'YEV, A.A., prof., doktor fiz.-matem.nauk; GORBUNOV, V.I., kand. tekhn.nauk; TITOV, V.M., dotsent, kand.tekhn.nauk

Using betatrons for radiographic inspection of very thick workpieces. Izv.vys.ucheb.zav.; mashinostr. no.5:195-202 '59. (MIRA 13:4)

1. Tomskiy politekhnicheskiy institut.
(Betatron) (Testing)

SOV/143-59-6-7/21

9(3)
AUTHOR: Vorob'yev, A.A., Doctor of Physical-Mathematical Sciences, Professor

TITLE: The Development of the Studies of Interaction Between Ionic Crystals in the Works of the Tomsk Scientists

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy - Energetika, 1959, Nr 6, pp 48-54 (USSR)

ABSTRACT: The author reviews briefly the present state of the ionic crystal research. He presents graphs of temperature dependences, of energy changes in the crystal lattice, of dielectric losses, etc, for various ionic crystals. Figure 2 represents the dependence of the logarithm of electric conductivity on the reciprocal temperature value, which was obtained by A.P. Nakhodnova for sintered polycrystallic specimens made of chemically pure oxide compounds of metals belonging to the second group of D.I. Mendeleyev's table. Research on properties of ionic crystals in connection with their compcsition, structure and lattice energy is conducted at the SFTI since the mid-Thirties. In the

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