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The system of equations for those parts of the distribution functions which are symmetric and asymmetric with respect to velocity are given. When deriving this system the following was presupposed: 1.) The semiconductor is isotropic. 2.) The asymmetric part f_1 is much smaller than the symmetric part f_0: $f_1 \ll f_0$. 3.) Be it assumed that the distribution of phonos is equilibrium-like and that the range of the electrons does not depend on the field strength. At high temperatures this assumption holds in the case of any θ and at low temperatures approximatively only within the domain $\alpha = (\theta - T)/T \lesssim 1$. Also equations for the conservation of charge, energy, and the energy in the lattice are given. Next, the solution of the kinetic equations and the conservation- and transport equation are discussed. If f_0 is known the transport equations can be determined which, together with the conservation equations for the electrons and phonons, fully determine all galvanomagnetic, thermomagnetic, and thermoelectric phenomena. The following special cases are investigated: 1.) FERMI-like distribution functions: a) Homogeneous steady field, b) The magnetic field is lacking. 2.) The distribution function has the form: $f_0 = (e^{(z-\zeta)/KT} + 1)^{-1}$, $Z = \int^{\varepsilon} d\varepsilon/(1 + \alpha_H)$. In conclusion electromagnetic and thermoelectric phenomena are discussed.

INSTITUTION: Physical Institute "P.N.LEBEDEV" of the Academy of Science in the USSR

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Shabanskiy, V.P.

126-2-1/35

AUTHOR: Shabanskiy, V. P.

TITLE: Heating of the Electron Gas and Transport Processes in Conductors. (Razogrevaniye elektronnogo gaza i protsessy perenosa v provodnikakh).

PERIODICAL: Fizika Metallov i Metallovedeniye, 1957, Vol.V, No.2, pp. 193-202 (USSR)

ABSTRACT: In conductors where the main charge carriers are particles having a small mass (electrons, holes), the heating of the "gas" of these particles is possible in strong electric fields. This occurs as a result of a slow-down in the energy exchange in the interaction of electrons (holes) with the lattice, ions or molecules. This effect is particularly noticeable in gas discharge tubes where under certain conditions the temperature of the electrons in an electric field may reach 30 000 to 40 000°C while the temperature of the gas atoms and ions is of the order of room temperature. The increase in the temperature of the electrons in a gas discharge plasma occurs as a result of the fact that when electrons collide with an atom or ion they loose only a very small part of their energy $A\varepsilon \sim \frac{2m}{M}\varepsilon$ where m is the mass of the electron and

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M is the mass of the atom. For this reason the mean energy of electrons increases up to the value at which they begin to ionize the gas atoms. The latter is the upper limit to the energy increase, the corresponding temperature being U_i/k which is of the order of 3-4 x 10^4 degrees and where U_i is the ionization energy. It was shown in Refs.1 and 2 that an analogous effect should occur in semiconductors where the energy exchange between electrons and the lattice is also slowed down at temperatures higher than the Debye temperature. The kinetic equations for the electron gas in metals taking into account the heating up of electrons are set up and are given by:

$$\frac{\partial f_o}{\partial t} + \frac{v}{3}\vec{\nabla}\vec{f}_1 + \frac{1}{N}\frac{\partial}{\partial \varepsilon}(NS_1) + \sum_{ee}(f_o, f_o) = 0, \qquad (1)$$

$$\frac{\partial \vec{f}_1}{\partial t} + v\vec{\nabla}f_o + e\vec{E}v\frac{\partial f_o}{\partial \varepsilon} + \frac{e}{cm}\left[\vec{H}\,\vec{f}_1\right] + \frac{v}{L}\vec{f}_1 = 0 \qquad (2)$$

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$$S_1 = \frac{e\vec{E}f_1 v}{3} - S = \frac{e\vec{E}\vec{f}_1 v}{3} - \frac{2mv_s^2}{a\ell}\,\varepsilon\, v\left[\frac{f_o(1 - f_o)}{kT} + \frac{\partial f_o}{\partial \varepsilon}\right]. \quad (3)$$

These equations are solved for various special cases corresponding to different transport phenomena in conductors. The electron distribution function is written in the form:

$$f = f_o(\varepsilon) + \frac{\vec{v}}{v}\,\vec{f}_1(\varepsilon)$$

and consists of a part f_o which is symmetric with respect to the momenta and a nonsymmetrical part $-\frac{\vec{v}}{v}\vec{f}_1$ where v is the velocity of sound. New terms are introduced in Eqs.(1)and (2). If the interaction between the electrons is large compared with electronphonons the function f_o is of the form:

$$f_o = \frac{1}{\exp\left[(\varepsilon - \mu)/kT\right] + 1} \quad (22)$$

Card 3/4 Using this expression, formulae for the electric and

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Heating of the Electron Gas and Transport Processes in Conductors.

thermal flow are derived in the case where the magnetic field is absent and where it is present. This corresponds to the equilibrium distribution. A similar calculation is carried out for the non-equilibrium distribution in which case f_o must be obtained from Eq.(1). In the case of uniform fields f_o now takes the form given by:

$$f_o = (e^{(z - \zeta)/kT} + 1)^{-1}, \quad z = \int^{\varepsilon} \frac{d\varepsilon}{1 + \alpha_H}, \qquad (46)$$

Solutions for f_1 are also given.

There are 8 references, all of which are Slavic.

SUBMITTED: February 4, 1956.

ASSOCIATION: Physics Institute imeni P. N. Lebedev Ac.Sc. USSR. (Fizicheskiy Institut imeni P. N. Lebedeva AN SSSR).

AVAILABLE: Library of Congress.

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24(7) PHASE I BOOK EXPLOITATION SOV/1700

Lvov. Universitet

Materialy X Vsesoyuznogo soveshchaniya po spektroskopii, 1956.
t. II: Atomnaya spektroskopiya (Materials of the 10th All-Union Conference on Spectroscopy, 1956. Vol 2: Atomic Spectroscopy) /Lvov/ Izd-vo L'vovskogo univ., 1958. 5[illegible] p. (Series: Its: Fizicheskiy sbornik, vyp.4(9)) 3,000 copies printed.

Additional Sponsoring Agency: Akademiya nauk SSSR. Komissiya po spektroskopii.

Editorial Board: G.S. Landsberg, Academician, (Resp. Ed.); B.S. Neporent, Doctor of Physical and Mathematical Sciences; I.L. Fabelinskiy, Doctor of Physical and Mathematical Sciences; V.A. Fabrikant, Doctor of Physical and Mathematical Sciences; V.G. Koritskiy, Candidate of Technical Sciences; S.M. Rayskiy, Candidate of Physical and Technical Sciences; L.K. Klimovskaya, Candidate of Physical and Mathematical Sciences; V.S. Milyanchuk (Deceased), Doctor of Physical and Mathematical Sciences; A.Ye. Glauberman, Doctor of Physical and Mathematical Sciences; Ed.: S.L. Gazer; Tech. Ed.: T.V. Sarmanyuk.

PURPOSE: This book is intended for scientists and researchers in the field of spectroscopy, as well as for technical personnel using spectrum analysis in various industries.

COVERAGE: This volume contains 177 scientific and technical studies of atomic spectrography presented at the 10th All-Union Conference on Spectroscopy in 1956. The studies were carried out by members of scientific and technical institutes and include extensive bibliographies of Soviet and other sources. The studies cover many phases of spectroscopy: spectra of rare earths, electromagnetic radiation, physicochemical methods for controlling uranium production, physics and technology of gas discharge, optics and spectroscopy, abnormal dispersion in metal vapors, spectroscopy and the combustion theory, spectrum analysis of ores and minerals, photographic methods for quantitative spectrum analysis of metals and alloys, spectral determination of the hydrogen content of metals by means of isotopes, tables, and atlases of spectral lines, spark spectrographic analysis, statistical study of variation in the parameters of calibration curves, determination of traces of metals, spectrum analysis in metallurgy, thermochemistry in metallurgy, and principles and practice of spectrochemical analysis.

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Materials of the 10th All-Union Conference (Cont.) SOV/1700

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Ivanova, N.K., T.N. Lomonosova, and A.V. Yakovleva. Studying the Reflecting Power of Aluminum and Rhodium Mirrors in the Vacuum Ultraviolet Region 143

Gerasimova, N.G., N.K. Ivanova, S.A. Kulikov, T.N. Lomonosova, and A.V. Yakovleva. Studying the Reflection and Transmission of Various Materials in the Vacuum Ultraviolet Region 146

Mandel'shtam, S.L., N.K. Sukhodrev, and V.I.P. Shatanskiy. Processes at Electrodes for Spark Discharges 148

Vorontsov, Ye. I. Studying Certain Physical Processes in a High-power Pulse Discharge of Low Voltage 154

Bekrashevich, I.G., and I.A. Bakuto. Mechanism of a Low-Voltage Condensed Discharge 158

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SHABANSKIY, V.P.

8(2) PHASE I BOOK EXPLOITATION SOV/1855

Soveshchaniye po elektricheskim kontaktam. Moscow. 1956.

Elektricheskiye kontakty; trudy soveshchaniya (Electrical Contacts; Transactions of the Conference) Moscow, Gosenergoizdat, 1958. 303 p. 4,150 copies printed.

Editorial board: B.S. Sotskov (Resp. Ed.), V.V. Usov, R.S. Kuznetsov, I.Ye. Dekabrun, and Z.S. Kirillova; Ed.: I.Ye. Dekabrun; Tech. Ed.: K.P. Voronin.

PURPOSE: This collection of articles is intended for engineers and technicians designing, developing and operating electrical apparatus and is concerned with electric contact materials. It may also be useful in scientific research institutes and laboratories.

COVERAGE: This book comprises reports delivered at the Electric Contacts Conference held in Moscow in November, 1956. These papers cover physical processes occurring during connecting or disconnecting, methods of designing and testing electric contacts, production and characteristics of contact materials. During this conference of the Institut avtomatiki telemekhaniki AN SSSR (Institute of Automation and Telemechanics, Academy of Sciences, USSR) participants approved periodic conferences of physicists, metallurgists, chemists and apparatus design specialists to discuss problems of electric contacts, which are the components of electric

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apparatus primarily influencing the reliability of electric systems, especially d-c control systems. Their physical, thermal, mechanical and chemical processes have still not been well analyzed. References are given at the end of most of the reports.

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Kragel'skiy, I.V. (Institut mashinostroyeniya AN SSSR - Machine-Building Institute, Academy of Sciences, USSR) Contact Area of Rough Surfaces 7

According to the author, ideal smooth surfaces of mica protrusions measure 20 A, on the best quartz crystal 100 A, on highly polished metal surfaces 0.05 - 0.1 micron, and on rough metal surfaces 100-200 microns. Moreover, the machined surfaces usually have a wavy structure. The author has devoted his paper to finding methods of calculating the actual area of contact of surfaces. After a detailed theoretical and practical analysis he derives formulas for practical use by designers. There are 6 references, of which 5 are Soviet and 1 English.

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Electrical Contacts (Cont.) SOV/1855

Mandel'shtam, S.L., Sukhodrev, N.K. and Shabanskiy, V.P. (Fizicheskiy institut AN SSSR - Institute of Physics, Acedemy of Sciences, USSR) Processes Occurring on Electrodes During an Arc Discharge 25

This article is an abridged version of the report delivered at the 10th Spectroscopy Symposium. It was printed in full in the transactions of this symposium. It is based on the results of research carried out by the authors at the Institute of Physics. The authors found that processes of arc discharge are different for the plate and cathode. Photographs of spots, left after the discharge show a different structure, the plate sport being much larger than the cathode arc.

Zolotykh, B.N. (Tsnilelektrom, Academy of Sciences, USSR) Dynamics of the Process of Electric Erosion of Metals by Electric Pulse Discharge 27

The author explains briefly the theoretical fundamentals of this phenomenon and discusses in detail its basic regularities, the additivity law, the relation between erosion volume and spark energy, the relation between erosion volume and thermal constants of metals, the polarity of electric erosion and its relation to pulse duration. He reports results of experimental investigation of the formation of spots and indentations on electrode surfaces caused by single pulse discharge. He refers to G.V. Gusev and A.S. Zingerman and thanks A.I. Kruglov, Zh.Ye. Gryazunova and I.P. Korobova.

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Afanas'yev, N.V. (Belorusskiy politekhnicheskiy institut - Belorussian Polytechnical Institute) Erosion of Electric Contact Materials 50

The author reports results of experimental investigation carried out by him at the Belorussian Polytechnical Institute on the influence of thermal characteristics of some metals on their ability to withstand erosion. He supplies tables which enable designers to make advance judgements of the erosion resistance of a material by knowing its thermal parameters.

Razumikhin, M.A. Increasing the Erosion Resistance of Low-current Contacts in Automatic Apparatus 63

The author reports the results of experimental investigation of spark and arc or bridge erosion under operating conditions for various contact metals, air pressure and various gas mediums. He also discusses 5 quench circuits (spark discharge circuits) used under low-current conditions.

Pugin, A.I. (Institut metallurgii - Institute of Metallurgy, Academy of Sciences, USSR) Function of Electric Contact in the Process of Forming a Welded Joint 79

The author details his investigation of this problem. The total resistance in the welding process consists of the resistances of the two parts

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and the contact resistance. The latter is of great importance especially in the initial stage of welding process. The character of changes in the initial contact resistance as a function of the electrical and mechanical parameters of the welding process is demonstrated. The very wide changes in the initial resistance lead the author to conclude that this parameter is not suitable for evaluating the heat power determining the heating process in resistance welding.

II. DESIGN, APPLICATION AND TESTING METHODS

Sotskov, B.S. (Institute avtomatiki i telemekhaniki AN SSSR - Automation and Telemechanics Institute, Academy of Sciences, USSR) Problems in Designing Relay Contacts 96

The author explains theoretical fundamentals, and derives practical formulas for design and calculation of relay contacts for erosion-free, spark and arc conditions.

Bron, O.B. (Zavod "Elektrosila", Leningrad - Leningrad "Elektrosila" Plant) Operation Conditions of Contacts in Contactors and Automatic Circuit Breakers 111

The author discusses the basic problems relative to contactors, arc-suppression systems, and over-all dimensions. He describes operating condi-

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tions of contactors at switching-off and switching-on electric motors, the wearing away of contacts and methods of prolonging their life. Then he discusses the basic problems on automatic air circuit-breakers. Stages in their design are given. He explains abatement methods of eliminating electrodynamic repulsion of contacts, current-carrying links and liquid cooling of contacts.

Feyler, G.O. (Zavod "Dinamo," Moscow - Moscow "Dinamo" Plant) Wear Resistance of Contacts in D-c Contactors and Controllers 138

The author describes the method of testing wear resistance of contacts at the "Dinamo" Plant in Moscow and proposes that all other plants adopt this method as a standard one to enable the comparison of test results.

Gordon, A.V. Methods of Testing the Resistance to Wear of Electric Contacts in Aircraft D-c Contactors 148

The author reports the results of work he carried out along with engineers K.V. Isayev, M.A. Prusov, V.P. Simonova. He describes the method applied for testing aircraft D-c contacts. This method permits approximating testing conditions with real operating conditions. He suggests applying this method for testing contactors of general industrial use.

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Fiks, V.I., and M.A. Gurevich. (Zavod "ATE-1 "-Moscow "ATE-1" Plant)
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The authors summarize the results of investigations they carried out in the Electric Machine Laboratory of the "ATE-1" Plant along with Engineers Ye.K. Shvedov, V.I. Khrunin, Ya.M. Levit, L.B. Bayer, R.V. Gorelov, O.G. Suchkova on operating conditions of contacts in vibrator voltage regulators of automobile generators, on the design of contact fittings and on various pairs of contact metals.

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Al'tman, A.B., I.P. Melashenko, and E.S. Bystrova (Nauchno-issledovatel'skiy institut elektrotekhnicheskoy promyshlennosti - Scientific-Research Institute for the Electrical Industry) Modern Sintered-Metal Electric Contacts. 171

Sintered metals are presently the most suitable materials for arcing tips of high-duty circuit-breakers. The authors explain the technical requirements, describe the structure of the compositions, methods of production, characteristics and applications.

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Frantsevich, I.N., and O.K. Teodorovich. (Institut Metallokeramiki i Spetsial'nykh Splavov AN USSR - Institute for Sintered Metals and Special Alloys, UkrSSR Academy of Sciences) Production Methods of Sintered-Metal Electric Contacts 186

The authors describe the results of their investigation of the comparison of various methods of producing sintered metals.

Usov, V.V. and Murav'yeva, Ye.M. (Nauchno-issledovatel'skiy institut elektrotekhnicheskoy promyshlennosti - Scientific-Research Institute for the Electrical Industry) Thermochemical Method for Production of Contact Compositions. 199

Oxidation of alloys at higher temperatures results in structure similar to that obtained by the sintered metal power method. The authors explain this thermochemical method and its advantages.

Al'tman, A.B., and E.D. Bystrova. (Scientific-research Institute for the Electrical Industry) Internal Structure of Wear-resistant Electric Contacts 214

The authors discuss their investigation of the influence of internal structure of heterogeneous materials on wear resistance. They paid special attention to the alloys Ag-Cu, Ag-Si-Mg, and Ag-Al.

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Dekabrun, I.Ye. (Institute of Automation and Telemechanics, Academy of Sciences, USSR) Characteristics of Some Sintered Metal Contact Materials 244
The author describes arrangements and equipment he has used in this investigation. He gives the results of the study as well as the characteristics of the most used composition.

Shumskaya, Ye.A. (NII - Avtopriborov) Wear Resistance of Tungsten Contacts 239
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Usov, V.V. and Povolotskaya, M.D. (Nauchno-issledovatel'skiy institut elektrotekhnicheskoy promyshlennosti - Scientific-research Institute for the Electrical Industry) Atmospheric Corrosion in Tungsten Contacts 249
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Rudnitskiy, A.A. (Institut metallurgii AN SSSR - Metallurgical Institute, Academy of Sciences, USSR) Alloys of Precious Metals as Electric Contact Materials for Very Low Voltages and Currents 255
The author analyzes the characteristics and resistance to corrosion and mechanical wear of various alloys composed of metals.

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Kirillova, Z.S. Alloys for Electric Contacts With Small Contact Resistance 267
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Yuferova, Ye.K. Application of New Materials for Sliding Contacts in SSP Systems [Self-synchronizing Systems] 279
The author specifies the new Soviet standard sliding contacts, discussing their characteristics and application.

Mityushev, V.A. Survey of Experimental Research on Contact Materials From Precious Metals 292
This is a brief report on Soviet standard palladium alloys PDS-40, PDS-80, PDI-10, and PDI-18.

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Electrical Contacts (Cont.) SOV/1855

Kozlov, V.Z. State of the Production and Standardization of Contacts and Contact Materials From Precious Metals 293

The author describes briefly the developments obtained in the production of contacts made from alloys of precious metals. Considering the great number of contact and contactor types, the author expresses the opinion that a standardization of types is necessary. He suggests the creation of a special organization for the coordination of scientific research activities on contacts of all kinds and the standardization of metals and alloys used in these.

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In the general discussion participated besides the authors of the above articles, L.S. Palatnik (KhGU), R.S. Kuz'netsov (NII EP), Ye.V. Podol'skaya (Khar'kovskiy elektromekhanicheskiy zavod - Kharkov Electromechanical Plant), N.Ye. Lysov (MEI), I.G. Kislyakov (Moskovskiy institut tsvetnykh metallov i zolota - Moscow Institute for Nonferrous Metals and Gold), M.N. Tylkina (IMET AN SSR), L.A. Rotshteyn (Zavod "Elektrosita" - "Elektrosila" Plant), L.M. Voronel' (Cheboksarskiy elektroapparatnyy zavod - Cheboksary Electric Apparatus Plant), P.V. Smirnova.

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MANDEL'SHTAM, S.L.; SUKHODREV, N.K.; SHABANSKIY, V.P.

Processes on spark-discharge electrodes. Fiz.shor. no.4:148-154 '58. (MIRA 12:5)

1. Fizicheskiy institut imeni P.N.Lebedeva AN SSSR.
(Electric spark) (Electrodes)

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SOV/56-35-1-20/59

AUTHOR: Shabanskiy, V. P.

TITLE: Non-Equilibrium Processes in Impurity-Semiconductors (Neravnovesnyye protsessy v primesnykh poluprovodnikakh)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol. 35, Nr 1, pp. 143 - 153 (USSR)

ABSTRACT: The present paper is the immediate continuation of one of the author's publications (Ref 1) and is based upon the distribution functions for electrons and holes in the semiconductor, which are derived in the publication mentioned. Kinetic equations are set up in consideration of the transitions from the impurity levels to the conduction band. Basing on the assumption that the distribution function of the free electrons (holes) has the shape of an equilibrium-distribution function at a certain effective temperature, explicit expressions for the energy- and kinetic coefficients are derived; the life of the electrons in the conduction band is determined by photo-recombination- and three-fold recombination processes. Radiationless transitions, which differ from the three-fold radiationless recombination transitions, are

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introduced phenomenologically. In this case the energy and kinetic coefficients can be represented as functions of the life of the electrons (in equilibrium). The equations obtained make it possible to determine electron temperature and the number of electrons in the conduction band for various non-equilibrium processes. The application of individual equations is demonstrated on the basis of numerical data. There is 1 reference which is Soviet.

ASSOCIATION: Fizicheskiy institut im. P.N.Lebedeva Akademii nauk SSSR (Physics Institute imeni P.N.Lebedev, AS USSR)

SUBMITTED: February 5, 1958

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24(4) SOV/51-6-6-8/34

AUTHORS: Popov, Yu.M. and Shabanskiy, V.P.

TITLE: Effect of Radiationless Recombination on Saturation in Cathodoluminescence. (Vliyaniye bezyzluchatel'noy rekombinatsii na nasyshcheniye pri katodolyuminestsentsii)

PERIODICAL: Optika i spektroskopiya, 1959, Vol 6, Nr 6, pp 769-775 (USSR)

ABSTRACT: The paper was presented at the Seventh Conference on Luminescence. The authors solve kinetic equations for particles in the conduction band and at capture levels, taking part in luminescent processes. Triple recombination, which occurs at high free charge-carrier densities is allowed for in these equations (triple recombination is defined as radiationless recombination which is the reverse of the process of ionization removal of electrons from traps by conduction electrons or by holes). It is shown that the non-linear portion of cathodoluminescence yield (saturation effect) occurs at the high free electron and hole densities at which triple recombination appears. Theoretical predictions of the cathodoluminescence yield and its dependence on the excitation intensity were found to agree with experiment. In the final section the

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Effect of Radiationless Recombination on Saturation in Cathodoluminescence SOV/51-6-6-8/34

authors give the energy balance of electrons in recombination processes and they estimate the electron temperature in the phosphor. The paper is entirely theoretical. Acknowledgments are made to V.L. Levshin and M.V. Fok for their advice. There are 2 figures and 6 references, 3 of which are Soviet and 3 English.

SUBMITTED: May 12, 1958.

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E032/E314

AUTHORS: Severnyy, A.B. and Shabanskiy, V.P.

TITLE: On the Production of Cosmic Rays in Flares

PERIODICAL: Astronomicheskiy zhurnal, 1960, Vol. 37, No. 4, pp 609 - 615

TEXT: In a free magnetic field the pinch effect in the neighbourhood of a neutral point can take place during the annihilation of azimuthal fields of approaching force tubes with opposite longitudinal fields. The contraction of plasma in the neighbourhood of the neutral point can also be produced by rapid changes in the field of sun spots if this field is external and dipolar. In both cases strong shock waves converging to the neutral point can appear. The incident shock fronts travel in front of the region of strong magnetic fields and as a result of reflection at the neutral point a high-temperature region is set up behind the reflected wave moving through contracting plasma. Thermonuclear reactions can take place in this region (up to 10^4 (D,D) reactions per cm^3 during the entire lifetime of a strong flare). The products of these reactions (protons) having energies of a few MeV are reflected from the regions of strong magnetic fields which converge

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83230
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E032/E314

On the Production of Cosmic Rays in Flares

on the neutral point and are accelerated up to about 10 BeV. An estimate is given of the energy lost in collisions and of the injection energy. The above increase in the energy occurs after about 100 reflections and is determined only by the final displacement of the magnetic mirrors (10^6 - 10^7 cm) and not by their velocity. It is claimed that this mechanism is more effective than the statistical Fermi mechanism (Ref 11) and the other possible mechanisms put forward by Severnyy (Ref 12) and Dorman (Ref 13).
There are 13 references: 1 Swedish, 2 English and 10 Soviet.

ASSOCIATIONS: Krymskaya astrofizicheskaya observatoriya Akademii nauk SSSR (Crimean Astrophysical Observatory of the Academy of Sciences, USSR)
Nauchno-issledovat. institut yadernoy fiziki Moskovskogo gos. universiteta (Scientific-Research Institute for Nuclear Physics of Moscow State University)

SUBMITTED: April 15, 1960

Card 2/2

APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2"

"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

38245

3,2410 (2205, 2705, 2805)

3,2430

S/169/62/000/005/075/093
D228/D307

AUTHORS: Severnyy, A. B. and Shabanskiy, V. P.

TITLE: The solar flare mechanism and generations of cosmic rays in flares

PERIODICAL: Referativnyy zhurnal, Geofizika, no. 5, 1962, 11-12, abstract 5G88 (Izv. Krymsk. astrofiz. observ., 25, 1961, 88-113)

TEXT: The compression of plasma around a magnetic field's neutral point may be related to the pinch-effect, arising under conditions of a free field on the approach of two field tubes (possessing, for example, a forceless field) and on the mutual cancellation of their azimuthal fields. It is also discussed whether such compression is possible during the rapid measurement of the spot field that is external with respect to the flare's area. In both cases we arrive at the notion about strong shock waves converging on the neutral point. Near it (at distances of $\lambda \leqslant 10^7$ cm) the incident

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D228/D307

The solar flare ...

shock wave is not hydromagnetic. Its front outstrips the movement of the magnetic partition, which represents the region of the large magnetic field moving together with the medium behind the front. After being reflected in a neutral plane, the front of the reflected wave moves through the condensing plasma, and a more or less stationary high-temperature region, which draws its energy from the magnetic energy going into the plasma's compression, is formed behind it. On interacting with the magnetic partition the reflected wave front may brake or arrest its movement, so that compression may change into expansion or into pulsations, as is also observed in flares. Thermonuclear reactions arise in the hot region behind the front of the wave reflected from the neutral point; for example, $10^3 - 10^4$ cm^{-3} of the (D, D)-reaction develop during the flare (when the deuterium content is $D/H \sim 5 \times 10^{-5}$), which corresponds to the flow of cosmic rays in strong flares. It is shown that, on rebounding from the magnetic partitions converging towards the neutral point, fragments of these reactions (mainly protons) with an energy of about several Mev are accelerated to

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"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

energies of ~10 Bev (the energy losses of the particles under acceleration are calculated on account of collisions with other particles, and the threshold energy of ejection is estimated). It is shown that the increase of energy in the reflections is governed not by the approach velocity of the magnetic partitions but by their terminal displacement (an approach of from 10^8 to 10^7 cm is sufficient for a proton to collect an energy of from ~2 Mev to 10 Bev after ~100 reflections). Other possible acceleration mechanisms are considered (Fermi's statistical mechanism, acceleration during the approach of magnetic plugs, acceleration at the front of a single shock wave in a perpendicular magnetic field, the case of an oblique collision of shock waves); it is also shown that all these mechanisms are much (by no less than 10 times) less effective than the one considered above. It is likewise shown that in consequence of the thermal velocities (Parker, Dorman) the suggested mechanisms of particle acceleration are not competent. [Abstracter's note: Complete translation.]

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"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

SHABANSKIY, V.P.

Disturbance of the adiabatic invariant and particle acceleration in magnetic fields and shock waves. Geomag. i aer. 1 no.4:483-489 Jl-Ag '61. (MIRA 14:12)

1. Moskovskiy gosudarstvennyy universitet imeni Lomonosova, Institut yadernoy fiziki.
(Magnetohydrodynamics)

APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2"

"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

34353

S/203/61/001/006/005/021
D055/D113

3,2420(1049,1395,1482)

AUTHORS: Ivanenko, I.P., and Shabanskiy, V.P.

TITLE: The acceleration of particles in the Earth's outer radiation belt

PERIODICAL: Geomagnetizm i aeronomiya, v. 1, no. 6, 1961, 888-896

TEXT: Conditions in the inner and outer radiation belts of the Earth are compared. The relative stability of the outer belt is stressed. Particles in the outer belt may be accelerated under the influence of hydrodynamic waves originating on the boundary between the geomagnetic field and interplanetary plasma. It is shown that fairly fast protons and electrons are lost by being carried by hydromagnetic waves into denser layers of the atmosphere. The energy density of electrons with an energy of several tens of kev is either one order (according to a later estimate) or three orders (according to Van Allen) higher than the energy of the cold component, while the energy density of electrons with more than 200 kev is 1÷2 orders higher. Whatever the estimate, the Debye radius of the energy component is con-

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D055/D113

The acceleration ...

siderably smaller than the outer zone ($L \sim 3 \cdot 10^9$ cm). Therefore, the energy component assumes the form of a plasma and all its properties; one should not proceed from the assumption that the separate particles move in a geomagnetic field in questions concerning the potential acceleration of particles, their injection from solar flows, zonal instability, etc. There is no attachment between the Earth's nucleus and the force lines of the outer field because there is a neutral layer of atmosphere between the Earth and the ionosphere. Therefore, only the latter can have a stabilizing influence. But the energy of the particles of the radiation field contained in the neighboring tubes of force, which become considerably narrower towards the ionosphere, may be sufficient for slow displacement of the mass of the ionosphere during convection of these tubes. This may be one cause of ionospheric winds. It follows that, besides ionization losses and the exit of particles through magnetic plugs, particles can also escape from a geomagnetic trap by means of the relative convective instability of the system and the exit of tubes of force with the energy component of the plasma on the outside. Particles should accelerate endlessly, because the depth at which they enter the atmosphere and disintegrate is determined by the point of

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D055/D113

The acceleration ...

reflection in the magnetic field and depends on the angle between the direction of the particle and the field. Therefore, there must be some mechanism which limits acceleration from above (1) scattering on Alfven waves, whereby the angle between the direction of the particle and the force line alters; (2) exit of particles from the geomagnetic field during ionization of the tubes of force; (3) removal of energy particles by shock waves into denser layers of the atmosphere. When an energy particle passes through the front of a perpendicular shock wave in plasma with a magnetic field, the particle accelerates much more quickly than heat particles. This occurs if the Larmor radius of the particle is much greater than the width of the front. The particle becomes attached to the front for a certain time and moves with it. Thus, particles whose Larmor radius is greater than the width of the front, will be carried away by waves reaching the denser layers of the atmosphere from the periphery of the geomagnetic field along a radius towards the center of the Earth. There are 1 table and 13 references: 8 Soviet and 5 non-Soviet references. The four most recent English-language references are: J.A. Van Allen, C.E. McIlwain, J.H. Ludwig - J. Geophys. Res., 1959, 64, no. 3, 271; W.H. Hess - J. Geophys. Res., 1960, 65, no. 10, 3107; P. Rothwell, C.E. McIlwain - J. Geophys. Res., 1960,

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The acceleration . . . 3/203/61/001/006/005/021
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65, no. 3, 799. H. L. Arnold; R.A. Hoffman . . R. Winckler - J. Geophys. Res., 1960, 65, no. 9, 1361.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M.V. Lomonosova. Institut yadernoy fiziki (Moscow State University imeni M.V. Lomonosov, Institute of Nuclear Physics)

SUBMITTED: October 19, 1961

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"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

3,1540 (1559)

S/033/61/038/005/003/015
E133/E435

AUTHOR: Shabanskiy, V.P.

TITLE: On the origin and development of solar flares and the formation of the cosmic ray spectrum

PERIODICAL: Astronomicheskiy zhurnal, v.38, no.5, 1961, 844-848

TEXT: This is a continuation of earlier work of A.B.Severnyy and the present author (Ref.1: Astron.zh., v.37, 609, 1960 and Ref.2: Izv. Krymsk. astrofiz. observ. v.25, 1961) on the construction of a model to explain the production and acceleration of solar cosmic rays. The major characteristics of flares are: (1) they occur near neutral points (see Ref.3: A.B.Severnyy, Izv. Krymsk. astrofiz. observ., v.20, 22, 1958, v.22, 12, 1960); (2) they lie in the lower chromosphere where the hydrogen particle density is $\sim 10^{13}$ cm^{-3} and the temperature $\sim 10^4$ °K; (3) the flare region, as determined from H_α, increases during the lifetime of a flare ($\sim 10^3$ sec) with velocities $\sim 10^7$ cm/sec; (4) the velocities, with which the boundary of the flare expands, may increase sometimes. The observation (1) has been explained as a pinch effect due to current flow at neutral points (Ref.3: as quoted above and

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E133/E435

On the origin and development ...

Ref.4: A.B.Severnyy, Astron. zh., v.35, 335, 1958). Such a mechanism will not allow magnetic energy to be accumulated slowly, as is required. On the other hand, a mechanism consisting of the interaction between two tubes of force does demand a diffusion time for the fields of the right order of magnitude (Ref.1 as quoted above and Ref.5: T.Cold and F.Hole, Monthly Notices Roy. Astron. Soc., v.120, 7, 1960). The difficulty here, however, is that the occurrence of a flare will increase the conductivity to such an extent that diffusion will stop. The model proposed earlier (Ref.1 and Ref.2) considers flares as a result of an increase in pressure near a neutral point when, for example, the magnetic moments of two nearby, oppositely polarized sunspots increase. Such a compression produces shock waves which move outwards, away from the neutral point, producing high temperatures and pressures. Nuclear particles, produced by deuterium reactions, can be accelerated by reflection from these wavefronts. The author believes that the motions of the magnetic fields in the chromosphere, which are required in this theory, are brought about by annihilation of magnetic lines of force as is suggested by

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On the origin and development ... E133/E435

Cold and Hole (Ref.5). However, these authors suggest that this takes place in the chromosphere, whereas the author of this paper is of the opinion that it occurs deep in the photosphere (particle density $\sim 10^{17}$ and gas pressure equal to magnetic pressure). The conversion of magnetic energy to thermal energy produces a change in volume. Such a change has been observed in the region of a flare (Ref.6: S.I.Gopasyuk, Astron. zh., v.38, no.2, 1961). The resulting motions can lead to particle acceleration. The author finds that flares can produce protons with an energy of 3 to 14 Mev and α-particles with an energy of ~ 4 Mev. Although flares vary considerably in their appearance, the observed solar cosmic ray spectrum always has the same characteristics. This indicates that the spectrum is not formed in the flare itself. It seems possible that the spectrum character is produced in the region of the chromospheric magnetic field above the flares. S.I.Gopasyuk is mentioned in the article for his studies of solar flares. There are 9 references: 8 Soviet-bloc and 1 non-Soviet-bloc. The reference to an English language publication is as follows: Ref.5: as quoted in text.

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On the origin and development ... S/033/61/038/005/003/015
E133/E435

ASSOCIATION: Institut yadernoy fiziki
Moskovskogo gosudarstvennogo universiteta
(Institute of Nuclear Physics, Moscow State University)

SUBMITTED: January 17, 1961

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"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

SHABANSKIY, V.P.

Structure of the transition layer between a plasma and a magnetic field. Zhur. eksp. i teor. fiz. 40 no.4:1058-1064 Ap '61. (MIRA 14:7)

1. Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta.
(Plasma (Ionized gases)) (Magnetic fields)

APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2"

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28925
S/056/61/041/004/009/019
B104/B102

26.2311

AUTHOR: Shabanskiy, V. P.

TITLE: Acceleration of particles passing through the front of a hydromagnetic shock wave

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 41, no. 4(10), 1961, 1107-1111

TEXT: The author studies the passage of a charged particle from medium 1 through the front of a plane hydromagnetic shock wave into medium 2. The front of the shock wave is assumed to move with a velocity v_1 relative to medium 1. The velocity of the front relative to medium 2 behind the shock wave is given by v_2. v is the velocity of the incident particle. It is assumed that $v \gg v_1$. Furthermore, the shock wave is assumed to move perpendicular to a magnetic field. Since the velocity component of the particle, which is directed along the magnetic field, does not change when passing through the shock wave, a coordinate system is chosen in which the particle moves in a plane perpendicular to the magnetic field.

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B104/B102

Acceleration of particles passing ...

The Larmor radius of the particle rotation is large as compared to the front width which is neglected. The component of the particle momentum p_0, which is perpendicular to the magnetic field, is determined by

$$p = p_0 \exp I(\varphi_0). \tag{6}$$

$$I(\varphi_0) = \int_{\varphi_0}^{\pi/2} f(\varphi)\, d\varphi = \int_{\varphi_0}^{\pi/2} \frac{4(1 - v_2/v_1)\cos^2\varphi\, d\varphi}{(\pi + 2\varphi)\, v_2/v_1 + (\pi - 2\varphi) - 4(1 - v_2/v_1)\sin\varphi\cos\varphi}, \tag{7}$$

in the passage through the front of the shock wave. φ_0 is the incidence angle of the particle in medium 2. This expression is characterized by the fact that it does not contain the magnetic field in explicit form. The momentum is determined solely by the ratio of the front velocities relative to the gas before and behind the front of the shock wave. $1 - v_2/v_1 = 1 - \rho_1/\rho_2 = (\rho_2 - \rho_1)/\rho_2$ holds for this ratio. Here ρ_2 and ρ_1 are the densities of the media 1 and 2. In general, the expression for v_2/v_1 is very intricate. The author studies the two limiting cases

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B104/B102

Acceleration of particles passing ...

for weak and strong shock waves. For these two cases expressions are obtained for $I(\xi_0)$. Furthermore, p/p_0 is determined as a function of ξ_0 ($\gamma = 5/3$) for a strong shock wave (Fig.). p_0 is the initial particle momentum. With $\xi_0 = \pi/2$, $p/p_0 = 5.23$, i. e., the energy of a non-relativistic particle increases by 27 times in the passage of the front. The energy of an ultrarelativistic particle increases by 5.23 times. Finally, a paper of L. I. Dorman and G. I. Freydman (Voprosy magnitnoy gidrodinamiki i dinamiki plazmy, Riga, 1959) is criticized. It is demonstrated that the approximation used in this paper is not well founded. There are 1 figure and 1 Soviet reference.

ASSOCIATION: Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta (Institute of Nuclear Physics of Moscow State University)

SUBMITTED: February 15, 1961

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"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

IVANENKO, I. P., TVERSKOY, B. A. and CHALYSHKIN, V. P.

"On the radiation belt theory"

report to be submitted for the 13th Intl. Astronautical Congress, IAF, Varna, Bulgaria, 23-29 Sep 1962.

APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2"

"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

LOGACHEV, Yu.I.[translator]; TIMOFEYEV, G.A.[translator]; GORCHAKOV, Ye.V.[translator]; ASTAF'YEV, V.A.[translator]; SAVIN, B.I. [translator]; SHABANSKIY, V.P., red.; PAPTAYEVA, V.A., red.; DUBKOVA, S.I., red.; PRIDANTSEVA, S.V., tekhn. red.

[Solar corpuscular streams and their interaction with geomagnetic field]Solnechnye korpuskuliarnye potoki i ikh vzaimodeistvie s magnitnym polem Zemli. Moskva, Izd-vo inostr. lit-ry, 1962. 438 p. Translated from the English. (MIRA 15:11)

1. Nauchno-issledovatel'skiy institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta (for Logachev, Timofeyev, Gorchakov, Astaf'yev, Savin).
(Solar radiation) (Magnetism, Terrestrial)

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"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

SAVIN, B.I.[translator]; TIMOFEYEV, G.A.[translator]; SHABANSKIY, V.P., red.; SAMSONENKO, L.V., red.; DZHATIYEVA, F.Kh., tekhn. red.

[Earth's radiation belts]Radiatsionnye poiasa Zemli. Moskva. Izd-vo inostr. lit-ry, 1962. 208 p. (MIRA 16:4)
Translated from the English
(Van Allen radiation belts)

APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2"

"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

SHABANSKIY, V.P.;

" The first phase of a magnetic storm" and "A hydromagnetic and thermodynamic picture of a magnetic and thermodynamic picture of a magnetic storm" will be presented as comments in the discussion. (USSR)

Report submitted for the COSPAR Fifth International Space Science Symposium, Florence, Italy, 8-20 May 1964.

APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2"

"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

SHABANSKIY, V.P.; SKURIDIN, G.A.;

"Hypothesis of the formation of radiation belts"

Report submitted for the COSPAR Fifth International Space Science Symposium, Florence, Italy, 8-20 May, 1964.

APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2"

"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

ACCESSION NR: AP4043496 S/0293/64/002/004/0595/0602

AUTHOR: Shabanskiy, V. P.

TITLE: A hydromagnetic and thermodynamic model of a magnetic storm

SOURCE: Kosmicheskiye issledovaniya, v. 2, no 4, 1964, 595-602

TOPIC TAGS: magnetic storm, geomagnetism, shock wave, interplanetary gas, solar corpuscular stream, magnetosphere, magnetohydrodynamic wave, solar wind, plasma, Larmor radius, geocorona

ABSTRACT: The sudden onset of a magnetic storm is due to the arrival of a shock wave, propagating from the sun through the interplanetary plasma (or an undisturbed supersonic corpuscular stream -- the solar wind). Despite the fact that the length of the path of individual particles in the interplanetary plasma is greater than the distance from the sun to the earth, as a result of the presence of a magnetic field in the solar wind the width of the front in such collisionless plasma can be considerably less than the length of the free path and is determined by the Larmor radius of the protons. When $B \sim 10^{-5}$ gauss, protons with an energy of 500 ev have a Larmor radius of the order of 10^8 cm. The steepness of the front is indicated by the duration of the increase of the horizontal component of the magnetic field at the earth's surface -- a time of the order of one minute. This

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ACCESSION NR: AP4043496

time coincides precisely with the time required for the stream, moving at a velocity of 10^8 cm/sec, to pass through the region occupied by the earth's magnetosphere, with dimensions of the order of 10^{10} cm. The width of the front of the stream therefore should not exceed 10^{10} cm. Upon arriving at the region occupied by the earth's magnetosphere the shock wave is partially reflected, causing a SC; the magnetosphere on the daytime side is surrounded by a region with higher density. The arriving disturbance will experience partial reflection on the boundary of this region, increasing in it the jump in density, pressure, temperature and the interplanetary magnetic field frozen in the solar plasma. The first phase of the magnetic storm, associated with an increase in the horizontal component of the magnetic field at the earth's surface, can be attributed to a decrease in the volume of the magnetosphere as a result of additional compression caused by the pressure increase in the gas surrounding the magnetosphere through which the shock wave arriving from the sun passed. It is assumed that the shock wave in passing through the magnetosphere does not heat the plasma of the magnetosphere. Only in this case will there be compression of the magnetosphere under the influence of the increased pressure (caused by the shock wave) in the gas surrounding the magnetosphere. With movement into a medium with a greater magnetic field, the jump in pressure and density on the shock wave

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ACCESSION NR: AP4043496

front decreases. Since, on the average, the magnetic field of the magnetosphere exceeds considerably the magnetic fields of interplanetary space, the magnetosphere (with the possible exception of its outermost parts) is heated by the shock wave considerably less than the surrounding interplanetary gas. Compression of the magnetosphere under the influence of external pressure can be regarded as an adiabatic process. The first phase of a magnetic storm with a sudden onset lasts an average of 2-8 hours, after which the main phase of the storm begins. At that time there is a decrease in the horizontal component of the magnetic field at the earth's surface in the middle and low latitudes. At the time of the first phase and during the first half of the main phase of the storm there is an equalization of the temperatures between the relatively cold magnetosphere and the shock-wave heated gas surrounding the magnetosphere. The carriers of energy are hydromagnetic waves arising on the boundary between the magnetosphere and nonhomogeneities of the stream. In the process of equalization of temperatures, the magnetosphere as a whole (or at least its inner part) begins to expand. For this expansion to lead to an appreciable decrease in the horizontal component it is necessary that the relative expansion be greater in the inner regions of the magnetosphere than in the outer regions. The existence of a region of high density of plasma near the earth (geocorona) with a sharp decrease in density at a distance of 3.5 earth radii should lead to a partial reflection of the hydromagnetic waves propagating from the surface of the magnetosphere and therefore a sharp heating

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ACCESSION NR: AP4043496

and expansion of the plasma on this boundary. Orig. art. has: 24 formulas.

ASSOCIATION: None

SUBMITTED: 27Mar64

ENCL: 00

SUB CODE: ES, AS

NO REF SOV: 002

OTHER: 009

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L 19805-65 EWT(1)/EWG(v)/FCC/EEC-4/EEC(t)/EWA(h) Pc-4/Pe-5/Pq-4/Pae-2/Peb/Pi-4
ASD(a)-5/ESD(t) GW/WS
ACCESSION NR: AP5000527 S/0203/64/004/006/1108/1111

AUTHOR: Shabanskiy, V.P.

TITLE: Radial drift of particles of the terrestrial radiation belts produced by hydromagnetic waves in the magnetosphere

SOURCE: Geomagnetizm i aeronomiya, v. 4, no. 6, 1964, 1108-1111

TOPIC TAGS: radial drift, radiation belt, hydromagnetic wave, magnetosphere, magnetic envelope, betatron effect, electron energy component, solar corpuscular flux, high altitude nuclear explosion

ABSTRACT: A study of the terrestrial radiation belts reveals a close connection between the behavior of the radiation belts and hydromagnetic disturbances. In most cases, these events are characterized by a sharp drop in the intensity of the high-energy (> 1.5 Mev) electrons of the outer belt during a magnetic storm, followed by a slow restoration of that intensity. Characteristic from this point of view is the behavior of an artificial electron belt with energies exceeding 5 Mev, produced by high-altitude nuclear explosions. Experiments have so far failed to produce any definitive information on whether the changes that high-energy particles undergo during storms are reversible or irreversible,

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L 19805-65
ACCESSION NR: AP5000527

or whether the changes in the intensity are associated with the betatron effect accompanying the variations of the magnetic field at a given distance from the Earth. Most of the experimental data apparently point to the irreversibility of the changes in the electron energy components. Attention is called to the specific nature of the interaction between a high-energy particle and a hydromagnetic wave as one of the possible causes of the intensity reduction in the outer electron belt during the first phase of a storm, followed by a gradual restoration of the intensity in the following days. Orig. art. has: 6 formulas.

ASSOCIATION: Moskovskiy gosudarstvenny*y universitet, Institut yadernoy fiziki (Institute of Nuclear Physics, Moscow State University)

SUBMITTED: 22Jun64 ENCL: 00 SUB CODE: ES

NO REF SOV: 003 OTHER: 004

Card 2/2

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L 40440-65 EWT(1)/EWG(v)/FCC/EEC-4/EEC(t)/EWA(h) Po-4/Pe-5/Pq-4/Pae-2/Peb/
Pi-4 GW

ACCESSION NR: AP5009638 UR/0293/65/003/002/0221/0230

AUTHOR: Shabanskiy, V. P.

TITLE: Motion of particles of different energies in a rotating magnetosphere

SOURCE: Kosmicheskiye issledovaniya, v. 3, no. 2, 1965, 221-230

TOPIC TAGS: solar wind, magnetosphere, magnetic force line, geomagnetic field, plasma, magnetic drift, electric drft, ionosphere, auroral belt

ABSTRACT: A change in the solar wind and the extension of the magnetosphere to the night side of the earth cause a transfer of force lines of the geomagnetic field to the night side. In the author's model, the magnetosphere is divided into layers A and B, of which the B layer is marked the tail because of its great rarefaction on the night side. On the day side, the B layer is condensed, and it protects the A layer from solar winds. The drift of magnetic force lines, caused by plasma particles of the magnetosphere, occurs more rapidly than the drift of the whole magnetic field because the force lines are connected with the earth through the ionosphere. An increased

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ACCESSION NR: AP5009638

intensity of solar winds compresses the magnetosphere without a change in the distribution of force lines in the A and B layers. A new distribution of force lines in the A and B layers occurs under the action of hydrodynamic perturbations when part of the force lines is pushed from B to A layer, and the auroral belt is transferred to higher latitudes. Magnetograms of storms with sudden commencement show a slow increase of the field intensity in the beginning. Solar winds cause the transfer of force lines from A to B layer. This transfer is connected with induction currents in the ionosphere which originate magnetic oscillations with large amplitudes on the earth's surface. On the morning side of the magnetosphere, force lines rotate in the direction of the frictional action of solar winds, and on the evening side, the inverse is the case. Orig. art. has: 5 figures and 2 formulas.

[EG]

ASSOCIATION: none

SUBMITTED: 27Mar64 ENCL: 00 SUB CODE: AA, ES

NO REF SOV: 001 OTHER: 003 ATD PRESS: 3245

Card 2/2

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"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

SHABANOVA, [illegible]

[illegible] of particles of various energies within a rotating [illegible]sphere. Kosm. issl. 3 no. [illegible] 230 Mr-Ap '65.

(MIRA 18[illegible])

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"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

L 12883-66 EWT(1)/FCC/EWA(h) GS/GW

ACCESSION NR: AT5023601 UR/0000/65/000/000/0326/0334

AUTHOR: Antonova, A. Ye.; Yershkovich, A. I.; Shabanskiy, V. P.

26
B+1

TITLE: Formation of radiation belts as a result of particle drift deep into the magnetosphere

SOURCE: Vsesoyuznaya konferentsiya po fizike kosmicheskogo prostranstva. Moscow, 1965. Issledovaniya kosmicheskogo prostranstva (Space research); trudy konferentsii. Moscow, Izd-vo Nauka, 1965, 326-334

TOPIC TAGS: radiation belt, neutron albedo, geomagnetism, particle production

ABSTRACT: Measurements made by the "Relay-1" satellite indicate that the intensity of trapped protons with energies greater than 34 Mev varies during magnetic storms as if the particles were drifting toward the earth. The authors consider two mechanisms which may be responsible for such a drift: 1) deviation of the third invariant due to a sudden change in the amplitude symmetry of the geomagnetic field with subsequent gradual restoration and 2) the action of hydromagnetic waves. Assuming that the first and second invariants remain constant during particle drift, the

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L 1283-66

ACCESSION NR: AT5023601

betatron mechanism is responsible for motion of the particles to magnetic shells with lower McIlwain L parameters. To determine the spatial distribution of particle intensity, an equation of continuity must be solved, assigning definite mechanisms for particle production and annihilation. The authors evaluate the effectiveness of the albedo neutron source, assuming for simplicity that particle drift to shell L_1 takes place instantaneously. It is found that the albedo neutron source cannot be of considerable importance in formation of the Davis protonosphere. However, this source may be responsible for the relativistic electron belt. If electron drift toward the earth is fast enough, the albedo neutron source may cause the observed intensity of relativistic electrons within a time much less than the lifetimes as determined by ionization losses. Since the power of the neutron source was found to be insufficient for the observed proton intensity, the authors evaluate the effect of proton drift toward the earth from the layer between the magnetosphere and the leading edge of the standing shock wave. A comparison of experimental and theoretical results shows that the proton drift source may be responsible for the observed intensity in the proton belt. It is pointed out that drift of solar protons with energies of the order of a few hundred kev to magnetic shells with $L \sim 1.5$ may be responsible for a certain number of high-energy protons in the inner belt. However, evaluation of this source requires spectral measurements of solar protons with

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L 12883-66

ACCESSION NR: AT5023601

energies of several hundred kev outside the magnetosphere. Orig. art. has: 3 figures, 1 table, 26 formulas. [14]

ASSOCIATION: none

SUBMITTED: 02Sep65 ENCL: 00 SUB CODE: ES, NP

NO REF SOV: 006 OTHER: 008 ATD PRESS: 4102

Card 3/3

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"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

L 14196-66 EWT(1)/FCC/EWA(h) GW

ACC NR: AP6002744 SOURCE CODE: UR/0203/65/005/006/0969/1002

AUTHOR: Shabanskiy, V. P.

ORG: Institute of Nuclear Physics, Moscow State University (Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta)

27

B

TITLE: Radiation belts

SOURCE: Geomagnetizm i aeronomiya, v. 5, no. 6, 1965, 969-1002

TOPIC TAGS: radiation belt, magnetosphere

ABSTRACT: The article briefly reviews basic experimental and theoretical literature on the nature of processes in the radiation belts which are responsible for their structure and spatial distribution. The experimental data cover the period up to April 1964 when this article was written. The author discusses data on the various energy levels of the proton and electron components of the radiation belts, as well as particle losses due to various factors. The albedo mechanism for capture of electrons and protons is briefly considered. Models are proposed for the structure of the earth's magnetosphere based on the motion of the particles in the radiation

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"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

L 14196-66

ACC NR: AP6002744

belts. Orig. art. has: 19 figures, 1 table, 6 formulas.

SUB CODE: 08/ SUBM DATE: 09Oct64/ ORIG REF: 017/ OTH REF: 096

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"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

L 33313-66 EWT(1)/FCC GW

ACC NR: AP6011692 SOURCE CODE: UR/0203/66/006/002/0205/0214

47
B

AUTHOR: Shabanskiy, V. P.

ORG: Institute of Nuclear Physics, Moscow State University (Institut yadernoy fiziki, Moskovskiy gosudarstvennyy universitet)

12

TITLE: Character of the change of solar wind parameters, the form of the magnetosphere, and the magnetic field during magnetic storms

12

SOURCE: Geomagnetizm i aeronomiya, v. 6, no. 2, 1966, 205-214

TOPIC TAGS: magnetic storm, solar wind, magnetosphere, magnetic field

ABSTRACT: The author examines the problems of the interaction of the corpuscular flux with the earth's magnetosphere. The configuration of the magnetosphere and disturbance of the magnetic field in the vicinity of the earth are determined. It is shown that the magnitude of the increase of the H component on the earth during the first phase of a magnetic storm depends strongly upon the change in the configuration of the magnetosphere. When the parameters of the flux change due to the passage of a shock wave from the sun, which causes a magnetic storm with a sudden start, the magnetosphere becomes less extended. This appreciably enhances the effect of the increase of the magnetic field on the earth during the first phase in comparison with a case of compression of only the daytime side of

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ACC NR: AP6011692

of the magnetosphere in fluxes with a high dynamic pressure, with which storms without a sudden start can be identified. The author mathematically analyzes the shock wave from the sun, the change of the magnetosphere parameters upon passage of the shock wave, gives an approximate method of determining the disturbed field within the magnetosphere, and determines the disturbed field in the vicinity of the earth. Orig. art. has: 16 formulas and 1 figure.

SUB CODE: 03 / SUBM DATE: 12May65 / ORIG REF: 001 / OTH REF: 009

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L 04928-67 EWP(m)/EWT(1)/FCC GW/WW

ACC NR: AP6018914 SOURCE CODE: UR/0203/66/006/003/0472/0478

67
B

AUTHOR: Shabanskiy, V. P.

ORG: Institute of Nuclear Physics, Moscow State University (Moskovskiy gosudarstvennyy universitet, Institut yadernoy fiziki)

TITLE: Interaction of charged high-energy particles with hydromagnetic waves

SOURCE: Geomagnetizm i aeronomiya, v. 6, no. 3, 1966, 472-478

TOPIC TAGS: hydromagnetics, charged particle, high energy particle, particle interaction, SHOCK WAVE FRONT

ABSTRACT: The author discusses the generation by a high-energy particle of a hydromagnetic shock wave front, propagating perpendicular to a magnetic field, on the assumption that the particle velocity is considerably greater than the wave velocity and that the wave front width is considerably smaller than the Larmor radius of the charged particle. It is shown that the magnetic moment of the particle remains constant during this process. The displacement of the instantaneous rotational center of the particle as it passes through the front is derived in an expression which is in good agreement with other results on the increase in the energy of the particle and its displacement under similar conditions. An estimate is made

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ACC NR: AP6018914

of the possible displacement of particles (diffusion rate) of the radiation belts of a hydromagnetic wave propagating in the magnetosphere. A characteristic feature of the diffusion considered is the fact that its velocity increases along with the magnetic moment of the particle in the field (i.e., with the energy of the particle), as opposed to diffusion caused by global changes in the geomagnetic field. Orig. art. has: 23 formulas.

SUB CODE: 20/ SUBM DATE: 16Jun65/ ORIG REF: 007/ OTH REF: 004

kh

Card 2/2

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"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

L 29577-66 EWT(1)/FCC GW

ACC NR: AP6018915 SOURCE CODE: UR/0203/66/006/003/0479/0485

43
41
B

AUTHOR: Shabanskiy, V. P.

ORG: Moscow State University, Institute of Nuclear Physics (Moskovskiy gosudarstvennyy universitet, Institut yadernoy fiziki)

TITLE: Particle behavior in the radiation belts during magnetic storms

SOURCE: Geomagnetizm i aeronomiya, v. 6, no. 3, 1966, 479-485

TOPIC TAGS: magnetic shell, magnetic perturbation, terrestrial dipole, solar wind, magnetic field, spherical function, magnetosphere

ABSTRACT: The radial dislocation of particles with magnetic shells acted upon by the universal component of magnetic perturbation during magnetic storms is analyzed by the harmonics of the magnetic field. The first harmonic expresses the maximum dislocation of particles. The terrestrial dipole field on the equator is deformed by the solar wind acting perpendicularly to the dipole moment. The deformation of the magnetic field is expressed by the harmonics formula

$$B = \frac{B_0}{r^3} + \alpha \frac{B_0}{r_1^3}\left(1 + \beta \frac{r}{r_1} \cos\lambda\right),$$

where the first harmonic expresses the unperturbed dipole field, the second term

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PROCESSES AND PROPERTIES INDEX

Determination of the platinum-group metals and of gold. O. F. Zayagintsev, S. K. Shabalin, V. A. Vorob'eva and A. P. Bochkareva. *Trudy Vsesoyuz. Konferentsii Anal. Khim., Akad. Nauk S. S. S. R.* 1, 375-83 (1939); *Khim. Referat. Zhur.* **1940**, No. 2, 63-4; cf. *C. A.* **34**, 1580[4].—The test-tube method was used for detg. Ir and Rh in ores. A large excess in the charge of Ag (5 times the ordinary amt.) and of Pt (exceeding 5-10 times the content of Ir) transforms nearly all Ir into the metallic state. A rapid method for detg. Au in ores has been developed. The method is applicable to field conditions. Pulverize the sample to 65 mesh, treat in a porcelain dish with 60-70 cc. of HNO_3 (d. 1.4) (avoiding a violent evolution of N oxides), dil. with 100 cc. of water, filter, wash the residue with hot water and proceed as in the analysis of quartz and oxidized ores. For the analysis of quartz and ocher ore place 10-50 g. of the ore in a porcelain dish or mortar, add gradually an I soln. (I_2 2 g. + KI 4 g. in 100 cc. of water) until the brown color of the excess I_2 persists, let stand overnight or grind in the mortar after every 5-10 min. in the course of 60 min., filter the soln. and wash the ppt. until the wash water is clear. All Au is dissolved as AuI_3. Add to the Au soln. 40 g. of metallic Hg for each 100 cc. of liquid and shake for 60 min. Decant the soln. and wash the Au amalgam with water by decantation. Transfer the amalgam to a porcelain dish and dissolve the Hg in HNO_3 (1:2) with careful heating. Decant the soln. and wash the Au by decantation. Dissolve Au in 1 drop of aqua regia and evap. excess on a water bath. Dissolve the $AuCl_3$ in 1 cc. of water, place 0.1 cc. of the soln. on a filter paper satd. with $Hg(NO_3)_2$ soln. and compare the dark spot of reduced Au with the color scale. The following method is proposed for detg. Au in cyanide solns: To 100 cc. of the soln. add 5-10 cc. of HNO_3, heat to boiling, during boiling add 1.0-1.5 g. of $KClO_3$ in the course of 15-20 min., boil for 30 min., cool, neutralize with OH to a weakly acid reaction to litmus and det. Au by the drop or the volumetric method. In the volumetric method dil. the soln. with water to 50 cc., add 1 cc. of KHF_2 or $NaHF_2$ buffer soln. satd. in the cold and 2 cc. of *o*-dianisidine and titrate from the microburet with hydroquinone until the reddish color disappears. A min. of 2 mg. of Au in 1 l. of the soln. can be detd. Free Cl and Br interfere with the detn. because they also produce a pink color with *o*-dianisidine.

W. R. Henn

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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1ST AND 2ND ORDERS

3RD AND 4TH ORDERS

PROCESSES AND PROPERTIES INDEX

Physico-Chemical Conditions for the Solution of Gold and Its Alloys in Cyanide Solutions.—I. I. N. Plaksin and S. K. Shabarin (*Izvest. Sekt. Fiziko-Khimich. Analiza.* (*Ann. Secteur Anal. Phys.-Chim.*), 1940, **12**, 65–84).—[In Russian.] The effect of such factors as concentration of cyanide solution (up to 0·75% KCN), oxygen content of solution (additions of H_2O_2), and rate of stirring on the solution of annealed and polished sheet specimens of gold, and of gold alloys with 10% silver and 10% copper, respectively, was investigated. The shape of the rate of solution-concentration curve is determined by the proportions of oxygen and cyanide reaching the surface of the metal. The first part, which rises steeply, represents conditions under which excess oxygen reaches the surface, and the rate of solution increases with increasing concentration of KCN. The second, slightly inclined portion of the curve, corresponds to conditions under which the amount of oxygen reaching the surface approaches equivalence with the amount of KCN. Finally the third portion of the curve, which is horizontal or inclined downwards, corresponds to conditions under which the amount of oxygen is equivalent to or less than the amount of KCN reaching the surface. Depending on the conditions, the

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CA

9

Extraction of platinum and palladium by chlorination. I. N. Plaksin and S. K. Shabarin. *J. Applied Chem.* (U.S.S.R.) 14, 1021-5(1941)(French summary); cf. *C.A.* 39, 2043.—Chlorination is applicable to ores contg. large amts. of Pt and Pd, when the metals are in the sulfide state, or bound with As, or, in case of Pd, exist in the oxide form. Optimum conditions are: equal amts. of sulfide and oxide ores are mixed, and treated at 500-50° with Cl for 4 hrs.; in some cases a 2-hr. treatment is satisfactory. Granulation to 28 mesh size is sufficient. In all cases complete extn. of Pd is easy, under conditions which otherwise ext. often not more than 50-75% of Pt.

G. M. K.

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PROCESSES AND PROPERTIES INDEX

CA 9

Extraction of Pd and Pt from oxidized ores by chlorination. I. N. Plaksin and S. K. Shabarin. *Bull. acad. sci. U.R.S.S., Classe sci. tech.* **1944**, 305-8. Conditions for the chlorination of the oxidized mineral palladite (PdO) and extn. of Pd and Pt were studied. Two samples of Pd-Pt ore contained 23.71 and 3.21% of S, resp. (the latter was an oxidized ore). The sulfide ore consisted of pyrrhotite contg. chalcopyrite and pentlandite. The oxidized ore consisted chiefly of limonite, mainly of a porous structure, with traces of sulfides. Pt and Pd were contained in these ores partly in the bound state and partly in the free, finely dispersed state. Chlorination was effected in a tubular elec. furnace (220 v., 11 amp.). Three 10-g. samples of ore and 1.2 g. of NaCl were placed simultaneously in the furnace in thin layers in porcelain boxes (60 × 30 × 10 mm.). Oxidized ore fused less readily than did sulfide ore and it could endure higher temps. of chlorination. The sulfide ore was chlorinated at 100°, 200°, and 300°. At 100° no Pt metals were extd. At 200° Pd began to be chlorinated and it could be extd. in small quantities. At 300° the extn. of Pd was complete. Practically no Pt was extd. at these temps. Oxidized ore was chlorinated at from 300 to 500°, at these temps. all Pd was extd. The percentage extns. of Pt from ores roasted for 4 hrs. were: at 500°, 50°, 66, 78, at 400°, 20°, 69, at 370, 400°, 73-8 and at 300°, 50°, 51-85. Pt and Pd were completely extd. from mixts. of equal parts by wt. of the oxidized and sulfide ore by roasting them at 500°, 50° for 4 hrs. Chlorination of mixts. of oxidized ore 75 and sulfide ore 25% and of oxidized ore 90 and sulfide ore 10% at 400°, 50° extd., resp.: Pt 71.0, 75.5 and 11.67%; Pd 100% in both cases. Extn. with 2% aq. HCl with the addn. of NaCl by agitating the mixt. (liquid: solid = 0.4:1) for 3 hrs. by means of a glass mixer (120 r.p.m.) yielded Pt 35-70 and Pd 30-50%. Pt metals were extd. to the extent of 15% from flotation tailings contg. Pt 3.5, Pd 1.11, Ir 0.26, and Au 0.3 g. ton by amalgamation. No Pt metals were extd. from these tailings by the cyanide process. Various methods of soln. in HCl and aqua regia without roasting, and with a preliminary roasting, gave a max. extn. of 65.7%. Extn. was 85% with Cl water at 20° for 16 hrs. Successive oxidation and chlorination roasting of flotation tailings at 700° followed by treatment with HCl + H_2SO_4 (1:10) at 90° gave a 85% extn. Max. extn. of the Pt metals (93%) was obtained by roasting at approx. 700°, followed by lixiviation of the tailings with HCl + H_2SO_4 (1:10) at 90° for 5 hrs. Max. extn. was obtained with ore ground to 0.5 mm. (28 mesh). W. R. Henn

Moscow Inst. Nonferrous Metals & Gold im. M. I. Kalinin

AMERICAN METALLURGICAL LITERATURE CLASSIFICATION

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"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

PLAKSIN, I.N.: SHABARIN, S.K.

"Concerning Ludwig's Curve of Flow," Iz. Ak. Nauk SSSR, Otdel. Tekh. Nauk, No. 4-5, 1944

[redacted]

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"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

[illegible], [illegible], [illegible] [illegible]

Dissertation: "Form of Gold Occurrence in the Quartz and Calcined Ores and its Influence on Extraction in Hydrometallurgical Processes." Moscow Inst of Nonferrous Metals and Gold imeni M. I. Kalinin, 3 Mar 47.

SO: Vecherniaya Moskva, Mar, 1947 (Project #17836)

APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2"

"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

PROCESSES AND PROPERTIES INDEX

B

190-B. Determination of Grain-Size Distribution of Minerals During Investigation of Influence of Composition and Structure of Ores on Their Ability to be Concentrated. (In Russian.) I. N. Plaksin and S. K. Shabarin. *Izvestiya Akademii Nauk SSSR* (Bulletin of the Academy of Sciences of the USSR), Section of Technical Sciences, Feb. 1950, p. 250-263.

New graphic method for determining size distribution of disperse minerals. Such characterization may be used for evaluation of ability of ores to be concentrated. (gold ores used as an example). 21 ref. (B14, Au)

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2"

"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

SHABARIN, S. K.

Chemical Abst.
Vol. 48 No. 3
Feb. 10, 1954
Metallurgy and Metallography

(2)

History of the origin of the platinum industry in Russia. S. K. Shabarin. *Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk* 1952, 1512-19.—Historical sketch with 15 references. G. M. Kosolapoff

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"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

SOV/137-57-10-18554

Translation from: Referativnyy zhurnal, Metallurgiya, 1957, Nr 10, p 13 (USSR)

AUTHOR: Shabarin, S.K.

TITLE: The Origins of Gold and Silver Refining in Russia (Voznikno-veniye affinazha zolota i serebra v Rossii)

PERIODICAL: Tr. In-ta istorii yestestvozn. i tekhn., 1957, Vol 9, pp 36-61

ABSTRACT: Bibliographic entry

Card 1/1

APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2"

"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

SOV/137-59-1-2084

Translation from: Referativnyy zhurnal. Metallurgiya, 1959, Nr 1, p 273 (USSR)

AUTHOR: Shabarin, S. K.

TITLE: The Fourth Conference on the Analysis of Noble Metals (IV soveshchaniye po analizu blagorodnykh metallov. Sverdlovsk, 20-23 maya 1957 g.)

PERIODICAL: Izv. vyssh. uchebn. zavedeniy. Tsvetn. metallurgiya, 1958, Nr 1, pp 183-184

ABSTRACT: At the conference called by IONKh (Institute of General and Inorganic Chemistry), Academy of Sciences, USSR, and other organizations, 111 delegates from 32 organizations were present and 35 reports were heard on various methods of analysis. A considerable portion of the reports was devoted to spectroscopic methods of analysis for the determination of various impurities of refined Pt metals. Reports were presented on the determination of Pt, Pd, Yr, Bi, and Pb in refined Au by the following methods: The photocolorimetric method for determination of Pt metals and of Sb in Au; the spectrometric method for determining Yr; the electrometric method for determination of Ag in Pt metals which is accepted in

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SOV/137-59-1-2084

The Fourth Conference on the Analysis of Noble Metals

the practice of assay inspections; and the chromatographic methods of separation of Pt metals. A valuable method for the determination of binary Pt-metal alloys by the thermo-emf was given special notice. A report was made on the radio-activation methods for the determination of micro-amounts of Au and Ag in Pt metals and on the testing of Pt alloys on the touchstone. Three reports were heard on Cu assay fusing used for analyzing Pt ores. The conference adopted a resolution on the main trends of work on the analysis of noble metals. The desirability of the organization of an arbitration laboratory for the analysis of noble metals was expressed.

V. N.

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"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

AUTHOR: Shabarin, S.K. SOV/149-58-6-16/19

TITLE: Ivan Andreyevich Shlatter (1708-1768) (On the 250th, Anniversary of His Birth) (Ivan Andreyevich Shlatter (1708-1768) (K 250-letiyu so dnya rozhdeniya)

PERIODICAL: Izvestiya Vysshikh Uchebnykh Zavedeniy, Tsvetnaya Metallurgiya, 1958, Nr 6, pp 136 - 142 + 1 Plate (USSR)

ABSTRACT: Born in Germany, son of a mining engineer, I.A. Shlatter came to Russia when he was 11 years old and later settled there, becoming eventually a Russian citizen. He followed his father's profession, had a distinguished career and made important contributions to the progress of the metallurgical science in his adopted country. He developed an industrial method of combined refining of auriferous silver which continued to be used for 74 years, introduced a process for treating precious metals scrap in the Petersburg Mint and was responsible for perfecting both the smelting techniques and the methods of fabrication of coins in this establishment. He was the author of the first Russian language textbooks on assaying and refining of gold and silver which are also a valuable source of technical terminology in 18th century Russia. He also

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SOV/149-58-6-16/19

Ivan Andreyevich Shlatter (1708-1768) (On the 250th Anniversary of His Birth)

wrote a mining manual under the title "A Comprehensive Treatise on Mining Technology" (4 parts), a handbook of extraction metallurgy entitled "A Comprehensive Treatise on the Ore Smelting Practice" (5 volumes) and translated into Russian I. Valeri's work on mineralogy. There are 28 Soviet references.

ASSOCIATION: Moskovskiy institut tsvetnykh metallov i zolota. Kafedra metallurgii blagorodnykh metallov (Moscow Institute of Non-ferrous Metals and Gold. Chair of Metallurgy of Noble Metals)

SUBMITTED: August 14, 1958

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"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

SHABARIN, S.K.

I.I. Varvinskii. Trudy inst. ist. est. i tekh. 18:51-74 '58.
(MIRA 11:10)

(Varvinskii, Iov Ignat'evich 1797-1838)

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"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

SHABARIN, S.K.

First book about platinum ("la platine, platine, l'or blanc ou le huitieme metal" French edition of "Relacion Historica del Viage a la America Meridional" by A. de Ulloa. Reviewed by S.K. Shabarin. Izv. vys. ucheb. zav.; tsvet. met. 2 no.2:140-143 '59. (MIRA 12:7)

(Platinum) (de Ulloa, A.)

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18.2000

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SOV/149-60-1-7/27

AUTHORS: Astaf'yeva, A. V., Ivanovskiy, M. D., Shabarin, S. K.

TITLE: Beneficiation of Poor Copper-Cobalt Ore by Hydrometallurgical Processes

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Tsvetnaya metallurgiya 1960, Nr 1, pp 50-56 (USSR)

ABSTRACT: Cobalt ores of the Soviet Union are characterized by low Co content. Considerable difficulties encountered in dressing are due to very fine dispersion of Co minerals. This article deals with a laboratory test of dressing ore of this type from one of the deposits in the Krasnoyarsk region (not named). The size of Co mineral inclusions ranged from 0.001 to 0.1 mm minus mesh with a total content of 0.086% Co in the ore. The other components were: (%) 65.0 SiO_2, 13.7 Al_2O_3, 3.4 Fe, 3.6 CaO, 1.8 MgO, 0.05 Mn, 1.5 S, 0.12 Sb, 1.63 As, 0.88 Cu, 0.23 Ni, and 37.4 g/ton Ag. About 20% cobalt content

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Beneficiation of Poor Copper-Cobalt Ore by Hydrometallurgical Processes

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consisted of oxidized minerals and 80% arsenides and sulfoarsenides. The mineralogical analysis was made by A. I. Vitushkina and it disclosed the presence of safflorite, smaltite, glaucodote, aeritrite, tetrahedrite, tennantite, chalcopyrite, covellite, malachite, rammelsbergite, chloantite, annabergit, and silver. The dressing tests comprised the following stages. The first determined the advantages of collective vs selective flotation, each having its own set of reagents. Collective flotation was given preference while selective flotation produced concentrate richer in Co (1.22 vs 1.01%), Co losses in tailings were much higher (16.7% Co content in ore vs 10.6%). After deciding in favor of collective flotation, two variations were tried: (a) with one-stage crushing, three reruns, and selective flotation of the copper-cobalt concentrate; (b) with two-stage crushing, three flotations, selective flotation of the first concentrate, and three reruns of the cobalt concentrate Alternative (b) proved to be best and resulted in a 10%

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Beneficiation of Poor Copper-Cobalt Ore by Hydrometallurgical Processes

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higher rate of Co extraction. Following details of this method are given: The first crushing reduces 45% ore to minus mesh 0.074 mm; in the second crushing this figure is raised to 80%. Crushing is done with soda addition (250 g/ton). During the first flotation 100 g/ton butyl xanthogenate and 30 g/ton pine oil are added; during the second and third flotation, 50 g/ton sodium sulfide, 100 g/ton amyl xanthogenate, and 70 g/ton foaming agent D (not specified). Total flotation time is 40 min. During recleaning operations water glass (500 g/ton) and amyl xanthogenate were added. To eliminate excessive flotation reagents carbon (100 g/ton) was introduced into selective flotation as well as lime (8 kg/ton) as a depressant for cobalt minerals and pyrite. Cobalt extraction according to this schedule reached 70.68%, and the concentrate contained 1.17% Co. Selective flotation methods as suggested by S. I. Krokhin and B. D. Nekrasov and finishing by gravitation as used at the Silence plant, Canada, has failed to produce satisfactory results. Subsequently, hydrometallic

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Beneficiation of Poor Copper-Cobalt Ore by Hydrometallurgical Processes

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methods were adopted as shown in the process flow chart below (Fig. 6). Cobalt concentrates as obtained from flotation were processed in following stages: oxidizing roasting at 500°, sulfatizing roasting with sodium bisulfate at 700° for 2 hrs, leaching by water, and weak sulfuric acid solution. Under these conditions 90 to 95% available Co passes into the solution. The latter is separated from iron and copper by soda: Fe is precipitated at pH=4.2, Cu at pH=5.2. Cobalt is precipitated by soda (70 mg/liter) or sodium sulfide. The final product contains 12-14% Co at a 84-85% rate of extraction from the concentrate. These processes are incorporated in the flow chart (see Fig. 6). The Co extraction rate from ore amounts to 61.0%, that of Cu is 78.4%. The conclusions contain a short recapitulation of the above data. There are 4 tables; 6 figures; 5 references, 3 Soviet, 1 Canadian, 1 U.K. The Canadia and U.K. references are D. C. McLaren, Can. Mining J., Vol 66, March 1945; H. L. Talbat, Eng. Mining J., August 1953.

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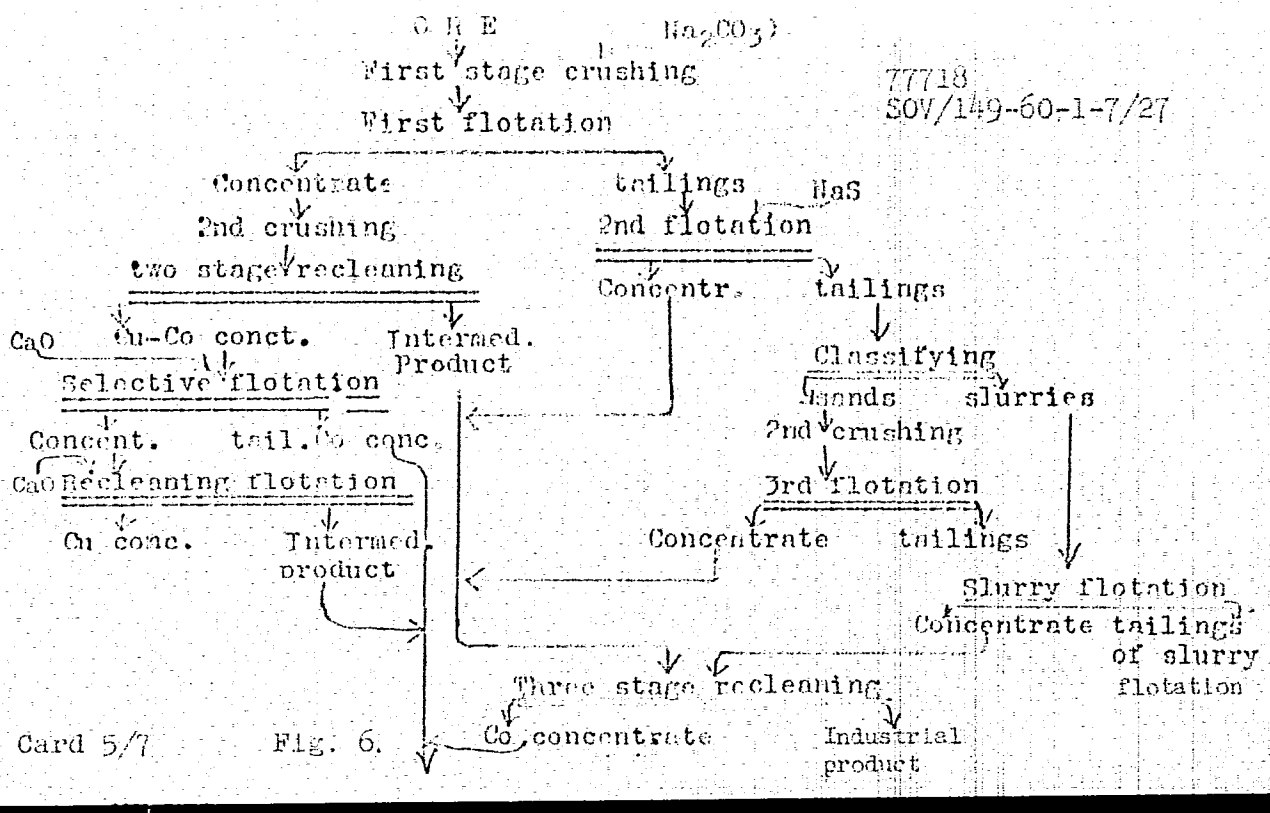

Card 5/7 Fig. 6.

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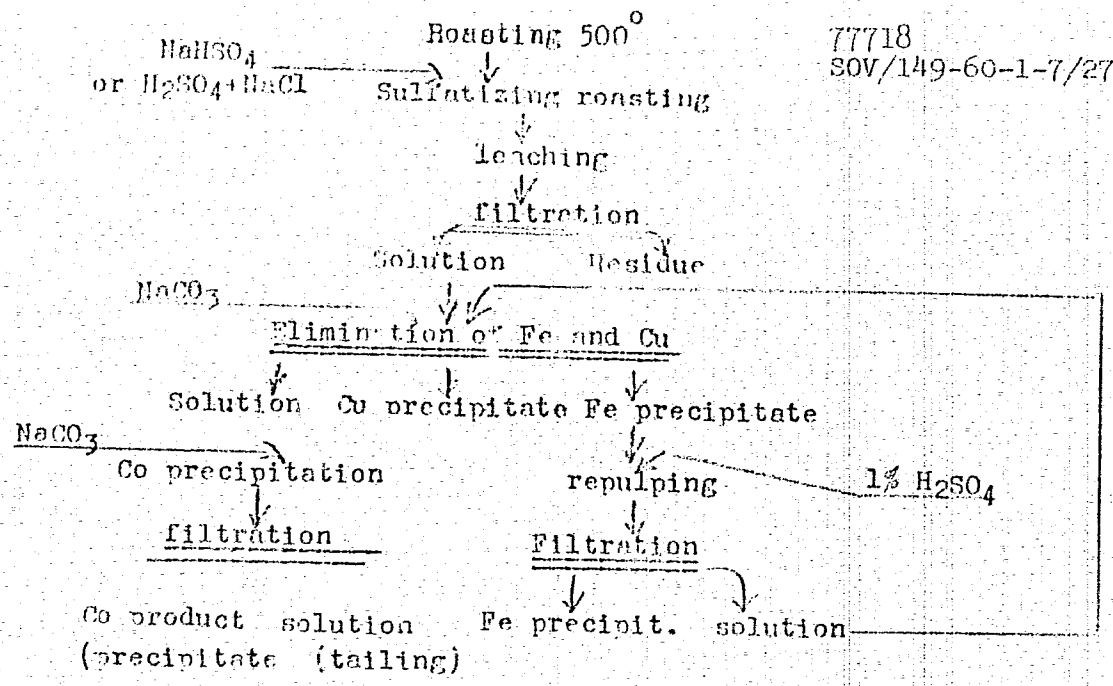

Card 6/7 Fig. 6. Alternative (b) (continued)

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Beneficiation of Poor Copper-Cobalt Ore by Hydrometallurgical Processes

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SOV/149-60-1-7/27

ASSOCIATION: Krasnoyarsk Institute of Non-ferrous Metals. Chair of Metallurgy of Noble Metals (Krasnoyarskiy institut tsvetnykh metallov Kafedra metallurgiyi blagorodnykh metallov)

SUBMITTED: May 26, 1959

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"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

S/149/60/000/005/003/015
A006/A001

AUTHORS: Asrat'yeva, A.V., Ivanovskiy, M.D. and Shabanin, S.K.

TITLE: Chemical-Metallurgical Methods of Processing Oxidized Lead-Zinc Ores

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Tsvetnaya metallurgiya, 1960, No. 5, pp. 49-57

TEXT: The use of flotation, gravitation and other concentration methods for oxidized ores where lead and zinc minerals are closely associated to iron hydroxides and are represented by oxidized minerals, did not yield satisfactory results (Mineralogical analysis of ores was made by A.I. Vitushkina). The investigation of various chemico-metallurgical methods for the extraction of valuable metals from such ores proved the possibility of employing the following processes: 1) Chlorination roasting with sodium chloride to sublimate lead, gold and silver. This is the cheapest method. After crushing, the ore is roasted with sodium hydroxide in a furnace. The lead chlorides formed, are sublimated and collected after cooling in the form of dust. Sodium hydroxide consumption is 10% from the ore weight during roasting for 2-3 hours. For ores where the basic

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Chemical-Metallurgical Methods of Processing Oxidized Lead-Zinc Ores

valuable constituents is lead (7.5%), 700°C is the optimum temperature of roasting. In this case lead extraction into the sublimate attains 95.4% and the lead content in the sublimate is 65-75%. 2) Lixiviation of gold, lead and silver with metal chloride solutions. Lead may be extracted into alkali metal solutions by direct leaching out in the presence of hydrochloric acid and ferric chloride: $PbO + 2NaCl + H_2O = PbCl_2 + 2NaOH$. The lead chloride dissolves in the excess of solvent. Best results were obtained in leaching out with solutions of two compositions: 300 g/l NaCl + 50 g/l HCl and 300 g/l NaCl + 100 g/l $FeCl_3$ + 25 g/l HCl. Experiments have shown that lead extraction into NaCl solutions without addition of hydrochloric acid was 90% and in the presence of 40-50 g/l HCl increased to 97-98%. 3) Sulfatizing roasting with ammonium sulfate and leaching out of zinc by weak solutions of sulfuric acid. Experiments have shown that sulfatizing roasting should be conducted at 500°C for 2 hours. Leaching out of zinc may be performed with weak 5% sulfuric acid solutions at 60°C. Depending on the consumption of $(NH_4)_2SO_4$, 70 to 94.5% Zn passes into the solution. For crea

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Chemical-Metallurgical Methods of Processing Oxidized Lead-Zinc Ores

with high zinc content the following processes may be used: 1. Chlorination roasting with sodium chloride at 1,100°C according to Figure 9. 2. Chlorination roasting at 700°C, sulfatizing roasting at 500°C with ammonium sulfate and leaching out of zinc with weak sulfuric acid solution (Figure 9, dotted line). 3. Sulfatizing roasting at 500°C with $(NH_4)_2SO_4$ and leaching out of zinc with subsequent leaching out of lead with metal chloride solutions according to Figure 10. 4. After sulfatizing roasting and leaching out of zinc, and drying of the residue, roasting with NaCl at 1,100°C (Figure 10, dotted line). In this case lead, gold and silver are extracted into the sublimate.

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Chemical-Metallurgical Methods of Processing Oxidized Lead-Zinc Ores

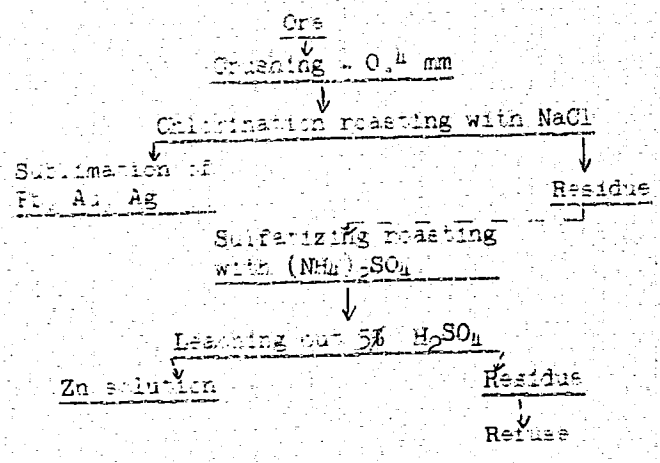

Figure 9. Schematic representation of chlorination roasting with NaCl

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Chemical-Metallurgical Methods of Processing Oxidized Lead-Zinc Ores

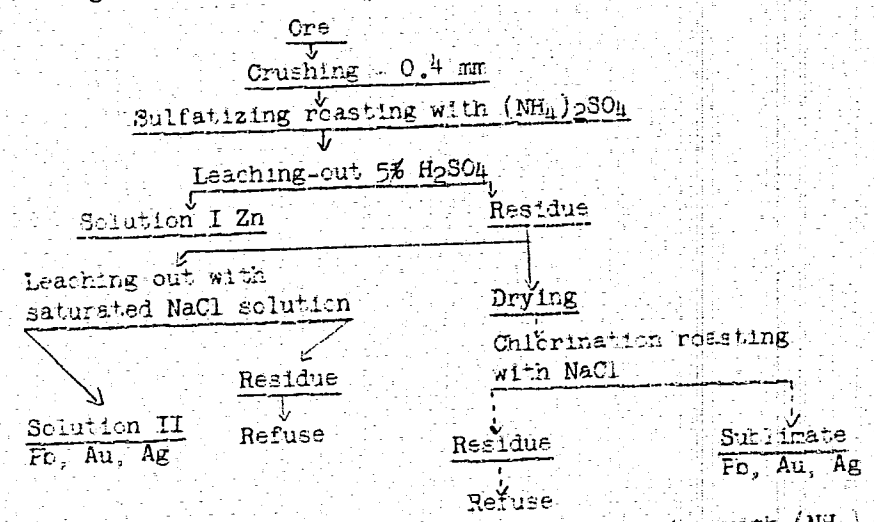

Figure 10. Schematic representation of sulfatizing roasting with $(NH_4)_2SO_4$

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Chemical-Metallurgical Methods of Processing Oxidized Lead-Zinc Ores

There are 8 tables, 10 figures and 6 references: 4 Soviet and 2 English.

ASSOCIATION: Krasnoyarskiy institut tsvetnykh metallov (Krasnoyarsk Institute of Non-Ferrous Metals) Kafedra metallurgii blagorodnykh metallov (Department of Metallurgy of Precious Metals)

SUBMITTED: January 30, 1960

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"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

SHABARIN, S.K.

Brief outline of the history of assaying in Russia (16th - 19th centuries). Izv. vys. ucheb. zav.; tsvet. met. 3 no.4:164-171 '60. (MIRA 13:9)

1. Krasnoyarskiy institut tsvetnykh metallov, Kafedra metallurgii blagorodnykh metallov.

(Assaying)

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"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

ASTAF'YEVA, A.V.; IVANOVSKIY, M.D.; SHABARIN, S.K.

Chemical and metallurgical methods of treating lead-zinc oxide ores. Izv. vys. ucheb. zav.; tsvet. met. 3 no.5:49-57 '60. (MIRA 13:11)

1. Krasnoyarskiy institut tsvetnykh metallov. Kafedra metallurgii blagorodnykh metallov.
(Nonferrous metals--Metallurgy)
(Ore dressing)

APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2"

"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

PLAKSIN, I.N.; ASTAF'YEVA, A.V.; VOSKRESENSKAYA, M.M.; SHABARIN, S.K.

Chlorination as a method to extract platinum and palladium from oxidized copper-nickel ores. Izv. vys. ucheb. zav.; tsvet. met. 3 no. 6:95-103 '60. (MIRA 14:1)

1. Krasnoyarskiy institut tsvetnykh metallov. Kafedra metallurgii blagorodnykh metallov.
(Chlorination) (Nonferrous metals--Metallurgy)

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SHABARIN, S.K.

Fifth All-Union Conference on Noble Metal Analysis. Izv. vys. ucheb. zav.; tsvet. met. 3 no. 6:165-166 '60. (MIRA 14:1)
(Metallurgical analysis--Congresses)

APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2"

"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

SHABARIN, S.K.

Results of a discussion on the technical classification of metals. Izv. vys. ucheb. zav.; tsvet. met. 4 no.4:33-39 '61. (MIRA 14:8)

(Metals--Classification)

APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2"

"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

SHABARIN, S.K.

Seminar for workers of an assaying laboratory. Izv. vys. ucheb. zav.; tsvet. met. 5 no.2:166-168 '62. (MIRA 15:3)
(Assaying)

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"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

SHABARIN, S.K.

Vladimir Andreevich Vaniukov. Izv. vys. ucheb. zav.; tsvet. met. 5 no.4:185-187 '62. (MIRA 16:5)
(Vaniukov, Vladimir andreevich, d. 1957)

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"APPROVED FOR RELEASE: 07/20/2001 CIA-RDP86-00513R001548510005-2

SOV/84-58-7-42/46

AUTHORS: Shabarkov, S., Chief Pilot of Bulgarian Airlines, and Timev, A., Flight Commander

TITLE: From the Experience of Soviet Friends (Po opytu sovetskikh druzey)

PERIODICAL: Grazhdanskaya aviatsiya, 1958, Nr 7, p 39 (USSR)

ABSTRACT: The author discusses the short period of development of Bulgarian air services and pays tribute to the assistance of the Soviets in starting and building up the establishment. Further economy and safety of flights are briefly dealt with and he points out that the administration is aware of its debt to the USSR.

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