22882
S/089/61/010/005/010/015
B102/B214

Steady boiling of a volume heated liquid

constant. This relation is now used to determine the distribution of the vapor bubbles according to size. The liquid is assumed to be strongly boiling and therefore in rapid motion so that a mean lifetime of the bubble (independent of the age of the bubble) can be introduced. τ is independent also of the size of the bubble. Further, the probability $P(t)$ is introduced which gives the probability that the bubble does not leave the liquid volume during the time t: $P(t)dt = (1/\tau)e^{-t/\tau}dt$; $\int_0^\infty P(t)dt = 1$. If $f(R)$ is the distribution function showing how the bubbles are distributed according to their radii, then on account of $f(R)dR = P(t)dt$:

$$f(R)dR = \frac{3}{2}\alpha R^{1/2}\exp(-\alpha R^{3/2})dR, \quad \text{where } \alpha = \frac{1}{\tau}\left(\frac{1}{kau}\right)^{1/2}\left(\frac{r\gamma''}{\sigma\gamma'}\right)\frac{1}{\Delta T}.$$

Since α is constant one obtains for the most probable bubble radius: $R_{prob} = (1/\alpha)^{2/3}$. If the new variable $x = R/R_{prob}$ is introduced there results:

$$f(x)dx = \frac{1}{2}x^{1/2}\exp\left(-\frac{1}{3}x^{3/2}\right)dx \quad \text{with} \int_0^\infty f(x)dx = 1.$$

That is, if the most probable radius of the bubble is known the distribution function of the

Card 2/3

bubbles in size is also known. The ratio of the average to the most probable radius is given by: $\bar{R}/R_{prob} = \bar{x} = 3^{2/3}\Gamma(1+2/3) \simeq 1.87$. The ratio of the total surface of the bubbles to their total volume is given by $S/V = \frac{4\pi\bar{R}^2 n}{\frac{4}{3}\pi\bar{R}^3 n}$, where n is the number of the bubbles. Approximately, $S/V \simeq 0.86/R_{prob}$. The validity of this formula was checked by an instrument described in the previous paper mentioned above. There are 3 figures and 1 Soviet-bloc reference.

SUBMITTED: September 1, 1960

ZAVOYSKIY, V.K.

Kinetics of a boiling homogeneous reactor. Atom. energ. 14 no.6: 579-580 Je '63. (MIRA 16:7)

(Nuclear reactors)

ZAVOYSKIY, V.K.

Changes in the density of a volume heated boiling liquid due to pulsewise variations in power supply. Atom. energ. 15 no.2: 164-165 Ag '63. (MIRA 16:8)

(Ebullition)

ZAVOYSKIY, V. K.

"Heat transfer in a boiling liquid."

report submitted for 2nd All-Union Conf on Heat & Mass Transfer, Minsk, 4-12 May 1964.

All-Union Correspondence Polytechnic Inst.

ZAVOYSKIY, V.K.

Size distribution of steam bubbles in a boiling liquid. Atom. energ. 16 no.1:64-65 Ja '64. (MIRA 17:2)

ZAVOYSKIY, V.N. [Zavois'kyi, V.M.]; KRUTIKHOVSKAYA, Z.A. [Krutykhovs'ka, Z.A.]

Effect of the anisotropism of magnetic susceptibility on the accuracy of residual magentism measurements. Dop. AN URSR no.6:736-739 '61. (MIRA 14:6)

1. Institut geologicheskikh nauk AN USSR. Predstavleno akademikom AN USSR V. G. Bondarchukom [Bondarchuk, V.H.].
(Magnetism—Measurement)

ZAVOYSKIY, V.N.; KRUTIKHOVSKAYA, Z.A.

Remanent magnetism of ferruginous quartzites in the southern termination of the Krivoy Rog synclinorium. Izv. AN SSSR. Ser. geofiz. no.8:1150-1157 Ag '61. (MIRA 14:7)

1. Akademiya nauk USSR, Institut geofiziki.
(Krivoy Rog region--Quartzite--Magnetic properties)

KRUTIKHOVSKAYA, Z.A.; ZAVOYSKIY, V.N.

Experience in studying the magnetization of ferruginous quartzites in the Kremenchug Magnetic Anomaly. Geofiz.sbor. no.1:85-98 '62. (MIRA 16:3)

1. Institut geofiziki AN UkrSSR.

(Dnieper Valley--Quartzite--Magnetic properties)

ZAVOYSKIY, V.N.

Effect of the coring shell on the magnetization of the core. Geofiz. sbor. no.3:117-119 '62. (MIRA 15:9)
(Core drilling) (Rocks—Magnetic properties)

KRUTIKHOVSKAYA, Zoya Aleksandrovna; ZAVOYSKIY, Vladimir Nikolayevich; PODOLYANKO, Svetlana Mikhaylovna; SAVENKO, Boris Yakovlevich; SUBBOTIN, S.I., akademik, otv. red.; SERDYUK, O.P., red.

[Magnetization of the rocks of iron ore formations of the Greater Krivoy Rog and Kursk Magnetic Anomaly] Namagnichennost' porod zhelezorudnykh formatsii Bol'shogo Krivogo Roga i KMA. [By] Z.A.Krutikhovskaia i dr. Kiev, Naukova Dumka, 1964. 178 p. (MIRA 18:2)

1. Akademiya nauk URSR, Kiev. Instytut geofizyky.

ZAVODSKIY, V.Yu.

Shifting potentials for an elastic stratified inhomogeneous medium.
Akust. zhur. 10 no.3:289-292 '64. (MIRA 17:11)

1. Akusticheskiy institut AN SSSR, Moskva.

ZAVOYSKIY, YE. K.

2849. Absorption Changes with Field-Strength of Weak H.F. Fields in Certain Substances. E. K. Savojskij and B. M. Kosyrev. *Comptes Rendus (Doklady) de l'Acad. des Sciences, U.S.S.R.* 1, 3, pp. 109–113 and 1, 5, pp. 219–220, 1936. *In German.*—The present accepted models of dipole liquids and ionized solutions do not include the possibility of a relation of absorption of weak electrical fields to field intensity. This is studied for the case of acetic acid, both liquid and solid. The absorption is found to be a very complex function of the field strength. Measurements are made by means of a Lecher wire system containing the test condenser, the oscillations being produced by an ultra-short wave generator. The grid current against voltage of the output valve is determined as a measure of absorption. Curves of I_g against the applied voltage give a number of maxima when the substance is employed as dielectric in the test condenser. Several confirmatory tests are made. The critical values of voltage are independent of temperature or state. Similar results are also found for sodium acetate. It is concluded that the effect is due to an intramolecular process and the study will be extended to determine the effect of frequency and to non-aqueous solutions and other compounds of acetic acid. A. M. T.

A 53

Dokl. AN SSSR

ASA-SLA METALLURGICAL LITERATURE CLASSIFICATION

ZAVOYSKIY, YE. K.

3

IIA

Zhur. Eksper. i Teor. Fiz.

Determination of the excitation potential of atoms and molecules. E. K. Zavoiskii. *J. Exptl. Theoret. Phys.* (U. S. S. R.) 6, No. 1, 57-61 (In English 61)(1936). A new method is described. The gas or vapor is placed in the elec. field of a high-frequency generator. Variation of the grid current of the generator with the anode voltage serves as a basis for calcg. excitation potentials. This method is much simpler than the method of direct electron bombardment.

S. L. Madorsky

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

ZAVOYSKIY, YE. K.

BC

H 1

Relations between certain properties of gases and vapours, in connexion with absorption by them of high-frequency electrical fields. E. K. ZAVOJSKI and S. G. SALICHOV (Sci. Mem. Kazan State Univ., 1938, 98, No. 4, 101—114).—Absorption of a high-frequency electrical field by vapours or gases is given by $Q = \beta T + \epsilon$, where T is the temp., β is a const., the val. of which depends on the no. of atoms per mol. of the given gas, and ϵ is a characteristic const. for each gas. An empirical equation connecting dQ/dT with the dipole moment, and its temp. coeff., is given. Identical vals. of β are found for $COMe_2$, Et_2O, EtOAc, EtOH, C_6H_6, and CO_2; β for diat. gases (air, O_2, N_2) is 1·4 times as great as for the preceding group, whilst for highly asymmetrical mols. (HCl, HBr, NH_3) β is still higher. R. T.

CA: 34-3146/7

ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION

E. Zavoiskii.—J. Phys. (U.S.S.R.) 8

elec. method is used to measure the paramagnetic absorption of solns. of Mn salts in a const. magnetic field parallel to the oscillating elec. field. The magnitude of the losses is obtained from the coeff. of the imaginary part of the magnetic susceptibility from the equation developed by Gorter (C.A. 34, 2223[4]). $\chi'' = \chi_0 F\rho\nu/(1 + \rho^2\nu^2)$. χ_0 is the static magnetic susceptibility; ρ is the relaxation time of the spin lattice interaction; ν is the frequency of the oscillating field; $F = aH^2/b + cH_1$; H is the magnetic field; and a and b are two consts. The values of the absorption referred to a single paramagnetic ion are tabulated for three aq. solns. of $MnSO_4$ with concns. of 0.314, 0.160, and 0.064 g./cc. for a wave length of 24 m. and room temp. The absorption per ion increases with diln. and the magnetic field, H. The relaxation time for a soln. of $MnSO_4$ of 0.160 g./cc. at 290°K. and a field of 2200 oersteds is calcd. to be $\rho = 2.4 \times 10^{-4}$ sec. K. A. O.

METALLURGICAL LITERATURE CLASSIFICATION

ZAVOYSKIY, YE.K.

2

A new method of investigating paramagnetic absorption. S. Al'tshuler, E. Zavoiskii, and V. Kozyrev. *J. Exptl. Theoret. Phys.* (U.S.S.R.) 14, 407-9 (1944). —The method is based on a very high sensitivity of the current in the generator circuit to the magnitude of absorption of high-frequency vibrations. The expts. were made at room temp. (291°K.) and at the temp. of liquid air (~81°K.). The following salts were used in the investigation: Fe NH_4 alum, chrome alum, Al alum, $CuSO_4.5H_2O$, $MnSO_4$, $CoSO_4.7H_2O$, $NiSO_4$, and $FeSO_4.7H_2O$. It was found that complete suppression of paramagnetic absorption for $CuSO_4.5H_2O$ occurs in fields of the order of 100 oersteds, and for $MnSO_4$ in fields of the order of 1000 oersteds. The effect of complete suppression of absorption is inversely proportional to abs. temp. Galina M. Lebedeff

Zhur. Eksper. i Teor. Fiz. Nos. 10-11

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

ZAVOISKII, E. K.

Spin magnetic resonance in paramagnetic substances. Zavoiskii [illegible] ... was measured ... as a function ... [illegible] dependent of $H_{\parallel}$. The max. is due to resonance between the frequency of the magnetic spin precession of the ion in the const. field and the frequency of the oscillating field. [illegible] to be $1/_{8}$. A. O. Allen as shown by T. in 1944, the susceptibility is strongly dependent on the field at low temp. W. W. Stifler

Technique of determining the ferromagnetic Curie point of thin nickel films. André Aron. *Cahiers phys.* 4, 19-24(1941).—Description of the app. and methods used to det. the results previously reported (*C.A.* 39, 1082[7]). C. C. Kiess

ZAVOYSKIY, YE.K.

Zhur-Fiz.,

Paramagnetic absorption in some salts in perpendicular magnetic fields. E. Zavoiskii. *J. Phys.* (U.S.S.R.) 10, 170-3(1946); cf. *C.A.* 40, 1705[5].—The paramagnetic absorption of energy by $CuCl_2 \cdot 2H_2O$, $CuSO_4 \cdot 5H_2O$, $CrCl_3$, and $MnCO_3$ was investigated in a const. magnetic field perpendicular to an oscillating field with a frequency of 1.51×10^5 kc. The results of the measurements are discussed in view of Frenkel's theory of spin-magnetic resonance. Also in *J. Exptl. Theoret. Phys.* (U.S.S.R.) 16, 603-6. B. B. Whitcomb

Kazan State University

METALLURGICAL LITERATURE CLASSIFICATION

ZAVOYSKIY, Ye. K.

"Spin Magnetic Resonance in the Decimetre-Wave Region." J. Phys., 10, No. 2, pp. 197-8, 1946 Physics Abstracts No. 590, Vol. 50 February 1947. Abstract 409.

PA70192

ZAVOYSKIY, YE K

USSR/Physics Aug 1946
Paramagnetism
Magnetic Fields

"Paramagnetic Absorption in Some Salts in Perpendicular Magnetic Fields," [illegible] Kazan State University, [illegible]

"Zhur Eksper i Teoret Fiz" Vol XVI, No 7

Measurements of the relative value of paramagnetic absorption in perpendicular magnetic fields at a frequency of 1.51 x 10^5 kc are performed for the following salts: $CuCl_2 \cdot 2H_2O$, $CuSO_4 \cdot 5H_2O$; $CrCl_3$, and [illegible]. These results are directly related to the [illegible] previous paper in which [illegible] was published [illegible]. Submitted [illegible]

28 Jul 1945

Also in J. Phys. 10, 170-3 (1946)

ZAVOYSKIY, YE. K.

Measurement of the magnetic susceptibility of paramagnetic substances in decimeter waves. E. K. Zavoiskii. *Zhur. Eksptl. Teoret. Fiz.* (J. Exptl. Theoret. Phys.) 17, 155-61(1947); *J. Phys.* (U.S.S.R.) 11, No. 2 (1947).—Two self-induction coils, filled with, and immersed in, the substance examd., are disposed at an angle α close to $\pi/2$, and a const. magnetic field H_0 forms an angle $(90 - \varphi)^{\circ}$ with the high-frequency magnetic field H of coil 1. The e.m.f. of mutual inductance ϵ in the measuring coil 2 is a function of the components of the magnetic susceptibility, $\chi'_{\perp}$ $\chi'_{\parallel}$, $\chi''_{\perp}$ and $\chi''_{\parallel}$ (the real and the imaginary parts perpendicular to and parallel to H_0) and of the angles α and φ. Measurements on anhyd. $MnSO_4$ at 290°K., λ = 16 cm, give, for $\chi'_{\perp}$, a sharp min. at about H_0 = 580 and a flat max. at about 900 oersteds, for $\chi''_{\perp}$ a sharp max. at about 700 oersteds. These findings are discussed from the point of view of Frenkel's theory (*J. Exptl. Theoret. Phys.* 15, 409(1945)).

N. Thon

Kazan Br, Acad Sci USSR

ZAVOYSKIY, YE. K.

M

*Magnetospin Resonance in Ferromagnetic Substances in Centimetre Waves. E. K. Zavoisky (Zhur. Eksper. Teoret. Fiziki, 1947, 17, 883–884; C. Abs., 1950, 44, 3316). [In Russian]. The resonance curves are plotted, from measurements of the absorption Q of magnetic oscillations of frequency ν (of the order of 10^{10} c/s), in the presence of a perpendicular const. magnetic field H, in co-ordinates $\Delta Q/\Delta H$ against H. The curves show a maximum, followed by a fall to negative values, and a minimum. For electrolytic nickel, the ratio ν/H at the maximum is $a = 5.40 \times 10^6$, and the half-width δ, i.e. the distance from the maximum to the minimum, 500 Oe. Highly disperse nickel powder, obtained by reduction of a salt with hydrogen, shows two superposed resonance curves, one with $a = 5.40 \times 10^6$, and the other with $a = 2.73 \times 10^6$, two maxima, at $H = 650$ and 1300 Oe., and very nearly equal half-widths. The difference is ascribed to an as yet insufficiently understood role of the surface, which is much more prominent in the fine powder. Transformer iron gives $a = 2.6 \times 10^6$, $\delta = 770$ Oe., i.e. much higher than in nickel. Hardening or annealing have no significant effect. The magnetospin resonance behaviour of ferromagnetic substances is thus analogous to that of paramagnetic substances. The magnetic field H results in a split of the energy level into $2s + 1$ sub-levels, and H is related to ν by $H = h\nu/g\mu n$, where $n = 1, 2, 3 \ldots 2s$; it can therefore be concluded that, for nickel, $H = 1300$ Oe. corresponds to $n = 1$, and $H = 650$ Oe. to $n = 2$, and the Landé factor $g = 1.90$, close to the values of Einstein de Haas and of Barnett. From the presence of the two maxima, the spin s of nickel cannot be $s = \frac{1}{2}$ but must be at least $s = 1$, and the magnetic moment $\mu = 2$ Bohr magnetons. The absence of the main maximum in pure nickel may mean either very low probability between neighbouring sublevels, or that the level corresponding to a 90° orientation of the spin to H is unoccupied.

Kazan State University

[illegible]

Chem Abstracts

ZAVOYSKIY, YE. K.

General and Physical (2)

Theory of paramagnetic relaxation in perpendicular fields. S. A. Al'tshuler, E. K. Zavoiskii, and B. M. Kozyrev (Kazan State Univ.). *Zhur. Eksptl. Teoret. Fiz.* 17, 1122-3 (1947).—Frenkel's (*ibid.* 15, 409 (1945)) theory of magnetospin resonance, leading to the relation $\chi''/\chi_0 = 2\nu_0\nu^2/[(\nu_0^2 - \nu^2)^2 + 4\nu^2\tau^2]$ between the coeff. χ'' of paramagnetic absorption, the static susceptibility χ_0, the frequency ν_0 of the Larmor precession of the spin in a const. field H, and the frequency ν of the weak alternating magnetic field perpendicular to H, is in conflict with results of Z. (*C.A.* 40, 6908¹) and of Salikhov (*C.A.* 44, 3786e) who have established, for the position of the max. of $\chi''(H)$, the condition $h\nu = g\mu_0 H^*$ (g = Landé factor, μ_0 = Bohr magneton, H^* = H at the max.), the constancy of the half-width of χ'', and the "zero absorption" (i.e. a finite χ'' at $H \to 0$) at $\nu < 10^9$. This conflict can be resolved by taking into account the effect of the interaction between the magnetic ions on the resonance curve. As a result of such interactions, the internal fields will broaden the resonance curve symmetrically on both sides, so that the position of the max. will remain unaffected, whereas the width will be detd. by the internal field H_i. Semimacroscopic calcn. leads to the expression $\chi''/\chi_0 = (\sqrt{\pi}/2)(\nu/\nu_i)[e^{-(\nu_0-\nu)^2/\nu_i^2} + e^{-(\nu_0+\nu)^2/\nu_i^2}]$, with $\nu_i = g\mu_0 H_i/h$, valid for $(\nu_0 - \nu) < \nu_i$, whereas Frenkel's formula remains in force for $(\nu_0 - \nu) \gg \nu_i$. The values of H_i, calcd. by the authors' formula for Cr^{+++}, Mn^{++}, and Cu^{++}, are in agreement with Van Vleck's formula (*C.A.* 31, 4880⁶) $H_i = \alpha\mu_0\sqrt{S(S+1)}N$ (where S = resulting spin, N = no. of magnetic ions per cc.) with $\alpha = 1$. N. Thon

1951

ZAVOYSKIY, YE. K.

PA 57T90

USSR/Phys — Feb 1947
Paramagnetism
Magnetic Susceptibility

"Measurement of Paramagnetic Susceptibility With Decimeter Waves," Ye. K. Zavoyskiy, Kazan Br, Acad Sci USSR, 7 pp

"Zhur. Eksper. i Teoret Fiz.," Vol XVII, No 2

Measurement of active part of magnetic susceptibility of paramagnetics in frequencies not greater than $5 \cdot 10^7$ kc is accomplished by well-developed method of pulsation. For higher frequencies, a sufficiently precise and practical useful method of measurement has not been suggested. Necessity of such method is

[redacted] 57T90

USSR/Phys (Contd) — Feb 1947

obvious, especially to study paramagnetic reactions. Study of the latter, and specifically the phenomenon of magnetospin resonance, led authors to consideration of method they describe. Article also appears in English in "Journal of Physics" Vol XI, No 2, 1947.

[redacted] 57T90

PA 53T93

USSR/Physics
Magnetism
Ions

Sep 1947

"Determining the Magnetic and Mechanical Moments in the Atoms of Solid Bodies," Ye. Zavoyskiy, Kazan State U; Kazan Br, Acad Sci USSR, 2 pp

"Dok. Akad Nauk SSSR, ~~Nova Ser~~" Vol LVII, No 9

Magnetic spin resonance in solid and liquid bodies permits exact determination of Land's factor for magnetic ions, but does not permit simultaneous determination of magnetic and mechanical moments. Proves resonance method can be utilized with high degree of accuracy to determine spin as well as

53T93

[redacted]

USSR/Physics (Contd) Sep 1947

magnetic moment of an ion. Submitted by Academician L. D. Landau, 26 Apr 1947.

Chem. Zentr (Russian Zone Ed.) 1949, I, 170.

ZAVOYSKIY, YE. K.

[redacted]

53T93

ZAVOYSKIY, Ye. K.

SUBJECT USSR / PHYSICS CARD 1 / 2 PA - 1510
AUTHOR ZAVOJSKIJ, E.K., BUTLOV, M.M., PLACHOV, A.G., STOL'KIN, G.E.
TITLE On the Luminescence Chamber.
PERIODICAL Atomnaja Energija, 1, fasc. 4, 34-37 (1956)
Issued: 19.10.1956

The present work contains an accurate description of the main elements of this chamber. Such a main element is the electron-optic transformer which is constructed in accordance with the principle of the cascadelike electron-optic amplification of light. This transformer consists of an input- and some amplification-cascades which are connected by an optical contact (a thin film). On one side of the screen a fluorescent screen and on the other a photocathode is fitted. The focussing of the electronic image is discussed. In the domain between aperture and screen two pairs of deflecting lenses are fitted for high frequency development. The inertialess character of this device is of great advantage; it permits a development in cadres and a continuous high frequency development with a resolving time of 10^{-8} and 3.10^{-12} sec respectively. In the case of static operation all cascades are fed by a sectioned high frequency source. For the recording of the traces of the cosmic rays a pulse-like method of feeding the output cascade was, however, selected. In frequent cases the cascade is fed with a pulselike high tension by means of special circuits. "Impulse shutters" are synchronized by means of a photomultiplier, a discriminator and a coincidence scheme (with a resolving power with respect to time of 4.10^{-8} sec). The mode of operation of the luminescence chamber de-

ZAVOYSKIY, Ye. K.

USSR/Nuclear Physics

C-2

Abs Jour : Referat Zhur - Fizika, No 5, 1957, 11017

Author : Zavoyskiy, Ye.K., Smolkin, G.Ye.

Inst :

Title : Investigation of the Time Resolution of Plane-Parallel Spark Counters.

Orig Pub : Atom energiya, 1956, No 4, 46-50

Abstract : It is shown that the resolution time of plane-parallel spark counters can be reduced to 10^{-10} seconds by reducing the interelectrode gape and increasing the working voltage. An investigation of the resolving time was made from the gamma gamme coincidence by determining the relative delay of the discharge in two counters, which registered cascade gamma quanta from a Co^{60} compound (lifetime of excited level 1.33 Mev of Ni^{60} is approximately

Card 1/2

Card 2/2

ZAVOYSKIY, Ye.K.; AL'TSHULER, S.A.; KOZYREV, B.M.

Paramagnetic resonance. Izv.AN SSSR.Ser.fiz. 20 no.11:1199-1206 N '56. (MLRA 10:5)

(Nuclear magnetic resonance)
(Magnetic materials)

ZAVOYSKIY, YE.K.

Category : USSR/Electronics - Electronic Optics H-3

Abs Jour : Ref Zhur - Fizika, No 2, 1957, No 4281

Author : Zavoyskiy, Ye.K., Fanchenko, S.D.
Title : Physical Principles of Electron-Optical Chronography.

Orig Pub : Dokl. AN SSSR, 1956, 108, No 2, 218-221

Abstract : Description of a method for using the electron-optical converter for the study of processes of very short duration (10^{-9} -- 10^{-14} seconds) using the method of scanning the electron image. The factors limiting the time resolution of the method are analyzed: the electronic chromatic aberration, the finite thickness of the photocathode, the finite dimensions of the source of light, and chromatic and spherical aberrations of the input optical system. The authors reached the conclusion that the limiting time resolution of this method is 10^{-14} seconds. Bibliography, 5 titles.

Card : 1/1

ZAVOYSKIY, Ye. K.

24(7) p.3 PHASE I BOOK EXPLOITATION SOV/1365

L'vov. Universytet

Materialy X Vsesoyuznogo soveshchaniya po spektroskopii. t. 1: Molekulyarnaya spektroskopiya (Papers of the 10th All-Union Conference on Spectroscopy. Vol. 1: Molecular Spectroscopy) [L'vov] Izd-vo L'vovskogo univ-ta, 1957. 499 p. 4,000 copies printed. (Series: Its: Fizychnyy zbirnyk, vyp. 3/8/)

Additional Sponsoring Agency: Akademiya nauk SSSR. Komissiya po spektroskopii. Ed.: Gazer, S.L.; Tech. Ed.: Saranyuk, T.V.; Editorial Board: Landsberg, G.S., Academician (Resp. Ed., Deceased), Neporent, B.S., Doctor of Physical and Mathematical Sciences, Fabelinskiy, I.L., Doctor of Physical and Mathematical Sciences, Fabrikant, V.A., Doctor of Physical and Mathematical Sciences, Kornitskiy, V.G., Candidate of Technical Sciences, Rayskiy, S.M., Candidate of Physical and Mathematical Sciences, Klimovskiy, L.K., Candidate of Physical and Mathematical Sciences, Miliyanchuk, V.S., Candidate of Physical and Mathematical Sciences, and Glauberman, A. Ye., Candidate of Physical and Mathematical Sciences.

Card ~~1~~/30

PURPOSE: This collection of articles is intended for scientists working in the field of spectroscopy and for engineers and laboratory analysts who use spectroscopic methods in their work.

COVERAGE: This collection of articles is concerned with theoretical, experimental, and technical problems in molecular spectroscopy. The application of molecular spectroscopy to various fields of theoretical research is described in articles covering chemical structure, kinetics, catalysis, theory of the chemical bonding, properties of crystals, effect of radiation on substance, etc. Good coverage is also given to the use of spectroscopy in organic and inorganic technology including the study of petrochemicals, polymers, glass, phosphate, boron compounds, etc. Each article is followed by references. The text includes tables and figures.

Papers of the 10th All-Union (Cont.) SOV/1365

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Card ~~3/30~~

ZAVOYSKIY, YE.K. ZAVOYSKIY, YE.K.

CARD 1 / 2 PA - 1795

SUBJECT USSR / PHYSICS
AUTHOR ZAVOJSKIJ,E.K., SMOLKIN,G.E.
TITLE On the intermolecular Transfer of Excitation Energy in Crystals.
PERIODICAL Dokl.Akad.Nauk, 111,fasc. 2, 328-330 (1956)
Issued: 1 / 1957

The present work endeavors to carry out immediate photographic registration of the dimensions of the domain in which energy transfer takes place in a large stilben crystal on the occasion of its irradiation with the α-particles of Po^{210}. The authors found that the transfer of excitation energy takes place at distances of some millimeters.

The dimensions of the domain of intermolecular energy transfer in crystals can be estimated with comparative ease by means of a luminescence chamber. For this purpose it is sufficient to photograph the traces of the ionizing particles in these crystals. The authors carried out such experiments with crystals of anthracene and CsJ(Tl), on which occasion they caused α-particles of Po^{210} (with 5,3 MeV) to impinge upon the surface of the crystal under a small angle. The images of the traces were projected by means of a microscope (200-300-fold enlargement) upon the photocathode of an electron-optic transformer. The α-particles in the crystals of the anthracene and cesium iodide had ranges of 34 and 27 μ. The amplification coefficient of the electron-optic transformer was sufficiently high and made the photographic registration of an electron flying out from the input photocathode possible. Some photographs of the traces of α-particles are attached. The images of the traces in some cases consist of single points. Each point corresponds to an electron emitted from the input photocathode. The number of points per unit of length of the trace is determined by the light yield of the crystal, by the quantum yield of the photocathode of the electron-optic transformer, by the properties of the optics used and finally by agreement of the spectrosensitivity of the photocathode with the emission spectrum of the crystal. The traces in the anthracene and in the cesium iodide were photographed at the same conditions and the emission spectra of these crystals agreed fully with the curve of the spectral sensitivity of the antimony-cesium cathode. There follows a rough calculation of the number N of the points for the total range of α-particles. $N \sim 10$ is found for anthracene and $N \sim 150$ for CsJ(Tl). These values agree satisfactorily with the experimental data obtained by the authors. In the case of anthracene and also of CsJ(Tl) luminescence-light is thus radiated from such molecules as are located at no greater distance from the plane of the passage of the α-particle than the minimum distance ($\pm 1 \mu$) still resolvable by the experimental device.

INSTITUTION:

ZAVOYSKIY, Ye.K.

CARD 1 / 2 PA - 1911

SUBJECT USSR / PHYSICS
AUTHOR ZAVOJSKIJ, E.K., BUTSLOV, M.M., SMOLKIN, G.E.
TITLE The Utmost Amplification Coefficient and the Inherent (Own) Noises of Electron-Optic Light Amplifiers.
PERIODICAL Dokl.Akad.Nauk, 111, fasc.5, 996-999 (1956)
Issued: 1 / 1957

There exists a certain limiting value η_{lim} of this amplification coefficient which corresponds to the smallest possible signal, an electron emitted from the input photocathode of the light amplifier. η_{lim} is here roughly estimated according to the formula $\eta_{lim} = n\sigma$, where n denotes the number of electrons incoiding on the surface unit of the screen which is necessary for a normal recording with an optic density of 0,2 to 0,4. With $n \sim 10^9$ (at $\sim 2.10^4$ eV) and $\sigma \sim 10^{-4}$ cm^2 one obtains η_{lim} 10^5. The authors were able to realize one single electron with the type 95 light amplifier. For this purpose at first the electrons of the dark emission of the input photocathode were used. According to various experiments the majority of light flashes does not correspond to single electrons at operating voltages of from 8.000 to 20.000 V, but to whole groups of electrons (electron packets), which fly away from the input cathode. There are thus two different components of the dark emission of the SbCs of the photocathode: the "single-electronic" and the "multielectronic" component. From the minimum optic density of the negative it is not possible to register the single electrons, because then separation of the one-electron component is too difficult.

Dokl.Akad.Nauk, 111, fasc.5, 996-999 (1956) CARD 2 / 2 PA - 1911

For the reliable separation and registration of an electron, and for the purpose of determining the character of the emission of the multi-electron component of inherent (own) noises the defocussing of the electronic image in the input cascade of the light amplifier was used here. On this occasion quantitative measurements of both components of the dark current were successfully carried out. The fact that the two components are created in different manners is, above all, indicated by the dependence on temperature. When the photocathode was cooled in liquid nitrogen, the single electron current vanished completely, which indicates its thermoelectronic origin. At the same time the multi-electron component of the dark current remained practically unchanged. The data available at present are not sufficient for the determination of the origin of the multi-electronic dark current. Possible causes are the autoelectronic emission from the unevennesses (spheroliths) of the photocathode or the bombarding of the cathode with heavy ions.
The aforementioned experimental data prove that the utmost coefficient of electron-optic amplification is attained and that a further increase of sensitivity must be attempted by increasing the quantum yield of the photocathode. Besides, the registration of an electron permits the study of such phenomena at which only one photoelectron (or a secondary electron) flies away from the input photocathode.

INSTITUTION:

ZAVOYSKIY, Ye.K., ADIASEVICH, B.P., BELYAYEV, S.T., POLUNIN, Yu.P.

"Sources of Polarized Particles."

paper submitted at the All-Union Conf. on Nuclear Reactions in Medium and Low Energy Physics, Moscow, 19-27 November 1957.

ZAVOYSKIY, Ye. K. 25-5-5/35

SUBJECT: USSR/Magnetic Radio-Spectroscopy

AUTHOR: Zavoyskiy, Ye.K., Corresponding member of the USSR Academy of Sciences

TITLE: Paramagnetic Resonance (Paramgnitnyy rezonans)

PERIODICAL: Nauka i Zhizn' - May 1957, No 5, pp 10-12 (USSR)

ABSTRACT: The article contains a description of the paramagnetic resonance phenomena, which are explained as the absorbtion of radio waves of Larmore frequency by paramagnetic materials. A description is given of the arrangement for demonstrating the resonance. It consists of a radio frequency generator, which generates the high frequency magnetic field. The paramagnetic materials under investigation are placed between the poles of a powerful electromagnet. The current in the electromagnet can be changed by a variable resistance. A galvanometer or oscillograph is connected into the circuit of the radio frequency generator, whose indications are very sensitive to the amount of energy absorbed by the paramagnetic material.

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25-5-5/35

TITLE: Paramagnetic Resonance (Paramgnitnyy rezonans)

The paramagnetic resonance was discovered by the Soviet scientist E.K. Zavoyskiy in 1944. With its help the magnetic qualities of atomic nuclei can be studied as well as the structure of numerous liquids and solids.

The article contains four figures and one photo.

ASSOCIATION:

PRESENTED BY:

SUBMITTED:

AVAILABLE:

Card 2/2

PA - 2716

AUTHOR ZAVOYSKIY, E.K.,

TITLE On a Possible Method for the Polarization of a Proton Bundle. (O vosmozhnom metode polarisatsii puchka protonov - Russian)

PERIODICAL Zhurnal Eksperim. i Teoret. Fiziki, 1957, Vol 32, Nr 2, pp 408-408, (U.S.S.R.)
Reviewed 6/1957
Received 5/1957

ABSTRACT A bundle of protons (as well as deuterons, tritium, He^3, etc.) passing through a thin, ferromagnetic, film magnetized up to saturation must "polarize" because the polarized ferromagnetic electrons are captured by protons. Actually, the obtained hydrogen atoms will be polarized after the capture of such electrons with respect to the electron spin. If they are magnetized outside themagnetic field once more by causing them to pass through a thin foil (or through a gas jet), the protons prove to be partly polarized. The percentage of the protons issuing from the second foil will be equal to half of the percentage of the polarization of the neutral atoms with respect to electronic spin. The polarization degree of hydrogen atoms is defined by the probability of the capture of "ferromagnetic" electrons by protons divided by the probability of the capture of non-polarized electrons. The power of polarization will apparently depend on the velocity of the protons and on the type of the ferromagnetic. If 3d- and s- electrons are captured with equal probability, the degree of polarization of the protons in the case of the application of an iron foil must attain ~15%. The intensity of the current of pola-

Card 1/2

56-4-14/52

AUTHOR ZAVOYSKIY, Ye.K.

TITLE A Source of Polarized Nuclei for Accelerators.
(Istochnik polyarizovannykh yader dlay uskoriteley-Russian)

PERIODICAL Zhurnal Eksperim.i Teoret.Fiziki,1957,Vol 32,Nr 4,pp 731-735(USSR)

ABSTRACT The paper under review discusses the possibility of constructing sources of polarized protons(and of some other nuclei)by utilizing the Lamb shift of the levels $2S_{1/2}$ and $2P_{1/2}$ and the metastability of the first level.In a Lamb experiment with an atomic hydrogen bundle it is possible to obtain polarized proton bundles,if the hydrogen atoms(which are polarized with respect to the electron spin) are brought out adiabatically in their metastable state from the magnetic field,and if they are ionized by light or electron collision.In the paper under review,its author considers the most efficient method for the polarization of protons.Through a cavity that is filled with atomic hydrogen and that is situated in a homogeneous magnetic field of H=540 oersted there passes an electron current.Then conditions are created in the cavity at which,(1),the density of occupation of the levels $2S_{1/2}$ is considerably higher than the density of occupation of the P-states;,(2),the ionization of the atoms takes place mainly by the $2S_{1/2}$ states.Here it is possible,with the aid of the resonance field, to leave in the gas practically pure $2S_{1/2}$ states, which leads to a polarization of 100% of the protons.With the aid of the usual methods,the polarized protons then can be brought out of the cavity and introduced into the ac-

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A Source of Polarized Nuclei for Accelerators. 56-4-14/52

celerator. All atoms remaining in the metastable state are polarized with respect to the electron spin. Under influence of the field with resonance frequency, one of the remaining mixed metastable states is transferred into the corresponding sublevel $2P_{1/2}$ and from there, during the life duration of the P-state(τ_p), into the basic state $1S_{1/2}$. Thus a polarization of the atomic nuclei in the $2S_{1/2}$ state is achieved. With the aid of the methods subsequently discussed in the paper under review it is possible to select the optimal conditions for the intensity and for the polarization of the proton source. The intensity of the source is limited mainly by the diffusion of the resonance radiation in the hydrogen. It is possible to utilize the strong diffusion of the resonance radiation in the hydrogen. It is possible to utilize the strong diffusion of the Lyman's radiation also for the purpose of realizing the polarization of protons.
(No reproductions)

ASSOCIATION Not Given.
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SUBMITTED 14.12.1956
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ZAVOYSKIY, Ye. K. (Correspondent-member AS USSR)

"Phenomena of Electron Paramagnetic Resonance"

Lecture to be delivered by Soviet Scientists at the Brussels Exhibition, August 1958. The delivered lectures will be available in English, French, Flemish and German as individual brochures.
(Priroda, 1958. No. 8, p. 116)

3(1)

SOV/20-121-5-13/50

AUTHORS: Butslov, M. M., Zavoyskiy, Ye. K., Corresponding Member, Academy of Sciences, USSR, Kalinyak, A. A., Nikonov, V. B., Prokof'yeva, V. V., Smolkin, G. Ye.

TITLE: The Use of Multistage Electron-Optical Light Amplifiers in Astrophysics (O primenenii mnogokaskadnykh elektronno-opticheskikh usiliteley sveta v astrofizike)

PERIODICAL: Doklady Akademii nauk SSSR, Vol 121, Nr 5, 1958 pp 815 - 818 (USSR)

ABSTRACT: This paper investigates some problems connected with the application of electron-optical light amplifiers in astrophysics. The authors estimate the increase in efficiency of the utilization of the photon flux with respect to the usual photographic method. Under the investigated conditions, and in the case of equal dimensions of the pictures, the efficiency of the electron-optical method is by $\sim 4.10^3$ times higher than in ordinary photography. An increase in scale on the photocathode of the light amplifier reduces the increase in sensitivity of the electron-optical method compared with a usual photographic plate by 160 times. An estimation of the sensitivity

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The Use of Multistage Electron-Optical Light Amplifiers in Astrophysics SOV/20-121-5-13/50

of the light amplifiers gives a value of the order of 1000. The use of an electron-optical amplifier usually cannot increase the penetration range of the telescope. But the reduction of the times of exposure by hundreds of times of its amount due to the high sensitivity of the light amplifier essentially changes the possibilities of the astrophysical investigation. The short times of exposure permit the investigation of rapidly varying processes of very faintly visible objects and a considerable increase of the utilization coefficient of the astrophysical instruments. The reduction of the times of exposure is very important for astrospectroscopy. The above-discussed considerations are confirmed by the results obtained by experiments carried out by the authors in the Krymskaya astrofizicheskaya observatoriya AN SSSR (Crimean Astrophysical Observatory AS USSR). The proper noises of the light amplifier may be neglected in comparison with the background of the sky. According to the experimental values, the use of the light amplifier permitted a reduction of the times of exposure approximately to a thousandth part of their former amount

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The Use of Multistage Electron-Optical Light Amplifiers in Astrophysics SOV/20-121-5-13/50

which satisfactorily agrees with the above-given estimate. A figure shows the photographs of 2 extragalactic nebulae which were taken by means of a light amplifier. There are 4 figures, 1 table, and 6 references, 3 of which are Soviet.

ASSOCIATION: Krymskaya astrofizicheskaya observatoriya Akademii nauk SSSR (Crimean Astrophysical Observatory AS USSR) Glavnaya astronomicheskaya observatoriya Akademii nauk SSSR (Astronomical Main Observatory, AS USSR)

SUBMITTED: April 14, 1958

Card 3/3

BUTSLOV, M.M.; ZAVOSKIY, Ye.K.; PLAKHOV, A.G.; SMOLKIN, G. Ye.; FANCHENKO, S.D.

Electron optical method of the photography of ultrahigh-speed processes. Usp.nauch.fot. 6:84-89 '59. (MIRA 13:6)
(Electron optics)
(Photography, Instantaneous--Scientific applications)

BOLOTIN, V.F.; ZAVOYSKIY, Ye.K.; OGANOV, M.N.; SMOLKIN, G.Ye.; STRIGANOV, A.R.

[Use of electron-optical light amplifiers for spectroscopic studies of a weakly radiating plasma] O primenenii elektronno-opticheskikh usilitelei sveta dlia spektroskopicheskikh issledovanii slabosvetiashcheisia plazmy. Moskva, In-t atomnoi energii, 1960. 11 p. (MIRA 17:2)

AKHMATOV, A.P.; BLINOV, P.I.; BOLOTIN, V.F.; BORODIN, A.V.;
GAVRIN, P.P.; ZAVOYSKIY, Ye.K.; KOVAN, I.A.; OGANOV, M.N.;
PATRUSHEV, B.I.; PISKAREV, Ye.V.; RUSANOV, V.D.; SMOLKIN,
G.Ye.; STRIGANOV, A.R.; FRANK-KAMENETSKIY, D.A.; CHEREMNYKH,
P.A.; CHIKIN, R.V.

[Magnetoacoustic resonance in a plasma] Magnito-zvukovoi rezonans v plazme. Moskva, In-t atomnoi energii, 1960. 23 p.
(MIRA 17:2)

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S/056/60/039/003/002/045
B004/B060

26.1410

AUTHORS: Akhmatov, A. P., Blinov, P. I., Bolotin, V. F., Borodin, A. V., Gavrin, P. P., Zavoyskiy, Ye. K., Kovan, I. A., Oganov, M. N., Patrushev, B. I., Piskarev, Ye. V., Rusanov, V. D., Smolkin, G. Ye., Striganov, A. R., Frank-Kamenetskiy, D. A., Cheremnykh, P. A., Chikin, R. V.

TITLE: Magnetoacoustic Resonance in the Plasma

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 39, No. 3 (9), pp. 536-544

TEXT: The authors wanted to study the penetration of oscillations into the plasma taking place transversally to a static magnetic field. From the physical point of view, this process has a course similar to acoustic oscillations, with the difference that the magnetic pressure $H^2/8\pi$, and not the gas pressure, is effective here. (1) is written down as a resonance condition: $aH_0/\omega R\sqrt{4\pi\rho} = 1$, where a is a dimensionless number characterizing the type of oscillations, H_0 the strength of the

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static magnetic field, ρ the density of the plasma, ω the cyclic frequency, and R the radius of the plasma cylinder. The following is written down for the radial amplitude of the plasma motion velocity: $v_r \approx \tilde{H}v_{ph}/H_0 \approx \tilde{H}/\sqrt{4\pi\rho}$ ($\tilde{H}$ - strength of the magnetic alternating field, v_{ph} = phase velocity of the magnetic field). The interaction of an electromagnetic high-frequency field $\tilde{H}$ with a cold plasma was experimentally investigated in a cylinder in the presence of an axial quasistatic magnetic field H_0. Fig. 1 shows the scheme of the apparatus used for the experiments. In one such experimental series the alternating field had a frequency of 12.5 Mc/sec, while in another series the frequency was 50 Mc/sec. The plasma glow was recorded by means of an ФЭУ-19 (FEU-19) photomultiplier and an ОК-17М (OK-17M) oscilloscope, while the penetration of high-frequency oscillations into the plasma and the radial amplitude distribution of the magnetic alternating field were studied with the aid of a magnetic probe. The experiments were conducted with hydrogen, helium, argon, and air at an initial pressure of

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10^{-4} - 6.10^{-3} torr. The oscillograms of Figs. 2,3 show that resonance phenomena appear in the range between 300 oersteds and 5 kilooersteds. Fig. 4 shows the effect of resonance on the spectral lines of hydrogen. There is a dependence of the amplitude H_r of the magnetic resonance field on the amplitude of the $\tilde{H}$-field. Fig. 5 shows the spatial distribution of the amplitude H_r of the resonance field in hydrogen and argon. As may be seen from Fig. 6, the resonance shows a fine structure. This effect is being further investigated. A gas temperature of 2.5 ev was calculated from the Doppler broadening of the H_β line (Figs. 7,8) corresponding to 0.8 A. Experimental data for H_r confirmed the validity of equation (1). Experiments with argon at frequencies above the hybrid frequency yielded no appreciable difference as compared with the effect observed with frequencies below the hybrid frequency. The authors assume that the appearing oscillations propagated obliquely, not perpendicularly to H_0. This was confirmed by measurement of the azimuthal component of the magnetic field H_φ (Fig. 9). The authors thank I. V. Kurchatov, Academician, for interest displayed in the work. There are 9 figures and 4 references: 2 Soviet, 1 US, and 1 German.

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SUBMITTED: April 2, 1960

Zavoyskiy, Ye. K.

22770
S/057/61/031/005/001/020
B104/B205

21.2311

AUTHORS: Zavoyskiy, Ye. K., Kovan, I. A., Patrushev, B. I., Rusanov, V. D., and Frank-Kamenetskiy, D. A.

TITLE: Magnetosonic method of plasma ionization

PERIODICAL: Zhurnal tekhnicheskoy fiziki, v. 31, no. 5, 1961, 513-517

TEXT: The conventional methods of producing concentrated plasma are discussed in the introduction. It is noted that the application of these methods to a magnetic field is limited. The thermal method can only be used for atoms of low ionization potentials. Ionization by longitudinal current causes instabilities, and ionization by an oscillating electron beam meets with experimental and technical difficulties. The concentration of plasma attainable by h-f discharge is limited by the plasma frequency, and the production of concentrated plasma by a longitudinal alternating field requires the use of millimeter and sub-millimeter waves. The authors tested several methods of obtaining concentrated plasma, which are not limited by the plasma frequency. This is achieved by an alternating electric field, the electric vector of which is perpendicular to a

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static magnetic field. This method makes it possible to use electron and ion-cyclotron or magnetosonic resonances. The latter method is not limited as to the attainable plasma concentration. It makes use of magnetosonic oscillations of a limited plasma volume, and from the theory of these oscillations it follows that the velocity amplitude of the azimuthal electron drift is given by $v_e = \omega V/\omega_i$ (1), where V denotes the velocity amplitude of the radial plasma motion. For the kinetic electron energy one has

$$E=\frac{mv_e^2}{2}=\frac{1}{2}\frac{\omega^2}{\omega_i\omega_e}\frac{\tilde{H}^2}{4\pi n_e}. \quad (3)$$

where H_0 indicates the strength of the static magnetic field, $\tilde{H}$ the amplitude of the alternating magnetic field, and ω its frequency; ω_e and ω_i are the electron and ion cyclotron frequencies, respectively, and n_e denotes the electron concentrations. Ionization by radial magnetic sound is possible if its energy is higher than the ionization energy. It is obvious that the required amplitude of the alternating field is the higher, the higher are the concentration and strength of the static field. With a given amplitude of the h-f field $\check{H}$ and a given plasma concentration, there exists a threshold H^* of the static field strength above which ionization will not be possible any longer. By increasing the amplitude of the h-f field, the strength of the static field and the attainable plasma concentration can be extended infinitely. In a strong static field, however, a very strong alternating field is required for obtaining high concentrations by radial magnetic sound. Ionization by magnetic sound has been observed experimentally in a quasi-static field in several installations. Effective ionization occurred both below and above the hybrid frequency, resulting in concentrations of more than 10^{13} cm^{-3}. The ionization had the nature of resonance and was always accompanied by the penetration of an alternating field into the plasma. Fig. 1 shows resonance ionization by a h-f magnetic field with an increase of the quasi-static magnetic field in time. By blanking a 3-cm probe signal it was possible to indicate a concentration higher than 10^{12} cm^{-3}. The penetration of an external h-f field was observed by means of a magnetic probe introduced into the discharge space. In fields larger than H^*, concentration dropped considerably. It could be shown that in experiments

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with a quasi-static magnetic field, H^* is a linear function of $\tilde{H}$. This can be explained by formula (3). The calculated values of H^* are somewhat lower than the experimental ones, i.e., ionization can be achieved more easily than would have been expected from the drift. This can be ascribed to longitudinal currents which are due to the fact that the oscillations are not completely radial. Based on these results the authors designed the model of a plasma source with magnetosonic ionization. The plasma comes from the source which is placed in a magnetic field and flows along the field into a measuring volume. In previous experiments, a plasma column having a diameter of 6 cm and a concentration of 10^{12} cm^{-3} was obtained in the measuring volume at a rated power of the ionization generator of 4 kw. The experiments were made above the hybrid frequency, in weak magnetic fields where the drift motion imparts energy to the electrons, which is sufficiently high for ionization. There are 4 figures and 8 references: 7 Soviet-bloc and 1 non-Soviet-bloc. The reference to the English-language publication reads as follows: P. C. Thonemann et al., Nature, 181, 217 1958.

SUBMITTED: July 21, 1960

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20452
S/056/61/040/002/005/047
B113/B214

24,7900 (1147,1158,1160)

AUTHORS: Zavoyskiy, Ye. K., Skoryupin, V. A.

TITLE: Magnetic analyzers of emission spectra

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 40, no. 2, 1961, 426-432

TEXT: An investigation is made of the extent to which the phenomena of paramagnetic and other forms of magnetic resonance can be used for the study of emission spectra. Some methods are described in this paper. Theory and description of some magnetic spectral analyzers (MSA) are given. The principle of such an analyzer may be seen from Fig.1. 1 is the input broad-band appliance which guarantees the connection of line 2 with the radiating system. 3 is the load resistance of the line, 4 is a broad-band detector; 5 is a recording instrument, for example, an oscilloscope; and H is a quasistatic magnetic field. For a spiral wire without ohmic loss, the decrement of damping is given by

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$$\alpha = \frac{2\pi^4 \nu^2 g^2 \beta^2 N \delta f(\nu) r n_1 \sqrt{\varepsilon\mu}}{kTAc} \frac{S(S + 1) - M(M - 1)}{2S + 1} \quad (4),$$

where γ is the frequency, g - spectroscopic splitting factor, β - Bohr magneton, N - number of paramagnetic particles, δ - density of the paramagnetic, k - Boltzmann's constant, T - the temperature, $f(\nu)$ - a function having the form of the paramagnetic resonance curve, S - spin, M - quantum number, ε - dielectric constant, μ - magnetic permeability, n_1 - number of windings per cm of the line, and r - radius of the spiral.

$$\alpha_{н.п.} = \frac{\pi^3 \nu^2 g^2 \beta^2 N \delta f(\nu) \sqrt{\varepsilon\mu}}{kTAc} \frac{S(S+1) - M(M-1)}{2S+1}.$$

holds for a coaxial line. The total damping factor of the line per unit length is given by: $\alpha + \alpha_0 + \alpha_1$, where α_0 is the part due to loss in the conductor, and α_1 that due to loss without resonance. If the spectrum consists of one or several monochromatic lines, then, at a rate of change of the magnetic field of $7 \cdot 10^7$ oe$\cdot$sec^{-1}, a transmission band of

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$3.5 \cdot 10^7$ cps is necessary for the recording instrument in order to record these lines; for continuous emission spectra, the frequency need not be so high. If there are m grams of a paramagnetic in the line, the highest energy that can be absorbed by it in a time smaller than the relaxation time T_0 is equal to: $U = (N/A)(g\beta^2 H^2/kT)m$ (9). If the pulse duration $\tau < T_0$, the pulse output is $W = U/\tau$ which causes the saturation of paramagnetic resonance. To avoid this, W must be less than U/τ. A ferrite can also be used, but it has the disadvantage that there is a non-resonance change in the loss due to the change of the constant magnetic field. Ferrites for which this is not the case and which have a narrow resonance line can replace paramagnetics in the region $\lambda > 3$ cm. Four MSA circuits were investigated. The first works on the principle of compensation at low and high frequencies. Two similar lines containing a paramagnetic are used. The second works as a discrete "resonance" spectral analyzer. The third is a spectral analyzer which uses the induced radiation for the amplification of weak signals. Finally, the fourth is an induction MSA. Measurements were made of the damping

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factor of the line, of the non-resonant loss in the paramagnetic, of the sensitivity of MSA, and of the dielectric constant of the paramagnetic. The compensation principle of the MSA was also tested. Also the paramagnetic resonance curve of $MnSO_4$, shown in Fig. 3, was recorded for a rate of growth of the magnetic field $dH/dt = 2.5 \cdot 10^9$ oe. For a transmission band of the amplifier of 2 Mc/sec, the measurement of the sensitivity of MSA gave the result 10^{-9}w. Experiments with ferrites showed that they can be used in MSA. It is, therefore, possible to use the phenomenon of magnetic resonance for static and dynamic analysis of the radiation of a wide range of waves, where MSA can be used best in the millimeter and sub-millimeter ranges. Academician A.Ye.Arbuzov and Professor F. G. Valitova are thanked for the preparation of the diphenyl-picrylhydrazyl preparations, and Professor S. A. Al'tshuler for discussions. There are 5 figures, 1 table, and 2 references: 1 Soviet-bloc and 1 non-Soviet-bloc.

SUBMITTED: July 18, 1960

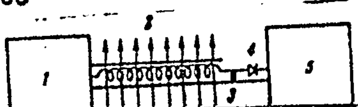

Fig. 3

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26.2311

AUTHORS: Bartov, A. V., Zavoyskiy, Ye. K., Frank-Kamenetskiy, D. A.

TITLE: Magnetoacoustic resonance in strong magnetic fields

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 41, no. 2(8), 1961, 588-591

TEXT: The authors put aside the previous limiting condition $\omega_0^2 \gg \omega_e^2$ in order to study the possibility of the occurrence of resonance phenomena of the magnetoacoustic type in a plasma with a concentration variable in time. They study the case where the plasma frequency is of the same order as, or less than, the electron cyclotron frequency. Here, ω_e denotes the electron cyclotron frequency. This case occurs either in a rarefied plasma (low plasma frequency) or in very strong magnetic fields (high cyclotron frequency). A plasma with a cyclotron frequency higher than collision frequency is said to be magnetized (with regard to collisions). If the cyclotron frequency is higher than the plasma frequency, the electrostatic oscillations will be magnetized. Such a

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plasma shows oscillatory magnetization. Then, the ratio $\omega_o^2/\omega_e^2 = 4\pi nmc^2/H^2$ is about the same as the ratio of electron rest energy to magnetic energy. Thus, a plasma with magnetic energy higher than the electron rest energy will undergo oscillatory magnetization. In a rarefied plasma, the resonance frequency of magnetic sound will, with a purely radial propagation, approach the lower hybrid frequency. The following general expression for the lower hybrid frequency is derived:

$$\omega_h^2 = \omega_1\omega_e \frac{\omega_o^2 + \omega_1\omega_e}{\omega_o^2 + \omega_e^2} \qquad (1).$$

The approximate formula derived by D. A. Frank-Kamenetskiy (ZhETF, 39, 669, 1960) holds for $\omega_o^2 \gg \omega_1\omega_e$. When $\omega_o^2 \ll \omega_1\omega_e$, the lower hybrid frequency tends towards the ion cyclotron frequency, and when $\omega_o^2 \gg \omega_e^2$, towards the geometric mean of ion-electron the cyclotron. There is a wide interval $\omega_e^2 \gg \omega_o^2 \gg \omega_1\omega_e$, in which the approximate formula for the lower hybrid frequency reads $\omega_h^2 \sim \omega_0^2\ \omega_i/\omega_e$ (2). Here, the lower hybrid frequency is proportional to the plasma frequency. At a given magnetic field strength (ω_e = const) the resonance frequency of magnetic sound decreases with increasing concentration in a dense plasma and increases in a rarefied one. In between, it should pass through a maximum. If the maximum is flat enough, resonance may occur over a wide range of concentrations. The dispersion relation

$$\Omega^5 - b_4\Omega^4 + b_3\Omega^3 - b_2\Omega^2 + b_1\Omega - b_0 = 0; \quad (7)$$
$$b_4 = 3A + B + 2R\,(1 + \mathrm{ctg}^2\,\theta),$$
$$b_3 = A^2 + 3AB + B^2 - [2A + B + R\,(1 + \mathrm{ctg}^2\,\theta)]^2,$$
$$b_2 = (A + B)\,[A + R\,(1 + \mathrm{ctg}^2\,\theta)]^2 - AB\,(A + R),$$
$$b_1 = AR\,[A + R + BR\,\mathrm{ctg}^2\,\theta\,(1 + \mathrm{ctg}\ \theta)],$$
$$b_0 = AR^2\,\mathrm{ctg}^2\,\theta\,(1 + \mathrm{ctg}^2\,\theta).$$

defines the dimensionless frequency $\Omega = \omega^2/\omega_i\omega_e$. Neglecting all coefficients except b_2 and b_1, the following approximate formula is

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obtained where $\cot^2\theta \ll 1$: $\Omega = (1 + \frac{BR}{A+R}\cot^2\theta) \Big/ \left(\frac{A}{R} + 1 + \frac{B}{A}\right)$ (8). The formula corresponds to the "long cylinder approximation". In these formulas, $A = \omega_0^2/\omega_i\omega_e$ (4) indicates the square of the Alfvèn index of refraction; $B = \omega_e/\omega_i$ is the ratio of the cyclotron frequencies; $R = k_1^2c^2/\omega_i\omega_e = k_1^2\tilde{r}_i\tilde{r}_e$; $\tan\theta = k_1/k_3$. Here, ω is resonance frequency; ω_0 is plasma frequency; ω_e and ω_i are the electron and ion cyclotron cyclic frequencies; k_1 and k_3 are the radial and the longitudinal wave numbers; $\tilde{r}_e$ and $\tilde{r}_i$ are the cyclotron radii at the velocity of light; and $0 \leqslant \theta \leqslant \pi/2$. Under the usual experimental conditions, the "long cylinder approximation" is satisfied with sufficient accuracy. When $\theta = \pi/2$, the maximum in this approximation lies at $A = \sqrt{BR}$, and the maximum value of the dimensionless frequency is $\Omega_m = \sqrt{BR}/(2B + \sqrt{BR})$ (9). The position of the maximum is only slightly shifted, whereas its height increases considerably. The authors' investigations are of great importance in the interpretation of

27202

S/056/61/041/002/024/028
B125/B138

Magnetoacoustic resonance in strong...

experiments on magnetoacoustic resonance under non-linear conditions. There are 1 figure and 7 references: 4 Soviet and 3 non-Soviet. The reference to the English-language publication reads as follows: P. Auer, H. Hurwitz, R. Miller. Phys. Fluids, 1, 501, 1958.

SUBMITTED: March 16, 1961

Card 5/5

BABYKIN, M.V.; GAVRIN, P.P.; ZAVOYSKIY, Ye.K.; RUDAKOV, L.I.; SKORYUPIN, V.A.

Turbulent heating of a plasma. Zhur. eksp. i teor. fiz. 43 no.2: 411-421 Ag '62. (MIRA 16:6)
(Plasma (Ionized gases)) (Electromagnetic waves)

BABYKIN, M.V.; GAVRIN, P.P.; ZAVOYSKIY, Ye.K.; RUDAKOV, L.I.;
SKORYUPIN, V.A.

Capture and confinement of a turbulent heated plasma in a magnetic trap. Zhur. eksp. i teor. fiz. 43 no.4:1547-1549 O '62. (MIRA 15:11)

(Plasma (Ionized gases))
(Magnetic fields)

BABYKIN, M.V.; ZAVOYSKIY, Ye.K.; RUDAKOV, L.I.; SKORYUPIN, V.A.

Observation of a double-flow ion instability in turbulent heating of a plasma. Zhur. eksp. i teor. fiz. 43 no.5:1976-1978 N '62. (MIRA 15:12)

(Plasma (Ionized gases))

S/089/63/014/001/007/013
B102/B186

AUTHOR: Zavoyskiy, Ye. K.

TITLE: Collective interaction and the problem of producing high temperature plasma

PERIODICAL: Atomnaya energiya, v. 14, no. 1, 1963, 57-65

TEXT: The author gives a review of the present position of theoretical and experimental investigations into the mechanism of the turbulent heating of plasma. The mechanism depends on the fact that a large part of the energy from strong electromagnetic oscillations is absorbed by the plasma through a kind of resonance absorption. As a consequence of the collective interaction there an energy dissipation occurs and the plasma electrons become strongly heated. According to a two-current mechanism described by B.B. Kadomtsev the energy of the electrons can be transferred to the ions. The following problems are treated in detail: The conditions for the build-up of electron oscillations in the plasma, the build-up of ion oscillations, the pinch effect in a turbulent heated plasma, experiments relating to collective interaction. The results

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S/089/63/014/001/007/013
Collective interaction and the ... B102/B186

given here were already published by: M.V. Babykin et al. (IAEA Plasma Conference at Salzburg, 1961; Paper 209; Zh. eksperim.i teor.fiz., 43, no.2(8),411,1962; 43,4,1547,1962; 43,5,1976,1962), A.A. Vedenov, Ye. P. Velikhov, R. Z. Sagdeyev (Yadernyy sintez (Nuclear synthesis),1,82,1961)), B.B. Kadomtsev (Sbornik "Fizika plazmy",("Plasma Physics"),v.4,M.Izd-vo AN SSSR, 1958,p.364); D.A. Frank-Kamenetskiy, (Zh.eksper. i teor.fiz.39, 669,1960). [Abstracter's note: cf also Vedenov, Velikhov, Atomnaya energiya 13, pp. 5-24, 1962 and DAN 146, 1, 65, 1962.].

SUBMITTED: October 15, 1962

Card 2/2

AFONIN, I. P.; GAVRILOV, B. I.; ZAVOYSKIY, Ye. K.; KARMANOV, F. V.; MAKSIMOV, G. P.; PLAKHOV, A. G.; CHEREMNYKH, P. A.; SHAPKIN, V. V.

The experimental plasma apparatus C-1 with screw magnetic fields. Atom. energ. 14 no.2:143-150 F '63. (MIRA 16:1)

(Plasma(Ionized gases)) (Magnetic fields)

L 17870-63 EWT(1)/EWG(k)/BDS/EEC(b)-2/ES(w)-2 AFFTC/ASD/ESD-3/AFWL

L 39662-66 EPF(n)-2/EEC(k)-2/EWT(1)/ETC(f)/EWG(m) IJP(c) AT/GD-2

ACC NR: AT6001404 SOURCE CODE: UR/3180/64/009/000/0175/0183

AUTHOR: Bolotin, V. F.; Demidov, B. A.; Zavoyskiy, Ye. K.; Skachkova, Yu. F.; Smolkin, G. Ye.; Fanchenko, S. D.

ORG: none

TITLE: Further development of the electrooptical chronographic method and its application to physical plasma investigations

SOURCE: AN SSSR. Komissiya po nauchnoy fotografii i kinomatografii. Uspekhi nauchnoy fotografii, v. 9, 1964. Vysokoskorostnaya fotografiya i kinomatografiya (High-speed photography and cinematography), 175-183 and insert facing page 169

TOPIC TAGS: time measurement, electric discharge, electrooptic image intensifier, plasma diagnostics

ABSTRACT: It was established earlier that the multistage electrooptic converter invented by Prof. M. M. Butslov has a limiting brightness amplification coefficient which allows it to register single photons. Theoretical discussions showed that similar setups can have a resolving time down to 10^{-14} sec and some spark radiation scanning experiments achieved a resolution of $3 . 10^{-12}$. This led to the use of similar devices in electrooptical chronography. This article surveys the principles of operation of electrooptical devices and the results of plasma investigations using electrooptical chronography. The authors cover 1) the methodology of electrooptical chronography, including power feeding and synchronization of multistage electrooptical converters and time scanning of converted images; and 2) physical

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ACC NR: AT6001404

studies of the plasma including processes in spark discharge plasmas (circuit and block diagrams of setups for time scanning, spark channel widening velocity data), use of electrooptical chronography for the study of HF-field interaction with plasma (block diagram of a device for the study of plasma luminosity during magnetoacoustic resonance), and a brief discussion of special features of electrooptical investigation of plasmas. A resonator for the scanning systems was proposed by R. V. Chikin of the Butslov laboratory. Orig. art. has: 11 figures and 1 table.

SUB CODE: 14, 20 / SUBM DATE: none / ORIG REF: 015

Card 2/2 ✓ 5

ACCESSION NR: AP4019216 S/0056/64/046/002/0511/0530

AUTHORS: Baby*kin, M. V.; Gavrin, P. P.; Zavoyskiy, Ye. K.; Rudakov, L. I.; Skoryupin, V. A.; Sholin, G. V.

TITLE: New results on the turbulent heating of plasma

SOURCE: Zhurnal eksper. i teor. fiz., v. 46, no. 2, 1964, 511-530

TOPIC TAGS: plasma, plasma heating, turbulent plasma, heating, plasma electron heating, plasma ion heating, collisionless plasma heating, plasma confinement, plasma confinement time, electron confinement time, ion confinement time

ABSTRACT: This is a continuation of earlier work by the same authors on turbulent plasma heating in a rapidly alternating magnetic field (Yaderny*y sintez, Appendix III, 1962; ZhETF, v. 43, pp. 411, 1547, and 1976, 1962). The present paper reports the results of experiments with a net setup, the parameters of which have made possible (1) rapid collisionless heating of the plasma electrons to 1.5 keV by a strong hydrodynamic wave propagating in the plasma transversely

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ACCESSION NR: AP4019216

through the magnetic field; (2) investigations of the confinement of a plasma in a magnetic trap; (3) observations of the collisionless heating of ions, which accompanies the turbulent heating of the electrons under certain conditions. The electron temperature was determined from the absorption of the electron bremsstrahlung in thin carbon films, from the ratio of the rates of decay of various spectral lines, and from readings of a probe. The plasma concentration was determined by optical means. The noise produced in the plasma was due to ion cyclotron oscillations and to magnetic sound resonance. A plasma electron pressure of 10^{15} eV/cm^3 (approximately 20% of the alternating magnetic field pressure) was obtained in the concentration range from 10^{12} to 10^{13}/cm^3. Confinement times were ~130 μsec for ~100-eV ions and ~60 μsec for 500-eV electrons. No strong instabilities were observed during the time of plasma confinement in the trap. Ion cyclotron waves and natural oscillations of the plasma column were

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ACCESSION NR: AP4019216

observed. A theoretical mechanism is proposed for this electron heating and is found to agree qualitatively with experimental results. Orig. art. has: 17 figures and 10 formulas.

ASSOCIATION: None

SUBMITTED: 13Aug63 DATE ACQ: 27Mar64 ENCL: 01

SUB CODE: PH NO REF SOV: 008 OTHER: 002

Card 3/3

ACC NR: AT7008874 SOURCE CODE: UR/0000/65/000/000/0003/0008

AUTHOR: Zavoyskiy, Ye. K. (Academician)
ORG: none

TITLE: Progress in plasma studies

SOURCE: Problemy termoyadernykh issledovaniy, 1965, 3-8

TOPIC TAGS: plasma heating, plasma jet, plasma oscillation

SUB CODE: 20

ABSTRACT: The advances in understanding of the two basic unresolved problems of plasma physics - the heating of plasma and the containment of such plasmas within a given volume - are discussed on an elementary level. The first apparent stumbling block has been the need for extremely high magnetic fields (about 100,000 oersteds) to keep the 1 billion-degree plasma from leaving the magnetic trap. In addition, the process of heating the plasma seemed to deform the trapping magnetic fields, leading to an escape of plasmas. The first hope of plasma stabilization appeared when it was discovered in the Soviet and US laboratories that small admixtures of cold plasma stabilized the so-called channel instability. The next step was in the direction of plasma heating by means of electron jets which, upon entering the plasma, excite plasma oscillations and cause the turbulent heating of

Card 1/2 UDC: none

0929 1672

ACC NR: AT7008874

plasma. This heating seems to proceed during such short intervals that the plasma does not have time, in spite of its high temperature, to escape the magnetic trapping field. It is clear, however, that all these advances refer to experimental apparatuses which are still very small as compared with those needed for carrying out tests which would be of practical interest. Further progress may come only after other large-scale preliminary investigations conducted basically at the scientific-research level rather than in the domain of engineering applications. Orig. art. has: 1 formula. [JPRS]

APPROVED FOR RELEASE: 03/15/2001 CIA-RDP86-00513R001964010017-2"

L 40883-66 EWT(1) WW/GD

ACC NR: AT6021838 (A) SOURCE CODE: UR/0000/65/000/000/0100/0108

40
B+1

AUTHOR: Zavoyskiy, V. K.

ORG: All-Union Polytechnic Institute, Moscow (Vsesoyuznyy politekhnicheskiy institut, Moskva)

TITLE: Heat transfer in a boiling liquid

SOURCE: Teplo- i massoperenos. t. III: Teplo- i massoperenos pri fazovykh prevrashcheniyakh (Heat and mass transfer. v. 3: Heat and mass transfer in phase transformations). Minsk, Nauka i tekhnika, 1965, 100-108

TOPIC TAGS: heat transfer, boiling

ABSTRACT: In the most general form of the problem, the heat flux can be described in the following manner:

$$q(t) = \int_{R=0}^{\infty} N(t) \frac{dv}{dt} r \gamma'' f(R, t)\, dR, \qquad (1)$$

where γ'' is the density of the vapor; f is the distribution function of the bubbles. It is evident from the above that to determine the heat

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ACC NR: AT6021838

flux it is necessary to know the rate of growth of a vapor bubble, the distribution of the bubbles, and their total number. The article next considers the growth of an ensenble of vapor bubbles, and derives the corresponding equations. Finally, the author proceeds to the determination of the heat transfer coefficient, making use of the following basic formulation of the problem:

$$k = \frac{q}{S''\Delta T}, \qquad (6)$$

where S" is the total phase separation surface and k is the heat transfer coefficient from the liquid phase to the vapor phase. Orig. art. has: 9 formulas and 3 figures.

SUB CODE: 20/ SUBM DATE: 09Dec65/ ORIG REF: 007/ OTH REF: 003

Card 2/2 mlp

ZAVOYSKIY, Ye.K., akademik

[illegible]rbulent heating of plasma. [illegible] AN SSSR 3[illegible] [illegible]:53 5[illegible] My [illegible].

APPROVED FOR RELEASE: 03/15/2001 CIA-RDP86-00513R001964010017-2"

ZAVOYSTYY, S. A.

"Epidemic, Contagious and Erosive Stomatitis," Vest. Venerol. i Dermatol.,

No. 3, 1949.

Lt. Col., Med. Corps.-c1949-.

Mil. Med. Acad. im. S. M. Kirov (Mbr., Chair Microbiology,-c1949-; Mbr.,

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ZAVOYSTYI, S.A., kandidat meditsinskikh nauk.

Surface tension of urine in dermatoses. Vest.ven.i derm. no.2:57-58 Mr-Ap '53. (Urine) (Skin--Diseases)

ZAVOYSTYY, G.A., kandidat meditsinskikh nauk

[redacted]

Treating dermatosis with protective inhibition. Vest. ven. i derm. no.1:44 Ja-F '55. (MIRA 8:4)
(SKIN--DISEASES) (SLEEP--THERAPEUTIC USE)

ZAVOZIN, L.

"Handbook of the mine electrician" by A.M.Varshavskii, B.Z.Palei. Reviewed by L.Zavozin. Sov.shakht. 11 no.11:44 N '62. (MIRA 15:11)

(Electricity in mining) (Varshavskii, A.M.) (Palei, B.Z.)

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"For the operator of mine electric locomotives" by E.A.Vasil'ev. Reviewed by L. Zavozin. Sov.shakht. 10 no.4:42-43 Ap '61. (MIRA 14:9)

(Electric locomotives)

KARATYGIN, A.M., kand. tekhn. nauk; KORSHUNOV, B.S., kand. tekhn. nauk; MASLOV, Ye.N., prof., doktor tekhn. nauk, retsenzent; ZAVOZIN, L.F., inzh., red.; IVANOVA, N.A., red.izdva; EL'KIND, V.D., tekhn. red.

[Grinding and lapping metal-cutting tools] Zatochka i dovodka rezhushchego instrumenta. Izd.2., perer. i dop. Moskva, Mashgiz, 1963. 270 p. (MIRA 16:12)
(Metal-cutting tools)
(Grinding and polishing)

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[Angara and its basin; outline of the hydrology] Angara i ee basseing gidrologicheskii ocherk. Moskva, Izd-vo Akad. nauk SSSR. 1962. 90 p. (Akademiia nauk SSSR. Sibirskoe otdelenie. Vostochno-Sibirskii geologicheskii institut. Trudy, no.12). (MIRA 15:11)

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(Mine pumps) [Microfilm]

ZAVOZIN, Leonid Filippovich; D'YAKOVA, G.B., red.izd-va; BEKKER, O.G., tekhn.red.

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