MANENKOV, A. A.

MANENKOV, A. A. - "Paramagnetic resonance in certain compounds of elements in the iron and rare-earth groups". Moscow, 1955. Acad Sci USSR, Physics Inst imeni P. N. Lebedev. (Dissertation for the Degree of Candidate of Physicomathematical Sciences.)

SO: Knizhnaya Letopis' No. 46, 12 November 1955. Moscow

MANENKOV, A.A.

USSR/Physics - Paramagnetic resonance FD-2366

Card 1/1 Pub. 146 - 31/34

Author : Manenkov, A. A., and Prokhorov, A. M.

Title : Fine structure of the spectrum of paramagnetic resonance of Cr^{3+} ion in chromium corundum

Periodical : Zhur. eksp. i teor. fiz. 28, 762, Jun 1955

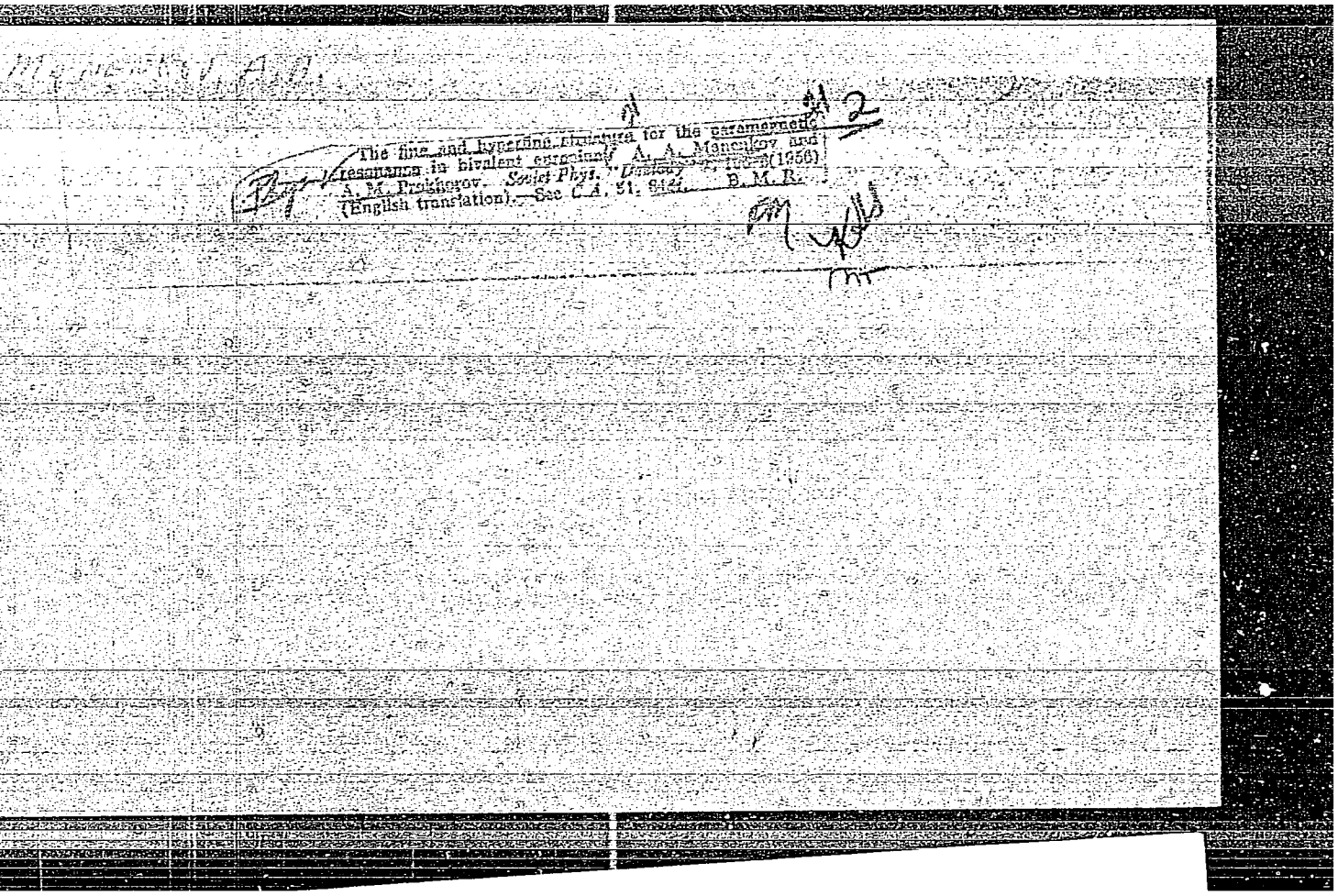
Abstract : The authors investigated the spectrum of paramagnetic resonance in the solid solution Al_2O_3-Cr_2O_3 (chromium corundum) for concentration of chromium of 0.05%, which compound was earlier studied by S.-Kh. G. Kashayev (Dissertation, Molotov University, 1954) but without successfully explaining the observed spectrum. They investigated this compound at two frequencies, 11970 and 8960 megacycles, and at room temperature. They note that paramagnetic resonance of chromium salts have been best studied in alums (V. Bleaney, Rep. Progr. Phys. 16, 108, 1953). The authors observed two lines at 8960 and four lines at 11970 and in agreement with theory find that the relative intensities of the lines depend upon the angle between the axis of symmetry of the crystal and direction of the radiofrequency field. Two ref.

Institution : Physical Institute im. P. N. Lebedev, Academy of Sciences USSR

Submitted : February 26, 1955

MANENKOV, A. A., and PROKHOROV, A. M., (Moscow)

"Fine and Superfine Structure of the Paramagnetic Resonance in Bivalent Europium," a paper submitted at the International Conference on Physics of Magnetic Phenomena, Sverdlovsk, 23-31 May 56.



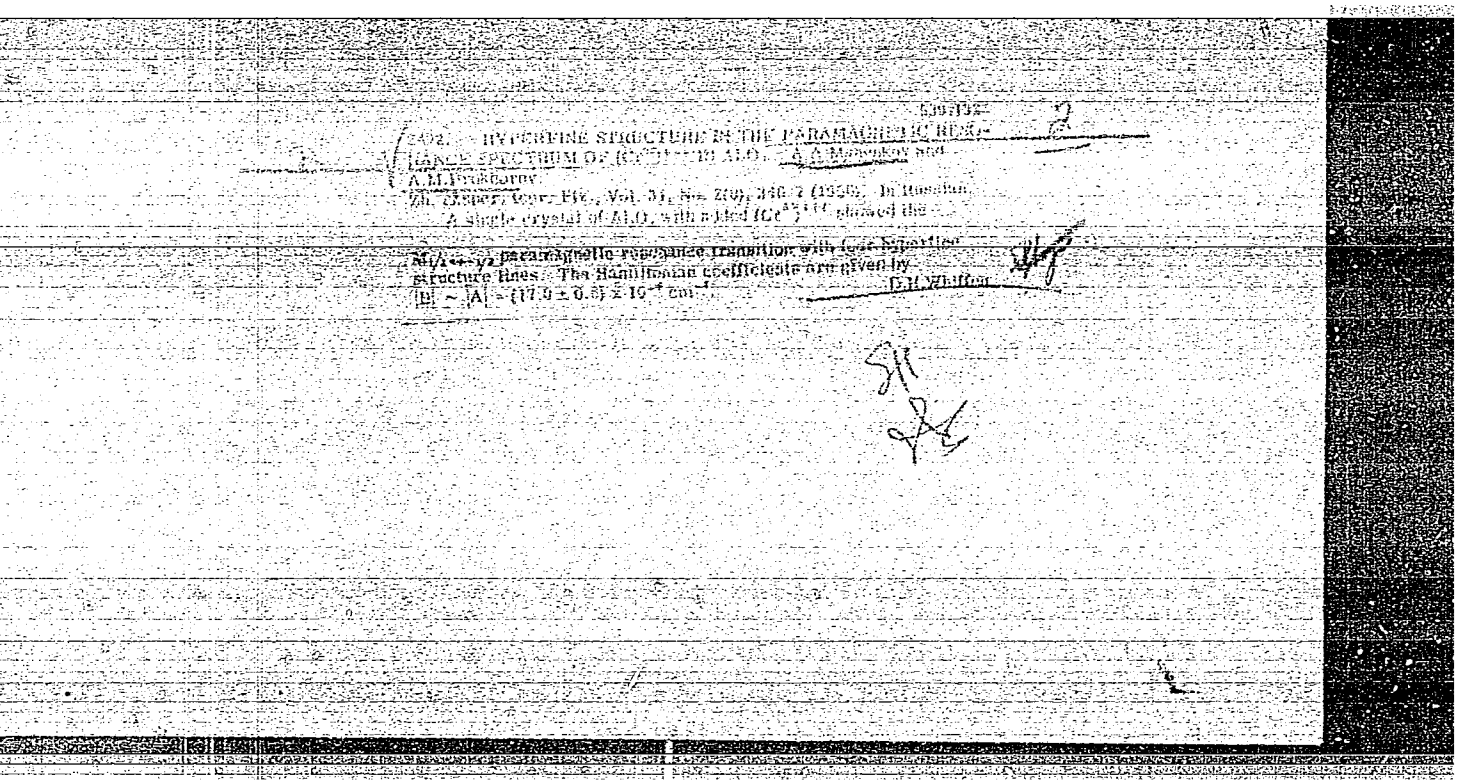
The fine and hyperfine structure for the paramagnetic resonance in bivalent europium A. A. Manenkov and A. M. Prokhorov. *Soviet Phys. "Doklady"* (1956) (English translation).—See *C.A.*, 51, 9121. E. M. R.

USSR / Radio Physics, Application of Radio-Physics Methods. I-12

Abs Jour : Ref Zhur - Fizika No 3, 1957, No 7391

Abstract : natural frequency of the resonator, [illegible] frequency of the generator, and H_{res} is the resonant frequency of the magnetic field.

Card : 2/2



Manenkov, A.A.

538.222 : 539.152.1

6784. FINE AND HYPERFINE STRUCTURE OF THE PARAMAGNETIC RESONANCE OF DIVALENT EUROPIUM.
A.A.Manenkov and A.M.Prokhorov.

Dokl. Akad. Nauk SSSR, Vol. 107, No. 3, 402-4 (1956). In Russian.

In the electron resonance spectrum of Eu^{++} in SrS there are 12 hyperfine lines in the $M = 1/2$ to $-1/2$ transition and the spins of Eu^{151} and Eu^{153} are both 5/2. The Hamiltonian coefficients are $A_{151} = 30.0 \pm 0.1$) and $A_{153} = (13.4 \pm 0.1) \times 10^{-4}$ cm^{-1}, $g = 1.992 \pm 0.00$ and the ratio $\mu_{151}/\mu_{153} = 2.24 \pm 0.03$. For a single crystal with Eu^{++} in CaF_2 $A_{151} = (34.67 \pm 0.1)$, $A_{153} = (15.41 \pm 0.1) \times 10^{-4}$ cm^{-1}, $g = 1.971 \pm 0.001$ and $\mu_{151}/\mu_{153} = 2.25 \pm 0.03$.

D.H.Whiffen

51-4-10/25

AUTHORS: Manenkov, A.A., Prokhorov, A.M., Trapeznikova, Z.A. and Fok, M.V.

TITLE: Application of the paramagnetic resonance method to the study of the activator state in phosphors. (Primeneniye metoda paramagnitnogo rezonansa dlya issledovaniya sostoyaniya aktivatora v fosforakh.)

PERIODICAL: "Optika i Spektroskopiya" (Optics and Spectroscopy), 1957, Vol.2, No.4, pp.470-474 (U.S.S.R.)

ABSTRACT: This paper was presented at the 5th Conference on Luminescence in Tartu, June, 1956. From the nature (or absence) of the paramagnetic resonance spectrum of a crystal it is possible to deduce the valency state (and changes of that valency state) of paramagnetic ions in crystal. This is more difficult for powders when the paramagnetic absorption lines may be very broad due to relaxation or anisotropy. These difficulties are particularly pronounced for the case of ions whose paramagnetism is due to unpaired d-electrons. Results are reported for powdered SrS:Eu, SrS:Gd and for artificial CaF_2:Eu monocrystals. Measurements were carried out at 9340 Mc/s and at room temperature. The apparatus used is described in Radiotekhnika i Elektronika, Vol.1, 469, 1956. Some of the present results were reported earlier (A.A.Manenkov and A.M.Prokhorov, Doklady Akad. Nauk SSSR,

Card 1/3

Application of the paramagnetic resonance method to study of the activator state in phosphors. (Cont.)

Vol.107, 402, 1956). In SrS:Eu and CaF_2:Eu only the Eu^{2+} ion ($^8S_{7/2}$ state) is effective; Eu^{3+} is non-magnetic. For Eu^{2+} the electron spin is 7/2 and therefore 7 electron transitions are possible due to crystal electric field splitting. In SrS:Eu only one of these transitions $M=1/2 \leftrightarrow -1/2$ was found; the others could not be observed due to anisotropic broadening. This one transition was split into 12 hyperfine structure (h.f.s.) components by the interaction of the nuclear spins of the two Eu isotopes: Eu^{151} and Eu^{153} with the electron Spim. The SrS:Eu paramagnetic spectrum confirms that the europium activator is in the Eu^{2+} state. In the fluorite (CaF_2:Eu) spectrum all 7 electron transitions, each with 12 h.f.s. components, were observed. From the h.f.s. of the paramagnetic spectra of SrS:Eu and CaF_2:Eu the ratio of the magnetic moments of the Eu^{151} and Eu^{153} nuclei was found to be μ_{151}/μ_{153} = +2.24 ± 0.03 nuclear magnetons. Frequency of the absorption lines for CaF_2:Eu monocrystals was found to depend strongly on the crystal orientation with respect to the applied constant magnetic field. This indicates that the crystal electric-field

48-5-53/56

SUBJECT: USSR/Luminescence

AUTHORS: Manenkov A.A., Prokhorov A.M., Trapeznikova Z.A., and Fok M.V.

TITLE: Application of Paramagnetic Resonance Method for Investigation of the Activator State in Phosphors (Primeneniye metoda paramagnitnogo rezonansa dlya issledovaniya sostoyaniya aktivatora v fosforakh)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, 1957, Vol 21, #5, p 779 (USSR)

ABSTRACT: The paramagnetic resonance method was applied to determine the valence state of an activator in crystallophosphors and to detect the changes of valence during the excitation of phosphors.

The paramagnetic resonance was investigated in the phosphors SrS-Eu; CaF_2-Eu; SrS-Gd and SrS-Tb at the room temperature by means of a superheterodyne radiospectroscope. It was established that Eu in phosphors is in bivalent state (Eu^{2+}), and Gd and Tb are in the trivalent states (Gd^{3+} and Tb^{3+}).

The ratio of nuclear magnetic momenta of Eu^{151} and Eu^{153} nuclei was determined to be 2.24 ± 0.03 by observing the

Card 1/2

48-5-53/56

TITLE: Application of Paramagnetic Resonance Method for Investigation of the Activator State in Phosphors (Primeneniye metoda paramagnitnogo rezonansa dlya issledovaniya sostoyaniya aktivatora v fosforakh)

superfine structure of Eu^{2+} and Gd^{3+} spectra. The values of nuclear magnetic momenta of Gd^{155} and Gd^{157} were estimated to be approximately equal to 0.2 of nuclear magnetons.

One Russian reference is cited.

INSTITUTION: Physical Institute im.Lebedev of the USSR Academy of Sciences.

PRESENTED BY:

SUBMITTED: No date indicated

AVAILABLE: At the Library of Congress.

Card 2/2

Manenkov A. A

AUTHORS: Manenkov, A. A., Prokhorov, A. M. 56-5-5/46

TITLE: A Determination of the Nuclear Moments of Gd^{155} and Gd^{157} From the Hyperfine Structure of Paramagnetic Resonance (Opredeleniye yadernykh momentov Gd^{155} i Gd^{157} iz sverkhtonkoy struktury paramagnitnogo rezonansa)

PERIODICAL: Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 1957 Vol. 33, Nr 5, pp. 1116-1118 (USSR)

ABSTRACT: The gadolinium spectrum was recorded by means of a superheterodyne radiospectroscope at 9383 MHz. The magnetic field was measured by means of the proton resonance. A SrS-Gd preparation was used for measuring the paramagnetic resonance, in which case Gd^{155} or Gd^{157} respectively, were found accumulated in enriched state (~93%) in the test pieces.
The following results were obtained:
$I = 3/2$ for Gd^{155} and Gd^{157}

$$\left|\mu(Gd^{155})\right| : \left|\mu(Gd^{157})\right| = 0,73 \pm 0,03$$

From a comparison of the decomposition of the hyperfine structure of SrS - Gd^{3+} and SrS - Eu^{2+} results:

$$\left|\mu(Eu^{151})\right| : \left|\mu(Gd^{157})\right| = 10,60 \pm 0,03$$

Card 1/2

A Determination of the Nuclear Moments of Gd^{155} and Gd^{157} From the Hyperfine Structure of Paramagnetic Resonance. 56-5-5/46

Let it be assumed that 3,6 is the (theoretical value) of $\mu(Eu^{151})$, it hence results from the ratio measured:

$|\mu(Gd^{155})|$ = o,25 atomic magnetons

$|\mu(Gd^{157})|$ = o,34 atomic magnetons

There are 1 table, 1 figure, and 11 references, 3 of which are Slavic.

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

SUBMITTED: May 11, 1957

AVAILABLE: Library of Congress

Card 2/2

MANENKOV, A. A.

6/ BMK

6515

THE HYPERFINE STRUCTURE OF PARAMAGNETIC RESONANCE. I. THE NUCLEAR SPIN AND MAGNETIC MOMENT OF THE 5.3-YEAR RADIOACTIVE ISOTOPE Eu^{152} / A. A. Manenkov, A. M. Prokhorov et al. Doklady Akad. Nauk S.S.S.R. 112, 623-5(1957) Feb. 1. (In Russian)

The nuclear spin and magnetic moment of 5.3-year radioactive Eu^{152}: $I(Eu^{152}) = 3./\mu_{(152)}/ = 2.03$ nuclear magneton, were determined. Studies were made of the paramagnetic resonance in the SrS dust activated by europium containing 5.3-year radioactive Eu^{152} which formed from the natural mixture Eu^{151}(47.77%) and Eu^{153}(52.23%) irradiated by reactor neutrons. This irradiation produced a considerable yield of radioactive Eu^{151}, formed from Eu^{151} in reaction of $Eu^{151}(n,\gamma)Eu^{152}$. The initial mixture of Eu^{151} and Eu^{153} was exposed for 35 days to neutron flux 4×10^{19}. Specimens of phosphors SrS activated by mixture of Eu isotopes were developed by introducing $EuCl_3$ into the mixture of 2g $SrCO_3$, 1.5 g S, and 0.35 g $SrCl_2$, after which the mixture was dried and heated in the air at 1150°C for 20 min. The concentration of europium was $\sim 10^{-4}$. The spectrum of the hyperfine structure paramagnetic resonance in SrS - Eu^{151}, ^{152}, and ^{153} in electron transition $M = 1/2 \rightarrow -1/2$, is shown in graphic form. (II.V.J.)

BMK

MANENKOV, A. M. (FIAN, Moscow)

"Molecular Amplifiers and Generators".

report presented at the All-Union Conference on Statistical Radio Physics, Gor'kiy, 13-18 October 1958. (Izv. vyssh uchev zaved-Radiotekh., vol., 2, No. 1, pp 121-127) COMPLETE card under SIFOROV, V. I.)

SOV/56-34-6-50/51

AUTHORS: Zverev, G. M., Korniyenko, L. S., Manenkov, A. A., Prokhorov, A. M.

TITLE: A Paramagnetic Amplifier and Generator on the Basis of Chromic Corundum (Paramagnitnyy usilitel' i generator na khromovom korunde)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol. 34, Nr 6, pp. 1660-1661 (USSR)

ABSTRACT: The spectrum of Cr^{3+} in corundum was investigated in previous papers (Refs 6-9). The ion Cr^{3+} within the corundum is placed in an axial electromagnetic field which splits up the spin quadruplet of the lower singlet orbital level into 2 dublets with the distance $2D = - 0{,}3824\ cm^{-1}$ between them. For the construction of the paramagnetic amplifier the authors use the levels which (in the case that the crystal axis is orientated parallelly to the external constant paramagnetic field) are characterized by the quantum numbers $M = 3/2, \pm 1/2$. If the crystal axis is turned the states are intermixed and the transitions between all 3 levels are allowed. The levels

Card 1/2

SOV/56-34-6-50/51

A Paramagnetic Amplifier and Generator on the Basis of Chromic Corundum

M = - 1/2, 1/2 are used for the amplification and the auxiliary radiations excitate the transitions between the levels M = 1/2, -3/2. The frequency at which the amplification (or the generation) is carried out is equal to ~3000 megacycles and the frequency of the auxiliary radiation was equal to ~15000 megacycles. At T ~ 2°K the system was excitated by itself and changed over to the function of a generator. The exact data concerning this amplifier will be published later. The authors thank A. I. Shal'nikov for his help in carrying out the experiments at low temperatures. There are 1 figure and 10 references, 6 of which are Soviet.

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

SUBMITTED: April 1, 1958

Card 2/2

5(4)

AUTHORS: Rode, T. V., Manenkov, A. A. SOV/76-33-2-43/45

TITLE: Letters to the Editor (Pis'ma v redaktsiyu). On the Problem of the Valence State of Chromium Ions in Compounds Formed in the Thermal Decomposition of Chromic Anhydride (K voprosu o valentnom sostoyanii ionov chroma v soyedineniyakh, obrazuyushchikhsya pri termicheskom razlozhenii khromovogo angidrida)

PERIODICAL: Zhurnal fizicheskoy khimii, 1959, Vol 33, Nr 2, p 503 (USSR)

ABSTRACT: It has previously been found (Ref 1) that in the thermal decomposition of CrO_3 three chemical compounds form, and at a pressure of 250 atm CrO_2 is formed in addition. Chemical analyses showed that these three compounds are the decachromate, dichromate, and monochromate of chromium. Since it was possible that because of a disproportionation of the chromium "wet" analyses had yielded incorrect results on the valence states investigations using the method of electronic paramagnetic resonance were carried out here. The measurements were taken at a frequency of 9375 megacycles. In CrO_3 no electronic

Card 1/2

Letters to the Editor. On the Problem of the Valence State of Chromium Ions in Compounds Formed in the Thermal Decomposition of Chromic Anhydride

SOV/76-33-2-43/45

paramagnetic resonance was observed, while decachromate and dichromate showed absorption lines corresponding to a g-factor ~ 1.9 and a width of about 100 gauss, which was attributed to paramagnetic resonance of the trivalent chromium ion with an electron transfer $M = 1/2 \leftrightarrow -1/2$. As a result of these observations it was concluded that the trivalent chromium is present and that no disproportionation had taken place in investigating these compounds by "wet" chemical analysis. The experimental results obtained agree with those obtained by T. V. Rode (Ref 1). There are 2 Soviet references.

ASSOCIATION: Akademiya nauk SSSR, Institut obshchey i neorganicheskoy khimii im. Kurnakova, Moskva (Academy of Sciences USSR, Institute of General and Inorganic Chemistry imeni Kurnakov, Moscow)

SUBMITTED: October 28, 1958

Card 2/2

24 (3)

AUTHORS: Piskunov, A. K., Manenkov, A. A., Bagdasar'yan, Z. A.

SOV/56-37-1-49/64

TITLE: Paramagnetic Resonance in Potassium Ozonide (Paramagnitnyy rezonans v ozonide kaliya)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 37, Nr 1, pp 302 - 304 (USSR)

ABSTRACT: Kazarnovskiy, Nikol'skiy and Abletsova (Ref 1) assumed that the magnetism of KO_3 is caused by the O_3^--ion and that the latter has the character of a free radical with unsaturated valence. The authors of the present "Letter to the Editor" investigated these conditions by employing the method of paramagnetic electron resonance. Polycrystalline samples containing $\sim 90\%$ KO_3 were investigated at the frequencies of 2580, 9375, 12,000 and 37,000 megacycles, at room temperature, as well as at the temperature of liquid nitrogen. In the case of the first 3 experimental frequencies, an absorption line of symmetrical shape was in each case obtained, which had half-widths of 31 ± 3, 39 ± 2, and 45 ± 3 G respectively; at 37,000 megacycles, however, an asymmetric line (see figure) with a width of ~ 77 G (at room temperature) was

Card 1/3

found. The asymmetry indicates an anisotropy of the g-factor. For parallel and perpendicular orientation respectively of the crystal with respect to the direction of the external magnetic field, $g_{\parallel} = 2.005 \pm 0.003$ and $g_{\perp} = 2.012 \pm 0.002$ was found respectively. In the following, the contributions made by spin-lattice-, magnetic dipole-, and spin-spin exchange interaction is discussed. By means of the same method other authors (Ref 4) investigated also NaO_3; at $\lambda = 1.25$ cm they found a weak asymmetry of the line, and the value of the g-factor determined by them agrees within the error limits with that found here for KO_3, which confirms the assumption that in ozonides the binding of the metal with the O_3 group has ion character. The authors also investigated the spontaneous decay of KO_3 at a temperature of 295°K by means of diphenylpicrylhydrazyl as a standard. It was found that the KO_3-decay developed approximately according to an exponential law (time constant 0.02/hour). The authors finally thank D. N. Shigorin and S. D. Kaytmazov for their help in carrying out the experiments and for discussing the results. [redacted]

Card 2/3

2 Physico-Chemical Institute imeni L. Ya. Karpov

MANENKOV, A.A.; PROKHOROV, A.M.

Spin-lattice relaxation in chromium corundum. Zhur.eksp.i teor.fiz. 38 no.3:729-733 Mr '60. (MIRA 13:7)

1. Fizicheskiy institut im. P.N.Lebedeva Akademii nauk SSSR.
(Nuclear magnetic resonance)
(Corundum)

83712

S/056/60/038/004/005/048
B019/B070

24.7900

AUTHORS: Manenkov, A. A., Fedorov, V. B.

TITLE: An Investigation of the Width and Form of the Lines of the Paramagnetic Resonance Spectrum of the Cr^{+++}-Ion in Single Crystals of Corundum

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 38, No. 4, pp. 1042-1046

TEXT: The authors have investigated the width and the form of the absorption lines of the electron paramagnetic resonance of the Cr^{+++}-ions in the corundum lattice at room temperature. The samples were single crystals of $Al_2O_3.Cr_2O_3$ with a relative chromium content of 10^{-5} to 10^{-2} (This concentration is the ratio of the number of paramagnetic chromium ions to that of the aluminum ions). The investigations were made at the frequency of 9375 Mcs with the magnetic field parallel to the trigonal axis of the crystal. From the fact that the width of the lines is not

An Investigation of the Width and Form of the Lines of the Paramagnetic Resonance Spectrum of the Cr^{+++}-Icn in Single Crystals of Corundum

altered when the sample is cooled from 300° to 77°K, the conclusion is drawn that the spin lattice interaction has no effect on the line width. The broadening of the lines ascribed to the magnetic dipole interactions of the spins. The authors next describe the measurements of the dependence of the widths, peak intensities, and the form of the lines on the concentration for different electron transitions. The results are shown in Figs. 1 and 2, and also in a table. The spectrum investigated consists of three lines corresponding to the electron transitions $3/2 \longrightarrow 1/2$, $-1/2 \longrightarrow 1/2$, and $1/2 \longrightarrow 3/2$. The lines corresponding to the first and the last transitions are equal and somewhat broader than the line corresponding to the second transition. The authors consider the larger broadening of the two lines as being due to lattice defects. The ratio of the widths and that of the peak intensities is nearly constant. The form of the lines corresponds nearly to a Gaussian curve, and for the highest concentration investigated here approaches a Lorentz curve; the forms of the lines differ very little. The authors compare the experimental data with the theory of the dipole broadening of the lines. It is found that with the help of the mechanism of dipole interaction and assuming an inhomogeneity

83712

A Investigation of the Width and Form of the Lines of the Paramagnetic Resonance Spectrum of the Cr^{+++}-Ion in Single Crystals of Corundum

S/056/60/038/[illegible]/[illegible]/[illegible]
B019/B070

of the electric field in the crystal caused by lattice defects, it is possible to explain the results qualitatively, but not quantitatively. The line widths observed experimentally are somewhat less than the theoretical values due, presumably, to the exchange interactions. The authors thank A. S. Bebchuk, R. P. Bashuk, and L. M. Kharitonova for the preparation of the samples and measuring the concentrations. There are 2 figures, 1 table, and 3 references: 1 Soviet and 2 US.

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

SUBMITTED: September 15, 1959

Card 3/3

LUSHCHIKOV, V.I.; MANENKOV, A.A.; TARAN, Yu.V.

[Dynamic polarization of protons in hydrogen peroxides and tertiary butyl] Dinamicheskaia poliarizatsiia protonov v perekisiakh vodoroda i tretichnogo butila. Dubna, Ob"edinennyi in-t iadernykh issl., 1961. 7 p. (MIRA 15:1)
(Protons) (Hydrogen peroxide) (Butoxy group)

S/61/003/011/037/056
B108/B138

AUTHORS: Lushchikov, V. I., Manenkov, A. A. and Taran, Yu. V.

TITLE: Dynamic polarization of protons in irradiated polyethylene

PERIODICAL: Fizika tverdogo tela, v. 3, no. 11, 1961, 3503-3508

TEXT: The authors investigated possibilities of producing targets with aligned protons. Some experiments with polyethylene are described with reference to work carried out by G. Hwang and T. M. Sanders (Ref. 3, see below). Fig. 1 shows the experimental arrangement by means of which simultaneous observations can be made of nuclear magnetic resonance and electron paramagnetic resonance at helium temperatures. 9300-Mcps vibrations (H_{102}-mode) were excited in the cavity. The amplitude of the primary oscillations were kept at a low (~0.005 w) and constant level by means of an automatic level trimmer. Various types of polyethylene were studied: (1) ПЭВП1 (PEVP1) - viscosity 3.2 poise, (2) ПЭВП2 (PEVP2) - viscosity 2.6 poise, (3) ПЭНП (PENP) - low viscosity. The specimens were bombarded by fast neutrons for 20 hours at 65°C. The rise in proton polarization was determined in terms of the dynamic amplification factor η

Card 1/4 3

which is the ratio of the nuclear magnetic resonance signal in the case of saturation of the electron resonance of the F-centers to the signal without saturation of the F-centers. This factor increased with the molecular weight of the polymer chains. Between 1.6 and 77°K, η was practically independent of temperature. Nuclear spinlattice relaxation time was determined from the drop in the nuclear magnetic resonance signal. Both build-up and decay of nuclear magnetic resonance are characterized by two time components, a long one and a short one, which is some 30 % of the long component. This is explained by the existence of two kinds of protons. Protons near the F-centers have a short relaxation time, protons far from the paramagnetic centers have a long relaxation time. The polarization of the second kind is due to spin diffusion. F. L. Shapiro, V. A. Milyayev, P. A. Krupchitskiy, and B. I Kokorev are thanked for their interest and assistance. There are 5 figures, 1 table, and 5 non-Soviet references. The two most recent references to English-language publications read as follows: G. Hwang, T M Sanders. Proceedings of the 7-th International Conference on Low Temperature Physics, University of Toronto, p. 98, 1960; O. S. Leifson, C. D. Jeffries Bull. Am. Phys. Soc., 6, no. 3, 1961.

Card 2/4 3

Dynamic polarization of protons...

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva AN SSSR Moskva
(Institute of Physics imeni P. N. Lebedev AS USSR Moscow)

SUBMITTED: June 26, 1961

Legend to Fig. 1: Г1 - 900-kcps-generator, Г2 - nuclear magnetic resonance generator, Г3 - ЗГ-12 (ZG-12) audio-frequency oscillator, У1 - hf-amplifier, У2 - lf-amplifier, У3 - 860-cps resonance amplifier, У4 - automatic frequency control amplifier, Д - detector, Сд - synchronous detector, Кд - crystal detector, Пк - klystron supply, saturation clystron, Ат - attenuator, Сн - matched load, фц - ferrite rotor, Гк - helium cryostat, Ад - nitrogen Dewar, К - coaxial cable, р. - resonator cavity, М.К. - modulator coils, М.В.о. - water-cooled magnet, О - oscilloscope, Сп. - ЭПП-09 (EPP-09) recorder.

Card 3/4 3

25186
S/056/61/040/006/007/031
B102/B214

24.7900

AUTHORS: Manenkov, A. A., Prokhorov, A. M.

TITLE: Paramagnetic resonance of Mn^{2+} in SrS

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 40 no. 6, 1961, 1606 - 1609

TEXT: The known fact that the ground state (^6S) of the Mn^{2+} ion with zero orbital momentum suffers no splitting in the first approximation due to the crystal electric field, and that experimentally, however, in many crystals even large splitting is observed (which is attributed to an admixture of higher states to ^6S) were the reasons for undertaking fresh investigations of the behavior of this ion in the crystal field. The authors investigated the paramagnetic resonance of Mn^{2+} in the crystal field of SrS which crystallizes in the cubic form. The samples were polycrystalline and contained about 0.05 % Mn^{2+} ions. The measurements were made at room temperature, and at the temperature of liquid nitrogen

Card 1/6

Paramagnetic resonance of....

for ν = 9300 Mc/sec. The spectrum observed at both temperatures consisted of six groups of hyperfine-structure lines corresponding to the nuclear spin of Mn^{55} : I = 5/2. The general character of the spectrum at 300 and 77° K was the same. However, a closing together of the lines and a small increase in the hyperfine-structure constant was observed on transition to 77° K. The observed spectrum is described by the spin-Hamiltonian:

$$\hat{\mathcal{H}} = g\beta \mathbf{H}\hat{\mathbf{S}} + A\hat{\mathbf{S}}\hat{\mathbf{I}} + \tfrac{1}{6}a\left[\hat{S}_x^4 + \hat{S}_y^4 + \hat{S}_z^4 - \tfrac{1}{5}S(S+1)(3S^2-1)\right], \quad (1)$$

The first term therein describes the interaction between the electron spin $\vec{S}$ and the external magnetic field $\vec{H}$, the second term gives the interaction between $\vec{S}$ and the Mn^{55} nuclear spin $\vec{I}$, and the third term that between $\vec{S}$ and the cubic crystal field. A perturbation - theoretical calculation taking into account terms of the third order with respect to

Paramagnetic resonance of....

the hyperfine interaction, and terms of the first order with respect to the constant of the cubic crystal field gives for the magnetic field strength at which the absorption line corresponding to the transition M - M - 1 is observable:

$$H = H_0 - Am - \frac{A^2}{2H_0}\{I(I+1) - m^2 + m(2M-1)\} + \\ + \frac{A^3}{4H_0}\{[S(S+1) - M(M+1) + 2M(m-M)][I(I+1) - m(m-1)] - \\ - [S(S+1) - M(M-1) + 2(M-1)(m-M+2)] \times \\ \times [I(I+1) - m(m+1)]\} + F(a, M), \qquad (2)$$

Here $H_0 = h\nu/g\beta$, and $F(a,M) = \begin{cases} 0 \text{ for the transition } M = 1/2 \rightarrow -1/2 \\ \pm 5/2pa \text{ for transitions } M = \pm 3/2 \rightarrow \pm 1/2 \\ \mp 2pa \text{ for transitions } M = \pm 5/2 \rightarrow \pm 3/2 \end{cases}$

Card 3/6

Paramagnetic resonance of....

$p = 1 - 5\Phi$, $\Phi = l^2m^2+l^2n^2+m^2n^2$. l, m, n are the direction cosines of the angle which the magnetic field makes with the cubic crystal axes. As is evident from it, the displacements of the second and the third order in the hyperfine structure depend on the electronic transitions, and the magnitude of the splitting increases with increasing m . For the two outermost groups of lines ($m=\pm 5/2$) all the five lines are well resolved. The comparison of the observed spectrum with the formula (2) gives the following expression for the constants of the Hamiltonian:

$g = 2{,}0009 \pm 0{,}0005$, $A = (75{,}4 \pm 0{,}2)\cdot 10^{-4}\ см^{-1}$, $a < 1{,}4\cdot 10^{-4}\ см^{-1}$ при $T = 300°$ K;

$g = 2{,}0010 \pm 0{,}0005$, $A = (77{,}0 \pm 0{,}2)\cdot 10^{-4}\ см^{-1}$, $a < 1{,}2\cdot 10^{-4}\ см^{-1}$ при $T = 77°$ K.

In the case of the best resolution ($m=5/2$) the line width of the transition is: $M = 1/2 - -1/2$ 2.8 G (300°K) and 1.9 G (77°K) for the transitions $M = \pm 3/2 - \pm 1/2$ and $M = \pm 5/2 - \pm 3/2$ 5.6 G (300°K) and 4.3 G (77°K).

Card 4/6

25186
S/056/61/040/006/007/031
B102/B214

Paramagnetic resonance of .

The constant of the cubic field (a) was determined from the anisotropic broadening of the lines M = ±3/2 → ±1/2, ΔH_a 5/2^pa g and A are determined by a comparison of the position of the lines M = 1/2 → -1/2 having the minimum width with the formula (2). The spin-lattice relaxation time was estimated from the dispersion of the lines M = 1/2 → -1/2 at room temperature, and at 77°K, the value found being $5 \cdot 10^{-8}$ sec The contribution of the spin-lattice interaction to the line-width is negligible The intensity ratio of the lines M = ±5/2 → ±3/2, M = ±3/2 → ±1/2, M = 1/2 → -1/2 agrees well with the theoretical result: 5 : 8 : 9 : 8 : 5 if the line-width is taken into account The hyperfine structure constant A for Mn^{2+} in SrS is considerably smaller than that for Mn^{2+} in CaF_2

This is related to the covalent character of the Mn^{2+} binding in SrS There are 2 figures and 5 non-Soviet-bloc references The most important references to English-language publications read as follows: M. Stanislaus-Brada, W Low Phys Rev 116, 561, 1959; W Low, U. Rosenberger Phys. Rev 116, 621, 1959; H. Watanabe Progr Theor Phys 18, 405, 1957.

Card 5/6

25196
S/056/61/040/006/007/031
B102/B214

Paramagnetic resonance of ..

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

SUBMITTED: January 4, '96'

Card 6/6

26411
S/056/61/041/001/006/021
B102/B212

24.7900

AUTHORS: Manenkov, A. A., Milyayev, V. A.

TITLE: Relaxation phenomena in the paramagnetic resonance of Mn^{2+} ions in the cubic crystal field of SrS

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 41, no. 1 (7), 1961, 100 - 105

TEXT: Following a previous work (ZhETF, 40, 1606, 1961) the authors have investigated the spin-lattice relaxation of Mn^{2+} ions in SrS. In this reference it has been shown that SrS will crystallize cubic-symmetrically with a very weak splitting ($\sim 10^{-4}$ cm^{-1}) of the ^6S state. Therefore, the ground state of Mn^{2+} in SrS has to be nearly a pure S state, and it may be assumed that the spin-lattice relaxation time is already significant at room temperature. This, however, is not the case, since at room temperature it is $\sim 10^{-8}$ sec, and at liquid nitrogen temperature $\sim 10^{-6}$ sec. The authors discuss these results with regard to relaxation mechanisms. Mn^{2+} ions are

Card 1/5

Relaxation phenomena in the....

also very interesting with respect to the spin-spin cross relaxation since they exhibit a large number of hyperfine-structural levels, which come about through an interaction of the electron spin of Mn^{2+} ($S = 5/2$) with the nuclear spin of Mn^{55} ($I = 5/2$). These effects have already been studied theoretically and experimentally. The authors have observed marked cross-relaxation effects at liquid helium temperature in the Mn^{2+} spectrum of SrS The studies have been made with polycrystalline SrS·Mn specimens (0.05 % Mn^{2+}). A superheterodyne radiospectroscope (9300 Mc/sec) was employed, and measurements were made at 300°K, 77°K, 4.2 and 1.6°K. The measurements were made at the lines corresponding to the electron transition $M = 1/2 \rightarrow -1/2$, for various hyperfine-structural constants ($m = \pm 1/2, \pm 1/3, \pm 5/2$) The spin-lattice relaxation time T_1 was estimated at 300°K from the line broadening caused by spin-lattice interaction. The broadening was calculated by comparing the lines at 300 and 77°K. At 77°K T_1 was determined by the method of continuous saturation of the lines (ZhETF, 38, 729, 1960), and at liquid helium temperatures the relaxation phenomena were investigated by

Card 2/5

the method of pulsed saturation of the lines. In order to separate the spin-spin cross relaxation and spin-lattice relaxation effects, two types of saturation pulses were used: "narrow" pulses (τ = 0.1 - 1 msec) and "broad" pulses (τ = 70 msec). For comparison, the relaxation times were also determined by the method of continuous saturation at 4.2°K. T_1 was determined at 300°K for the components m = $\pm 5/2$. For both lines T_1 was $5 \cdot 10^{-8}$ sec. At 77°K the value was $T_1 = 1.5 \cdot 10^{-6}$ sec. The spin-spin relaxation time was found to be $T_2 = 6 \cdot 10^{-8}$ sec. At 4.2°K it was found that $T_1 = 2.9 \cdot 10^{-2}$ if T_2 had the same value as at 77°K. If however a spin-spin cross relaxation exists, than T_2 will only be 1/5 as great as at 77°K, and the following results are obtained: $T_1 = 9 \cdot 10^{-2}$ sec. At 1.6°K $T_1 = 2.1 \cdot 10^{-1}$ sec. All these data are valid for lines with m = $\pm 5/2$. As to the character of the relacation processes of the Mn^{2+} spectrum, the following can be concluded: In the range 4.2 - 1.6°K one finds that $T_1 \sim T^{-1}$, i.e. single-

Relaxation phenomena in the...

phonon processes play the main role in spin-lattice relaxation. At higher temperatures, T_1 becomes a stronger function of temperature. T_1 drops non-monotonically ($T_1 \sim T^{-n}$) at an increase from 4.2 to 300°K. At 300°K it is found that $T_1 \approx T_2$. The Mn^{2+} ions are found in the S state, and their levels are only slightly split by the SrS crystal field. The spin lattice relaxation is essentially determined by mechanisms other than Kroning's. One of these mechanisms can be a modulation of the covalent bond between M^{2+} and the surrounding diamagnetic ions. Marked spin-spin cross relaxation occurs at liquid helium temperatures. The authors thank Professor A. M. Prokhorov and Professor S. A. Al'tshuler for discussion, and A. M. Medvedev for producing the SrS·Mn specimens. There are 2 figures and 9 references: 4 Soviet and 5 non-Soviet. The two most important references to English-language publications read as follows: N. Bloembergen et al. Phys. Rev. 114, 445, 1959; J. G. Cartle et al. Phys. Rev. 119, 955, 1960.

Card 4/5

Relaxation phenomena in the...

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Institute of Physics imeni P. N. Lebedev of the Academy of Sciences USSR)

SUBMITTED: February 25, 1961

Card 5/5

MANENKOV, A. A.; MILYAYEV, V. A.

"Investigations of the Spin-Lattice Relaxation of ions in S-state"
Report presented at the First International Conference on
Paramagnetic Resonance, Jerusalem, Israel, 16-20 July 1962.

MANENKOV, A. A.; PROKHOROV, A. M.

"On the Temperature dependence of the spin-lattice relaxation times in crystals."
Report presented at the First International Conference on Paramagnetic Resonance, Jerusalem, Israel, 16-20 July 1962

34230

S/181/62/004/002/013/051
B102/B138

24.7900 (1055, 1144, 1163)

AUTHORS: Manenkov, A. A., Milyayev, V. A., and Prokhorov, A. M

TITLE: Relaxation times of Cr^{3+} and Fe^{3+} ions in rutile single crystals

PERIODICAL: Fizika tverdogo tela, v. 4, no. 2, 1962, 388 - 391

TEXT: The pulse saturation method (9400 Mc) was used to study spin-lattice relaxation for Cr^{3+} and Fe^{3+} ions in rutile at liquid-helium temperatures. The paramagnetic resonance lines were saturated with pulse durations between 100 and 0.01 msec, in order to find the reason for the existence of spin-spin cross relaxation effects. With no cross relaxation, the curves describe spin-lattice relaxation only and are independent of pulse duration. The single crystals investigated were grown by the Verneuil method. In all experiments crystal orientation was such that the external magnetic field was perpendicular to the c-axis and coincided with one of the a-axes. With saturation pulses of 100-50 msec the relaxation curves of rutile with Cr^{3+} impurity were found to consist of two components.

Card 1/3

S/181/62/004/002/013/051
B102/B138

Relaxation times of Cr^{3+} and Fe^{3+}...

$I(t) - I_c = A_1 e^{-t/T_1} + A_2 e^{-t/T_1'}$; $A_1 + A_2 = -I_o$, where $I(t)$ is the line intensity at a moment of time t after the end of the pulse, I_c - equilibrium line intensity. The following spin-lattice relaxation times were calculated for the Cr^{3+} ions:

Transition	4.2°K			1.7°K		
	T_1	T_1'	A_1/I_o	T_1	T_1'	A_1/I_o, %
	msec		%	msec		
1 ⟷ 2	4	1.1	38	9	2.8	60
3 ⟷ 4'	2.3	0.5	13	3.3	0.8	30
3 ⟷ 4	2.2	0.5	24	3.3	1	60

The weak temperature dependence of the transitions 3⟷4 and 3'⟷4' can be explained if the lower levels 1,2 and 1',2' take part in these transitions. For the 1⟷2 transition cross-relaxation was observed with pulses of 0.05 msec duration. In this case, besides T_1 and T_1', the relaxation curve als

Card 2/3

34230

S/181/62/004/002/013/031
B102/B138

Relaxation times of Cr^{3+} and Fe^{3+}...

contains a "fast" exponent $T_{12} \ll T_1, T_1'$. For Fe^{3+} relaxation was studied in several paramagnetic resonance lines for [110], between 1000 and 4000 oe. The relaxation times for the lines observed were similar and ~7 msec. T_1 and T_1' were between 3.5 and 6, and 0.6 and 2.5 msec. Cross relaxation was also observed with short pulses. R. P. Basnuk and A. S. Bebchuk were thanked for the preparation of the rutile single crystals. There are 2 figures, 1 table, and 5 references: 1 Soviet and 4 non-Soviet. The four references to English-language publications read as follows: H. J. Gerritsen et al. Phys. Rev. Lett. 2, 153, 1959; H. J. Gerritsen et al. Appl. Phys., 31, 1566, 1960; A. Okaya et al. Bull. Am. Phys. Soc. 2, 73, 1960; J. H. Van Vleck. Phys. Rev. 57, 426, 1940; J. M. Pace et al. Proc. Phys. Soc. B77, 257, 1961.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva AN SSSR Moskva (Physics Institute imeni P. N. Lebedev AS USSR, Moscow)

SUBMITTED: August 14, 1961

Card 3/3

MANENKOV, A.A., kand.fiz.-matem.nauk

First international conference on paramagnetic resonance.
Vest. AN SSSR 32 no.11:120-121 N '62. (MIRA 15:11)
(Paramagnetic resonance and relaxation—Congresses)

33997
S/056/62/042/001/012/048
B104/B102

9.2574 (also 1055, 1163, 1144)

AUTHORS: Manenkov, A. A., Prokhorov, A. M.

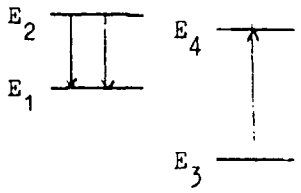
TITLE: Spin-lattice relaxation and cross-relaxation interactions in chromium corundum

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 42, no. 1, 1962, 75-83

TEXT: The relaxation effects in the Cr^{3+} spectrum of Al_2O_3 single crystals were studied at helium temperatures. The relaxation times were measured with a superheterodyne radiospectroscope (9400 Mc/sec) by the technique of pulse saturation of paramagnetic resonance lines. This method (A. A. Manenkov et al., ZhETF, 41, 100, 1961) allows to separate the effects of spin-lattice relaxation from those of cross relaxation by saturation with pulses from 0.8 μsec to 1 sec duration. In the single crystals, 0.05, 0.1, 0.15, 0.4, and 0.65 % of Al^{3+} ions were replaced by Cr^{3+} ions. A four-level scheme of Cr^{3+} ions is assumed:

Card 1/5

Spin-lattice relaxation and...



and it is presupposed that no spin-lattice transitions take place between levels 1 and 3, 1 and 4, 2 and 3, and 2 and 4. If the transitions induced by an external field are less probable than spin-lattice and cross-relaxation transitions, the difference between the populations of the four levels can be given by

$$\Delta n_{12} = A \exp(\alpha_1 t) + B \exp(\alpha_2 t) + \Delta n^0_{12},$$
$$\Delta n_{34} = A \exp(\alpha_1 t) - \frac{B}{m} \exp(\alpha_2 t) + \Delta n^0_{34}, \qquad (3).$$

$\alpha_1 = -1/T_1$, $\alpha_2 = -1/T_1 - 1/T_{12}$, $T_{12} = m/(1+\beta m)w$, where T_1 is the spin-

Card 2/5

Spin-lattice relaxation and...

lattice relaxation time, w is the probability of cross relaxation, and m = 1,2,3, ... Normally, $T_{12} \ll T_1$. Therefore, a_2 in (3) characterizes the spin-lattice relaxation. The experiments proved the existence of different relaxation times (Tables 1 and 2) in specimens with a Cr^{3+} concentration of 0.15 %. Relaxation curves which can be described by one exponential function were observed on specimens with Cr^{3+} concentrations of 0.05, 0.4, and 0.65 %. These curves correspond to spin-lattice relaxation. B. I. Kochalev (DAN SSSR, 131, 1053, 1960) and G. M. Zverev (ZhETF, 40, 1667, 1961) are mentioned. There are 5 figures, 4 tables, and 12 references: 5 Soviet and 7 non-Soviet. The four most recent references to English-language publications read as follows: J. H. Pace, D.F. Sampson, J. S. Thorp. Proc. Phys. Soc., 77, 257, 1961; B. Bolger, B. J. Robinson. Physica, 26, 133, 1960; R. A. Armstrong, A. Sabo. Canad. J. Phys., 38, 1304, 1960; J. E. Geusic. Phys. Rev., 118, 129, 1960.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute imeni P. N. Lebedev of the Academy of Sciences USSR)

SUBMITTED: July 31, 1961

Card 3/3

S/056/62/042/005/036/050
B102/B138

AUTHORS: Manenkov, A. A., Prokhorov, A. M.

TITLE: The temperature dependence of the spin-lattice relaxation times

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 42, no. 5, 1962, 1371-1374

TEXT: The temperature dependence of the spin-lattice relaxation times $T_1(T)$ in paramagnetic crystals is usually assumed as $T_1 \sim T^{-1}$, a law which is known to be violated in certain cases. The authors studied in detail the time dependence of the spin-lattice relaxation times for direct resonance energy exchange between the spin system and the lattice. Two special cases are considered: (1) A two-level system, in which equilibrium with thermal lattice vibrations is established according to the law $n_2-n_1=A\exp(-t/T_1)+(n_2-n_1)_{eq}$; the last term denotes the equilibrium difference of population corresponding to Boltzmann distribution. In this case the sought dependence is $T_1 \sim T^{-1}$. Only when level splitting is

Card 1/2

very high ($h\nu_{21} \gg kT$), T_1 is almost temperature independent. (2) A system of three levels: (a) $E_3 > E_2 > E_1$, $E_3 - E_2 \ll kT$, $E_2 - E_1 \gg kT$. If $h\nu_{21} \gg kT$, $n_3 - n_2 = A \exp(\alpha_1 t) + (n_3 - n_2)_{eq}$ with $T_1 = -1/\alpha_1 \approx 1/w_{31}$. w_{ik} is the probability of a transition $E_i \rightarrow E_k$. In this case the temperature dependence of the relaxation time is very weak and at $h\nu_{31} \gg kT$ it vanishes. (b) $E_3 - E_2 \gg kT$, $E_2 - E_1 \ll kT$. For $h\nu_{32} \gg kT$, for the $2 \rightarrow 1$ transition $n_2 - n_1 = A\exp(\alpha_1 t) + (n_2 - n)_{eq}$, $T_1 = -1/\alpha_1 \approx 1/w_{23}$, i. e. the temperature dependence is strong (exponential). The results indicate that the temperature dependence of the spin-lattice relaxation time depends on the relation between level splitting and kT.

ASSOCIATION:: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute imeni P. N. Lebedev of the Academy of Sciences USSR)

SUBMITTED: December 26, 1961

MANENKOV, A.A.

S/053/62/077/001/001/003
B117/B112

AUTHORS: Zverev, G. M., Karlov, N. V., Korniyenko, L. S., Manenkov, A. A., Prokhorov, A. M.

TITLE: Application of paramagnetic crystals in quantum electronics

PERIODICAL: Uspekhi fizicneskikh nauk, v. 77, no. 1, 1962, 61 - 108

TEXT: Western and Soviet studies during the period 1952 - 1962 concerning the progress in the application of paramagnetic crystals for building quantum devices are reviewed. In these devices, which are used in the fields of radio and optics, negative temperatures are produced by auxiliary radiation. The following problems are discussed: energy levels of paramagnetic ions in crystals; relaxation phenomena in paramagnetic crystals; (paramagnetic) quantum amplifiers of the radio range (paramagnetic resonance amplifier PRY (RPU), paramagnetic progressive wave amplifier PUBV (PUBV)); quantum generators and amplifiers of the optical range (optical quantum generators with ruby and fluorite, quantum amplifiers, quantum counters). Finally, the great progress achieved in quantum electronics during the short time of its existence is pointed out:

Card 1/2

establishment of highly accurate frequency standards for various purposes; development of low-noise paramagnetic amplifiers of the radio range and of optical generators having a high degree of coherence and high spectral radiation density. The quick progress of quantum electronics and its promising prospects, are the consequence of its development on the basis of already existing technology. Progress was first achieved in the radio range, and later in the optical range. At present work is in progress in developing the entire range, including the submillimeter- and distant infrared range. There are 27 figures and 134 references: 45 Soviet-bloc and 99 non-Soviet-bloc. The four most important English-language references are: J. R. Singer and S. Wang, Second International Conference on Quantum Electronics, Berkeley, 1961; W. G. Wagner and G. Birnbaum, Second International Conference on Quantum Electronics, Berkeley, 1961; R. W. Hellwarth, Phys. Rev. Lett., v. 6, 19 (1961); A. L. Schawlow, G. E. Devlin, Phys. Rev. Lett., v. 6, 96 (1961).

APPROVED FOR RELEASE: 03/13/2001 CIA-RDP86-00513R001032120010-1"

4451
S/181/63/005/001/036/064
B108/B180

AUTHORS: Lushchikov, V. I., Manenkov, A. A., and Taran, Yu. V.

TITLE: Dynamic polarization of protons in lanthanum-magnesium binary nitrate

PERIODICAL: Fizika tverdogo tela, v. 5, no. 1, 1963, 233 - 236

TEXT: Earlier work on the dynamic polarization of protons (FTT, 3, 3503, 1961) is continued here. $(La,Ce)_2Mg_3(NO_3)_{12}\cdot 24H_2O$ single crystals were grown from a saturated $La_2Mg_3(NO_3)_{12}$ solution with an appropriate addition of $Ce_2Mg_3(NO_3)_{12}$. The sample was placed in a resonator so that the hexagonal crystal axis was always perpendicular to H_o the external magnetic field. In this position, $g_\perp = 1.83$ for the Ce^{3+} ion. The increase in the polarization of the protons in the crystal on saturation of the epr was determined from the increased amplitude of the nmr signal from the proton. With fixed epr frequency typical polarization peaks were observed at $H_o \pm \frac{\Delta H}{2}$, which corresponds to the forbidden transition at the frequency

Dynamic polarization of...

$\nu_{exc} \mp \nu_{nucl}$. The greatest increase in polarization was found at 1.6°K in a field of 3700 oe for a crystal with 0.5% Ce. In this case, the proton polarization was 170 times greater than in thermal equilibrium. This decreases somewhat when the temperature falls to 1.5°K. Measurements of the coefficient of dynamical increase in polarization in dependence on the power of epr saturation showed good agreement with the simple phenomenological theory of spin diffusion (O. S. Leifson, C. D. Jeffries. Bull. Am. Phys. Soc., 6, no. 3, 1960; Phys. Rev., 122, 1781, 1961). The same applies to the nuclear spin-lattice relaxation time in dependence on the Ce^{3+} concentration in the range 0.2 - 1% (at constant temperatures between 1.5 and 1.7°K). Between 1.5 and 1.7°K, the relaxation time is proportional $T^{-4\pm1}$ at any Ce^{3+} concentration. There are 3 figures and 1 table.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva AN SSSR, Moskva
(Physics Institute imeni P. N. Lebedev AS USSR, Moscow)

SUBMITTED: August 6, 1962

Card 2/2

S/181/63/005/002/009/051
B104/B186

AUTHORS: Kessenikh, A. V., Lushchikov, V. I., Manenkov, A. A., and Taran, Yu. V.

TITLE: Proton polarization in irradiated polythene

PERIODICAL: Fizika tverdogo tela, v. 5, no. 2, 1963, 443 - 454

TEXT: The aim is to find materials suitable for polarized proton targets, and to investigate the physical properties of irradiated polythene. To this end the studies of dynamic polarization in high-density polythene irradiated with fast protons (V. I. Lushchikov, A. A. Manenkov, Yu. V. Taran, FFT, 3, 3503, 1961) were continued. The dynamic nuclear polarization was measured at 77, 4.2 and 1.6°K in a magnetic field of ~3400 oe using a device described in a previous paper. The 17.9·6 mm test pieces were placed in the coil of an autodyne n.m.r pickup, with the axis of the coil perpendicular to the long side of the resonator. H_{102} oscillations with a frequency of 9440 Mc/s were set up in the resonator. The dynamic polarization factor of the protons was determined from the amplification factor of the n.m.r. signal at saturated e.p.r. of the free radicals formed when the

Card 1/3

Proton polarization in...

polythene was irradiated. Results: In the He temperature range, the cross-relaxation under conditions of non-uniform e.p.r. line broadening plays an important part in the dynamic polarization of the nuclei. This can be used to explain the increase in the broadening of the dynamic nuclear polarization maxima as the temperature decreases, and the fact that the dynamic polarization factor does not depend on temperature. The time dependence of the n.m.r. lines is described as the sum of two exponents with relaxation times of T_1 and T_2. The nuclear relaxation depends linearly on T_1 and T_2, this result being contrary to theoretical predictions (O. S. Leifson, C. D. Jeffries, Phys. Rev., 122, 1781, 1961). It is explained on the assumption that the action zone of the paramagnetic centers is equalized at the expense of fast spin diffusion. The dynamic polarization coefficient depends linearly on the molecular weight of the initial material. There are 6 figures.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva AN SSSR (Physics Institute imeni P. N. Lebedev AS USSR); Nauchno-issledovatel'skiy fiziko-khimicheskiy institut im. L. Ya. Karpova, Moskva (Scientific Physicochemical Research Institute imeni L. Ya. Karpov, Moscow)

B/181/63/005/002/009/051
B104/B186

Proton polarisation in...

SUBMITTED: August 6, 1962

Card 3/3

S/181/63/005/004/028/047
B102/B186

AUTHORS: Kessenikh, A. V., and Manenkov, A. A.

TITLE: Dynamic polarization of nuclei in the case of saturation of non-uniform e.p.r. line broadening

PERIODICAL: Fizika tverdogo tela, v. 5, no. 4, 1963, 1143 - 1146

TEXT: Since cross relaxation between spin transitions plays a role in the case of saturation of non-uniform e.p.r. line broadening, it may be assumed that this will also affect dynamic polarization of nuclei which is due to saturation of forbidden e.p.r. transitions (FTT, 5, 443, 1963). An exact solution to the problem of saturation of non-uniform e.p.r. line broadening is very complex when cross relaxation has to be taken into account; therefore the authors have developed an approximate method allowing of qualitative comparison with experiment. On the basis of a phenomenological model using Portis' approximation (Phys. Rev. 104, 584, 1956) a qualitative theory of temperature and concentration dependences of dynamic nuclear polarization is developed which takes account of cross relaxation. The calculations are made for nuclei with I = 1/2 and saturation of the magnetic resonance of the electron spins (S = 1/2). The optimum conditions for

Card 1/3

dynamic polarization are discussed; they have to be known for a proper choice of a suitable polarized nuclear target. The theory was found to be qualitatively applicable to $La_2Mg_3(NO_3)_{12}\cdot 24H_2O$ (Phys. Rev. 122, 1781, 1961) and irradiated polyethylene at helium temperatures. The experimental data on proton polarization at 4.2°K in these substances show that the dynamic polarization coefficient η passes through a maximum when the temperature of the concentration of paramagnetic centers is varied; the distance between the extrema of η as a function of the magnetic field increases monotonically with decreasing temperature and increasing concentration of the paramagnetic centers (in the present case Ce^{3+} in 0.1 - 1% concentrations). The theoretical result, namely that the extrema of η will arise at the lower temperatures the lower the concentration of the centers, is not yet verified experimentally but appears reasonable. Deviations from the theory may arise in the case of extraneous relaxation or cross relaxation between allowed and forbidden transitions.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva AN SSSR (Physics Institute imeni P. N. Lebedev AS USSR); Fiziko-khimicheskiy institut im. L. Ya. Karpova Moskva (Physicochemical Institute imeni L. Ya. Karpov, Moscow)

Dynamic polarization of nuclei...

S/181/63/005/004/028/047
B102/B186

SUBMITTED: November 27, 1962

Card 3/3

L 17999-63 EWP(j)/EPF(c)/EWT(m)/BDS AFFTC/ASD Pc-4/Pr-4
RM/WW/MAY

ACCESSION NR: AP3001284 S/0181/63/005/006/1640/1642 74

AUTHORS: Kessenikh, A. V.; Lushchikov, V. I.; Manenkov, A. A.; Taran, Yu. V. 68

TITLE: Relaxation and dynamic polarization of protons in polyethylenes

SOURCE: Fizika tverdogo tela, v. 5, no. 6, 1963, 1640-1642

TOPIC TAGS: proton, dynamic polarization, spin diffusion, nuclear magnetic resonance, polyethylene, molecular weight, ultra-high frequency

ABSTRACT: The authors started with data from V. I. Lushchikov, A. A. Manenkov, and Yu. V. Taran (FTT, 3, 3503, 1961) and A. V. Kessenikh, V. I. Lushchikov, A. A. Manenkov, and Yu. V. Taran (FTT, 4, 433, 1963) concerning the dependence of dynamic polarization in polyethylenes on the average molecular weight. They expected the coefficient of dynamic polarization to be about 60 when the molecular weight was 2.3×10^6. To test this view and to refine the results of the cited papers, they made this study on several samples of polyethylene bombarded by fast neutrons. Measurements were made on a setup described in the first of the above papers, at 77, 4.2, and 1.6K. These experiments have shown that within the limits of experimental accuracy the resolution of dynamic polarization at ultra-high-frequency output and restoration of nuclear polarization after removal of nuclear-

Card 1/2

L 17999-63

ACCESSION NR: AP3001284

6

magnetic-resonance saturation are described by exponents with identical value of the time of nuclear relaxation. This indicates that the theory of spin diffusion (G. R. Khutsishvili (ZhETF, 42, 1311, 1962)) is equally applicable to dynamic polarization. The measured values of dynamic polarization proved to be smaller than expected and the authors ascribe the difficulty of demonstrating dependence of this property on molecular weight to peculiarities in the technology of preparing the samples. "In conclusion the authors thank B. I. Kokorev for his aid in the work and they thank V. L. Karpov, Doctor of Chemical Sciences, for a number of interesting discussions. They also take this opportunity to express their thanks to T. I. Terekhov and Yu. P. Vy*tskiy for determining the molecular weight of one sample and N. A. Slovokhotov for studying the infrared spectrum of the same sample." Orig. art. has: 1 table.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova, Moscow (Physical and Chemical Institute)

SUBMITTED: 21Jan63 DATE ACQ: 01Jul63 ENCL: 00

SUB CODE: PH, MA NO REF SOV: 003 OTHER: 001

Card 2/2

L 10331-63 EWA(k)/EPF(c)/EWT(l)/EWP(q)/EWT(m)/FBD/BDS/T-2/3W2/EEC(b)-2/ES(t)-2--AFFTC/ASD/ESD-3/RADC/APGC/AFWL--Pr-4--GG/WH/JHB/WG/K/EH/IJP(C)

ACCESSION NR: AP3001285 S/0181/63/005/006/1643/1648

AUTHOR: Manenkov, A. A.; Popova, A. A.; Khaimov-Mal'kov, V. Ya.

TITLE: Investigation of crystal-field inhomogeneity in the ruby

SOURCE: Fizika tverdogo tela, v. 5, no. 6, 1963, 1643-1648

TOPIC TAGS: crystal-field inhomogeneity, ruby laser, EPR-line broadening, trigonal axis dispersion

ABSTRACT: Inhomogeneous EPR-line broadening caused by local inhomogeneities of the crystal field and dispersion of the trigonal axis orientation has been used to study such inhomogeneities in the ruby and their reaction to thermal treatment. The method yielded direct information on the nature of the local crystal field around paramagnetic ions in crystals and the influence of this field on the energy levels of the ions. Relative peak intensity rather than line width was used as a measure of crystal-field inhomogeneity in various 0.05% Cr sup plus 3 ion-concentration samples. Measurements were made with an EPR radio spectroscope operating at 9400 Mc. Small samples (volume approximately 0.5 cm

Card 1/2

sup 3) were shown to contain both local inhomogeneities and trigonal axis disperaion. Annealing at 1850C for several hours caused a considerable decrease in inhomogeneities, but additional annealing over 16 hours produced no further observable decrease. Larger samples suitable for laser applications (rods 1 cm in diameter and 12 to 20 cm in length) were shown to have considerable zoning and disorientation (up to 10 degrees) of the trigonal axis from zone to zone. It is noted that this zoning can affect the directional properties, threshold, and output power of laser emissions. "The authors express their gratitude to A. M. Prokhorov and L. M. Belyayev for useful discussion of the work." Orig. art. has: 11 formulas and 3 figures.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva AN SSSR, Moscow (Physics Institute AN SSSR)

SUBMITTED: 28Jan63 DATE ACQ: 01Jul63 ENCL: 00

SUB CODE: 00 NO REF SOV: 001 OTHER: 002

mcs/CL
Card 2/2

RITUS, A.I.; MANENKOV, A.A.

Splitting of the paramagnetic resonance lines of Cr^{3+} ions in ruby in an external electric field. Fiz. tver. tela 5 no.12:3590-3593 D '63. (MIRA 17:2)

1. Fizicheskiy institut imeni P.N.Lebedeva AN SSSR, Moskva.

MANENKOV, A.A.

AID Nr. 984-6 6 June

EPR SPECTRUM AND SPIN-LATTICE RELAXATION OF Cr^{3+} AND Fe^{3+} IONS IN $ZnWO_4$ SINGLE CRYSTALS (USSR)

Yemel'yanova, Ye. N., N. V. Karlov, A. A. Manenkov, V. A. Milyayev, A. M. Prokhorov, S. P. Smirnov, and A. V. Shirokov. Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 44, no. 3, Mar 1963, 868-869.

S/056/63/044/003/016/053

The EPR of Cr^{3+} and Fe^{3+} ions in $ZnWO_4$ single crystals in equal concentrations of ~ 0.1% has been studied in the 1.6 to 300°K range at frequencies from 9.4 to 15 Gc. Constants of the spin Hamiltonian describing the Cr^{3+}

Card 1/2

EPR SPECTRUM AND SPIN-LATTICE (Cont.) S/056/63/044/003/016/053

spectrum were obtained, and the spin-lattice relaxation time (T_1) of the Cr^{3+} ion was determined by the pulse saturation method at a frequency of 9.4 Gc for the transition M = + 1/2 ⟷ - 1/3. The relaxation time of the Cr^{3+} ion was 1.1 msec at 4.2°K and 5.3 msec at 1.6°K, satisfying the relationship $T_1 = 1.15(\exp(\delta/kT)-1)\cdot 10^{-3}$ sec, with the parameter δ/k equalling 2.8°K. This relationship is explained as due to direct resonance processes under the assumptions that transition between lower levels M = ± 1/2 is forbidden and that the relaxation is accomplished through the upper level M = 3/2 located at a distance δ from M = 1/2. Tne spin-lattice relaxation time of the Fe^{3+} ions obtained by the same method was 75 μ sec at 4.2°K and 180 μsec at 1.6°K, satisfying the relationship $T_1 \sim 1/T$ within this temperature range. Crystals containing only Fe^{3+} ions (in a concentration of ~ 0.3%) had a relaxation time of 85 ± 5 μ sec at 1.6°K and were shown to contain two nonequivalent groups of ions. Crystals containing both Fe^{3+} and Cr^{3+} ions did not show the presence of two Fe^{3+} ion systems. [BB]

Card 2/2

MANENKOV, A.A.; POL'SKIY, Yu.Ye.

Relaxation processes in paramagnetic resonance of Gd^{3+} ions in CaF_2 crystals. Zhur. eksp. i teor. fiz. 45 no.5:1425-1429 N '63. (MIRA 17:1)

1. Fizicheskiy institut imeni P.N. Lebedeva AN SSSR.

ACCESSION NR: AP4019845 S/0181/64/006/003/0827/0830

AUTHORS: Kessenikh, A. V.; Manenkov, A. A.; Pyatnitskiy, G. I.

TITLE: Discussion of experimental data on dynamic polarization of protons in irradiated polyethylenes

SOURCE: Fizika tverdogo tela, v. 6, no. 3, 1964, 827-830

TOPIC TAGS: polarization, polyethylene, ultra high frequency irradiation, magnetic resonance, magnetic property

ABSTRACT: The authors have investigated samples of polyethylene of high density, containing 10^{18} - 10^{19} cm^{-3} polyene radicals: $CH_2-(CH)_{2M-1}-CH_2$, where $M > 2$. Studies were made at 77, 4.2, and 1.6K. The frequency of the ultra-high-frequency generator was kept constant, but the magnetic field was varied, and the intensity of the nuclear magnetic resonance signal was measured in its relation to the magnetic field. It was assumed that the relations between the probabilities of different spin transitions, during ultra-high-frequency irradiation of paramagnetic centers with irregularly expanded electron paramagnetic

Card 1/2

ACCESSION NR: AP4019845

resonance lines, are determined by the relations among rates of establishing equilibrium within the spin system and equilibrium of spin with the lattice. The dynamic polarization of protons was found to decline very rapidly (negative values) with increase in magnetic field, reach a minimum, then increase very rapidly (passing through zero) with further increase in field, reach a maximum, and then decline again. Theoretical values were found to correspond closely to experimental values in values of magnetic field where the minimums and maximums occur, but the theoretical values of the minimum and maximum proved to be numerically greater than the experimental values. The authors point out that it is possible to compute, within the framework of the model they employ, the effect of combination spin transition saturation on electron polarization, which cannot generally be neglected in calculations. Orig. art. has: 2 figures and 3 formulas.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova, Moscow (Physico-chemical Institute)

SUBMITTED: 02Sep63 DATE ACQ: 31Mar64 ENCL: 00

SUB CODE: SS, EC NO REF SOV: 004 OTHER: 003

Card 2/2

L 20375-65 EWT(1)/EWT(m)/EEC(t)/EWP(t)/EWP(b) Peb IJP(c)/AFWL/
ASD(a)-5/SSD/AS(mp)-2/RAEM(c)/RAEM(t)/ESD(gs)/ESD(t) JD/JG/GG
ACCESSION NR: AP4039648 S/0181/64/006/006/1649/1653

AUTHOR: Andreyeva, Ye. V.; Karlov, N. V.; Manenkov, A. A.; Milyayev, V. A.; Shirkov, A. V.

TITLE: Electron paramagnetic resonance of chromium ions in cadmium tungstate

SOURCE: Fizika tverdogo tela, v. 6, no. 6, 1964, 1649-1653

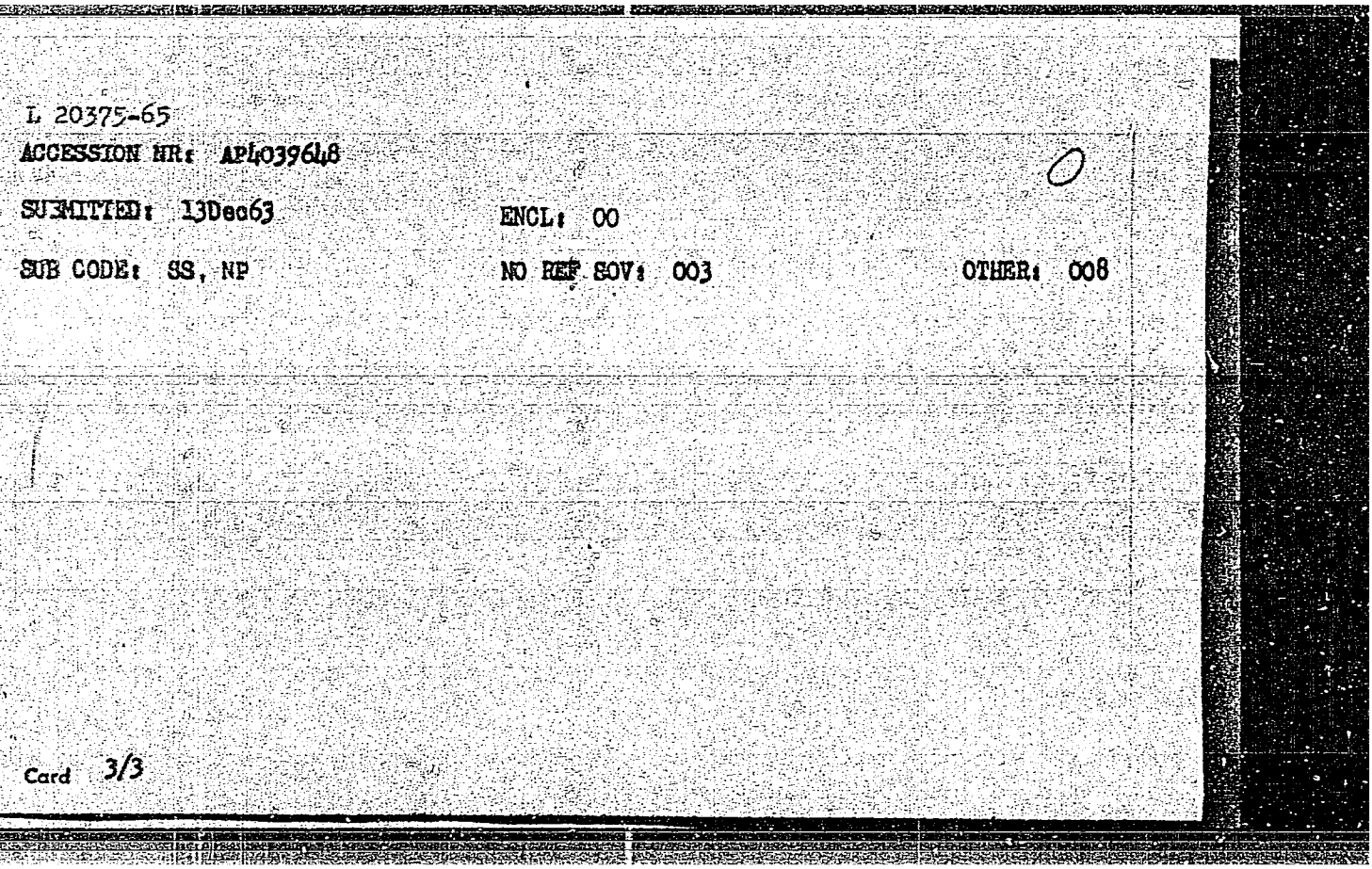
TOPIC TAGS: electron paramagnetic resonance, Czochralski method, spin lattice relaxation, spin Hamiltonian, chromium ion, cadmium tungstate

ABSTRACT: Samples were grown by the Czochralski method from pure fused $CdWO_4$ to which $(NH_4)Cr_2O_7$ had been added. The crystal thus obtained contained no Cr^{3+} ions, but after annealing in air for several hours at 700C, a transition to the trivalent state occurred. Electron paramagnetic resonance was observed in the temperature interval from 300 to 1.6K at frequencies from 9.4 to 98 gigacycles in magnetic fields ranging up to 10 kilogauss. The constants of the spin Hamiltonian for Cr^{3+}

Card 1/3

were found to be D = 42.9 ± 0.05 gigacycles, E = 2.35 ± 0.02 gigacycles, g_x = 1.97 ± 0.01, g_y = 1.97 ± 0.01, and g_z = 1.98 ± 0.01. The spin-lattice relaxation time, measured when the magnetic field was parallel to z, was found to be 0.36 microseconds at 4.2 and 3.0 microseconds at 1.6K. This time dependence may be explained by direct resonance processes of relaxation if it is assumed that direct relaxation is forbidden between the lower investigated levels M = ± 1/2 and is allowed through the upper level M = 3/2 at some distance d from the level M = 1/2. The value of d obtained from the equation for temperature dependence is 100 gigacycles; from spectroscopic data the splitting between the two levels (1/2 and 3/2) proved to be 96 gigacycles, very near 100. This supports the view of a relaxation mechanism. "The authors thank V. V. Osiko, who prepared the single crystals of $CdWO_4$, and L. N. Dem'yanets, who made the x-ray studies of the crystals." Orig. art. has: 2 figures, 3 tables, and 2 formulas.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva AN SSSR, Moscow (Physics Institute, AN SSSR)



L 20375-65
ACCESSION NR: AP4039648

SUBMITTED: 13Dec63 ENCL: 00

SUB CODE: SS, NP NO REF SOV: 003 OTHER: 008

Card 3/3

KARLOV, I.V.; MANENKOV, A.A.

Quantum paramagnetic amplifiers; review. Izv. vys. ucheb. zav.; radiofiz. 7 no.1:5-45 '64. (MIRA 17:3)

1. Fizicheskiy institut imeni Lebedeva AN SSSR.

L 11949-66 EWT(1)/EWP(e)/EWT(m)/EEC(k)-2/T/EWP(k)/EWA(m)-2 IJP(c) WG/WH

ACC NR: AP6000737 SOURCE CODE: UR/0386/65/002/009/0414/0418

AUTHOR: Manenkov, A. A.; Danileyko, Yu. K.

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences, SSSR (Fizicheskiy institut Akademii nauk SSSR)

TITLE: Concentration and temperature dependence of the spin-lattice relaxation times in ruby at helium temperatures. Relaxation in zero magnetic field

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 2, no. 9, 1965, 414-418

TOPIC TAGS: spin lattice relaxation, ruby, temperature dependence, ion density, paramagnetic relaxation, crystal, laser

ABSTRACT: In view of the contradictions between various experimental results, and in view of the great importance of the concentration dependence of the spin-lattice relaxation time in the theory of paramagnetic relaxation in crystals and the great practical value of ruby crystals for use in quantum amplifiers and lasers, the authors undertook to measure precisely the relaxation time in ruby at helium temperatures in a broad range of Cr^{3+} ion concentrations, from 0.05 to 0.7%. The samples were grown by the Verneuil method in a strongly reducing medium. The values of the spin-lattice relaxation time T_1 were measured by pulsed saturation of the paramagnetic resonance lines at frequencies $\nu_1 = 11{,}472$ and $\nu_2 = 9400$ Mc. The values of T_1 in ruby were measured at $T = 4.2$K for the transitions $\pm 1/2 \leftrightarrow \pm 3/2$ in zero magnetic field and $1/2 \leftrightarrow -1/2$ in a field $H = 3360$ oe at different Cr^{3+} concentrations. Investigations

Card 1/2

of the transition $\pm 1/2 \leftrightarrow \pm 3/2$ in zero magnetic field at the frequency ν_1 have shown that the relaxation curves are singly-exponential at all the investigated concentrations and do not depend on the duration of the saturating pulses. This confirms the assumption that there are no cross relaxation processes in this transition, and the observed relaxation curves corresponded to spin-lattice relaxation. The transition $1/2 \leftrightarrow -1/2$ was investigated at the frequency ν_2 for parallel orientation of the c axes of the ruby crystals relative to the external magnetic field (3360 oe). The doubly exponential relaxation curves observed at this frequency for certain Cr^{3+} concentrations corresponded to both spin-lattice and cross relaxations. These two processes were separated by investigating the dependence of the form of the relaxation curves on the duration of the saturating pulses. Investigations of the temperature dependence of T_1 have shown that $T_1 \sim T^{-1}$ in the interval $T = 1.6 - 4.2K$ at all investigated Cr^{3+} ion concentrations, showing no anomalies whatever even at large concentrations. It is concluded from the temperature dependence that the spin-lattice relaxation results from direct processes of energy exchange between the spin system and the lattice. The character of the concentration dependence of the relaxation rate indicates that there are two different effective spin-phonon interaction mechanisms. One depends on the concentration of the paramagnetic ions and is responsible for the relaxation at low concentrations ($\lesssim 0.05\%$), and is the Kroning-Van Vleck mechanism. The second mechanism leading to a concentration dependence of the relaxation time becomes predominating at concentrations $\gtrsim 0.3\%$, and is probably connected with the interaction between the Cr^{3+} ions. Authors thank A. A. Popove for supplying the ruby crystals. Orig. art. has 2 figures and 1 formula. 44,55

SUB CODE: 20/ SUBM DATE: 07Sep65/ ORIG REF: 003/ OTH REF: 008

L 24702-65 EWP(s)/EWT(m)/EWA(h) WH

ACCESSION NR: AP5001825 S/0056/64/047/006/2055/2063

AUTHOR: Manenkov, A. A.; Martirosyan, R. M.; Pimenov, Yu. P.; Prokhorov, A. M.; Syychugov, V. A.

TITLE: Transient processes in three-level radio-frequency masers

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 47, no. 6, 1964, 2055-2063

TOPIC TAGS: maser, three level maser, ruby maser, transient state maser, maser transient effect, paramagnetic maser, rutile maser

ABSTRACT: An investigation is made of transient processes in rf three-level paramagnetic masers. The investigation to a certain extent is also applicable to the optical range. The active substances used were ruby and rutile (TiO_2) doped with Cr^{3+}. The emission from the ruby and rutile masers was in the 21- and 10-cm ranges, respectively. The concentration of Cr^{3+} in ruby was 0.03% and in rutile 0.06%, and both masers operated at a temperature of 4.2K. The experimental results indicate that the steady-state amplitude is reached after a series of transient damped oscillations with subsequent exponential

Card 1/3

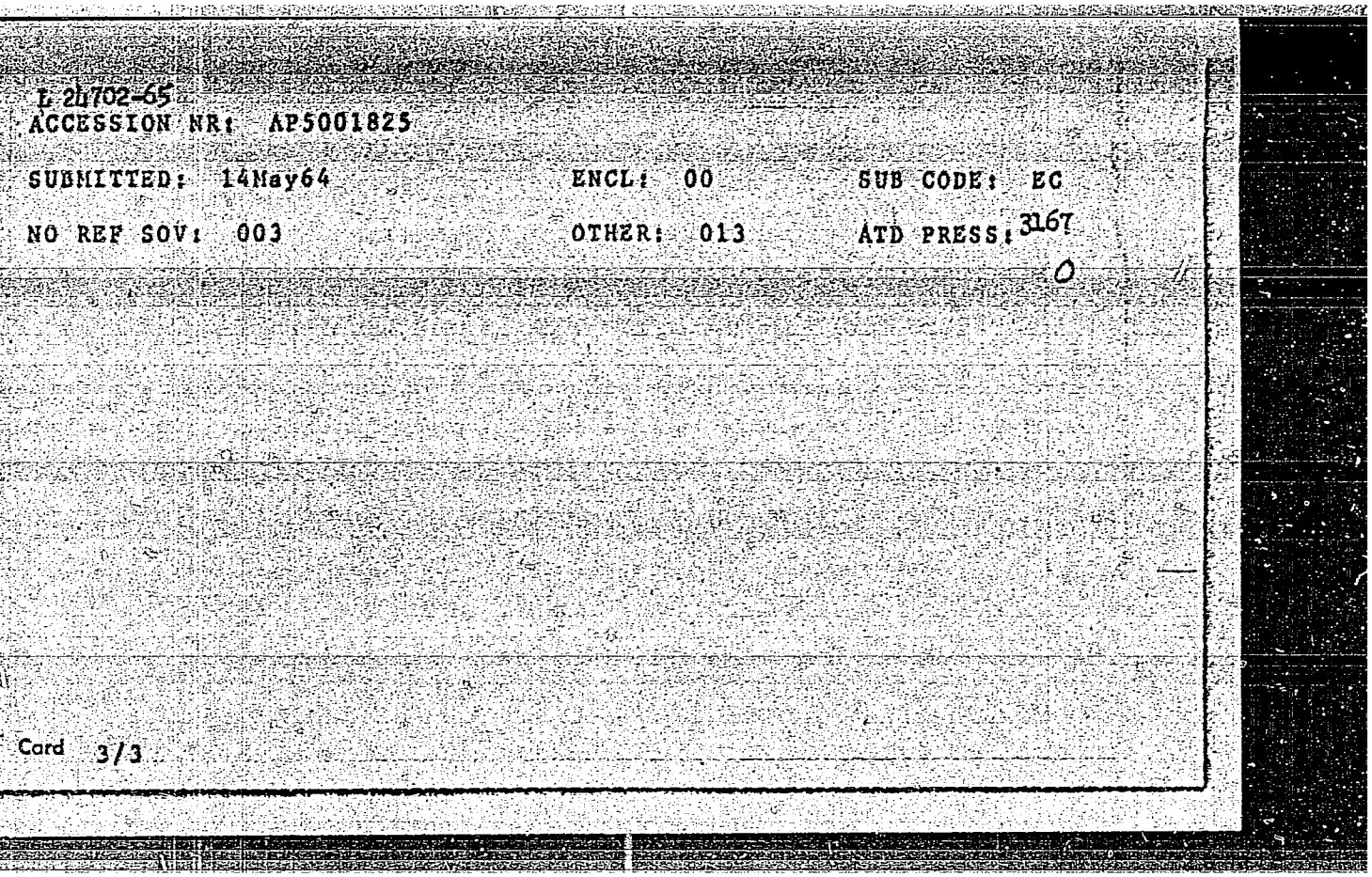
L 24702-65
ACCESSION NR: AP5001825

attenuation. The differences between the stages of a transient in ruby and rutile masers are discussed. A theoretical analysis of transient processes in masers is carried out on the basis of kinetic equations similar to those used by H. Statz and G. A. de Mars (Quantum Electronics, Columbia University Press, N. Y., 1960, 530 pp.) but generalized for a three-level maser. A solution of a system of nonlinear equations is obtained as a linear approximation in analytical form. The theoretical computations agree well with the experimental data. The results indicate that in a ruby maser oscillations with amplitude equal to, or higher than, the steady state occur. In the case of large deviations of the population and amplitude from the steady-state values, nonlinear effects are very likely to occur. These, in a ruby maser, cause nonsinusoidal oscillations at the start of a transient; the duration of the first peaks is considerably shorter than the duration of those near the steady-state level, where oscillations approach a sinusoidal form. Orig. art. has: 12 formulas and 4 figures.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Institute of Physics, Academy of Sciences, SSSR)

Card 2/3

APPROVED FOR RELEASE: 03/13/2001 CIA-RDP86-00513R001032120010-1"



L 24702-65
ACCESSION NR: AP5001825

SUBMITTED: 14May64 ENCL: 00 SUB CODE: EC

NO REF SOV: 003 OTHER: 013 ATD PRESS: 3167

0

Card 3/3

MANENKOV, A.A.; DANILEYKO, Yu.K.

Concentration and temperature dependence of spin-lattice relaxation times in a ruby at helium temperatures. Relaxation in a zero magnetic field. Pis'. v red. Zhur. eksper. i teoret. fiz. 2 no.3:414-418 N '65. (MIRA 18:12)

1. Fizicheskiy institut imeni P.N. Lebedeva AN SSSR. Submitted September 7, 1965.

L 21218-66 EWI(m)/EWP(t) IJP(c) JD
ACC NR: AP6003807 SOURCE CODE: UR/0181/66/008/001/0262/0262

AUTHORS: Zaripov, M. M.; Manenkov, A. A.; Chirkin, G. K.

ORG: Kazan' State University im. V. I. Ul'yanov-Lenin (Kazanskiy gosudarstvennyy universitet)

46
B

TITLE: EPR of Gd^{3+} in $SrWO_4$

SOURCE: Fizika tverdogo tela, v. 8, no. 1, 1966, 262

TOPIC TAGS: gadolinium, electron paramagnetic resonance, single crystal, strontium compound, crystal symmetry, spin lattice relaxation

ABSTRACT: The authors investigated the EPR spectrum of Gd^{3+} ions in single crystal $SrWO_4$ grown by the Verneuil method. The crystals contained ~0.1 atomic per cent paramagnetic ions. The authors found that the Gd^{3+} ions are in a crystalline field of tetragonal symmetry, the z axis of which coincides with the c axis of the crystal. This is evidence of isomorphic substitution of Gd^{3+} for

2

Card 1/2

L 21218-66
ACC NR: AP6003807

the Sr^{2+} ions. The parameters of the spin Hamiltonian of tetragonal symmetry are determined at room temperature and at wave lengths of 8 mm. The relaxation characteristics were measured at 9.4 Gcs by the pulse saturation method. The spin-lattice relaxation time at T = 4.2K was the same for all transitions (8 msec) with the field parallel to the z axis. Cross relaxation with a time constant 0.5 msec is observed for all lines. Orig. art. has: 1 formula.

SUB CODE: 20/ SUBM DATE: 29Jul65/

Card 2/2

L 07358-67 EWT(1) GG
ACC NR: AP6033265 SOURCE CODE: UR/0109/66/011/010/1899/1901

AUTHOR: Manenkov, A. A.; Sychugov, V. A.; Chernyshev, I. M.

ORG: Institute of Physics im. P. N. Lebedev AN SSSR (Fizicheskiy institut AN SSSR) 36 B

TITLE: SHF-power switching by semiconductor diodes 45

SOURCE: Radiotekhnika i elektronika, v. 11, no. 10, 1966, 1899-1901

TOPIC TAGS: SHF, semiconductor diode, SHF switch

ABSTRACT: The SHF-diode switch changes its resistance upon application of a suitable bias voltage (D. W. Foldman et al., Rev. Sc. Instr., 1961, 32, 74). Placed in a waveguide, the diode changes the value of the reflected SHF power. Switches (see figure) for 3.2-cm and 2.5-cm wavelengths with D-13 Ge diodes were constructed, tested, and used (since 1962) in Soviet radio-spectroscopes. Measured SHF loss in the switch was 2 db or less; switching factor, 40--60 db. SHF-pulse rise and fall times were 1.5 μsec or less when the switch was opened (or closed) by a square bias pulse with a rise time of 50 nsec. Orig. art. has: 2 figures.

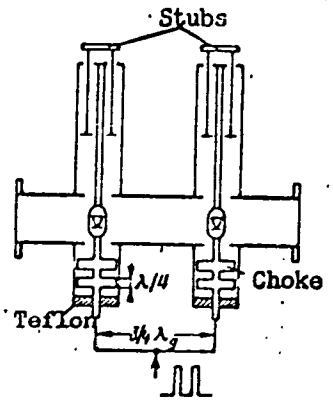


Fig. 1.

SUB CODE: 09 / SUBM DATE: 29Jan66 / ORIG REF: 001 / OTH REF: 003
ATD PRESS: 5101
Card 1/1 afs

AFONIN, L.A.; ZOZULYA, P.I.; MANEN'KOV, P.I.

Organizing communication channels in 6/04 kv. power-distribution networks on oil fields. Mash. i neft. obor. no.4:17-19 '65. (MIRA 18:5)

1. Groznenskiy filial Vsesoyuznogo nauchno-issledovatel'skogo i proyektno-konstruktorskogo instituta kompleksnoy avtomatizatsii neftyanoy i gazovoy promyshlennosti.

MANENKOV, P. V.

Manenkov, P. V. "Recollections of the scientific worker Professor Viktorin Sergeyevich Gruzdev," (The obstetrician and gynecologist, on the 10th anniversary of his death), Trudy Kazansk, gos. med. in-ta, 1943, p. 5-8, (with portrait).

SO: U-3736, 21 May 53, (Letopis 'Zhurnal 'nykh Statey, No. 18, 1949).

MANENKOV, P. V.

Manenkov, P. V. "The work done by the clinic imini Professor Gruzdev on local infiltration anesthesia, based on Vishnevskiy's method, specifically for gynecological operations," Trudy Kazansk. gos. med. in-ta, 1948, p. 37-48.

SO: U-3736, 21 May 53, (Letopis 'Zhurnal 'nykh Statey, No. 18, 1949).

MANENKOV, P. V.

Manenkov, P. V. "Equipment for local infiltration anesthesia according to the Vishnevskiymethod for operations," Trudy Kazansk. gos. med. in-ta 1948, Issue 2, p. 49-53.

SO: U-3736, 21 May 53 (Letopis 'Zhurnal 'Nykh Statey, No. 18, 1949).

MANENKOV, P. V.

Manenkov, P. V. and Syganova, K. N. "The diagnosis and systematic treatment of sterility in women," Trudy Kazansk. gos. med. in-ta, 1948, p. 55-60.

SO: U-3736, 21 May 53, (Letopis 'Zhurnal 'nykh Statey, No. 18, 1949).

MANENKOV, P. V.

Manenkov, P. V. "A simple, effective, and safe method of artificial removal of the placenta," Trudy Kazansk. gos. med. in-ta, 1948, p. 61-67.

SO: U-3736, 21 May 53, (Letopis 'Zhurnal 'nykh Statey, No. 18, 1949).

MANENKOV, P. V.

Manenkov, P. V. "Nomenclature and classification in obst tric physiology," Trudy Kazansk. gos. med. in-ta, 1948, p. 107-15.

SO: U-3736, 21 May 53, (Letopis 'Zhurnal 'Nykh Statey, No. 18, 1949).

MANENKOV, P. V.

Manenkov, P. V. and Deshevilo, I. Ya. "On the problem of leukoplakia of the vaginal portion of the [illegible] of the uterus," Trudy Kazansk. gos. med. in-ta, 1948, p. 177-82.

SO: U-3736, 21 May 53, (Letopis 'Zhurnal 'nykh Statey, No. 18, 1949).

MANENKOV, P.I.

Gruzdev (1866-1938). Moskva, Medgiz, 1952. 134 p. (MLRA 8:1 D)

MANENKO, P. V., Prof.

Physicans

Viktorin Sergeevich Gruzdev, 1866-1938. Fel'd. i akush. No. 1, 1953.

Monthly List of Russian Accessions, Library of Congress, June 1953. Uncl.

MANENKOV, P.V.

Local infiltration anesthesia according to A. V. Vishnevskii's method in gynecological and obstetric surgery. Sovet. med. 17 no.6:9-11 June 1953. (CLML 24:5)

1. Professor. 2. Of the Obstetric-Gynecological Clinic imeni Prof. V. S. Gruzdev, Kazan' Medical Institute (Director -- R. A. Vyaselev).

DANILOV, I.V.; MANENKOV, P.V., professor, direktor.

Comparative evaluation of the simplest biological reactions for the diagnosis of pregnancy. Sov.med. 17 no.9:35-36 S '53. (MLRA 6:9)

1. Akusherako-ginekologicheskaya klinika Kazanskogo meditsinskogo instituta.
(Pregnancy--Signs and diagnosis)

MANENKOV, P.V., professor (Kazan')

Discussion on P.A.Beloshapko and V.M.Maliavinskii's article "Clinical aspects and conduct of the third (placental) stage of labor." Akush.i gin. no.1:48-50 Ja-F '54. (MLRA 7:6)
(Labor (Obstetrics)) (Beloshapko, P.A.) (Maliavinskii, V.M.)

MANENKOV, P.V., ANDREZEN, N.V.

[Our method of local infiltration anesthesia in obstetrical and gynecological surgery] Masha tekhnika mestnoi infil'tratsionnoi anestezii pri akushersko-ginekologicheskikh operatsiiakh. Kazan', Tatknigoizdat, 1956. 70 p. (MIRA 11:1)
(ANESTHESIA IN OBSTETRICS)

MANENKOV, P.V.

Repeated normal deliveries following suture of an old laceration of the uterus. Akush. i gin. 33 no.6:77-78 N-D '57. (MIRA 11:3)

1. Iz 1-y kafedry akusherstva i ginekologii (zav.-prof. P.V. Manenkov) Kazanskogo meditsinskogo instituta.
(PREGNANCY LABOR, in various dis. comp.
uterine laceration followed by normal labors)
(UTERUS, perf.
in labor, followed by several normal labors)

MANENKOV, P.V., prof.

Prof. Aleksander Ignat'evich Timofeev (1881-1929). Akush. i gin. 34 no.2: 101-103. Mr-Ap '58. (MIRA 11:5)
(BIOGRAPHIES
Timofeev, Aleksandr I. (Rus))