APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6

ZVEREV, G.

J657

ON TRIPLE SYSTEM OF CERIUM–CALCIUM–CHLORINE.

G. L. Zverev. Doklady Akad. Nauk S.S.S.R. 104, 248-9 (1955)

Sept. 11. (In Russian)

Tables and a fusibility diagram of the Ce–Ca–Cl system are given. The constructed Ca–$CeCl_3$ phase diagrams produces important data on compounds, smelting temperatures, and crystallization processes of products in the calciothermal reduction of $CeCl_3$. (R. V. J.)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6

BOCHVAR, A.A., akademik, obshchiy red.; VINOGRADOV, A.P., akademik, obshchiy red.; YEMEL'YANOV, V.S.; ZEFIROV, A.P., doktor tekhn. nauk, obshchiy red.; ZUBOV, A.I., red.; ZVERKEV, G.L., red.; PERSVERZEV, V.V., red.; PCHELINTSEVA, G.M., red.; MAZEL', Ye.I., tekhn.red.

[Proceedings of the Second International Conference on the Peaceful Uses of Atomic Energy, Geneva, 1958] Trudy Vtoroi mezhdunarodnoy konferentsii po mirnomu ispol'zovaniyu atomnoy energii, Zheneva, 1958. (Doklady sovetskikh uchenykh) Moskva, Izd-vo Glav.uprav.po ispol'zovaniiu atomnoi energ. pri Sovete Ministrov SSSR. Vol.3. [Nuclear fuel and reactor metals] IAdernoe goriuchee i reaktornye metally. 1959. 670 p. (MIRA 12:11)

1. International Conference on the Peaceful Uses of Atomic Energy, 2d, Geneva, 1958. 2. Chlen-korrespondent AN SSSR (for Yemel'yanov). (Nuclear fuels)

BOCHVAR, A.A., akademik, red.; IEMEL'IANOV, V.S., red.; PEREVERZEV, G.L., red. toma; IVANOV, A.N., red. toma; SOKURSKIY, Yu.N., red. toma; STERLIN, Ya.M., red. toma; PEREVERZEV, V.V., red.; PCHELINTSEVA, G.M., red.; MAZEL', Ye.I., tekhn. red.

[Transactions of the International Conference On The Peaceful Uses of Atomic Energy] Trudy Vtoroy mezhdunarodnoy konferentsii po mirnomu ispol'zovaniyu atomnoy energii, 2d, Geneva, 1958. Izbrannye Doklady inos rannykh uchenykh. Moskva, Izd-vo Glav. uprav. po ispol'zovaniiu atomnoi energ. pri Sovete Ministrov SSSR. Vol.6. [Nuclear fuel and ractor materials] IAdernoe goriuchee i reaktornye materialy. Pod obshchei red. A.A.Bochvara i Emel'ianova V.S. 1959. 702 p. (MIRA 14:10)

1. International Conference on The Peaceful Uses of Atomic Energy. 2d, Geneva, 1958. 2. Chlen-korrespondent AN SSSR (for Yemel'yanov). (Nuclear fuels) (Nuclear reactors—Materials)

ZVEREV, G. M. Cand Phys-Math Sci -- "Study of the electronic paramagnetic resonance of V^{3+} and Co^{2+} ions in corundum." Mos, 1960. (Acad Sci USSR. Physics Inst im P. N. Lebedev) (KL, 1-61, 179)

V^{3+} and Co^{2+} ions

56-2-37/51

AUTHORS: Zverev, G. M., Prokhorov, A. M.

TITLE: The Fine and Hyperfine Structure of the Spectrum of Paramagnetic Resonance of Cr^{3+} in Corundum (Tonkaya i sverkhtonkaya struktura spektra paramagnitnogo rezonansa Cr^{3+} v korunde)

PERIODICAL: Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 1958, Vol 34, Nr 2, pp 513 - 514 (USSR)

ABSTRACT: First three works dealing with the same subject are mentioned. The authors investigated in detail this spectrum at a frequency of 37860 megacycles. The behavior of the energy levels with an external magnetic field being present is described by an Hamiltonian mentioned here. The microstructure was investigated of a corundum monocrystal which contained chromium in 1000-fold dilution. The position of the lines was measured for two orientations of the crystal in the external magnetic field: 1) The trigonal axis $Z \parallel \vec{H}$; 2) the trigonal axis $Z \perp \vec{H}$. In the first mentioned case three absorption lines were

The Fine and Hyperfine Structure of the Spectrum of Para-magnetic Resonance of Cr^{3+} in Corundum

noticed which correspond to the transitions between the levels with the following values for M_z: 1) $-3/2 \leftrightarrow -1/2$; 2) $-1/2 \leftrightarrow +1/2$; 3) $+1/2 \leftrightarrow +3/2$. In the second case the energy states ε_1, ε_2, ε_3, ε_4 form a mixture of states of various M_z. Altogether 6 absorption lines were observed of which the first three have an intensity which is smaller by two orders of magnitude than the last three. From the position of these lines the values of the constants in the spin Hamiltonian were determined. Proceeding from these values the position of all lines was computed. The experimental values coincide well with those computed. The spin-lattice relaxation time T_1 obviously has the order of magnitude 10^{-2} sec. The hyper--microstructure was investigated by means of a sample containing chromium in form of 95 % Cr^{95}; the dilution was 1 : 10000. The hyper-microstructure is only well dissolved in the case of the line $-1/2 \leftrightarrow +1/2$ with parallel orientation and in that of the line $\varepsilon_2 \leftrightarrow \varepsilon_3$ with vertical orientation. There are 4 components which correspond to the various projections of the nuclear spin ($I = 3/2$). The components do not have the same distance: The distance between the two inner

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lines is less than one third of that of the outer lines. These irregular distances can be explained by the existence of a weak line in the center (which corresponds to the even isotopes in the sample). The following values were found for the hyper-microstructure constants A and B: $|A| = (16,8 \pm \pm 0,04).10^{-4}$ cm^{-1} and $|B| = (16,8 \pm 0,06).10^{-4}$ cm^{-1}. The coincidence of these values speaks in favor of the practically complete isotropy of the hyper-microstructure. There are 1 figure, and 4 references, 3 of which are Slavic.

ASSOCIATION: Moscow State University
(Moskovskiy gosudarstvennyy universitet)

SUBMITTED: November 13, 1957

AVAILABLE: Library of Congress

1. Paramagnetic resonance-Spectrum analysis

56-34-4-48/60

AUTHORS: Zverev, G. M., Prokhorov, A. M.

TITLE: The Paramagnetic Electron Resonance of the Ion V^{3+} in Corundum (Elektronnyy paramagnitnyy rezonans iona V^{3+} v korunde)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol. 34, Nr 4, pp. 1023 - 1024 (USSR)

ABSTRACT: The authors investigated the spectrum of the paramagnetic electron resonance of the ion V^{3+} in a monocrystal of the corundum Al_2O_3. The spectroscopic basic state of this ion is $^3F_2$. The seven times degenerated orbital energetic level is split up by the electric field of the crystal into a singlet and a triplet, the triplet being the lowest level. This applies to crystal fields of cubic symmetry. A crystal field of trigonal or tetragonal symmetry further splits up this orbital triplet into a doublet and a singlet. The lowest energy level of the ion V^{3+} in a crystal field of trigonal symmetry is a singlet (S = 1), degenerated three times with regard to the spin. A line would have to be observel which corresponds to the transition from the level $S_z = +1$

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to the level $S_z = -1$. In order to be able to investigate this line its width must not be too great, i.e. the time of the spin-lattice relaxation must be more than 10^{-11} sec. In the lattice of corundum there exists a strong electric field of trigonal symmetry which drives the lower orbital levels of the ion V^{3+} far apart. Therefore the time of spin lattice relaxation is probably sufficiently long at low temperatures. In such crystal lattices, in which the axial component of the electric field is weaker, the lines of paramagnetic electron relaxation are probably not easily visible. The authors observed a line of the ion V^{3+} in a corundum monocrystal at $T = 4{,}2^{\circ}K$ at frequencies of from 14 000 to 38 000 megacycles. When the temperature dropped to $2^{\circ}K$ the intensity of this line decreased considerably. When the temperature rose, the line became wider and then disappeared. At $T = 77^{\circ}K$ this line was not observed. The line consisted of 8 equidistant components, which corresponds to the nuclear spin $I = 7/2$ of V^{51}. The line was visible at parallel orientation. The half life component of a single component was 20 Oersted at parallel orientation and the distance between the components amounted to 108 Oersted. The spectrum can be

The Paramagnetic Electron Resonance of the Ion V^{3+} in Corundum

interpreted by means of a given spin Hamiltonian.The authors thanked S. M. Grum-Grzhimaylo and A. A. Popova for the production of the samples and Professor A. I. Shal'nikov for his aid in carrying out experiments at low temperatures. There are 4 references, 0 of which are Soviet.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet
(Moscow State University)

SUBMITTED: January 16, 1958

1. Corundum--Resonance

Card 3/3

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

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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

24(3) SOV/56-36-2-62/63

AUTHORS: Zverev, G. M., Prokhorov, A. M.

TITLE: The Electron Paramagnetic Resonance of Co^{2+} in Corundum (Elektronnyy paramagnitnyy rezonans Co^{2+} v korunde)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 2, pp 647-648 (USSR)

ABSTRACT: In a corundum single crystal which contains admixtures of cobalt, the lines of the paramagnetic electron resonance of the cobalt ion were detected at T = 4.2°K at the frequencies 9800 and 37500 megacycles. All these lines have a hyperfine structure of 8 components, which corresponds to the spin I = 7/2 of the nucleus Co^{59}. If the magnetic field is parallel to the trigonal axis of the crystal, an intense line is observed, the components of which (for the frequency 9800 megacycles), have very different distances. If the magnetic field is perpendicular to the trigonal axis, the components of the hyperfine structure of these lines are equidistant for both of the above-mentioned frequencies. The observed spectrum can be ascribed to Co^{2+} of effective spin S' = 1/2. The hyperfine structure was not investigated in detail; the g-factors

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(measured in the center of the line) have the values $g_{\parallel} = 2.27$ and $g_{\perp} = 4.95$. Besides an intense line, some faint lines are observed which have the hyperfine structure characteristic of cobalt. In contrast to the ions Cr^{+}, Fe^{3+}, V^{3+} in corundum, the ion Co^{2+} has a noticeably longer relaxation time, since at $T = 4.2^{\circ}K$ the saturation effect takes place at powers of $\sim 10^{-8}$ W. This is a translation of this short letter.

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

SUBMITTED: December 16, 1958

31757
S/058/61/000/011/010/025
A058/A101

24.7900

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

TITLE: Investigation of electron paramagnetic resonance of iron-group ions in corundum

PERIODICAL: Referativnyy zhurnal. Fizika, no. 11, 1961, 130, abstract 11V267 (V sb. "Paramagnitn. rezonans". Kazan', Kazansk. un-t, 1960, 7)

TEXT: The electron paramagnetic resonance of Fe, Co, V, Cr and Cu ions in the corundum lattice was experimentally investigated in a wide frequency (40,000-10,000 Mcps) and temperature (290°-1.7°K) range. The observed spectra were given a pertinent theoretical interpretation, and the values of the spin Hamiltonian constants were determined. Electron paramagnetic resonance of Cu ions in corundum was not detected. The valence states of ions in corundum were determined, and relaxation times at liquid He temperature were evaluated. The feasibility of using Cr and Fe ions in corundum to design paramagnetic amplifiers was experimentally demonstrated.

[Abstracter's note: Complete translation]

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ZVEREV, G.M.

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S/056/60/038/02/21/061
B006/B011

24.7900

AUTHORS: Zverev, G. M., Prokhorov, A. M.

TITLE: Investigation of the Spectrum of Electron Paramagnetic Resonance of V^{3+} in Corundum

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 38, No. 2, pp. 449-454

TEXT: A previous paper (Ref. 1) had already reported on the investigations of the electron paramagnetic resonance spectrum in a corundum single crystal containing 0.13% V^{3+}. The present paper offers detailed information, and first of all, an interpretation of experimental results by the aid of the spin Hamiltonian, which describes the behavior of the three lowest energy levels in the magnetic field. The introduction offers several data concerning the free V^{3+} ion and the vanadium ion inserted in the crystal structure of Al_2O_3, and a few general structural problems are discussed. The splitting of the lowest energy level of the V^{3+} ion in fields of different symmetry had already been investigated to explain the magnetic behavior of vanadium alum. The level degeneration is schematically re-

presented in Fig. 1 and is discussed (level splitting into a singlet and two triplets). The spin-orbit interaction gives rise to a further splitting of the lower spin triplet into a singlet and a doublet (Refs. 4-6). The degeneration of the spin triplet is, however, completely eliminated on the contamination of a crystal with rhombic symmetry - which in fact occurs with corundum. Since already at room temperature, and all the more at lower temperatures, all of the energy levels except for the lowest are not populated, only the lower three spin levels are of interest for the electron paramagnetic resonance. Transitions among these three spin levels can be observed by the method of the electron paramagnetic resonance. Fig. 3 shows the picture of such a resonance line of the V^{3+} ion in corundum at ν = 37,450 Mc/sec, T = 4.2°K. There were also Cr^{3+} and Fe^{3+} ions in corundum, but their concentration did not exceed 0.001%. Measurements had already been made in a wide frequency range (9,000 - 39,000 Mc/sec) at helium temperature. Such a resonance line (Fig. 3) consisted of eight hyperfine structural components each, which is indicative of a nuclear spin of the V^{51} of I = 7/2. The Hamiltonian

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by which the experimental results were studied, reads

$$\hat{\mathcal{H}} = D\hat{S}_z'^2 + g_{\parallel}\beta H_z \hat{S}_z' + g_{\perp}\beta(H_x\hat{S}_x' + H_y\hat{S}_y') + A\hat{S}_z'\hat{I}_z + B(\hat{S}_x'\hat{I}_x + \hat{S}_y'\hat{I}_y) + E(\hat{S}_x'^2 - \hat{S}_y'^2),$$

where $\hat{S}_x'$, $\hat{S}_y'$, and $\hat{S}_z'$ are the projections of the effective electron spin, $\hat{I}_x$, $\hat{I}_y$, and $\hat{I}_z$ the projections of the nuclear spin, H_x, H_y, and H_z the projections of the field strength vector, $g_{\parallel}$ and $g_{\perp}$ the factors of the spectroscopic splitting, β the Bohr magneton, D the constant of primary splitting, E the constant of the rhombic field; A and B are constants of the hyperfine structure. The constants of the Hamiltonian were found by the authors to be

$g_{\parallel} = 1.915 \pm 0.002$; $D = (7.0 \pm 0.3)\ cm^{-1}$, $|A| = (0.959 \pm 0.005)\cdot 10^{-2} cm^{-1}$; $|E| < 10^{-2} cm^{-1}$. The results are discussed. The authors finally thank A. A. Popova, R. P. Bashuk, and A. S. Bebchuk for their assistance. There are 4 figures and 11 references: 5 Soviet, 2 Dutch, 2 British, and 2 American

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Inst. Nuclear Physics, Moscow State Univ.

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S/056/60/039/01/08/029
B006/B070

24.6400

AUTHORS: Zverev, G. M., Prokhorov, A. M.

TITLE: Electron Paramagnetic Resonance and Spin Lattice Relaxation of the Co^{2+} Ion in Corundum

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 39, No. 1 (7), pp. 57-63

TEXT: The purpose of the present work was an investigation of the electron paramagnetic resonance of the Co^{2+} ion in corundum, its theoretical interpretation, and a determination of the spin lattice relaxation time. The energy levels of the Co^{2+} ion which, as a free ion in the ground state, has a ^4F term corresponding to the $3d^7$ configuration, are split in the corundum crystal by the Stark effect of the electric field of the neighboring ions. The electric field in the crystal is formed by the O^{2-} octahedron, and has mainly cubic symmetry with slight trigonal impurities. The behavior of the Co^{2+} ion in the

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crystal field, and the splitting of the line are investigated in the introduction. The experimental results are then mentioned (Which have partly already been published in Ref. 8). The spectrum of the electron paramagnetic resonance of Co^{2+} was investigated at 4.2°K. It consists of two groups of strong lines which show eight hyperfine-structure components ($I=7/2$ for Co^{59}), and some groups of weak lines characteristic of cobalt hyperfine-structure. The intensities of all lines diminish with decreasing temperature; that means that the lines are due to transitions between levels of the lower Kramers doublet. For the constants of the spin Hamiltonian of the lines 9000 and 38000 Mc/sec, the following values were found:

Line I

$g_{\parallel} = 2.292 \pm 0.001$ $\quad g_{\perp} = 4.947 \pm 0.003$

$A = 3.24 \pm 0.01$ $\quad B = 9.72 \pm 0.05$

Line II

$g_{\parallel} = 2.808 \pm 0.003$ $\quad g_{\perp} = 4.855 \pm 0.005$

$A = 2.08 \pm 0.09$ $\quad B = 13.10 \pm 0.11$ $\quad$ (A and B in 10^{-3} cm^{-1})

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Fig. 1 shows lines I and II for parallel orientation, the magnetic field increasing from left to right. The lines I and II belong to different non-equivalent ion systems. The existence of the two ion systems of Co^{2+} in corundum is then discussed on the basis of the lattice system shown in Fig. 2. At the same time, brief mention is made of the calculation of the hyperfine structure constants A and B. The spin lattice relaxation time τ_1 in corundum for a cobalt concentration of 10^{-2}% at helium temperature was determined by the method of saturation of the resonance lines. At 4.2°K, τ_1 was found to be 1 sec which is abnormally high, while, at 22°K it was only 3.10^{-8} sec. Fig. 3 shows the temperature dependence of τ_1. From 1.8 to 4.2°K, τ_1 is inversely proportional to temperature. Some details of the experimental method, and the temperature dependence of τ_1 are discussed at length. The authors thank P. N. Bashuk and A. S. Sebchuk for preparation of the samples and L. S. Kornivenko for discussions. There are 3 figures and 16 references: 4 Soviet, 9 American, 1 Dutch, and 2 British.

Inst. Nuclear Physics Moscow State Univ.

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B006/B063

24.6200
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AUTHORS: Zverev, G. M., Prokhorov, A. M.

TITLE: Electron Paramagnetic Resonance of Vanadium in Rutile

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 39, No. 1(7), pp. 222-223

TEXT: In TiO_2 containing a 0.01% vanadium impurity the authors detected an electron paramagnetic resonance (e.p.r.) spectrum that consisted of two lines showing a hyperfine structure (split into eight components) characteristic of V^{51} (nuclear spin 7/2). For $S = 1/2$ and $I = 7/2$ the e.p.r. spectrum of vanadium is represented by the spin Hamiltonian $\hat{\mathcal{H}} = g_x\beta H_x\hat{S}_x + g_y\beta H_y\hat{S}_y + g_z\beta H_z\hat{S}_z + A_x\hat{I}_x\hat{S}_x + A_y\hat{I}_y\hat{S}_y + A_z\hat{I}_z\hat{S}_z$, where g - anisotropy factor of the spectroscopic splitting, A - constant of hyperfine structure, and β - Bohr magneton; z is in the tetragonal axis, and x and y run parallel with the directions [110] and [1$\bar{1}$0]. The following values were determined for the Hamiltonian constants at 77°K

Electron Paramagnetic Resonance of Vanadium in Rutile

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and 9800 Mc/sec: $g_x = 1.955 \pm 0.001$, $g_y = 1.913 \pm 0.001$, $g_z = 1.912 \pm 0.001$; $A_x = 14.15 \pm 0.07$, $A_y = 3.09 \pm 0.03$, and $A_z = 4.41 \pm 0.03$. A_x, A_y, and A_z are given in $10^{-3} cm^{-1}$. Other frequencies and temperatures yielded the same results, i.e., the constants were practically independent of temperature and frequency. At room temperature vanadium showed no e.p.r. in rutile. The lines became narrower with dropping temperature, and at 90°K their width was 3.5 oe, after which it remained constant. This width is supposed to be due to spin-spin interaction of paramagnetic vanadium ions. The spin-lattice relaxation of vanadium ions in rutile was measured by the method of continuous saturation. At 4.2°K it was 2.10^{-1} sec, and at 90°K, 6.10^{-6} sec. In the case of saturation, a line broadening was found at 90°K, which confirmed the above-mentioned assumption on the nature of the line width. All experiments indicate that vanadium is incorporated in the rutile lattice in the form of V^{4+} ions. R. P. Bashuk and A. S. Bebchuk are thanked for having supplied the specimens used. There are 3 non-Soviet references.

Inst. Nuclear Physics - Moscow State Univ.

Card 2/2

83758

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

24,5600 (1035, 1055, 1114)

AUTHORS: Zverev, G. M., Prokhorov, A. M.

TITLE: The Cross Spin Relaxation in the Hyperfine Structure of the Electron Paramagnetic Resonance of Co^{2+} in Corundum

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 39, No. 3 (9), pp. 545 - 547

TEXT: The authors discuss the effect of cross relaxation (Refs. 1-4) occurring in spin systems with little differing resonance frequencies. They studied the cross spin relaxation of transitions corresponding to different projections of the nuclear spin. The corundum sample used contained 10^{-2} % of Co, the time T_1 of the spin-lattice relaxation was 1.2 sec at 4.2°K. The trigonal axis of the crystal was parallel to $\vec{H}$ (outer magnetic field), the width of the individual components of the hyperfine structure was 7.5 oersteds, the distance between the components was 30 oersteds. The sample was placed into a resonator which was modulated to two close frequencies ν_1 and ν_2 ~9200 Mc/sec. The

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lines of the electron paramagnetic resonance were observed at the frequency ν_1 by means of a superheterodyne radiospectroscope. The frequency ν_2 supplied the saturation pulse. The restoration of the line intensity after switching off the saturation pulse was recorded by means of a cinematographic camera. A figure illustrates the relation $\log(J_o - J) = f(t)$. J is the absorption intensity, proportional to the filling n of the spin levels, J_o is the absorption intensity in thermal equilibrium. The curves are given for two cases: 1) All of the eight components of the hyperfine structure were saturated to one level. The relaxation is then expressed by $n_o - n = A \exp(-t/T_1)$ (1). 2) Only an outer component was saturated by a short pulse. The relaxation is in this case faster due to spin-spin interaction. The calculation was made here on the following assumption: a) the cross relaxation between each neighboring component pair can be expressed by the same parameter T_{12}, the cross relaxation time; b) only the spin-spin interaction of neighboring components is taken into account. The authors obtained

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equation $n_o - n_i = \sum_{j=1}^{8} A_{ji} \cdot \exp(-\lambda_j t)$; $\lambda_j = 1/T_1 + c_j/T_{12}$. c_j are constants, the coefficients A_{ji} are dependent on the experimental conditions. The experimental data corresponded to a T_{12} of 0.27 sec. While T_1 depends on temperature, T_{12} was constant between 1.8 and 4.2°K. There are 1 figure and 4 references: 1 Soviet and 3 US.

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

SUBMITTED: April 9, 1960

Card 3/3

ZVEREV, G.M.

Spectroscope for investigating spin-lattice relaxation of paramagnetic substances in the temperature range from 2 to 60° K. Prib.i tekh.eksp. 6 no.5:109-112 S-O '61. (MIRA 14:10)

1. Nauchno-issledovatel'skiy institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta.
(Spectroscope)

ZVEREV, G.M.; PROKHOROV, A.M.

Electron paramagnetic resonance of the V^{3+} ion in corundum. Zhur. eksp. i teor. fiz. 40 no.4:1016-1018 Ap '61. (MIRA 14:7)

1. Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta.

(Paramagnetic resonance and relaxation)
(Corundum--Electric properties)

25189
S/056/61/040/006/010/031
B111/B201

94.7900

AUTHOR: Zverev, G. M.

TITLE: Nature of spin-lattice interaction in chromium corundum. I

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 40, no. 6, 1961, 1667 - 1671

TEXT: The spin-lattice interaction plays an important part in paramagnetic amplifiers. Various mechanisms have been offered in previous papers to explain the interaction, but none has proved fully satisfactory. The author assumes, that several mechanisms participate in spin-lattice relaxation. All of his experiments have been conducted with 9400 Mc/sec by the method of continuous saturation. The spin-lattice relaxation time has been determined in corundum specimens of a uniform concentration, but with different contents of defects. The latter were produced by fast neutrons or gamma irradiation in a reactor, their concentration was of the order of 10^{19} cm^{-3}. In irradiated specimens with a Cr content of

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Nature of spin-lattice interaction...

$2 \cdot 10^{-4}$, the spin-lattice relaxation time τ_1 for $1/2 \rightarrow -1/2$ transitions with parallel spin orientation was three times less than that of non-irradiated specimens having the same chromium concentration. At a concentration of $8 \cdot 10^{-4}$, τ_1 of a test specimen was less. T = 4.2°K in both experiments. At a temperature of 77°K the relaxation times were found to coincide. The author states that phonon effects are of some importance in case of small chromium content only. A special apparatus was used to determine the temperature dependence of the relaxation time (G. M. Zverev, PTE (in print)). The attached figure shows results for different Cr contents. The curves hold for transitions $1/2 \rightarrow -1/2$ with an angle of $\theta = 5°$. Curve 1 refers to a chromium-ion concentration of $c = 2 \cdot 10^{-4}$; curve 2 holds for $c = 8 \cdot 10^{-4}$, and curve 3 for $c = 2.8 \cdot 10^{-3}$. Curve 1 corresponds to the Kroniger-Van Vleck mechanism; up to 50°K absorption processes and emission of individual phonons prevail, while the phonons show a Raman effect at higher temperatures. Curve 3 shows best how a new mechanism plays a role at higher concentrations of paramagnetic ions.

Card 2/3

Nature of spin-lattice interaction..

It corresponds to an exchange interaction between the chromium ion pairs. To explain the plateau in curve 3 it is necessary to assume a heat exchange reservoir between spin system and lattice. A. A. Manenkov is mentioned. Professor A. M. Prokhorov is thanked for valuable advice, N. I. Naumkin, N. G. Petelina and V. P. Kiryukhin for their assistance in the experiments. There are 1 figure and 18 references: 3 Soviet-bloc and 15 non-Soviet-bloc. The two most important references to English-language publications read as follows: R. Kronig, Physica, 6, 33, 1939; J. H. Van Vleck, Phys. Rev., 57, 426, 1940; A. I. Skwalow et. al., Phys. Rev. Lett., 3, 271, 1959.

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

SUBMITTED: January 30, 1961

Card 3/3

SHAVLOV, A.[Schawlow,A.]; FOGEL', S.[Fogel,S.]; DALBERDZHER, L. [Dulberger, L.]; KORNIYENKO, L.S.[translator]; ZVEREV, G.M., [translator]; MARKOV, V.N.[translator]; SHMAONOV, T.A., red.; POPOV, R.Yu., red.; IOVLEVA, N.A., tekhn. red.

[Optical masers (lasers)Opticheskie kvantovye generatory (lazery). Moskva, Izd-vo inostr. lit-ry 1962. 114 p. Translated from the English. (MIRA 15:11)

(Masers)

ZVEREV, G. M.; PROKHOROV, A. M.

"Investigation of ESRof Co^{2+} in TiO_2 "
Report presented at the First International Conference on Paramagnetic Resonance, Jerusalem, Israel, 16-20 July 1962.

34231
S/181/62/004/002/014/051
B102/B138

24,7900 (1055,1144,1163)

AUTHORS: Zverev, G. M., Korniyenko, L. S., Prokhorov, A. M., and Smirnov, A. I.

TITLE: Electron paramagnetic resonance and spin-lattice relaxation of the Er^{3+} ion in a CdF_2 single crystal

PERIODICAL: Fizika tverdogo tela, v. 4, no. 2, 1962, 392-395

TEXT: Er^{3+} was introduced as an isomorphic impurity into CdF_2, in which the fluor ions form a cubic lattice, the Cd ions being in the centers of cubes formed by the anions. The Er^{3+} ions replace Cd ions. The e. p. r. measurements were made at 4.2°K, with several different frequencies and for an Er^{3+} concentration of 0.1%. The following spectrum parameters were determined:

X

Card 1/2 4

Electron paramagnetic resonance and ...

ν, Mc/sec	g	A, oe
9500	6.758±0.010	73.0±1.0
25800	6.745±0.005	-
72000	6.735±0.005	73.9±1.0

The frequency dependence of the g-factor is due to the contributions of the wave functions of the excited states. The field-induced change of the g-factor can be determined by using perturbation theory:

$$g = g_0 \left[1 - \frac{\Lambda^2 \beta^2 H^2}{\delta^2} \left| \langle 1 \left| \hat{J}_z \right| 2 \rangle \right|^2 \right]$$

g_0 is the g-factor at H=0, Λ - Landé factor, δ is the mean distance to the nearest upper level of the state group (2): $\left\{ \pm \frac{13}{2}, \pm \frac{5}{2}, \mp \frac{3}{2}, \mp \frac{11}{2} \right\}$

Card 2/2 4

Electron paramagnetic resonance and ...

$\langle 1|$ and $|2\rangle$ denote the ground and excited states. $A = (2.31 \pm 0.03) \cdot 10^{-2} cm^{-1}$. Spin-lattice relaxation was studied by the continuous saturation method and by the pulse method with 3.2 cm waves. The temperature dependence of relaxation time τ_1 was determined by several methods, e. g. between 16 and 18°K from epr line broadening. Though S. A. Al'tshuler has developed a theory of spin-lattice relaxation of rare-earth ions, (ZhETF, 24, 691, 1953), the experimental results for Er^{3+} ions in a cubic lattice can only be explained qualitatively. At $T < 4.2°K$, $\tau_1 \sim T^{-1}$, at higher temperatures the course of $\tau_1(T)$ cannot be described by an exponential law of the $\tau_1 \sim T^{-n}$ type. This is due to anomalies caused by other bi- and trivalent ions. L. M. Belyayev, Kh. S. Bagdasarov and V. Ya. Khaimov-Mal'kov and P. P. Pashinin are thanked for help. There are 1 figure, 1 table, and 13 references: 5 Soviet and 8 non-Soviet. The four most recent references to English-language publications read as follows: M. Dvir, W. Low. Proc. Phys. Soc., 75, 136, 1960; W. Low. Paramagnetic Resonance in Solids. p. 130, New York - London.

Card 3/0 4

Electron paramagnetic resonance and ...

1960; C. B. P. Finn et al. Proc. Phys. Soc., B77, 261, 1961; J. M. Baker et al. Proc. Phys. Soc. B73, 942, 1959.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University imeni M. V. Lomonosov)

SUBMITTED: August 14, 1961

Fig. Time dependence of τ_1 for Er^{3+}.

4

Card 4/4

ZVEREV, G.M.; PROKHOROV, A.M.; SHEVCHENKO, A.K.

Mechanism underlying the effect of a vanadium admixture on the spin-lattice relaxation of chromium in corundum. Fiz. tver. tela 4 no.11:3136-3143 N '62. (MIRA 15:12)

1. Moskovskiy gosudarstvennyy universitet imeni M.V. Lomonosova.
(Paramagnetic resonance and relaxation)
(Nuclear spin)

ZVEREV, G.M.; PROKHOROV, A.M.

Electron paramagnetic resonance of rutile containing cobalt.
Zhur. eksp. i teor. fiz. 43 no.2:422-425 Ag '62. (MIRA 16:6)

1. Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta.
(Paramagnetic resonance and relaxation) (Rutile) (Cobalt)

37864
S/056/62/042/005/008/050
B125/B108

24.7900

AUTHORS: Zverev, G. M., Petelina, N. G.

TITLE: Electron paramagnetic resonance of Co^{2+} ions in corundum

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 42, no. 5, 1962, 1186 - 1190

TEXT: Various versions of the theory of electron paramagnetic resonance of Co^{2+} are checked. Cobalt ions in the Al_2O_3 lattice form two nonequivalent systems with a common axis of trigonal symmetry, but with different constants of the spin Hamiltonian. The following values were obtained from measurements of the g_1 factors:

ν, 10^9 cps	9	37	71
ion system I	4.947 ± 0.003	4.936 ± 0.003	4.938 ± 0.003
ion system II	4.855 ± 0.005	4.850 ± 0.005	4.850 ± 0.005

The results for $9 \cdot 10^9$ are taken from G. M. Zverev and A. M. Prokhorov

Card 1/3

Electron paramagnetic resonance...

(ZhETF, 39, 57, 1960). The high values of $g_{\perp}$ for I and II at $9 \cdot 10^9$ cycles are probably due to the circumstance that at this frequency the hyperfine structure is comparable to the mean magnetic field strength. The experiments do not confirm the expected diminution of $g_{\perp}$ with increasing frequency. The temperature dependence τ_1 (T) of spin-lattice relaxation time was measured by the method of continuous saturation using a 3.2-cm microwave spectroscope. The following relation is fairly satisfied for the system I at 9 - 30°K: $\tau_1 = 1.6 \cdot 10^{-11} e^{\delta I/kT}$ sec, while $\tau_1 = 10^{-12} e^{\delta II/kT}$ is satisfied for the system II at 14 - 26°K. Below 4.2°K, τ_1 is inversely proportional to T in both systems. $\delta_I = 110 \pm 15$ cm^{-1}, $\delta_{II} = 185 \pm 20$ cm^{-1}. The experimental form of $\tau_1(T)$ is explained by the relaxation process through an excited state, as suggested by R. Orbach (see reference) for magnesium-cerium nitrate. This excited state is respectively 110 cm^{-1} and 185 cm^{-1} above the ground state for the ion groups I and II. The process mentioned above determines relaxation as far as 30°K. The g-factors and the spin-lattice relaxation time of Co^{2+}

ions in an Al_2O_3 lattice can be explained under the usual assumptions on the character of the crystal field (A. Abragam, M. H. L. Pryce. Proc. Roy. Soc., A206, 173, 1951). The values of δ determined from the relaxation experiments are suited for stricter calculations taking account of the covalent bond. "Two-stage" relaxation must play an important part also in the other ions of the iron group. There are 2 figures and 1 table. The most important English-language reference is: C. B. P. Finn, R. Orbach, W. P. Wolf. Proc. Phys. Soc., 77, 261, 1961.

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

SUBMITTED: December 23, 1961

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 fizicheskikh nauk, v. 77, no. 1, 1962, 61 - 108

TEXT: Western and Soviet studies during the period 1932 - 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 РПУ (RPU), paramagnetic progressive wave amplifier ПУБВ (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).

AID Nr. 984-8 6 June

GENERATION OF MILLIMETER WAVES IN OPTICALLY PUMPED RUBY (USSR)

Zverev, G. M., A. M. Prokhorov, and A. K. Shevchenko. Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 44, no. 4, Apr 1963, 1415-1418.
S/056/63/044/004/042/044

Experiments have been conducted using a ruby laser at 77°K to pump a three-level ruby millimeter-wave ($35-50 \cdot 10^9$ cps) generator operating at the same temperature. Emission from the nitrogen-cooled ruby laser passed through a system of mirrors and a lens onto the end of a nitrogen-cooled ruby which served as a millimeter-band resonator and whose c-axis was perpendicular to the external magnetic field. Emission from the generator ruby was detected by a reflector-type superheterodyne radio spectroscope which also controlled

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6

the required magnetic field. The detected output, along with the photomultiplier-monitored laser pulse signal, was displayed on the screen of a pulse oscillograph. The generated millimeter-band power output was ~ 10^{-5} w. The emission had the multiple-spike form observed in rf-pumped paramagnetic generators. It was calculated that the maximum power ideally obtainable in the sample used (0.05% chromium ion concentration) is 1.7 mw in a pulse with a duration of ~ 150 μsec.

[BB]

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R0020657100004-6"

L 10762-63 EWT(1)/EWP(q)/EWT(m)/BDS--AFFTC/ASD--JD/WH

ACCESSION NR: AP3003111 S/0056/63/044/006/1859/1863

55
56

AUTHOR: Zverev, G. M.

TITLE: Temperature dependence of spin-lattice relaxation of tetravalent vanadium anion in rutile

SOURCE: Zhurnal eksper. i. teor. fiziki, v. 44, no. 6, 1963, 1859-1863

TOPIC TAGS: spin-lattice relaxation, epr, tetravalent vanadium anion, rutile

ABSTRACT: The temperature dependence of the spin-lattice relaxation τ of the V^{4+} ion in rutile was experimentally investigated in the temperature range between 4.2 and 110K. The concentration of the paramagnetic ions was $\leq 0.01\%$. All measurements were conducted with the tetragonal c axis of rutile parallel to the external magnetic field. It was found that between 4.2 and 10K, τ is inversely proportional to temperature (T). Between 10 and 50K, τ varies approximately as $T^{-5.5}$. Some deviation from this proportionality was observed in the range of 50-70K. At temperatures between 70 and 110K, $\tau = 6/10^{12} \exp(\Delta/kT)$,

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APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R0020657100041-6

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ACCESSION NR: AP3003111

3

where λ is the excited state of the V^{4+} ion 650 cm^{-1} above the ground state, which is responsible for spin-lattice relaxation in this temperature range. The values of τ obtained by different experimental methods were found to be in good agreement. Comparison of theoretical with experimental data indicates that the spin-lattice relaxation of tetravalent vanadium anion in rutile is caused by optical phonons or is due to a higher-order process in which four acoustic phonons participate in the relaxation. "The author thanks S. A. Al'tshuller for a valuable discussion and Y. V. Makarenko for his help in making measurements." Orig. art. has: 4 figures and 1 formula.

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

SUBMITTED: 22Jan63 DATE ACQ: 23Jul63 ENCL: 00

SUB CODE: 00 NO REF SOV: 005 OTHER: 006

Card 2/2

ACCESSION NR: AP4011743 S/0181/64/006/001/0096/0100

AUTHORS: Zverev, G. M.; Smirnov, A. I.

TITLE: Spin lattice relaxation of the Er^{3+} ion in single crystals of CdF_2, BaF_2, and CaF_2

SOURCE: Fizika tverdogo tela, v. 6, no. 1, 1964, 96-100

TOPIC TAGS: spin lattice relaxation, cadmium fluoride, barium fluoride, calcium fluoride, paramagnetic resonance, relaxation time temperature dependence, elastic scattering, two phonon process, direct relaxation process, excited state

ABSTRACT: The authors have examined both paramagnetic resonance spectra and relaxation processes for the Er^{3+} ion in single crystals of CdF_2, BaF_2, and CaF_2. Spin-lattice relaxation times were measured for 3-cm and 8-mm waves at temperatures ranging from 1.6 to 25K. The results are summarized in Figs. 1-3 of the Enclosures. At temperatures above that of liquid helium, relaxation is determined by the two-phonon process of relaxation through the excited state. This time depends exponentially on temperature: $\tau \sim \exp(\frac{\Delta}{kT})$. At temperatures of 1.6-4.2K, direct relaxation processes are complicated by heating of the phonon spectrum. The

ACCESSION NR: AP4011743

dependence of relaxation time on temperature is stronger then expected for ordinary direct processes. As mechanisms of phonon relaxation the authors suggest cross relaxation and the inelastic scattering of phonons by phonons. Orig. art. has: 3 figures.

ASSOCIATION: Moskovskiy gosudarstvenny*y universitet im. M. V. Lomonosova (Moscow State University)

SUBMITTED: 10Jul63 DATE ACQ: 14Feb64 ENCL: 03

SUB CODE: PH NO REF SOV: 002 OTHER: 004

Card 2/2

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065210004-6

ACC NR: AP6015493 SOURCE CODE: UR/0181/66/008/005/1379/1381

AUTHOR: Zverev, G. M.; Smirnov, A. I.

ORG: none

TITLE: Investigation of spin-lattice relaxation of a positive trivalent erbium ion in cadmium fluoride and calcium fluoride single crystals in the 3-70 Gc frequency range

SOURCE: Fizika tverdogo tela, v. 8, no. 5, 1966, 1379-1381

TOPIC TAGS: spin lattice relaxation, erbium, ion, fluoride, calcium fluoride, cadmium compound

ABSTRACT: The pulse saturation method was used for measuring the relaxation times τ_1 of the Er^{3+} ion in CdF_2 and CaF_2 single crystals at frequencies from 3 to 70 Gc. It was found that relaxation time decreases with an increase in frequency (from 400 to 200 μsec when the frequency is varied from 38 to 71 Gc). In the short-wavelength region of the millimeter range, the experimental data may be approximated by a power function of the form $\omega = \tau_1^{-1} \sim \nu^2$. Measurements on a wavelength of 9.4 cm showed a shorter relaxation time than on a wavelength of 3.2 cm (a reduction from 180 to 65 μsec) with τ_1 being very nearly proportional to ν. The experimental data in totality may be approximated by a function of the form

$$\tau_1^{-1} = \omega = 5 \cdot 10^4 \nu + 0.86 \nu^2$$

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APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6"

L 21826-66
ACC NR: AP6015453

where ω is in sec^{-1} and ν is in Gc. In weak magnetic fields, τ_1 increases linearly with frequency reaching a maximum followed by a sharp reduction. It is assumed that heating of resonance phonons has a considerable effect on relaxation of erbium ions so that relaxation of the line from even isotopes of the trivalent erbium ion is impeded by the lack of resonance phonons. As a result, the transfer of spin energy to the lattice is affected to a great extent by cross relaxation to the 'wings' of the line which are formed by trivalent erbium ions located in axial crystal fields of varying strength and symmetry. The obstruction to relaxation is relieved by this cross relaxation which introduces phonons in a wide range of frequencies. The effect is amplified when the 'wings' overlap the spectrum of impurities which have a short relaxation time. This type of mechanism gives a qualitative description of the experimentally observed relationship between relaxation time and magnetic field intensity in weak fields but becomes less significant as the magnetic field intensity increases. The experimental results depend considerably on the purity of the specimens studied and the concentration of erbium ions in various environments. The authors are grateful to P. P. Pashinin for giving them the opportunity to carry out the experiment on the 9.4 cm wavelength and for valuable consultation. Orig. art. has: 1 figure. [14]

SUB CODE: 20/ SUBM DATE: 10Sep65/ ORIG REF: 004/ OTH REF: 006/
ATD PRESS: 5003

Card 2/2 PB

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6

ACC NR: AP6007811 SOURCE CODE: UR/0051/66/021/003/0777/0779

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54
B

AUTHOR: Pashkov, V. A.; Zverev, G. M.

ORG: none

TITLE: Destruction of ruby and leucosapphire crystals by high-intensity laser beams

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 51, no. 3, 1966, 777-779

TOPIC TAGS: nonlinear optics, stimulated Brillouin scattering, multiphoton ionization, ruby, leucosapphire, crystal damage, laser induced damage, laser effect, LASER BEAM, CRYSTAL PROPERTY, SAPPHIRE, CRYSTAL DEFECT

ABSTRACT: An experimental investigation was made of the damage induced in ruby and leucosapphire crystals by the focused beam from a 1-j 30-Mw Q-switched laser. The damage in leucosapphire crystals at the focus of an f:5 cm lens was in the form of a spherical channel 1 mm in diameter. In the case of an f:15 cm lens, the lagging crystal surface sustained small, crater-like damage. Certain ruby crystals (group I) sustained damage identical to that in leucosapphire crystals, while in other ruby crystals (group II) the damage was in the form of "tracks" consisting of a series of small cracks perpendicular to the incident radiation. The tracks were several cm long and 2—3 mm in diameter and were observed for both the f:5 and f:15 lenses. The damage threshold for leucosapphire and Group I ruby crystals was approximately 10^{10} w/cm^2, while that in Group II ruby crystals was about 10^8 w/cm^2. Damage in all

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L 05618-67 SOURCE CODE: UR/0181/66/008/007/2205/2212

45
B

ACC NR: AP6024489

AUTHOR: Bobrovnikov, Yu. A.; Zverev, G. M.; Smirnov, A. I.

ORG: none

TITLE: Paramagnetic resonance and spin lattice relaxation of Er^{3+} in CaF_2 and their connection with the optical spectrum

SOURCE: Fizika tverdogo tela, v. 8, no. 7, 1966, 2205-2212

TOPIC TAGS: calcium fluoride, erbium, spin lattice relaxation, optic spectrum, electron paramagnetic resonance

ABSTRACT: This is a continuation of earlier EPR studies (FTT v. 6, 2799, 1964) which have shown that the occurrence of different types of Er^{3+} centers depends strongly on the method of growing the host crystal. Consequently, a study was made of the EPR spectrum and of the spin lattice relaxation of Er^{3+} of single-crystal CaF_2 grown in the presence of oxygen. A new EPR spectrum, belonging to the Er^{3+} ions in a crystal field of trigonal symmetry with $g_{\parallel} = 10.29 \pm 003$, $g_{\perp} = 1.475 \pm 0.05$, and A = 73.0 ± 0.8 Oe was observed. A study of the spin-lattice relaxation has made it possible to determine the distance to the nearest excited level, namely 18 ± 2 cm^{-1}. A corresponding excited state was obtained also in the optical absorption spectrum. It is concluded that the EPR method makes it possible to reveal the existence of many types of centers, and that most lines in the optical spectrum can be set in correspondence with electronic transitions inside the 4f shell. Orig. art. has: 4 figures, 10 formulas, and 2 tables.

SUB CODE: 20/ SUBM DATE: 27Jul65/ ORIG REF: 003/ OTH REF: 009

Card 1/1

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6

L 08516-67 EWT(m)/EWP(t)/ETI IJP(c) JD/JG

ACC NR: AP6030714 SOURCE CODE: UR/0368/66/005/002/0172/0177

AUTHOR: Bashuk, R. P.; Gritsenko, M. M.; Grum-Grzhimaylo, S. V.; Zverev, G. M.; Sevast'yanov, B. K.; Kharitonova, L. M. 14 B

ORG: none

TITLE: Comparison of different methods for determining chromium concentration in ruby 17

SOURCE: Zhurnal prikladnoy spektroskopii, v. 5, no. 2, 1966, 172-177

TOPIC TAGS: chromium, ruby, optical absorption, magnetic measurement

ABSTRACT: Chemical, magnetic, optical, and radiospectroscopic methods are described for determining the chromium concentration in ruby. The limitations and possibilities of these methods are compared. The factor for converting the optical absorption value into concentration is determined from magnetic measurements; it si equal to 0.29. Orig. art. has: 4 figures, 5 formulas, and 1 table. [NT]
[Based on authors' abstract]

SUB CODE: 03/ SUBM DATE: 09Aug65/ ORIG REF: 009/ OTH REF: 004/

UDC: 535.89

Card 1/1 egb

ACC NR: AP7005883 SOURCE CODE: UR/0181/66/008/012/3686/3688

AUTHOR: Zverev, G. M.; Makarenko, L. V.; Smirnov, A. I.

ORG: none

TITLE: Paramagnetic resonance of Ce^{3+} and Nd^{3+} in $SrMoO_4$ single crystals

SOURCE: Fizika tverdogo tela, v. 8, no. 12, 1966, 3686-3688

TOPIC TAGS: strontium compound, molybdate, epr spectrum, activated crystal, cerium, neodymium

ABSTRACT: To check against results obtained with other scheelites, the authors studied the EPR spectra of Ce^{3+} and Nd^{3+} in single crystals of strontium molybdate grown by the Czochralski method and containing approximately 0.5% of Ce or Nd. The EPR spectra were measured at 4.2K and 14.3 GHz. In the case of cerium, a single intense line was observed, due to the Ce^{3+} ion in a field of tetragonal symmetry. In the case of neodymium, the spectrum consisted of an intense line due to the even isotopes of Nd^{3+}, on which a hyperfine structure due to the odd isotopes Nd^{143} and Nd^{145} is superimposed. The g-factors half widths and the hyperfine structure constants were obtained for all lines and agreed with an empirical relation obtained by others. A wave function agreeing with the obtained data is also found for the lower state of Nd^{3+} in a field of tetragonal symmetry. Orig. art. has: 2 figures and 7 formulas. [02] [WA14]

SUB CODE: 20/ SUBM DATE: 04Jul66/ ORIG REF: 003/ OTH REF: 001

Card 1/1 UDC: none

ACC NR: AP6033575 SOURCE CODE: UR/0181/66/008/010/3086/3088

AUTHOR: Bobrovnikov, Yu. A.; Zverev, G. M.; Makarenko, L. V.; Smirnov, A. I.

ORG: none

TITLE: Paramagnetic resonance of Nd^{3+} ions in single-crystal oxides of yttrium and scandium

SOURCE: Fizika tverdogo tela, v. 8, no. 10, 1966, 3086-3088

TOPIC TAGS: yttrium, scandium, oxide, neodymium, paramagnetic resonance, crystal symmetry, forbidden transition, optic spectrum, microwave spectroscopy

ABSTRACT: This is a continuation of an earlier study of the optical spectra of Nd^{3+} ions in Y_2O_3 and Sc_2O_3 (Opt. i spektro., in press) where the results were interpreted under the assumption that only one type of rhombic-symmetry center exists. In view of the fact that other results suggest the existence of two types of symmetry centers (C_2 and S_6), the authors have carried out a radiospectroscopic study of the same crystals. Paramagnetic resonance of Nd^{3+} in Y_2O_3 and Sc_2O_3 was observed at 4.2K and 14.3 GHz. The samples were oriented in such a way that the constant field remained in the (110) plane during the crystal rotation, and the alternating field was perpendicular to the constant field. An analysis of the angular dependence of the paramagnetic resonance spectrum established the existence of centers in crystalline

ACC NR: AP6033575

fields of rhombic and trigonal symmetry, with predominant directions parallel to [110] and [111] respectively. The components of the g-factors in the Nd^{3+} spectra are calculated for both oxides and both symmetry centers. The concentrations of the two centers differ by only a factor of 2. Since the earlier investigation of the optical spectrum disclosed the existence of only rhombic-symmetry centers, this confirms the assumption that forbidden transitions have a high probability in the case of centers that have no inversion symmetry. Orig. art. has: 1 figure, 3 formulas, and 1 table.

SUB CODE: 20/ SUBM DATE: 28Mar66/ ORIG REF: 002/ OTH REF: 007

Card 2/2

ZYKIN, G.N.; KUSOV, V.A.

Magnetic dipole in a medium with cylindrical discontinuity. Izv. AN SSSR. Ser.geofiz. no.1:128-134 Ja '63. (MIRA 16:2)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut geofizicheskikh metodov razvedki, Volgo-Ural'skiy filial.
(Electric prospecting)

DYAD'KIN, I.G.; LISENENKOV, A.T.; ZVEREV, G.N.

Mathematical experiment for solving certain geophysical problems.
Izv. AN SSSR. Ser. geofiz. no.11:1694-1698 N '63. (MIRA 16:12)

1. Volgo-Ural'skiy filial Vsesoyuznogo nauchno-issledovatel'skogo instituta geofizicheskikh metodov razvedki.

SVESOV, G.N.

Problem of analysis in the theory of induction logging. Izv.vys. ucheb.zav.; geol.i razv. 8 no.11:120-127 N '65.

(MIRA 18:12)

1. Volgogradskiy filial Vsesoyuznogo nauchno-issledovatel'skogo instituta geofizicheskikh metodov razvedki.

ZVEREV, G.N.

Method of the information model in the theory of induction logging. Izv.vys.ucheb.zav.; geol. i razv. 8 no.10: 125-130 O '65. (MIRA 19:1)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6"

1. MEYERSON, G.A., ZVEREV, G.O., ZUBKOVA, F.M.

2. USSR (600)

Moscow Institute of Fine Chemical Technology, "Study of the Solubility of Complex Tantalum Fluoride and Niobium Fluoride," Tsvet. Met. 14, No 8, August 1939.

9. [redacted] Report U-1506, 4 Oct 1951.

ZVEREV, G.V.

A pushcart for servicing continuous production lines. Stan. i instr. 26 no.10:30 O'55. (MLRA 9:1)

(Material handling)

ZVEREV, G.Z.;BULYGIN, N.V., master

Automatic start-up of stand-by turbo-feed pumps. Energetik 6 no. 1:28 Ja '58. (MIRA 11:8)
(Steam power plants--Equipment and supplies)

ZURABOV, R., inzh.; ZVEREV, I., inzh.

Angarsk is being built of air-entrained fly-ash concrete. Na stroi. Ros. 3 no.3:25-27 Mr '62. (MIRA 16:2)
(Angarsk—Precast concrete construction) (Lightweight concrete)

Zverev, I. - "In the north", (With the hunters and deer keepers of the Koryak Tundra, outline), Dal'niy Vostok, 1948, No. 6, p. 86-92.

SO: U-3042, 11 March 53, (Letopis 'Zhurnal 'nykh Statey, No. 8, 1949).

RAKHMATULIN, Khalil Akhmedovich; SAGOMONYAN, Artur Yakovlevich; BUNIMOVICH, Abram Isaakovich; ZVEREV, Igor' Nikolayevich. PUTYATE, V.I., dots., retsenzent; PANICHKIN, I.A., prof., retsenzent; GINEVSKIY, A.S., kand. tekhn. nauk, red.

[Gas dynamics] Gazovaia dinamika. Moskva, Vysshaia shkola, 1965. 722 p. (MIRA 18:10)

ZVEREV, Il'ya; SEMENOV, R., redaktor; ABRAMOV, V.I., redaktor; IL'INSKAYA, G.M., tekhnicheskiy redaktor

[A miner's personality] Shakhterskii kharakter. Moskva, Gos. nauchno-tekhn. izd-vo lit-ry po ugol'noi promysh., 1955. 59 p. (MLRA 8:7)
(Vorona, Grigorii)

ZVEREV, Ivan Andreyevich, strogal'shchik; MOKROUSOV, Ivan Ivanovich, rastochnik; DEMICHEVA, D.M., redaktor; KIRSANOVA, N.A., tekhnicheskiy redaktor.

[Work practice with planing and boring machines] Opyt raboty na strogal'nom i rastochnom stankakh. Moskva, Izd-vo VTsSPS Profizdat, 1955. 95 p. (MIRA 9:4)

1.Voronezhskiy machinostroitel'nyy zavod imeni Kalinina (for Zverev, Mokrousov).
(Planing machines) (Drilling and boring machinery)

ZVEREV, Ivan Dmitriyevich; TAHNYAGINA, V.V., redaktor; RAKOVITSKIY, I.G., tekhnicheskiy redaktor

[Studying reflexes in animals; a teacher's experience] Izuchenie reflektornoi deiatel'nosti zhivotnykh; iz opyta raboty uchitelia. Leningrad, Gos. uchebno-pedagog. izd-vo Ministerstva prosveshcheniia RSFSR, Leningradskoe otd-nie, 1956. 116 p. (MLRA 9:12)
(Reflexes)

ZVEREV, I.D., kandidat pedagogicheskikh nauk.

Knowledge of chemistry in a course on human anatomy and physiology. Est. v shkole no.5:60-62 S-O '56. (MLRA 9:10)

1. Leningradskiy institut pedagogiki Akademii pedagogicheskikh nauk RSFSR.

(ANATOMY, HUMAN) (PHYSIOLOGICAL CHEMISTRY)

ZVEREV, I.D.

Problems in the physiology and hygiene of work in connection with the study of human anatomy and physiology. Biol. v shkole no.2:31-36 Mr-Ap '59. (MIRA 12:4)

1. Leningradskiy institut pedagogiki APN RSFSR.
(Anatomy, Human--Study and teaching)
(Physiology--Study and teaching) (Work)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6"

L 12346-63 EPF(c)/EWP(q)/EWT(m)/BDS AFFTC/ S/081/63/000/005/028/075 54
ASD JD

AUTHOR: Kushko, L. M. and Zverev, I. D.

TITLE: Radiogenic origin of argon in natural and petroleum gases

PERIODICAL: Referativnyy zhurnal, Khimiya, no. 5, 1963, 161, abstract 5E126 (Geol. nefti i gaza, 1962, no. 9, 48 - 50)

TEXT: The isotopic composition of argon is determined in natural gases from 4 deposits and in 8 by-product gases of petroleum and gas deposits. Only in one natural gas was radiogenic argon detected (14.1%), while in all the by-product gases it was detected in quantities ranging from 1 to 48.3%. An increase in the amount of radiogenic argon with increase in depth was observed. E. Sobotobich.

[Abstractor's note: Complete translation]

Card 1/1

ZVEREV, Ivan Dmitriyevich; KAZAKOVA, Ol'ga Vasil'yevna; YAKOVLEVA, Ol'ga Sergeyevna; GAL'PERIN, S.I., doktor med. nauk, prof., red. ; PRIDANTSEVA, A.M., red.

[Human anatomy, physiology and hygiene; a textbook for 8th grade students of evening (staggered) general secondary schools] Anatomiia, fiziologiia i gigiena cheloveka; posobie dlia uchashchikhsia VIII klassa vechernei (smennoi) srednei obshcheobrazovatel'noi shkoly. Izd.3. Moskva, Prosveshchenie, 1964. 167 p. (MIRA 17:7)

ZVEREV, I.D.

Ways to improve a course in human anatomy, physiology, and hygiene. Biol. v shkole no.1:40-43 Ja-F '63. (MIRA 16:6)

1. Leningradskiy pedagogicheskiy institut imeni A.I. Gertsena.
(BIOLOGY—STUDY AND TEACHING)

"APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6"

ZVEREV I D

A-7

Category: USSR/General Division. Problems of Teaching.

Abs Jour: Referat Zh.-Biol., No 9, 10 May, 1957, 35008

Author : Zverev, I.D.
Inst : not given
Title : Elements of Chemical Knowledge in the Course of Human Anatomy and Physiology (The Question of Intersubject Relations)

Orig Pub: Yestestvozn. v shkole, 1956, No 5, 59-62

Abstract: In covering the courses of human anatomy and physiology and chemistry in the VIIIth class, the teacher must utilize the intersubject relations between these disciplines and particularly lean upon the students' knowledge of chemistry. In explaining new material on the themes "digestion, breathing, metabolism" and others, the teacher should conduct related experiments in chemistry.

Card : 1/1

ZVEREV, I.D., kand.ped.nauk

Independent work of students on the fundamentals of Darwinism. (MIRA 13:8)
Biol.v shkole no.5:44-51 S-O '59.

1. Leningradskiy institut pedagogiki APN RSFSR.
(Evolution--Study and teaching)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6"

KUSHKO, L.M.; ZVEREV, I.D.

Radiogenic origin of argon in the composition of natural and petroleum gas. Geol. nefti i gaza 9 no.9:48-50 S '62. (MIRA 16:2)

1. Kuybyshevskiy nauchno-issledovatel'skiy institut po pererabotke nefti.

(Argon—Isotopes)

ZVEREV I.D.

ZVEREV, I.D.

Aspects of the physiology and hygiene of work in industrial excursions by eighth grade students. Politekh.obuch. no.8:6-10 Ag '57. (MIRA 10:9)

1. Leningradskiy institut pedagogiki. (School excursions) (Industrial hygiene)

ZVEREV, I.D., kandidat pedagogicheskikh nauk.

First lessons in the course of human anatomy and physiology. Biol.v shkole no.4:46-52 Jl-Ag '57. (MLRA 10:8)

1.Leningradskiy instutut pedagogiki Akademii pedagogicheskikh nauk RSFSR.

(Anatomy, Human--Study and teaching)
(Physiology--Study and teaching)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6

ZVEREV, I.D., kandidat pedagogicheskikh nauk (g. Leningrad).

Helping school children to work properly. Politekh. obuch. no.5:25-32 My '57. (MLRA 10:6)

(Work, Method of) (Education of children)

ZVEREV, I.D.

Conducting an excursion on the study of "farm animals." Est. v shkole no.1:63-68 Ja-F '55. (MLRA 8:3)

1. Uchitel' shkoly No.213 g.Leningrada.
(School excursions)(Stock and stockbreeding)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6

ZVEREV, Ivan Dmitriyevich; MARKOV, N.G., red.; SHCHEPTINA, T.A., tekhn.red.

[Use of anatomical and physiological knowledge by students in practical activity] Primenenie uchashchimisia anatomo-fiziologicheskikh znanii v prakticheskoi deiatel'nosti. Moskva, Gos. uchebno-pedagog.izd-vo M-va prosv.RSFSR, 1959. 89 p. (MIRA 13:7)

(SCHOOL HYGIENE)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6

ZVEREV, Ivan Dmitriyevich; MIKHAYLOVSKAYA, I.A., red.; GLADRINA, M.S., red.; KOSAREVA, Ye.A., tekhn. red.

[Development of students' knowledge about the evolution of the organic world] Razvitie znanii uchashchikhsia ob evoliutsii organicheskogo mira. Moskva, Izd-vo APN RSFSR, 1962. 166 p. (MIRA 15:7)

(Evolution—Study and teaching)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6"

BLANDOV, P.I., kand. tekhn. nauk; LEVKOYEVA, N.V., kand. tekhn. nauk; ZVEREV, I.I., kand. tekhn. nauk; KOKONIN, S.S., inzh.; SIMAKINA, I.L., red.

[Shock absorption and control of take-off and landing devices of airplanes] Amortizatsiia i upravlenie vzletno-posadochnykh ustroistv samoletov. Moskva, Mosk. aviatsionnyi in-t im. Sergo Ordzhonikidze, 1962. 307 p. (MIRA 17:4)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6"

ZVEREV, I

Dissertation: "An Investigation of the End System of Distribution of the Flow of Liquids With a Flat Stationary Valve in Piston Pumps and Motors." Cand Tech Sci, Moscow Order of Lenin Aviation Inst imeni Sergo Ordzhonikidze, 24 Jun 54. (Vechernyaya Moskva, Moscow, 15 Jun 54)

SO: SUM 318, 23 Dec 1954

ZVEREV, I.M.

Mechanized sugar mill. Nauka i zhizn' 21 no.7:6-7 Jl '54. (MLRA 7:7)

1. Upravlyayushchiy trestom "Sakhstroy".
(Sugar industry)

ZVEREV, I.M.

Order of equipment supply to sugar factories under construction. Sakh.prom. 36 no.5:50-51 My '62. (MIRA 15:5)

1. Glavkomplektoborudovaniye Ministerstva stroitel'stva RSFSR.
(Sugar industry--Equipment and supplies)

SELF-EXTINGUISHING ELASTIC FOAMED POLYURETHANE (USSR)

Sidorov, V. A., I. M. Zverev, V. P. Arefyev, and V. D. Samsonov

[illegible] S. [illegible] 024/015

Self-extinguishing elastic foamed polyurethane ПУ has been prepared by adding up to 25 parts of tricresyl or trichloroethyl phosphate to 118 parts of the polyurethane starting material. The new material can be produced with existing equipment. The physical and mechanical properties of experimental self-extinguishing ПУ were shown to meet the ТУ 35 XII-395-62 г. specifications, but addition of phosphates considerably lowers the heat resistance of ПУ. The self-extinguishing ПУ is easier to make with tricresyl than with trichloroethyl phosphate, and the product has better physical and mechanical properties. (BAO)

Card 1/1

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6"

SIDOROV, V.A.; ZVEREV, I.M.; AREF'YEV, V.P.; SAMSONOV, V.D.

Production of self-damping elastic polyurethane foams. Plast.massy no.4:69-70 '63. (MIR 16:4)
(Porous materials) (Urethanes)

ZVEREV, I.M.

Supplying more fully assembled equipment. Sakh.prom. 35 no.7:50-54 Jl '61. (MIRA 14:7)

1. "Glavkomplektoborudovaniye" Ministerstva stroitel'stva RSFSR.
(Sugar industry—Equipment and supplies)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6

USSR/Engineering - Mechanization

Card 1/1 : Pub. 77 - 4/26

Authors : Zverev, I. M.

Title : A mechanized sugar mill

Periodical : Nauka i zhizn' 21/7, 6 - 7, July 1954

Abstract : A description is given of the process of sugar making at a new mill that was to start operations in September, 1954 in the Lvov region. In this mill time-consuming manual operations are done mechanically and the mill is expected to produce 400,000 pounds of granulated sugar per day. Illustrations.

Institution : ...

Submitted : ...

ZVEREV, I.N.

AMR

Wave Motion, Dynamic

96

1944. Zverev, I. N., The propagation of a disturbance in a visco-elastic and visco-plastic bar (in Russian), *Prikl. Mat. Mekh.* 14, 3, 295-302, May-June 1950.

Longitudinal wave propagation in a viscoelastic bar stress-strain relation $\sigma = E\varepsilon + \mu\dot{\varepsilon}$) is studied using Laplace transform methods. Semi-infinite bar with given end velocity or end-strain variation is solved. Impact by rigid mass is also considered. Solution is modified for viscoplastic bar ($\sigma = \sigma_s + E'(\varepsilon - \varepsilon_s) + \mu\dot{\varepsilon}$). E. H. Lee, USA

May '51

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

ZVEREV, I.N.; LYAKHOV, G.M. (Moskva)

Experimental test of the equation for the state of water-saturated ground. Izv.AN SSSR.Otd.tekh.nauk.Mekh.i mashinostr. no.4:185-186 Jl-Ag '60. (MIRA 13:7)

(Soil--Moisture)

"APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6"

ZVEREV, V. K.

RT-1439 (The propagation of a disturbance in a visco-elastic and visco-plastic bar)

SO: Prikladnaia Matematika i Mekhanika, 15: 295-302, 1950 (Original Russian source unavialable for reveiw)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6"

ZVEREV, I.N.

CAND PHYSICOMATH SCI

Dissertation: "Certain Problems of Disturbance Propagation at Collision."

17 November 49

Sci Res Inst of Mechanics, Moscow Order of Lenin State V imeni M.V. Lomonosov.

SO Vecheryaya Moskva
Sum 71

ACC NR: AM6012203 Monograph UR/

Rakhmatulin, Khalil Akhmedovich; Sagomonyan, Artur YAkovlevich; Bunimovich, Abram Isaakovich; Zverev, Igor' Nikolayevich

Gas dynamics (Gazovaya dinamika) Moscow, Izd-vo "Vysshaya shkola", 1965, 722 p. illus., biblio., tables. 7500 copies printed.

TOPIC TAGS: gas dynamics, gas flow, supersonic flow, aerodynamic heating, boundary layer

PURPOSE AND COVERAGE: This textbook for university students is based on lectures in gas dynamics given by the authors at the Mechanical and Mathematical Department, Moscow State University. The book presents fundamentals of gas dynamics with special emphasis placed on modern numerical methods of solving gas dynamic problems using electronic computers.

TABLE OF CONTENTS:

UDC: NONE

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APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6"

ACC NR AM6011203

7. Steady-state supersonic gas flow about bodies of revolution — 351
8. Shock waves (self-modeling problems) — 437
9. Two-dimensional subsonic motion of gas with finite perturbations — 470
10. The boundary layer and problems of aerodynamic heating — 490
11. Rarefied gas-flow — 594
12. Physical principles of the theory of radiating gas — 642

Bibliography — 713

SUB CODE: 20/ SUBM DATE: 24May65/ ORIG REF: 092/ OTH REF: 039

Card 2/2

USSR/Physics - Elasticity May/Jun 50
Rods, Shells

"Propagation of Disturbances in Viscous-Elastic and Viscous-Plastic Rods," I. N. Zverev, Moscow

"Priklad Matemat i Mekh" Vol XIV, No 3, pp 295-302

Considers propagation of disturbance waves in semi-infinite beam whose material possesses viscoelastic and viscoplastic properties. Mathematically treats and solves the usual wave equation involving stress, strain, displacement, and time. Submitted 21 Jun 49.

[redacted]

163T79

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6

ZVEREV, G.

J657

ON TRIPLE SYSTEM OF CERIUM–CALCIUM–CHLORINE.

G. L. Zverev. Doklady Akad. Nauk S.S.S.R. 104, 248-9 (1955)

Sept. 11. (In Russian)

Tables and a fusibility diagram of the Ce–Ca–Cl system are given. The constructed Ca–$CeCl_3$ phase diagrams produces important data on compounds, smelting temperatures, and crystallization processes of products in the calciothermal reduction of $CeCl_3$. (R. V. J.)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6

BOCHVAR, A.A., akademik, obshchiy red.; VINOGRADOV, A.P., akademik, obshchiy red.; YEMEL'YANOV, V.S.; ZEFIROV, A.P., doktor tekhn. nauk, obshchiy red.; ZUBOV, A.I., red.; ZVERKEV, G.L., red.; PERSVERZEV, V.V., red.; PCHELINTSEVA, G.M., red.; MAZEL', Ye.I., tekhn.red.

[Proceedings of the Second International Conference on the Peaceful Uses of Atomic Energy, Geneva, 1958] Trudy Vtoroi mezhdunarodnoy konferentsii po mirnomu ispol'zovaniyu atomnoy energii, Zheneva, 1958. (Doklady sovetskikh uchenykh) Moskva, Izd-vo Glav.uprav.po ispol'zovaniiu atomnoi energ. pri Sovete Ministrov SSSR. Vol.3. [Nuclear fuel and reactor metals] IAdernoe goriuchee i reaktornye metally. 1959. 670 p. (MIRA 12:11)

1. International Conference on the Peaceful Uses of Atomic Energy, 2d, Geneva, 1958. 2. Chlen-korrespondent AN SSSR (for Yemel'yanov). (Nuclear fuels)

BOCHVAR, A.A., akademik, red.; IEMEL'IANOV, V.S., red.; PEREVERZEV, G.L., red. toma; IVANOV, A.N., red. toma; SOKURSKIY, Yu.N., red. toma; STERLIN, Ya.M., red. toma; PEREVERZEV, V.V., red.; PCHELINTSEVA, G.M., red.; MAZEL', Ye.I., tekhn. red.

[Transactions of the International Conference On The Peaceful Uses of Atomic Energy] Trudy Vtoroy mezhdunarodnoy konferentsii po mirnomu ispol'zovaniyu atomnoy energii, 2d, Geneva, 1958. Izbrannye Doklady inos rannykh uchenykh. Moskva, Izd-vo Glav. uprav. po ispol'zovaniiu atomnoi energ. pri Sovete Ministrov SSSR. Vol.6. [Nuclear fuel and ractor materials] IAdernoe goriuchee i reaktornye materialy. Pod obshchei red. A.A.Bochvara i Emel'ianova V.S. 1959. 702 p. (MIRA 14:10)

1. International Conference on The Peaceful Uses of Atomic Energy. 2d, Geneva, 1958. 2. Chlen-korrespondent AN SSSR (for Yemel'yanov). (Nuclear fuels) (Nuclear reactors—Materials)

ZVEREV, G. M. Cand Phys-Math Sci -- "Study of the electronic paramagnetic resonance of V^{3+} and Co^{2+} ions in corundum." Mos, 1960. (Acad Sci USSR. Physics Inst im P. N. Lebedev) (KL, 1-61, 179)

V^{3+} and Co^{2+} ions

56-2-37/51

AUTHORS: Zverev, G. M., Prokhorov, A. M.

TITLE: The Fine and Hyperfine Structure of the Spectrum of Paramagnetic Resonance of Cr^{3+} in Corundum (Tonkaya i sverkhtonkaya struktura spektra paramagnitnogo rezonansa Cr^{3+} v korunde)

PERIODICAL: Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 1958, Vol 34, Nr 2, pp 513 - 514 (USSR)

ABSTRACT: First three works dealing with the same subject are mentioned. The authors investigated in detail this spectrum at a frequency of 37860 megacycles. The behavior of the energy levels with an external magnetic field being present is described by an Hamiltonian mentioned here. The microstructure was investigated of a corundum monocrystal which contained chromium in 1000-fold dilution. The position of the lines was measured for two orientations of the crystal in the external magnetic field: 1) The trigonal axis $Z \parallel \vec{H}$; 2) the trigonal axis $Z \perp \vec{H}$. In the first mentioned case three absorption lines were

The Fine and Hyperfine Structure of the Spectrum of Para-magnetic Resonance of Cr^{3+} in Corundum

noticed which correspond to the transitions between the levels with the following values for M_z: 1) $-3/2 \leftrightarrow -1/2$; 2) $-1/2 \leftrightarrow +1/2$; 3) $+1/2 \leftrightarrow +3/2$. In the second case the energy states ε_1, ε_2, ε_3, ε_4 form a mixture of states of various M_z. Altogether 6 absorption lines were observed of which the first three have an intensity which is smaller by two orders of magnitude than the last three. From the position of these lines the values of the constants in the spin Hamiltonian were determined. Proceeding from these values the position of all lines was computed. The experimental values coincide well with those computed. The spin-lattice relaxation time T_1 obviously has the order of magnitude 10^{-2} sec. The hyper--microstructure was investigated by means of a sample containing chromium in form of 95 % Cr^{95}; the dilution was 1 : 10000. The hyper-microstructure is only well dissolved in the case of the line $-1/2 \leftrightarrow +1/2$ with parallel orientation and in that of the line $\varepsilon_2 \leftrightarrow \varepsilon_3$ with vertical orientation. There are 4 components which correspond to the various projections of the nuclear spin ($I = 3/2$). The components do not have the same distance: The distance between the two inner

The Fine and Hyperfine Structure of the Spectrum of Paramagnetic Resonance of Cr^{3+} in Corundum

lines is less than one third of that of the outer lines. These irregular distances can be explained by the existence of a weak line in the center (which corresponds to the even isotopes in the sample). The following values were found for the hyper-microstructure constants A and B: $|A| = (16,8 \pm \pm 0,04).10^{-4}$ cm^{-1} and $|B| = (16,8 \pm 0,06).10^{-4}$ cm^{-1}. The coincidence of these values speaks in favor of the practically complete isotropy of the hyper-microstructure. There are 1 figure, and 4 references, 3 of which are Slavic.

ASSOCIATION: Moscow State University
(Moskovskiy gosudarstvennyy universitet)

SUBMITTED: November 13, 1957

AVAILABLE: Library of Congress

1. Paramagnetic resonance-Spectrum analysis

56-34-4-48/60

AUTHORS: Zverev, G. M., Prokhorov, A. M.

TITLE: The Paramagnetic Electron Resonance of the Ion V^{3+} in Corundum (Elektronnyy paramagnitnyy rezonans iona V^{3+} v korunde)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol. 34, Nr 4, pp. 1023 - 1024 (USSR)

ABSTRACT: The authors investigated the spectrum of the paramagnetic electron resonance of the ion V^{3+} in a monocrystal of the corundum Al_2O_3. The spectroscopic basic state of this ion is $^3F_2$. The seven times degenerated orbital energetic level is split up by the electric field of the crystal into a singlet and a triplet, the triplet being the lowest level. This applies to crystal fields of cubic symmetry. A crystal field of trigonal or tetragonal symmetry further splits up this orbital triplet into a doublet and a singlet. The lowest energy level of the ion V^{3+} in a crystal field of trigonal symmetry is a singlet (S = 1), degenerated three times with regard to the spin. A line would have to be observel which corresponds to the transition from the level $S_z = +1$

The Paramagnetic Electron Resonance of the Ion V^{3+} in Corundum

to the level $S_z = -1$. In order to be able to investigate this line its width must not be too great, i.e. the time of the spin-lattice relaxation must be more than 10^{-11} sec. In the lattice of corundum there exists a strong electric field of trigonal symmetry which drives the lower orbital levels of the ion V^{3+} far apart. Therefore the time of spin lattice relaxation is probably sufficiently long at low temperatures. In such crystal lattices, in which the axial component of the electric field is weaker, the lines of paramagnetic electron relaxation are probably not easily visible. The authors observed a line of the ion V^{3+} in a corundum monocrystal at $T = 4{,}2^{\circ}K$ at frequencies of from 14 000 to 38 000 megacycles. When the temperature dropped to $2^{\circ}K$ the intensity of this line decreased considerably. When the temperature rose, the line became wider and then disappeared. At $T = 77^{\circ}K$ this line was not observed. The line consisted of 8 equidistant components, which corresponds to the nuclear spin $I = 7/2$ of V^{51}. The line was visible at parallel orientation. The half life component of a single component was 20 Oersted at parallel orientation and the distance between the components amounted to 108 Oersted. The spectrum can be

The Paramagnetic Electron Resonance of the Ion V^{3+} in Corundum

interpreted by means of a given spin Hamiltonian.The authors thanked S. M. Grum-Grzhimaylo and A. A. Popova for the production of the samples and Professor A. I. Shal'nikov for his aid in carrying out experiments at low temperatures. There are 4 references, 0 of which are Soviet.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet
(Moscow State University)

SUBMITTED: January 16, 1958

1. Corundum--Resonance

Card 3/3

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

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

24(3) SOV/56-36-2-62/63

AUTHORS: Zverev, G. M., Prokhorov, A. M.

TITLE: The Electron Paramagnetic Resonance of Co^{2+} in Corundum (Elektronnyy paramagnitnyy rezonans Co^{2+} v korunde)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 2, pp 647-648 (USSR)

ABSTRACT: In a corundum single crystal which contains admixtures of cobalt, the lines of the paramagnetic electron resonance of the cobalt ion were detected at T = 4.2°K at the frequencies 9800 and 37500 megacycles. All these lines have a hyperfine structure of 8 components, which corresponds to the spin I = 7/2 of the nucleus Co^{59}. If the magnetic field is parallel to the trigonal axis of the crystal, an intense line is observed, the components of which (for the frequency 9800 megacycles), have very different distances. If the magnetic field is perpendicular to the trigonal axis, the components of the hyperfine structure of these lines are equidistant for both of the above-mentioned frequencies. The observed spectrum can be ascribed to Co^{2+} of effective spin S' = 1/2. The hyperfine structure was not investigated in detail; the g-factors

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The Electron Paramagnetic Resonance of Co^{2+} in Corundum

(measured in the center of the line) have the values $g_{\parallel} = 2.27$ and $g_{\perp} = 4.95$. Besides an intense line, some faint lines are observed which have the hyperfine structure characteristic of cobalt. In contrast to the ions Cr^{+}, Fe^{3+}, V^{3+} in corundum, the ion Co^{2+} has a noticeably longer relaxation time, since at $T = 4.2^{\circ}K$ the saturation effect takes place at powers of $\sim 10^{-8}$ W. This is a translation of this short letter.

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

SUBMITTED: December 16, 1958

31757
S/058/61/000/011/010/025
A058/A101

24.7900

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

TITLE: Investigation of electron paramagnetic resonance of iron-group ions in corundum

PERIODICAL: Referativnyy zhurnal. Fizika, no. 11, 1961, 130, abstract 11V267 (V sb. "Paramagnitn. rezonans". Kazan', Kazansk. un-t, 1960, 7)

TEXT: The electron paramagnetic resonance of Fe, Co, V, Cr and Cu ions in the corundum lattice was experimentally investigated in a wide frequency (40,000-10,000 Mcps) and temperature (290°-1.7°K) range. The observed spectra were given a pertinent theoretical interpretation, and the values of the spin Hamiltonian constants were determined. Electron paramagnetic resonance of Cu ions in corundum was not detected. The valence states of ions in corundum were determined, and relaxation times at liquid He temperature were evaluated. The feasibility of using Cr and Fe ions in corundum to design paramagnetic amplifiers was experimentally demonstrated.

[Abstracter's note: Complete translation]

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ZVEREV, G.M.

82020
S/056/60/038/02/21/061
B006/B011

24.7900

AUTHORS: Zverev, G. M., Prokhorov, A. M.

TITLE: Investigation of the Spectrum of Electron Paramagnetic Resonance of V^{3+} in Corundum

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 38, No. 2, pp. 449-454

TEXT: A previous paper (Ref. 1) had already reported on the investigations of the electron paramagnetic resonance spectrum in a corundum single crystal containing 0.13% V^{3+}. The present paper offers detailed information, and first of all, an interpretation of experimental results by the aid of the spin Hamiltonian, which describes the behavior of the three lowest energy levels in the magnetic field. The introduction offers several data concerning the free V^{3+} ion and the vanadium ion inserted in the crystal structure of Al_2O_3, and a few general structural problems are discussed. The splitting of the lowest energy level of the V^{3+} ion in fields of different symmetry had already been investigated to explain the magnetic behavior of vanadium alum. The level degeneration is schematically re-

presented in Fig. 1 and is discussed (level splitting into a singlet and two triplets). The spin-orbit interaction gives rise to a further splitting of the lower spin triplet into a singlet and a doublet (Refs. 4-6). The degeneration of the spin triplet is, however, completely eliminated on the contamination of a crystal with rhombic symmetry - which in fact occurs with corundum. Since already at room temperature, and all the more at lower temperatures, all of the energy levels except for the lowest are not populated, only the lower three spin levels are of interest for the electron paramagnetic resonance. Transitions among these three spin levels can be observed by the method of the electron paramagnetic resonance. Fig. 3 shows the picture of such a resonance line of the V^{3+} ion in corundum at ν = 37,450 Mc/sec, T = 4.2°K. There were also Cr^{3+} and Fe^{3+} ions in corundum, but their concentration did not exceed 0.001%. Measurements had already been made in a wide frequency range (9,000 - 39,000 Mc/sec) at helium temperature. Such a resonance line (Fig. 3) consisted of eight hyperfine structural components each, which is indicative of a nuclear spin of the V^{51} of I = 7/2. The Hamiltonian

Investigation of the Spectrum of Electron Paramagnetic Resonance of V^{3+} in Corundum

by which the experimental results were studied, reads

$$\hat{\mathcal{H}} = D\hat{S}_z'^2 + g_{\parallel}\beta H_z \hat{S}_z' + g_{\perp}\beta(H_x\hat{S}_x' + H_y\hat{S}_y') + A\hat{S}_z'\hat{I}_z + B(\hat{S}_x'\hat{I}_x + \hat{S}_y'\hat{I}_y) + E(\hat{S}_x'^2 - \hat{S}_y'^2),$$

where $\hat{S}_x'$, $\hat{S}_y'$, and $\hat{S}_z'$ are the projections of the effective electron spin, $\hat{I}_x$, $\hat{I}_y$, and $\hat{I}_z$ the projections of the nuclear spin, H_x, H_y, and H_z the projections of the field strength vector, $g_{\parallel}$ and $g_{\perp}$ the factors of the spectroscopic splitting, β the Bohr magneton, D the constant of primary splitting, E the constant of the rhombic field; A and B are constants of the hyperfine structure. The constants of the Hamiltonian were found by the authors to be

$g_{\parallel} = 1.915 \pm 0.002$; $D = (7.0 \pm 0.3)\ cm^{-1}$, $|A| = (0.959 \pm 0.005)\cdot 10^{-2} cm^{-1}$; $|E| < 10^{-2} cm^{-1}$. The results are discussed. The authors finally thank A. A. Popova, R. P. Bashuk, and A. S. Bebchuk for their assistance. There are 4 figures and 11 references: 5 Soviet, 2 Dutch, 2 British, and 2 American

Card 3/4

Inst. Nuclear Physics, Moscow State Univ.

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S/056/60/039/01/08/029
B006/B070

24.6400

AUTHORS: Zverev, G. M., Prokhorov, A. M.

TITLE: Electron Paramagnetic Resonance and Spin Lattice Relaxation of the Co^{2+} Ion in Corundum

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 39, No. 1 (7), pp. 57-63

TEXT: The purpose of the present work was an investigation of the electron paramagnetic resonance of the Co^{2+} ion in corundum, its theoretical interpretation, and a determination of the spin lattice relaxation time. The energy levels of the Co^{2+} ion which, as a free ion in the ground state, has a ^4F term corresponding to the $3d^7$ configuration, are split in the corundum crystal by the Stark effect of the electric field of the neighboring ions. The electric field in the crystal is formed by the O^{2-} octahedron, and has mainly cubic symmetry with slight trigonal impurities. The behavior of the Co^{2+} ion in the

Electron Paramagnetic Resonance and Spin Lattice Relaxation of the Co^{2+} Ion in Corundum

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B006/B070

crystal field, and the splitting of the line are investigated in the introduction. The experimental results are then mentioned (Which have partly already been published in Ref. 8). The spectrum of the electron paramagnetic resonance of Co^{2+} was investigated at 4.2°K. It consists of two groups of strong lines which show eight hyperfine-structure components ($I=7/2$ for Co^{59}), and some groups of weak lines characteristic of cobalt hyperfine-structure. The intensities of all lines diminish with decreasing temperature; that means that the lines are due to transitions between levels of the lower Kramers doublet. For the constants of the spin Hamiltonian of the lines 9000 and 38000 Mc/sec, the following values were found:

Line I

$g_{\parallel} = 2.292 \pm 0.001$ $\quad g_{\perp} = 4.947 \pm 0.003$

$A = 3.24 \pm 0.01$ $\quad B = 9.72 \pm 0.05$

Line II

$g_{\parallel} = 2.808 \pm 0.003$ $\quad g_{\perp} = 4.855 \pm 0.005$

$A = 2.08 \pm 0.09$ $\quad B = 13.10 \pm 0.11$ $\quad$ (A and B in 10^{-3} cm^{-1})

Electron Paramagnetic Resonance and Spin Lattice Relaxation of the Co^{2+} Ion in Corundum

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B006/B070

Fig. 1 shows lines I and II for parallel orientation, the magnetic field increasing from left to right. The lines I and II belong to different non-equivalent ion systems. The existence of the two ion systems of Co^{2+} in corundum is then discussed on the basis of the lattice system shown in Fig. 2. At the same time, brief mention is made of the calculation of the hyperfine structure constants A and B. The spin lattice relaxation time τ_1 in corundum for a cobalt concentration of 10^{-2}% at helium temperature was determined by the method of saturation of the resonance lines. At 4.2°K, τ_1 was found to be 1 sec which is abnormally high, while, at 22°K it was only 3.10^{-8} sec. Fig. 3 shows the temperature dependence of τ_1. From 1.8 to 4.2°K, τ_1 is inversely proportional to temperature. Some details of the experimental method, and the temperature dependence of τ_1 are discussed at length. The authors thank P. N. Bashuk and A. S. Sebchuk for preparation of the samples and L. S. Kornivenko for discussions. There are 3 figures and 16 references: 4 Soviet, 9 American, 1 Dutch, and 2 British.

Inst. Nuclear Physics Moscow State Univ.

Card 3/3

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B006/B063

24.6200
24.6520

AUTHORS: Zverev, G. M., Prokhorov, A. M.

TITLE: Electron Paramagnetic Resonance of Vanadium in Rutile

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 39, No. 1(7), pp. 222-223

TEXT: In TiO_2 containing a 0.01% vanadium impurity the authors detected an electron paramagnetic resonance (e.p.r.) spectrum that consisted of two lines showing a hyperfine structure (split into eight components) characteristic of V^{51} (nuclear spin 7/2). For $S = 1/2$ and $I = 7/2$ the e.p.r. spectrum of vanadium is represented by the spin Hamiltonian $\hat{\mathcal{H}} = g_x\beta H_x\hat{S}_x + g_y\beta H_y\hat{S}_y + g_z\beta H_z\hat{S}_z + A_x\hat{I}_x\hat{S}_x + A_y\hat{I}_y\hat{S}_y + A_z\hat{I}_z\hat{S}_z$, where g - anisotropy factor of the spectroscopic splitting, A - constant of hyperfine structure, and β - Bohr magneton; z is in the tetragonal axis, and x and y run parallel with the directions [110] and [1$\bar{1}$0]. The following values were determined for the Hamiltonian constants at 77°K

Electron Paramagnetic Resonance of Vanadium in Rutile

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and 9800 Mc/sec: $g_x = 1.955 \pm 0.001$, $g_y = 1.913 \pm 0.001$, $g_z = 1.912 \pm 0.001$; $A_x = 14.15 \pm 0.07$, $A_y = 3.09 \pm 0.03$, and $A_z = 4.41 \pm 0.03$. A_x, A_y, and A_z are given in $10^{-3} cm^{-1}$. Other frequencies and temperatures yielded the same results, i.e., the constants were practically independent of temperature and frequency. At room temperature vanadium showed no e.p.r. in rutile. The lines became narrower with dropping temperature, and at 90°K their width was 3.5 oe, after which it remained constant. This width is supposed to be due to spin-spin interaction of paramagnetic vanadium ions. The spin-lattice relaxation of vanadium ions in rutile was measured by the method of continuous saturation. At 4.2°K it was 2.10^{-1} sec, and at 90°K, 6.10^{-6} sec. In the case of saturation, a line broadening was found at 90°K, which confirmed the above-mentioned assumption on the nature of the line width. All experiments indicate that vanadium is incorporated in the rutile lattice in the form of V^{4+} ions. R. P. Bashuk and A. S. Bebchuk are thanked for having supplied the specimens used. There are 3 non-Soviet references.

Inst. Nuclear Physics - Moscow State Univ.

Card 2/2

83758

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

24,5600 (1035, 1055, 1114)

AUTHORS: Zverev, G. M., Prokhorov, A. M.

TITLE: The Cross Spin Relaxation in the Hyperfine Structure of the Electron Paramagnetic Resonance of Co^{2+} in Corundum

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 39, No. 3 (9), pp. 545 - 547

TEXT: The authors discuss the effect of cross relaxation (Refs. 1-4) occurring in spin systems with little differing resonance frequencies. They studied the cross spin relaxation of transitions corresponding to different projections of the nuclear spin. The corundum sample used contained 10^{-2} % of Co, the time T_1 of the spin-lattice relaxation was 1.2 sec at 4.2°K. The trigonal axis of the crystal was parallel to $\vec{H}$ (outer magnetic field), the width of the individual components of the hyperfine structure was 7.5 oersteds, the distance between the components was 30 oersteds. The sample was placed into a resonator which was modulated to two close frequencies ν_1 and ν_2 ~9200 Mc/sec. The

The Cross Spin Relaxation in the Hyperfine Structure of the Electron Paramagnetic Resonance of Co^{2+} in Corundum

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B004/B060

lines of the electron paramagnetic resonance were observed at the frequency ν_1 by means of a superheterodyne radiospectroscope. The frequency ν_2 supplied the saturation pulse. The restoration of the line intensity after switching off the saturation pulse was recorded by means of a cinematographic camera. A figure illustrates the relation $\log(J_o - J) = f(t)$. J is the absorption intensity, proportional to the filling n of the spin levels, J_o is the absorption intensity in thermal equilibrium. The curves are given for two cases: 1) All of the eight components of the hyperfine structure were saturated to one level. The relaxation is then expressed by $n_o - n = A \exp(-t/T_1)$ (1). 2) Only an outer component was saturated by a short pulse. The relaxation is in this case faster due to spin-spin interaction. The calculation was made here on the following assumption: a) the cross relaxation between each neighboring component pair can be expressed by the same parameter T_{12}, the cross relaxation time; b) only the spin-spin interaction of neighboring components is taken into account. The authors obtained

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The Cross Spin Relaxation in the Hyperfine Structure of the Electron Paramagnetic Resonance of Co^{2+} in Corundum

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equation $n_o - n_i = \sum_{j=1}^{8} A_{ji} \cdot \exp(-\lambda_j t)$; $\lambda_j = 1/T_1 + c_j/T_{12}$. c_j are constants, the coefficients A_{ji} are dependent on the experimental conditions. The experimental data corresponded to a T_{12} of 0.27 sec. While T_1 depends on temperature, T_{12} was constant between 1.8 and 4.2°K. There are 1 figure and 4 references: 1 Soviet and 3 US.

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

SUBMITTED: April 9, 1960

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ZVEREV, G.M.

Spectroscope for investigating spin-lattice relaxation of paramagnetic substances in the temperature range from 2 to 60° K. Prib.i tekh.eksp. 6 no.5:109-112 S-O '61. (MIRA 14:10)

1. Nauchno-issledovatel'skiy institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta.
(Spectroscope)

ZVEREV, G.M.; PROKHOROV, A.M.

Electron paramagnetic resonance of the V^{3+} ion in corundum. Zhur. eksp. i teor. fiz. 40 no.4:1016-1018 Ap '61. (MIRA 14:7)

1. Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta.

(Paramagnetic resonance and relaxation)
(Corundum--Electric properties)

25189
S/056/61/040/006/010/031
B111/B201

94.7900

AUTHOR: Zverev, G. M.

TITLE: Nature of spin-lattice interaction in chromium corundum. I

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 40, no. 6, 1961, 1667 - 1671

TEXT: The spin-lattice interaction plays an important part in paramagnetic amplifiers. Various mechanisms have been offered in previous papers to explain the interaction, but none has proved fully satisfactory. The author assumes, that several mechanisms participate in spin-lattice relaxation. All of his experiments have been conducted with 9400 Mc/sec by the method of continuous saturation. The spin-lattice relaxation time has been determined in corundum specimens of a uniform concentration, but with different contents of defects. The latter were produced by fast neutrons or gamma irradiation in a reactor, their concentration was of the order of 10^{19} cm^{-3}. In irradiated specimens with a Cr content of

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Nature of spin-lattice interaction...

$2 \cdot 10^{-4}$, the spin-lattice relaxation time τ_1 for $1/2 \rightarrow -1/2$ transitions with parallel spin orientation was three times less than that of non-irradiated specimens having the same chromium concentration. At a concentration of $8 \cdot 10^{-4}$, τ_1 of a test specimen was less. T = 4.2°K in both experiments. At a temperature of 77°K the relaxation times were found to coincide. The author states that phonon effects are of some importance in case of small chromium content only. A special apparatus was used to determine the temperature dependence of the relaxation time (G. M. Zverev, PTE (in print)). The attached figure shows results for different Cr contents. The curves hold for transitions $1/2 \rightarrow -1/2$ with an angle of $\theta = 5°$. Curve 1 refers to a chromium-ion concentration of $c = 2 \cdot 10^{-4}$; curve 2 holds for $c = 8 \cdot 10^{-4}$, and curve 3 for $c = 2.8 \cdot 10^{-3}$. Curve 1 corresponds to the Kroniger-Van Vleck mechanism; up to 50°K absorption processes and emission of individual phonons prevail, while the phonons show a Raman effect at higher temperatures. Curve 3 shows best how a new mechanism plays a role at higher concentrations of paramagnetic ions.

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Nature of spin-lattice interaction..

It corresponds to an exchange interaction between the chromium ion pairs. To explain the plateau in curve 3 it is necessary to assume a heat exchange reservoir between spin system and lattice. A. A. Manenkov is mentioned. Professor A. M. Prokhorov is thanked for valuable advice, N. I. Naumkin, N. G. Petelina and V. P. Kiryukhin for their assistance in the experiments. There are 1 figure and 18 references: 3 Soviet-bloc and 15 non-Soviet-bloc. The two most important references to English-language publications read as follows: R. Kronig, Physica, 6, 33, 1939; J. H. Van Vleck, Phys. Rev., 57, 426, 1940; A. I. Skwalow et. al., Phys. Rev. Lett., 3, 271, 1959.

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

SUBMITTED: January 30, 1961

Card 3/3

SHAVLOV, A.[Schawlow,A.]; FOGEL', S.[Fogel,S.]; DALBERDZHER, L. [Dulberger, L.]; KORNIYENKO, L.S.[translator]; ZVEREV, G.M., [translator]; MARKOV, V.N.[translator]; SHMAONOV, T.A., red.; POPOV, R.Yu., red.; IOVLEVA, N.A., tekhn. red.

[Optical masers (lasers)Opticheskie kvantovye generatory (lazery). Moskva, Izd-vo inostr. lit-ry 1962. 114 p. Translated from the English. (MIRA 15:11)

(Masers)

ZVEREV, G. M.; PROKHOROV, A. M.

"Investigation of ESRof Co^{2+} in TiO_2 "
Report presented at the First International Conference on Paramagnetic Resonance, Jerusalem, Israel, 16-20 July 1962.

34231
S/181/62/004/002/014/051
B102/B138

24,7900 (1055,1144,1163)

AUTHORS: Zverev, G. M., Korniyenko, L. S., Prokhorov, A. M., and Smirnov, A. I.

TITLE: Electron paramagnetic resonance and spin-lattice relaxation of the Er^{3+} ion in a CdF_2 single crystal

PERIODICAL: Fizika tverdogo tela, v. 4, no. 2, 1962, 392-395

TEXT: Er^{3+} was introduced as an isomorphic impurity into CdF_2, in which the fluor ions form a cubic lattice, the Cd ions being in the centers of cubes formed by the anions. The Er^{3+} ions replace Cd ions. The e. p. r. measurements were made at 4.2°K, with several different frequencies and for an Er^{3+} concentration of 0.1%. The following spectrum parameters were determined:

X

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Electron paramagnetic resonance and ...

ν, Mc/sec	g	A, oe
9500	6.758±0.010	73.0±1.0
25800	6.745±0.005	-
72000	6.735±0.005	73.9±1.0

The frequency dependence of the g-factor is due to the contributions of the wave functions of the excited states. The field-induced change of the g-factor can be determined by using perturbation theory:

$$g = g_0 \left[1 - \frac{\Lambda^2 \beta^2 H^2}{\delta^2} \left| \langle 1 \left| \hat{J}_z \right| 2 \rangle \right|^2 \right]$$

g_0 is the g-factor at H=0, Λ - Landé factor, δ is the mean distance to the nearest upper level of the state group (2): $\left\{ \pm \frac{13}{2}, \pm \frac{5}{2}, \mp \frac{3}{2}, \mp \frac{11}{2} \right\}$

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Electron paramagnetic resonance and ...

$\langle 1|$ and $|2\rangle$ denote the ground and excited states. $A = (2.31 \pm 0.03) \cdot 10^{-2} cm^{-1}$. Spin-lattice relaxation was studied by the continuous saturation method and by the pulse method with 3.2 cm waves. The temperature dependence of relaxation time τ_1 was determined by several methods, e. g. between 16 and 18°K from epr line broadening. Though S. A. Al'tshuler has developed a theory of spin-lattice relaxation of rare-earth ions, (ZhETF, 24, 691, 1953), the experimental results for Er^{3+} ions in a cubic lattice can only be explained qualitatively. At $T < 4.2°K$, $\tau_1 \sim T^{-1}$, at higher temperatures the course of $\tau_1(T)$ cannot be described by an exponential law of the $\tau_1 \sim T^{-n}$ type. This is due to anomalies caused by other bi- and trivalent ions. L. M. Belyayev, Kh. S. Bagdasarov and V. Ya. Khaimov-Mal'kov and P. P. Pashinin are thanked for help. There are 1 figure, 1 table, and 13 references: 5 Soviet and 8 non-Soviet. The four most recent references to English-language publications read as follows: M. Dvir, W. Low. Proc. Phys. Soc., 75, 136, 1960; W. Low. Paramagnetic Resonance in Solids. p. 130, New York - London.

Card 3/0 4

Electron paramagnetic resonance and ...

1960; C. B. P. Finn et al. Proc. Phys. Soc., B77, 261, 1961; J. M. Baker et al. Proc. Phys. Soc. B73, 942, 1959.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University imeni M. V. Lomonosov)

SUBMITTED: August 14, 1961

Fig. Time dependence of τ_1 for Er^{3+}.

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Card 4/4

ZVEREV, G.M.; PROKHOROV, A.M.; SHEVCHENKO, A.K.

Mechanism underlying the effect of a vanadium admixture on the spin-lattice relaxation of chromium in corundum. Fiz. tver. tela 4 no.11:3136-3143 N '62. (MIRA 15:12)

1. Moskovskiy gosudarstvennyy universitet imeni M.V. Lomonosova.
(Paramagnetic resonance and relaxation)
(Nuclear spin)

ZVEREV, G.M.; PROKHOROV, A.M.

Electron paramagnetic resonance of rutile containing cobalt.
Zhur. eksp. i teor. fiz. 43 no.2:422-425 Ag '62. (MIRA 16:6)

1. Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta.
(Paramagnetic resonance and relaxation) (Rutile) (Cobalt)

37864
S/056/62/042/005/008/050
B125/B108

24.7900

AUTHORS: Zverev, G. M., Petelina, N. G.

TITLE: Electron paramagnetic resonance of Co^{2+} ions in corundum

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 42, no. 5, 1962, 1186 - 1190

TEXT: Various versions of the theory of electron paramagnetic resonance of Co^{2+} are checked. Cobalt ions in the Al_2O_3 lattice form two nonequivalent systems with a common axis of trigonal symmetry, but with different constants of the spin Hamiltonian. The following values were obtained from measurements of the g_1 factors:

ν, 10^9 cps	9	37	71
ion system I	4.947 ± 0.003	4.936 ± 0.003	4.938 ± 0.003
ion system II	4.855 ± 0.005	4.850 ± 0.005	4.850 ± 0.005

The results for $9 \cdot 10^9$ are taken from G. M. Zverev and A. M. Prokhorov

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Electron paramagnetic resonance...

(ZhETF, 39, 57, 1960). The high values of $g_{\perp}$ for I and II at $9 \cdot 10^9$ cycles are probably due to the circumstance that at this frequency the hyperfine structure is comparable to the mean magnetic field strength. The experiments do not confirm the expected diminution of $g_{\perp}$ with increasing frequency. The temperature dependence τ_1 (T) of spin-lattice relaxation time was measured by the method of continuous saturation using a 3.2-cm microwave spectroscope. The following relation is fairly satisfied for the system I at 9 - 30°K: $\tau_1 = 1.6 \cdot 10^{-11} e^{\delta I/kT}$ sec, while $\tau_1 = 10^{-12} e^{\delta II/kT}$ is satisfied for the system II at 14 - 26°K. Below 4.2°K, τ_1 is inversely proportional to T in both systems. $\delta_I = 110 \pm 15$ cm^{-1}, $\delta_{II} = 185 \pm 20$ cm^{-1}. The experimental form of $\tau_1(T)$ is explained by the relaxation process through an excited state, as suggested by R. Orbach (see reference) for magnesium-cerium nitrate. This excited state is respectively 110 cm^{-1} and 185 cm^{-1} above the ground state for the ion groups I and II. The process mentioned above determines relaxation as far as 30°K. The g-factors and the spin-lattice relaxation time of Co^{2+}

ions in an Al_2O_3 lattice can be explained under the usual assumptions on the character of the crystal field (A. Abragam, M. H. L. Pryce. Proc. Roy. Soc., A206, 173, 1951). The values of δ determined from the relaxation experiments are suited for stricter calculations taking account of the covalent bond. "Two-stage" relaxation must play an important part also in the other ions of the iron group. There are 2 figures and 1 table. The most important English-language reference is: C. B. P. Finn, R. Orbach, W. P. Wolf. Proc. Phys. Soc., 77, 261, 1961.

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

SUBMITTED: December 23, 1961

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 fizicheskikh nauk, v. 77, no. 1, 1962, 61 - 108

TEXT: Western and Soviet studies during the period 1932 - 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 РПУ (RPU), paramagnetic progressive wave amplifier ПУБВ (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:

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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).

AID Nr. 984-8 6 June

GENERATION OF MILLIMETER WAVES IN OPTICALLY PUMPED RUBY (USSR)

Zverev, G. M., A. M. Prokhorov, and A. K. Shevchenko. Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 44, no. 4, Apr 1963, 1415-1418.
S/056/63/044/004/042/044

Experiments have been conducted using a ruby laser at 77°K to pump a three-level ruby millimeter-wave ($35-50 \cdot 10^9$ cps) generator operating at the same temperature. Emission from the nitrogen-cooled ruby laser passed through a system of mirrors and a lens onto the end of a nitrogen-cooled ruby which served as a millimeter-band resonator and whose c-axis was perpendicular to the external magnetic field. Emission from the generator ruby was detected by a reflector-type superheterodyne radio spectroscope which also controlled

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6

the required magnetic field. The detected output, along with the photomultiplier-monitored laser pulse signal, was displayed on the screen of a pulse oscillograph. The generated millimeter-band power output was ~ 10^{-5} w. The emission had the multiple-spike form observed in rf-pumped paramagnetic generators. It was calculated that the maximum power ideally obtainable in the sample used (0.05% chromium ion concentration) is 1.7 mw in a pulse with a duration of ~ 150 μsec.

[BB]

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R0020657100004-6"

L 10762-63 EWT(1)/EWP(q)/EWT(m)/BDS--AFFTC/ASD--JD/WH

ACCESSION NR: AP3003111 S/0056/63/044/006/1859/1863

55
56

AUTHOR: Zverev, G. M.

TITLE: Temperature dependence of spin-lattice relaxation of tetravalent vanadium anion in rutile

SOURCE: Zhurnal eksper. i. teor. fiziki, v. 44, no. 6, 1963, 1859-1863

TOPIC TAGS: spin-lattice relaxation, epr, tetravalent vanadium anion, rutile

ABSTRACT: The temperature dependence of the spin-lattice relaxation τ of the V^{4+} ion in rutile was experimentally investigated in the temperature range between 4.2 and 110K. The concentration of the paramagnetic ions was $\leq 0.01\%$. All measurements were conducted with the tetragonal c axis of rutile parallel to the external magnetic field. It was found that between 4.2 and 10K, τ is inversely proportional to temperature (T). Between 10 and 50K, τ varies approximately as $T^{-5.5}$. Some deviation from this proportionality was observed in the range of 50-70K. At temperatures between 70 and 110K, $\tau = 6/10^{12} \exp(\Delta/kT)$,

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APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R0020657100041-6

D 10762-63

ACCESSION NR: AP3003111

3

where λ is the excited state of the V^{4+} ion 650 cm^{-1} above the ground state, which is responsible for spin-lattice relaxation in this temperature range. The values of τ obtained by different experimental methods were found to be in good agreement. Comparison of theoretical with experimental data indicates that the spin-lattice relaxation of tetravalent vanadium anion in rutile is caused by optical phonons or is due to a higher-order process in which four acoustic phonons participate in the relaxation. "The author thanks S. A. Al'tshuller for a valuable discussion and Y. V. Makarenko for his help in making measurements." Orig. art. has: 4 figures and 1 formula.

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

SUBMITTED: 22Jan63 DATE ACQ: 23Jul63 ENCL: 00

SUB CODE: 00 NO REF SOV: 005 OTHER: 006

Card 2/2

ACCESSION NR: AP4011743 S/0181/64/006/001/0096/0100

AUTHORS: Zverev, G. M.; Smirnov, A. I.

TITLE: Spin lattice relaxation of the Er^{3+} ion in single crystals of CdF_2, BaF_2, and CaF_2

SOURCE: Fizika tverdogo tela, v. 6, no. 1, 1964, 96-100

TOPIC TAGS: spin lattice relaxation, cadmium fluoride, barium fluoride, calcium fluoride, paramagnetic resonance, relaxation time temperature dependence, elastic scattering, two phonon process, direct relaxation process, excited state

ABSTRACT: The authors have examined both paramagnetic resonance spectra and relaxation processes for the Er^{3+} ion in single crystals of CdF_2, BaF_2, and CaF_2. Spin-lattice relaxation times were measured for 3-cm and 8-mm waves at temperatures ranging from 1.6 to 25K. The results are summarized in Figs. 1-3 of the Enclosures. At temperatures above that of liquid helium, relaxation is determined by the two-phonon process of relaxation through the excited state. This time depends exponentially on temperature: $\tau \sim \exp(\frac{\Delta}{kT})$. At temperatures of 1.6-4.2K, direct relaxation processes are complicated by heating of the phonon spectrum. The

ACCESSION NR: AP4011743

dependence of relaxation time on temperature is stronger then expected for ordinary direct processes. As mechanisms of phonon relaxation the authors suggest cross relaxation and the inelastic scattering of phonons by phonons. Orig. art. has: 3 figures.

ASSOCIATION: Moskovskiy gosudarstvenny*y universitet im. M. V. Lomonosova (Moscow State University)

SUBMITTED: 10Jul63 DATE ACQ: 14Feb64 ENCL: 03

SUB CODE: PH NO REF SOV: 002 OTHER: 004

Card 2/2

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065210004-6

ACC NR: AP6015493 SOURCE CODE: UR/0181/66/008/005/1379/1381

AUTHOR: Zverev, G. M.; Smirnov, A. I.

ORG: none

TITLE: Investigation of spin-lattice relaxation of a positive trivalent erbium ion in cadmium fluoride and calcium fluoride single crystals in the 3-70 Gc frequency range

SOURCE: Fizika tverdogo tela, v. 8, no. 5, 1966, 1379-1381

TOPIC TAGS: spin lattice relaxation, erbium, ion, fluoride, calcium fluoride, cadmium compound

ABSTRACT: The pulse saturation method was used for measuring the relaxation times τ_1 of the Er^{3+} ion in CdF_2 and CaF_2 single crystals at frequencies from 3 to 70 Gc. It was found that relaxation time decreases with an increase in frequency (from 400 to 200 μsec when the frequency is varied from 38 to 71 Gc). In the short-wavelength region of the millimeter range, the experimental data may be approximated by a power function of the form $\omega = \tau_1^{-1} \sim \nu^2$. Measurements on a wavelength of 9.4 cm showed a shorter relaxation time than on a wavelength of 3.2 cm (a reduction from 180 to 65 μsec) with τ_1 being very nearly proportional to ν. The experimental data in totality may be approximated by a function of the form

$$\tau_1^{-1} = \omega = 5 \cdot 10^4 \nu + 0.86 \nu^2$$

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APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6"

L 21826-66
ACC NR: AP6015453

where ω is in sec^{-1} and ν is in Gc. In weak magnetic fields, τ_1 increases linearly with frequency reaching a maximum followed by a sharp reduction. It is assumed that heating of resonance phonons has a considerable effect on relaxation of erbium ions so that relaxation of the line from even isotopes of the trivalent erbium ion is impeded by the lack of resonance phonons. As a result, the transfer of spin energy to the lattice is affected to a great extent by cross relaxation to the 'wings' of the line which are formed by trivalent erbium ions located in axial crystal fields of varying strength and symmetry. The obstruction to relaxation is relieved by this cross relaxation which introduces phonons in a wide range of frequencies. The effect is amplified when the 'wings' overlap the spectrum of impurities which have a short relaxation time. This type of mechanism gives a qualitative description of the experimentally observed relationship between relaxation time and magnetic field intensity in weak fields but becomes less significant as the magnetic field intensity increases. The experimental results depend considerably on the purity of the specimens studied and the concentration of erbium ions in various environments. The authors are grateful to P. P. Pashinin for giving them the opportunity to carry out the experiment on the 9.4 cm wavelength and for valuable consultation. Orig. art. has: 1 figure. [14]

SUB CODE: 20/ SUBM DATE: 10Sep65/ ORIG REF: 004/ OTH REF: 006/
ATD PRESS: 5003

Card 2/2 PB

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6

ACC NR: AP6007811 SOURCE CODE: UR/0051/66/021/003/0777/0779

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54
B

AUTHOR: Pashkov, V. A.; Zverev, G. M.

ORG: none

TITLE: Destruction of ruby and leucosapphire crystals by high-intensity laser beams

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 51, no. 3, 1966, 777-779

TOPIC TAGS: nonlinear optics, stimulated Brillouin scattering, multiphoton ionization, ruby, leucosapphire, crystal damage, laser induced damage, laser effect, LASER BEAM, CRYSTAL PROPERTY, SAPPHIRE, CRYSTAL DEFECT

ABSTRACT: An experimental investigation was made of the damage induced in ruby and leucosapphire crystals by the focused beam from a 1-j 30-Mw Q-switched laser. The damage in leucosapphire crystals at the focus of an f:5 cm lens was in the form of a spherical channel 1 mm in diameter. In the case of an f:15 cm lens, the lagging crystal surface sustained small, crater-like damage. Certain ruby crystals (group I) sustained damage identical to that in leucosapphire crystals, while in other ruby crystals (group II) the damage was in the form of "tracks" consisting of a series of small cracks perpendicular to the incident radiation. The tracks were several cm long and 2—3 mm in diameter and were observed for both the f:5 and f:15 lenses. The damage threshold for leucosapphire and Group I ruby crystals was approximately 10^{10} w/cm^2, while that in Group II ruby crystals was about 10^8 w/cm^2. Damage in all

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L 05618-67 ENT(1)/EWP(e)/EWT(m)/EWP(t)/ETI IJP(c) ... SOURCE CODE: UR/0181/66/008/007/2205/2212

45
B

ACC NR: AP6024489

AUTHOR: Bobrovnikov, Yu. A.; Zverev, G. M.; Smirnov, A. I.

ORG: none

TITLE: Paramagnetic resonance and spin lattice relaxation of Er^{3+} in CaF_2 and their connection with the optical spectrum

SOURCE: Fizika tverdogo tela, v. 8, no. 7, 1966, 2205-2212

TOPIC TAGS: calcium fluoride, erbium, spin lattice relaxation, optic spectrum, electron paramagnetic resonance

ABSTRACT: This is a continuation of earlier EPR studies (FTT v. 6, 2799, 1964) which have shown that the occurrence of different types of Er^{3+} centers depends strongly on the method of growing the host crystal. Consequently, a study was made of the EPR spectrum and of the spin lattice relaxation of Er^{3+} of single-crystal CaF_2 grown in the presence of oxygen. A new EPR spectrum, belonging to the Er^{3+} ions in a crystal field of trigonal symmetry with $g_{\parallel} = 10.29 \pm 003$, $g_{\perp} = 1.475 \pm 0.05$, and A = 73.0 ± 0.8 Oe was observed. A study of the spin-lattice relaxation has made it possible to determine the distance to the nearest excited level, namely 18 ± 2 cm^{-1}. A corresponding excited state was obtained also in the optical absorption spectrum. It is concluded that the EPR method makes it possible to reveal the existence of many types of centers, and that most lines in the optical spectrum can be set in correspondence with electronic transitions inside the 4f shell. Orig. art. has: 4 figures, 10 formulas, and 2 tables.

SUB CODE: 20/ SUBM DATE: 27Jul65/ ORIG REF: 003/ OTH REF: 009

Card 1/1

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6

L 08516-67 EWT(m)/EWP(t)/ETI IJP(c) JD/JG

ACC NR: AP6030714 SOURCE CODE: UR/0368/66/005/002/0172/0177

AUTHOR: Bashuk, R. P.; Gritsenko, M. M.; Grum-Grzhimaylo, S. V.; Zverev, G. M.; Sevast'yanov, B. K.; Kharitonova, L. M. 14 B

ORG: none

TITLE: Comparison of different methods for determining chromium concentration in ruby 17

SOURCE: Zhurnal prikladnoy spektroskopii, v. 5, no. 2, 1966, 172-177

TOPIC TAGS: chromium, ruby, optical absorption, magnetic measurement

ABSTRACT: Chemical, magnetic, optical, and radiospectroscopic methods are described for determining the chromium concentration in ruby. The limitations and possibilities of these methods are compared. The factor for converting the optical absorption value into concentration is determined from magnetic measurements; it si equal to 0.29. Orig. art. has: 4 figures, 5 formulas, and 1 table. [NT]
[Based on authors' abstract]

SUB CODE: 03/ SUBM DATE: 09Aug65/ ORIG REF: 009/ OTH REF: 004/

UDC: 535.89

Card 1/1 egb

ACC NR: AP7005883 SOURCE CODE: UR/0181/66/008/012/3686/3688

AUTHOR: Zverev, G. M.; Makarenko, L. V.; Smirnov, A. I.

ORG: none

TITLE: Paramagnetic resonance of Ce^{3+} and Nd^{3+} in $SrMoO_4$ single crystals

SOURCE: Fizika tverdogo tela, v. 8, no. 12, 1966, 3686-3688

TOPIC TAGS: strontium compound, molybdate, epr spectrum, activated crystal, cerium, neodymium

ABSTRACT: To check against results obtained with other scheelites, the authors studied the EPR spectra of Ce^{3+} and Nd^{3+} in single crystals of strontium molybdate grown by the Czochralski method and containing approximately 0.5% of Ce or Nd. The EPR spectra were measured at 4.2K and 14.3 GHz. In the case of cerium, a single intense line was observed, due to the Ce^{3+} ion in a field of tetragonal symmetry. In the case of neodymium, the spectrum consisted of an intense line due to the even isotopes of Nd^{3+}, on which a hyperfine structure due to the odd isotopes Nd^{143} and Nd^{145} is superimposed. The g-factors half widths and the hyperfine structure constants were obtained for all lines and agreed with an empirical relation obtained by others. A wave function agreeing with the obtained data is also found for the lower state of Nd^{3+} in a field of tetragonal symmetry. Orig. art. has: 2 figures and 7 formulas. [02] [WA14]

SUB CODE: 20/ SUBM DATE: 04Jul66/ ORIG REF: 003/ OTH REF: 001

Card 1/1 UDC: none

ACC NR: AP6033575 SOURCE CODE: UR/0181/66/008/010/3086/3088

AUTHOR: Bobrovnikov, Yu. A.; Zverev, G. M.; Makarenko, L. V.; Smirnov, A. I.

ORG: none

TITLE: Paramagnetic resonance of Nd^{3+} ions in single-crystal oxides of yttrium and scandium

SOURCE: Fizika tverdogo tela, v. 8, no. 10, 1966, 3086-3088

TOPIC TAGS: yttrium, scandium, oxide, neodymium, paramagnetic resonance, crystal symmetry, forbidden transition, optic spectrum, microwave spectroscopy

ABSTRACT: This is a continuation of an earlier study of the optical spectra of Nd^{3+} ions in Y_2O_3 and Sc_2O_3 (Opt. i spektro., in press) where the results were interpreted under the assumption that only one type of rhombic-symmetry center exists. In view of the fact that other results suggest the existence of two types of symmetry centers (C_2 and S_6), the authors have carried out a radiospectroscopic study of the same crystals. Paramagnetic resonance of Nd^{3+} in Y_2O_3 and Sc_2O_3 was observed at 4.2K and 14.3 GHz. The samples were oriented in such a way that the constant field remained in the (110) plane during the crystal rotation, and the alternating field was perpendicular to the constant field. An analysis of the angular dependence of the paramagnetic resonance spectrum established the existence of centers in crystalline

ACC NR: AP6033575

fields of rhombic and trigonal symmetry, with predominant directions parallel to [110] and [111] respectively. The components of the g-factors in the Nd^{3+} spectra are calculated for both oxides and both symmetry centers. The concentrations of the two centers differ by only a factor of 2. Since the earlier investigation of the optical spectrum disclosed the existence of only rhombic-symmetry centers, this confirms the assumption that forbidden transitions have a high probability in the case of centers that have no inversion symmetry. Orig. art. has: 1 figure, 3 formulas, and 1 table.

SUB CODE: 20/ SUBM DATE: 28Mar66/ ORIG REF: 002/ OTH REF: 007

Card 2/2

ZYKIN, G.N.; KUSOV, V.A.

Magnetic dipole in a medium with cylindrical discontinuity. Izv. AN SSSR. Ser.geofiz. no.1:128-134 Ja '63. (MIRA 16:2)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut geofizicheskikh metodov razvedki, Volgo-Ural'skiy filial.
(Electric prospecting)

DYAD'KIN, I.G.; LISENENKOV, A.T.; ZVEREV, G.N.

Mathematical experiment for solving certain geophysical problems.
Izv. AN SSSR. Ser. geofiz. no.11:1694-1698 N '63. (MIRA 16:12)

1. Volgo-Ural'skiy filial Vsesoyuznogo nauchno-issledovatel'skogo instituta geofizicheskikh metodov razvedki.

SVESOV, G.N.

Problem of analysis in the theory of induction logging. Izv.vys. ucheb.zav.; geol.i razv. 8 no.11:120-127 N '65.

(MIRA 18:12)

1. Volgogradskiy filial Vsesoyuznogo nauchno-issledovatel'skogo instituta geofizicheskikh metodov razvedki.

ZVEREV, G.N.

Method of the information model in the theory of induction logging. Izv.vys.ucheb.zav.; geol. i razv. 8 no.10: 125-130 O '65. (MIRA 19:1)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6"

1. MEYERSON, G.A., ZVEREV, G.O., ZUBKOVA, F.M.

2. USSR (600)

Moscow Institute of Fine Chemical Technology, "Study of the Solubility of Complex Tantalum Fluoride and Niobium Fluoride," Tsvet. Met. 14, No 8, August 1939.

9. [redacted] Report U-1506, 4 Oct 1951.

ZVEREV, G.V.

A pushcart for servicing continuous production lines. Stan. i instr. 26 no.10:30 O'55. (MLRA 9:1)

(Material handling)

ZVEREV, G.Z.;BULYGIN, N.V., master

Automatic start-up of stand-by turbo-feed pumps. Energetik 6 no. 1:28 Ja '58. (MIRA 11:8)
(Steam power plants--Equipment and supplies)

ZURABOV, R., inzh.; ZVEREV, I., inzh.

Angarsk is being built of air-entrained fly-ash concrete. Na stroi. Ros. 3 no.3:25-27 Mr '62. (MIRA 16:2)
(Angarsk—Precast concrete construction) (Lightweight concrete)

Zverev, I. - "In the north", (With the hunters and deer keepers of the Koryak Tundra, outline), Dal'niy Vostok, 1948, No. 6, p. 86-92.

SO: U-3042, 11 March 53, (Letopis 'Zhurnal 'nykh Statey, No. 8, 1949).

RAKHMATULIN, Khalil Akhmedovich; SAGOMONYAN, Artur Yakovlevich; BUNIMOVICH, Abram Isaakovich; ZVEREV, Igor' Nikolayevich. PUTYATE, V.I., dots., retsenzent; PANICHKIN, I.A., prof., retsenzent; GINEVSKIY, A.S., kand. tekhn. nauk, red.

[Gas dynamics] Gazovaia dinamika. Moskva, Vysshaia shkola, 1965. 722 p. (MIRA 18:10)

ZVEREV, Il'ya; SEMENOV, R., redaktor; ABRAMOV, V.I., redaktor; IL'INSKAYA, G.M., tekhnicheskiy redaktor

[A miner's personality] Shakhterskii kharakter. Moskva, Gos. nauchno-tekhn. izd-vo lit-ry po ugol'noi promysh., 1955. 59 p. (MLRA 8:7)
(Vorona, Grigorii)

ZVEREV, Ivan Andreyevich, strogal'shchik; MOKROUSOV, Ivan Ivanovich, rastochnik; DEMICHEVA, D.M., redaktor; KIRSANOVA, N.A., tekhnicheskiy redaktor.

[Work practice with planing and boring machines] Opyt raboty na strogal'nom i rastochnom stankakh. Moskva, Izd-vo VTsSPS Profizdat, 1955. 95 p. (MIRA 9:4)

1.Voronezhskiy machinostroitel'nyy zavod imeni Kalinina (for Zverev, Mokrousov).
(Planing machines) (Drilling and boring machinery)

ZVEREV, Ivan Dmitriyevich; TAHNYAGINA, V.V., redaktor; RAKOVITSKIY, I.G., tekhnicheskiy redaktor

[Studying reflexes in animals; a teacher's experience] Izuchenie reflektornoi deiatel'nosti zhivotnykh; iz opyta raboty uchitelia. Leningrad, Gos. uchebno-pedagog. izd-vo Ministerstva prosveshcheniia RSFSR, Leningradskoe otd-nie, 1956. 116 p. (MLRA 9:12)
(Reflexes)

ZVEREV, I.D., kandidat pedagogicheskikh nauk.

Knowledge of chemistry in a course on human anatomy and physiology. Est. v shkole no.5:60-62 S-O '56. (MLRA 9:10)

1. Leningradskiy institut pedagogiki Akademii pedagogicheskikh nauk RSFSR.

(ANATOMY, HUMAN) (PHYSIOLOGICAL CHEMISTRY)

ZVEREV, I.D.

Problems in the physiology and hygiene of work in connection with the study of human anatomy and physiology. Biol. v shkole no.2:31-36 Mr-Ap '59. (MIRA 12:4)

1. Leningradskiy institut pedagogiki APN RSFSR.
(Anatomy, Human--Study and teaching)
(Physiology--Study and teaching) (Work)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6"

L 12346-63 EPF(c)/EWP(q)/EWT(m)/BDS AFFTC/ S/081/63/000/005/028/075 54
ASD JD

AUTHOR: Kushko, L. M. and Zverev, I. D.

TITLE: Radiogenic origin of argon in natural and petroleum gases

PERIODICAL: Referativnyy zhurnal, Khimiya, no. 5, 1963, 161, abstract 5E126 (Geol. nefti i gaza, 1962, no. 9, 48 - 50)

TEXT: The isotopic composition of argon is determined in natural gases from 4 deposits and in 8 by-product gases of petroleum and gas deposits. Only in one natural gas was radiogenic argon detected (14.1%), while in all the by-product gases it was detected in quantities ranging from 1 to 48.3%. An increase in the amount of radiogenic argon with increase in depth was observed. E. Sobotobich.

[Abstractor's note: Complete translation]

Card 1/1

ZVEREV, Ivan Dmitriyevich; KAZAKOVA, Ol'ga Vasil'yevna; YAKOVLEVA, Ol'ga Sergeyevna; GAL'PERIN, S.I., doktor med. nauk, prof., red. ; PRIDANTSEVA, A.M., red.

[Human anatomy, physiology and hygiene; a textbook for 8th grade students of evening (staggered) general secondary schools] Anatomiia, fiziologiia i gigiena cheloveka; posobie dlia uchashchikhsia VIII klassa vechernei (smennoi) srednei obshcheobrazovatel'noi shkoly. Izd.3. Moskva, Prosveshchenie, 1964. 167 p. (MIRA 17:7)

ZVEREV, I.D.

Ways to improve a course in human anatomy, physiology, and hygiene. Biol. v shkole no.1:40-43 Ja-F '63. (MIRA 16:6)

1. Leningradskiy pedagogicheskiy institut imeni A.I. Gertsena.
(BIOLOGY—STUDY AND TEACHING)

"APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6"

ZVEREV I D

A-7

Category: USSR/General Division. Problems of Teaching.

Abs Jour: Referat Zh.-Biol., No 9, 10 May, 1957, 35008

Author : Zverev, I.D.
Inst : not given
Title : Elements of Chemical Knowledge in the Course of Human Anatomy and Physiology (The Question of Intersubject Relations)

Orig Pub: Yestestvozn. v shkole, 1956, No 5, 59-62

Abstract: In covering the courses of human anatomy and physiology and chemistry in the VIIIth class, the teacher must utilize the intersubject relations between these disciplines and particularly lean upon the students' knowledge of chemistry. In explaining new material on the themes "digestion, breathing, metabolism" and others, the teacher should conduct related experiments in chemistry.

Card : 1/1

ZVEREV, I.D., kand.ped.nauk

Independent work of students on the fundamentals of Darwinism. (MIRA 13:8)
Biol.v shkole no.5:44-51 S-O '59.

1. Leningradskiy institut pedagogiki APN RSFSR.
(Evolution--Study and teaching)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6"

KUSHKO, L.M.; ZVEREV, I.D.

Radiogenic origin of argon in the composition of natural and petroleum gas. Geol. nefti i gaza 9 no.9:48-50 S '62. (MIRA 16:2)

1. Kuybyshevskiy nauchno-issledovatel'skiy institut po pererabotke nefti.

(Argon—Isotopes)

ZVEREV I.D.

ZVEREV, I.D.

Aspects of the physiology and hygiene of work in industrial excursions by eighth grade students. Politekh.obuch. no.8:6-10 Ag '57. (MIRA 10:9)

1. Leningradskiy institut pedagogiki. (School excursions) (Industrial hygiene)

ZVEREV, I.D., kandidat pedagogicheskikh nauk.

First lessons in the course of human anatomy and physiology. Biol.v shkole no.4:46-52 Jl-Ag '57. (MLRA 10:8)

1.Leningradskiy instutut pedagogiki Akademii pedagogicheskikh nauk RSFSR.

(Anatomy, Human--Study and teaching)
(Physiology--Study and teaching)

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ZVEREV, I.D., kandidat pedagogicheskikh nauk (g. Leningrad).

Helping school children to work properly. Politekh. obuch. no.5:25-32 My '57. (MLRA 10:6)

(Work, Method of) (Education of children)

ZVEREV, I.D.

Conducting an excursion on the study of "farm animals." Est. v shkole no.1:63-68 Ja-F '55. (MLRA 8:3)

1. Uchitel' shkoly No.213 g.Leningrada.
(School excursions)(Stock and stockbreeding)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6

ZVEREV, Ivan Dmitriyevich; MARKOV, N.G., red.; SHCHEPTINA, T.A., tekhn.red.

[Use of anatomical and physiological knowledge by students in practical activity] Primenenie uchashchimisia anatomo-fiziologicheskikh znanii v prakticheskoi deiatel'nosti. Moskva, Gos. uchebno-pedagog.izd-vo M-va prosv.RSFSR, 1959. 89 p. (MIRA 13:7)

(SCHOOL HYGIENE)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6

ZVEREV, Ivan Dmitriyevich; MIKHAYLOVSKAYA, I.A., red.; GLADRINA, M.S., red.; KOSAREVA, Ye.A., tekhn. red.

[Development of students' knowledge about the evolution of the organic world] Razvitie znanii uchashchikhsia ob evoliutsii organicheskogo mira. Moskva, Izd-vo APN RSFSR, 1962. 166 p. (MIRA 15:7)

(Evolution—Study and teaching)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6"

BLANDOV, P.I., kand. tekhn. nauk; LEVKOYEVA, N.V., kand. tekhn. nauk; ZVEREV, I.I., kand. tekhn. nauk; KOKONIN, S.S., inzh.; SIMAKINA, I.L., red.

[Shock absorption and control of take-off and landing devices of airplanes] Amortizatsiia i upravlenie vzletno-posadochnykh ustroistv samoletov. Moskva, Mosk. aviatsionnyi in-t im. Sergo Ordzhonikidze, 1962. 307 p. (MIRA 17:4)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6"

ZVEREV, I

Dissertation: "An Investigation of the End System of Distribution of the Flow of Liquids With a Flat Stationary Valve in Piston Pumps and Motors." Cand Tech Sci, Moscow Order of Lenin Aviation Inst imeni Sergo Ordzhonikidze, 24 Jun 54. (Vechernyaya Moskva, Moscow, 15 Jun 54)

SO: SUM 318, 23 Dec 1954

ZVEREV, I.M.

Mechanized sugar mill. Nauka i zhizn' 21 no.7:6-7 Jl '54. (MLRA 7:7)

1. Upravlyayushchiy trestom "Sakhstroy".
(Sugar industry)

ZVEREV, I.M.

Order of equipment supply to sugar factories under construction. Sakh.prom. 36 no.5:50-51 My '62. (MIRA 15:5)

1. Glavkomplektoborudovaniye Ministerstva stroitel'stva RSFSR.
(Sugar industry--Equipment and supplies)

SELF-EXTINGUISHING ELASTIC FOAMED POLYURETHANE (USSR)

Sidorov, V. A., I. M. Zverev, V. P. Arefyev, and V. D. Samsonov

[illegible] S. [illegible] 024/015

Self-extinguishing elastic foamed polyurethane ПУ has been prepared by adding up to 25 parts of tricresyl or trichloroethyl phosphate to 118 parts of the polyurethane starting material. The new material can be produced with existing equipment. The physical and mechanical properties of experimental self-extinguishing ПУ were shown to meet the ТУ 35 XII-395-62 г. specifications, but addition of phosphates considerably lowers the heat resistance of ПУ. The self-extinguishing ПУ is easier to make with tricresyl than with trichloroethyl phosphate, and the product has better physical and mechanical properties. (BAO)

Card 1/1

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6"

SIDOROV, V.A.; ZVEREV, I.M.; AREF'YEV, V.P.; SAMSONOV, V.D.

Production of self-damping elastic polyurethane foams. Plast.massy no.4:69-70 '63. (MIR 16:4)
(Porous materials) (Urethanes)

ZVEREV, I.M.

Supplying more fully assembled equipment. Sakh.prom. 35 no.7:50-54 Jl '61. (MIRA 14:7)

1. "Glavkomplektoborudovaniye" Ministerstva stroitel'stva RSFSR.
(Sugar industry—Equipment and supplies)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6

USSR/Engineering - Mechanization

Card 1/1 : Pub. 77 - 4/26

Authors : Zverev, I. M.

Title : A mechanized sugar mill

Periodical : Nauka i zhizn' 21/7, 6 - 7, July 1954

Abstract : A description is given of the process of sugar making at a new mill that was to start operations in September, 1954 in the Lvov region. In this mill time-consuming manual operations are done mechanically and the mill is expected to produce 400,000 pounds of granulated sugar per day. Illustrations.

Institution : ...

Submitted : ...

ZVEREV, I.N.

AMR

Wave Motion, Dynamic

96

1944. Zverev, I. N., The propagation of a disturbance in a visco-elastic and visco-plastic bar (in Russian), *Prikl. Mat. Mekh.* 14, 3, 295-302, May-June 1950.

Longitudinal wave propagation in a viscoelastic bar stress-strain relation $\sigma = E\varepsilon + \mu\dot{\varepsilon}$) is studied using Laplace transform methods. Semi-infinite bar with given end velocity or end-strain variation is solved. Impact by rigid mass is also considered. Solution is modified for viscoplastic bar ($\sigma = \sigma_s + E'(\varepsilon - \varepsilon_s) + \mu\dot{\varepsilon}$). E. H. Lee, USA

May '51

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

ZVEREV, I.N.; LYAKHOV, G.M. (Moskva)

Experimental test of the equation for the state of water-saturated ground. Izv.AN SSSR.Otd.tekh.nauk.Mekh.i mashinostr. no.4:185-186 Jl-Ag '60. (MIRA 13:7)

(Soil--Moisture)

"APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6"

ZVEREV, V. K.

RT-1439 (The propagation of a disturbance in a visco-elastic and visco-plastic bar)

SO: Prikladnaia Matematika i Mekhanika, 15: 295-302, 1950 (Original Russian source unavialable for reveiw)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R002065710004-6"

ZVEREV, I.N.

CAND PHYSICOMATH SCI

Dissertation: "Certain Problems of Disturbance Propagation at Collision."

17 November 49

Sci Res Inst of Mechanics, Moscow Order of Lenin State V imeni M.V. Lomonosov.

SO Vecheryaya Moskva
Sum 71

ACC NR: AM6012203 Monograph UR/

Rakhmatulin, Khalil Akhmedovich; Sagomonyan, Artur YAkovlevich; Bunimovich, Abram Isaakovich; Zverev, Igor' Nikolayevich

Gas dynamics (Gazovaya dinamika) Moscow, Izd-vo "Vysshaya shkola", 1965, 722 p. illus., biblio., tables. 7500 copies printed.

TOPIC TAGS: gas dynamics, gas flow, supersonic flow, aerodynamic heating, boundary layer

PURPOSE AND COVERAGE: This textbook for university students is based on lectures in gas dynamics given by the authors at the Mechanical and Mathematical Department, Moscow State University. The book presents fundamentals of gas dynamics with special emphasis placed on modern numerical methods of solving gas dynamic problems using electronic computers.

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ACC NR AM6011203

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8. Shock waves (self-modeling problems) — 437
9. Two-dimensional subsonic motion of gas with finite perturbations — 470
10. The boundary layer and problems of aerodynamic heating — 490
11. Rarefied gas-flow — 594
12. Physical principles of the theory of radiating gas — 642

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SUB CODE: 20/ SUBM DATE: 24May65/ ORIG REF: 092/ OTH REF: 039

Card 2/2

USSR/Physics - Elasticity May/Jun 50
Rods, Shells

"Propagation of Disturbances in Viscous-Elastic and Viscous-Plastic Rods," I. N. Zverev, Moscow

"Priklad Matemat i Mekh" Vol XIV, No 3, pp 295-302

Considers propagation of disturbance waves in semi-infinite beam whose material possesses viscoelastic and viscoplastic properties. Mathematically treats and solves the usual wave equation involving stress, strain, displacement, and time. Submitted 21 Jun 49.

[redacted]

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