

SMIRNOV, L.P.

Storage of power cables. Energetik 13 no. 12:23-24 D '65  
(MIRA 19:1)

1. Glavnyy inzhener kabel'noy seti Moskovskogo rayonnogo  
upravleniya energeticheskogo khozyaystva.

SMIRNOV, L. S.

Smirnov, L. S. -- "Process of Knitting Hosiery with a Covered Point, Eliminating Looping." Cand Tech Sci, Moscow Textile Inst, 4 Feb 54.  
( Vechernyaya Moskva, 25 Jan 1954)

SO: Sum 168, 22 July 1954

SMIRNOV, L.S., kandidat tekhnicheskikh nauk.

Knitting hosiery products with closed toe end without looping.

Leg. prom. 14 no.7:17-21 J1 '54.

(MLRA 7:7)

(Hosiery)

SMIRNOV, L., kandidat tekhnicheskikh nauk; SOKOLOV, V.

Some data on the knit-goods industry in German Democratic Republic. Leg. prom. 16 no.1:54-55 Ja '56. (MIRA 9:6)  
(Germany, East--Knit goods industry)

SMIRNOV, L.S., kand.tekhn.nauk

Specialization in Ukrainian S.S.R. knit-goods enterprises. Leg.  
prom. 17 no.9:6-7 S '57. (MIRA 10:12)  
(Ukraine--Knit goods industry)

SMIRNOV, L.S., kand. tekhn. nauk.

Improve the knitting of hosiery with closed tips. Leg. prom. 18  
no.5:20-22 My '58. (MIRA 11:6)

(Hosiery)

SAIRNOV, L.S.

Tricot with two-sided raised capron nap. Tekst.prom. 19 no.4:92  
Ap '59. (MIRA 12:6)

(Knit goods)

SMIRNOV, Leonid Stepanovich; LIPKOV, I.A., kand.tekhn.nauk, retsenzent;  
DUKHOVNYI, F.N., red.; SHAPENKOVA, T.A., tekhn.red.

[Circular multiple-latch knitting machines] Kruglotrikotazhnye  
mногоzamochnye mashiny. Moskva, Izd-vo nauchno-tekhn.lit-ry  
RSFSR, 1960. 93 p. (MIRA 13:9)  
(Knitting machines)



SMIRNOV, L.S.; ASPER, B.G.

Manufacture of knit velveteen. Tekst.prom. 20 no.7:43-44  
Jl '60. (MIRA 13:7)  
(Velvet) (Knit goods industry)

SMIRNOV, Leonid Stepanovich [Smyrnov, L.S.]; KERSEK, Vladimir Nikolayevich  
[Kersek, V.M.]; LYASHCHENKO, T.V., red.; SHVARTSSHTEYN, K.A.,  
tekhn. red.

[New goods from synthetic fibers] Novi vyroby z khimichnykh  
volokon. Kyiv, Derzh. vyd-vo tekhn. lit-ry URSR, 1961. 17 p.  
(MIRA 15:3)

(Textile fibers, Synthetic)

SMIRNOV, L.S., kand. tekhn. nauk; STAROVOYTENKO, G.P., otv. red.; TUBOLEVA,  
M.V., red.

[Artificial fur] Iskusstvennyi mekh. Kiev, 1961. 39 p. (Obshchestvo  
po rasprostraneniuiu politicheskikh i nauchnykh znanii Ukrainskoi SSR.  
Ser.6, no.15) (MIRA 14:11)

(Fur, Artificial)

SMIRNOV, Leonid Stepanovich; GONTARENKO, Aleksandr Nikolayovich;  
GORDIYENKO, Mariya Georgiyevna; KRYLOV, Aleksandr Iosifovich;  
NOVAK, Nikolay Stepanovich; LYASHCHENKO, T.V., red.; STARODUB,  
T.A., tekhn. red.

[Manufacture of **artificial fur**] Proizvodstvo iskusstvennogo  
mekha. Kiev, Gos. izd-vo tekhn. lit-ry USSR, 1961. 138 p.  
(MIRA 15:4)

(Artificial fur)

SMIRNOV, L.S., kand.tekhn.nauk

Bulky yarns and their use in the manufacture of knit goods.  
Tekst.prom. 22 no.11:47-51 N '62. (MIRA 15:11)

1. Direktor Ukrainskogo nauchno-issledovatel'skogo instituta po  
pererabotke iskusstvennogo i sinteticheskogo volokna (UkrNIIPV).  
(Yarn) (Knit goods)

SMIRNOV, Leonid Stepanovich; TRUKHAN, Gennadiy Lukich; VINCH,  
Lidiya Vladimirovna; DUBININA, Ol'ga Alekseyevna; KOBLYAKOVA,  
Ye.B., kand. tekhn.nauk, dots., retsenzent; GABOVA, D.M.,  
red.; TRISHINA, L.A., tekhn. red.

[Pattern design for knit goods]Konstruirovaniye trikotazhnykh  
izdelii. Moskva, Rostekhzdat, 1962. 187 p. (MIRA 16:3)  
(Knit goods) (Dressmaking--Pattern design)

SMIRNOV, L.S., kand. tekhn. nauk

Manufacture of bulk yarns and knit goods in the U.S.A. Tekst. prom.  
24 no.4:81-85 Ap '64. (MIRA 17:6)

1. Direktor Ukrainskogo nauchno-issledovatel'skogo instituta po  
pererabotke iskusstvennykh i sinteticheskikh volokn.

PIGALEV, A.V.; SMIRNOV, L.P.; DZHALOVA, Ye.A.

Modification of the arrangement of cotton bales in front of the  
breaker unit in case of the increase of their number. Tekst.prom.  
25 no.2:42-43 F '65. (MIRA 18:4)

1. Nachal'nik pryadil'nogo proizvodstva No.1 Khersonskogo khlochatobumazhnogo kombinata (for Pigalev).
2. Nachal'nik sortirovochno-trepal'nogo tsekha pryadil'nogo proizvodstva No.1 Khersonskogo khlochatobumazhnogo kombinata (for Pigalev).
3. Starshiy inzh. laboratorii pryadil'nogo proizvodstva No.1 Khersonskogo khlochatobumazhnogo kombinata (for Dzhhalova).



SMIRNOV, L.S., kand. tekhn. nauk; SEMENIKHINA, M.V.

Characteristics of the technology of knit goods manufacture  
from bulked loop yarn. Leh. prom. no.4:7-9 O-D '65.  
(MIRA 19:1)

SMIRNOV, L.S., kand. tekhn. nauk; KALECHITS, I.S.

Characteristics of the technology for the manufacture of men's socks from bulked loop yarn. Tekst.prom. 25 no.11:48-51 N '65.  
(MIRA 18:12)

1. Direktor Ukrainskogo nauchno-issledovatel'skogo instituta po pererabotke iskusstvennykh i sinteticheskikh volokon (UkrNIIPV) (for Smirnov). 2. Zaveduyushchiy sektorom trikotazha laboratorii ob'yemnykh nitay Ukrainskogo nauchno-issledovatel'skogo instituta po pererabotke iskusstvennykh i sinteticheskikh volokon (for Kalechits).

L 44415-66 EWT(m)/EWP(j)/T RM  
ACC NR: AP6021367 (A) SOURCE CODE: UR/0342/66/000/003/0071/0072

AUTHOR: Smirnov, L. S., (Director, Candidate of Technical Sciences);  
Polokhova, S. S., (Senior Research Associate)

11  
B

ORG: Ukrainian Scientific Research Institute for the Processing of Artificial and Synthetic Fibers. [UkrNIIPV] (Nauchno-issledovatel' skiy institut po pererabotke iskusstvennykh i sinteticheskikh volokon)

TITLE: Some physicommechanical properties of bulked yarns

SOURCE: Tekstil' naya promyshlennost' , no. 3, 1966, 71-72

TOPIC TAGS: bulked yarn, chemical filament, banlon fiber, elastic fiber, meron fiber, flufion fiber, agilon fiber, spun fiber chemical fiber, crimp

ABSTRACT: The article describes tests made to determine the amount of crimp and the elasticity of various types of bulked yarns, including fluffy, elastic, and meron yarns from the USSR and banlon, flufion, agilon, and spun yarn from the USA. The amount of crimp was determined by a method developed at the Central Scientific Research Institute for Wool, (TsNIIShersti) mentioned in another work

Card 1/2

UDC: 677.494.001.4

SMIRNOV, L. S.

Effectiveness and characteristics of germanium photoelements with electron-hole transition, V. S. Vavilov and

L. S. Smirnov, *Radiotekhnika i Elektronika*, 1, 1147-54 (1958).  
 Germanium was vacuum impregnated at 500° into a Ge crystal 0.03 cm. thick with surface area 0.15 sq. cm. and a specific resistance 8 ohm-cm. The difference in potentials and thermal e.m.f. were measured by the method of competition. The value of contact potential difference ( $V_k$ ) during electron-hole transition was calcd. from the equation  $V_k = (kT/q) \ln n_e p_p / n_i^2$ ; (where  $q$  = electron charge,  $k$  = Boltzmann const.,  $T$  = abs. temp.,  $n_e$  = electron concn. in the electron region ( $3 \times 10^{14}$  cm.<sup>-3</sup>),  $p_p$  = concn. of holes in the hole region ( $10^{14}$ /cc.),  $n_i = 1.7 \times 10^{12}$  at 300°K.) and was found to be  $0.48 \pm 0.05$  v. The quantum yield within the wave lengths from 0.7  $\mu$  to 1.6  $\mu$  was const. The authors propose the construction of a transparent metallic electrode on the front surface of the semiconductor, in order to decrease the reflection from the surface and, thus, to increase the effective yields.

A. F. Kotlyar

RM MT [signature]

4/11  
-4 etc

SMIRNOV, L. S.

Phys

Investigation of a triode of semiconductors by aid of models. V. S. Vavilov and L. S. Smirnov. *Pribory i Tekh. Eksperimenta* 1956, No. 2, 99-104. — The current amplification coeff.  $\alpha$  of cryst. triodes is detd. by the rate of surface recombination  $R_s$  and the geometric shapes of the triode. In order to clarify how  $\alpha$  is a function of  $R_s$  and also of the geometry, the method of elec. analogy is applied. It is established in which way  $\alpha$  is a function of the ratio of the diams. of emitter and collector, of the depth of the emitter coating, and of the thickness of the base layer of the triode. Quantitatively evaluated is the role of the various parts of the surface of the semiconductor in the creation of the recombination current. The method allows detn. of  $R_s$ , as it will be obtained after one or the other surface treatment, if the geometry of the triode is known. Werner Jacobson

Phys. Inst. in. Sebedov, AS USSR

SMIRNOV, L.S.

SUBJECT  
AUTHOR

USSR / PHYSICS

WASILOW, W.S., SMIRNOW, L.S., GALKIN, G.H., SPIZYN, A.W.,  
PAZKEWIC, W.M.

CARD 1 / 3

PA - 1377

TITLE

The Formation of Defects on the Crystalline Lattice in Germanium  
on the Occasion of a Bombardment by Fast Electrons.

PERIODICAL

Žurn.techn.fis, 26, fasc. 9, 1865-1869 (1956)  
Issued: 10 / 1956 reviewed: 10 / 1956

The purpose of the present work was to clear up the dependence of the cross sections of formations of defects of the FRENKEL type on the electron energies  $W$  and to find out how many energetic levels, that are connected with the aforementioned structural defects of the crystal, influence conductivity. Experiments were carried out in the course of which the monocrystals of germanium with an electron conductivity were bombarded with monoenergetic electrons

( $\frac{\Delta W}{W_0} < 8\%$ ) of an energy of from 400 to 1000 keV. Electron irradiation and the

following measurements were carried out at room temperature. Thin ( $50 \mu$ ) mono-crystalline plates were used. The energy loss in them amounted to not more than 60 keV. Three different methods were employed for measuring the specific resistance  $q$  of the irradiated crystals: 1.) A homogeneous crystal with a known initial specific resistance  $q_0$  was bombarded with electrons that impinged upon a surface of the greatest area. The resistance of the sample was measured, whereupon a layer having a thickness of  $50 \mu$  was ground together with the bombarded

Zurn. techn. fis, 26, fasc. 9, 1865-1869

CARD 2 / 3

PA - 1377

surface and the resistance of the remaining part of the crystal was measured. From the distance between resistances the resistance of the part which was ground together was determined. Herefrom its specific conductivity  $q$  after bombardment was computed.

2.) A homogeneous crystal was bombarded as described under 1.) and then its bombarded surface was pasted on to a glass by means of Canada balsam where it was ground together to a thickness of  $50 \mu$ . The resistance of the thin remaining plate was then measured.

3.) The resistance of monocrystalline plates with a thickness of  $50 \mu$ , which were pasted on to glass, was measured, whereupon they were bombarded with electrons. The resistance was then newly measured.

When measuring the resistance of thin crystals of germanium it is always necessary to reckon with the possibility of the formation of surface layers with increased resistance. The experiment showed that the threshold value of the energy  $W_{\min}$ , from which onwards the conductivity of germanium crystals diminishes by irradiation, is equal to  $500 \pm 20$  keV. The results obtained by the present work are not in contradiction to the hypothesis of JAMES and LARK - HOROVITZ if it is assumed that a donor level of the defect and an acceptor are near the corresponding zones. (The hypothesis says that to an atom in the

SMIRNOV, L.S.

"Energy of Ionization by Beta-Particles in Crystals of Germanium and Silicon," V.s. Vavilov, L.S. Smirnov, V.M. Patskevich, Moscow, USSR

Paper submitted for presentation at the International Conference on Radioisotopes in Scientific Research, Paris, 9-20 Sep 1957

Acad. Sci. USSR, Moscow

Presented at Conf. by V. S. Vavilov



SMIRNOV, L.S.

"The Structural Defects in Germanium Monocrystals Irradiated by Beta-Particles and Fast Neutrons and the Influence of These Defects on Electron-Hole Recombination," V.S. Vavilov, L.S. Smirnov, A.V. Spitsyn, V.M. Patskevich, M.v. Chukichev, Moscow, USSR

Paper submitted for presentation at the International Conference on Radioisotopes in Scientific Research, Paris, 9-20 Sep 1957.

Acad. Sci. USSR, Moscow

Presented at Conf. by V. S. Vavilov

SMIRNOV, L.S.

89-1-7/24

AUTHOR

VUL, B.M., VAVILOV, V.S., SMIRNOV, L.S.,  
GALKIN, G.N., PATSKEVICH, V.M.,  
SPITSYN, A.V.

TITLE

On the transformation of the energy of  $\beta$ -particles into electric energy in germanium crystals with P-N transitions. (O preobrazovanii energii  $\beta$ -chastits v electroenergiyu v kristallakh germaniya s P-N-perekhodom. - Russian) Atomnaya Energiya 1957, Vol 2, Nr 6, pp 533-537 (USSR).

PERIODICAL

ABSTRACT

In 1955 the authors carried out experiments in the determination of the degree of efficiency of the transformation mentioned in the title. The P-N transitions were obtained by the melting of indium. Sr<sup>90</sup> - Y<sup>90</sup> preparations served as sources of  $\beta$ -particles. The total activity of the primary radioactive preparations amounted to 50, 100, and 200 millicuries. As source of  $\beta$ -particles strontium sulphate tablets with 50 and 100 millicurie and strontium carbonate tablets with 200 millicurie were used. A diagram shows the  $\beta$ -spectra of these sources. Also measurements during irradiation of a semiconductor with artificially accelerated electrons (400 to 1150 keV) were carried out. The degree of efficiency

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89-6-7/24

On the transformation of the energy of  $\beta$ -particles into electric energy in germanium crystals with P-N transitions.

the degree of efficiency of the transformer diminishes. Further details are mentioned.  
(With 8 Illustrations)

ASSOCIATION: not given.  
PRESENTED BY: -  
SUBMITTED: 18.1. 1957.  
AVAILABLE: Library of Congress.

CARD 3/3

PA - 2148

Probability of Charge Carriers by Frenkel Defekts in N-Germanium.

restitution of the original life. If the number of defects occurring in the chrystal lattice is compared with the attendant circumstance of reduction of life the capture cross-section of the carriers (holes) can be estimated (by the new-formed recombination-centers). The formula for the capture cross-section is derived on the assumption that the number of new recombination-centers is equal to the number of Frenkel-defects and that all these centers are filled with electrons. Experimental result for this domain which must be considered to be the lowest of the actual value, were approximatively  $7 \cdot 10^{-17} \text{cm}^2$ . (1 image).

ASSOCIATION: Physical Institute "P.N.Lebedev", Moscow.

PRESENTED BY:

SUBMITTED: 1.10.1956

AVAILABLE: Library of Congress.

Card 2/2

SMIRNOV, L. S.

57-11-7/33

AUTHOR: Smirnov, L. S.TITLE: Measurements of Small Lifetimes of Current Carriers in Germanium  
(Izmereniya malykh vremen zhizni nositeley zaryada v germanii).

PERIODICAL: Zhurnal Tekhn. Fiz., 1957, Vol. 27, Nr 11, pp. 2469-2471 (USSR).

ABSTRACT: For the measurements types in form of small germanium plates with a p-n-transition on a great surface were used. Non-equilibrium carriers were excited by monochromatic light in vicinity of the semiconductor surface. The lifetime of the current carriers was computed according to the short circuit current and the number of the absorbed light quanta. Applied to germanium this method facilitates the measuring of a lifetime of from  $2 \cdot 10^{-6}$  to  $10^{-8}$  sec. This method is very practical for the detection of the temperature dependence of the lifetime and for the determination of the position of recombination levels. Formulae are derived by means of which the lifetime in the semiconductor layer can be determined experimentally by determination of the quantity  $\frac{I}{N}$  is the ratio of the number of carriers which take part in the short circuit current I to the number of carriers N which develop by the light in the vicinity of the semiconductor surface within the time unit. The mentioned formulae effect

Card 1/2

G-3

USSR/Electricity - Semiconductors  
*SMIRNOV, L.S.*

Abs Jour : Ref Zhur - Fizika, No 1, 1958, 1325

Author : Vavilov, V.S., Spetsyn, A.V., Smirnov, L.S., Chukichev, M.V.

Inst : Physics Institute, Academy of Sciences, USSR, Moscow

Title : Effect of Fast Neutron Irradiation on Recombination of Electrons and Holes in Germanium Crystals.

Orig Pub : Zh. eksperim. i teor. fiziki, 1957, 32, No 4, 702-705

Abstract : On the basis on the transverse cross sections for the interaction of fast neutrons with germanium nuclei, using the Snyder and Neufeld method (Referat Zhur Fizika, 1956, No 7, 19840, No 12, 35072), the authors calculate the number of germanium atoms, shifted from their lattice points as a result of scattering of fast neutrons. It was established experimentally that the irradiation of germanium

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S. SMIRNOV, L.S.

AUTHOR: VAVILOV, V.S., SMIRNOV, L.S., PATSKEVICH, V.M. PA - 2332

TITLE: Energy of Ionization by Electrons in Germanium crystals (Energija ionisatsii elektronami v kristallakh germaniya, Russian).

PERIODICAL: Doklady Akademii Nauk SSSR, 1957, Vol 112, Nr 6, pp 1020 - 1022, (U.S.S.R.)

Received: 4 / 1957 Reviewed: 5 / 1957

ABSTRACT: The authors carried out experiments on the determination of the average ionization energy in germanium on the occasion of excitation by electrons with 5 - 15 keV. For these experiments N-Type crystals with P - N - transitions, into which indium was melted, were used. Irradiation occurred on the side opposite to the indium electrode. The electrons completely lost their energies within the domain of the N-type. The authors used the following denotations:  $N_0$  - the number of carrier pairs actually created in the unit of time,  $N_1$  - amperage of the electrons,  $N_2$  - amperage of the holes. It holds that  $\beta_1 = N_2/N_1 = I_2/I_1$ , where  $I_1$  corresponds to the primary current corresponding to the flux of the fast electrons. Up to very high intensities of the inciting bundle it further holds that  $N_2 = \alpha N_0$ . Due to recombination on the surface and in the interior of the crystal it always holds that  $\alpha < 1$ . For the multiplication factor  $\beta$  it holds that  $\beta = N_0/N_1 = \beta_1/\alpha = I_2/\alpha I_1$ . In the case of the crystals examined here did not depend on the wave length of the light. This holds good up to such wave

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Energy of Ionization by Electrons in Germanium crystals.

wave lengths in the case of which a considerable part of the light does not pass through the crystal but is absorbed in it. For the measuring of  $\alpha$  the authors used light with  $\lambda = 1,05 \mu$  which for the most is absorbed in layers with a maximum thickness of  $1,0 \mu$ .  $\alpha$  depends greatly on the conditions prevailing on the surface of the crystals and changes on the occasion of the pumping out of the device and of bombardment with electrons. For the purpose of a continuous control of  $\alpha$  in the course of measurements, the electrons were at the same time irradiated with electrons and light. The tests were carried out at pressures of  $10^{-4} - 2 \cdot 10^{-6}$  torr. No dependence of  $\epsilon$  (i.e. of the energy which must be used for the production of a carrier pair) on pressure (within the limits  $2 \cdot 10^{-6} - 10^{-4}$  torr) was noticed. The series of measurements on the crystals, which were subjected to different surface treatments, furnished the same value for  $\epsilon$ . The mean value  $\epsilon = 3,7 \pm 0,4$  eV was obtained from 4 series of measurements. In the case of V " 5 to 15 keV  $\epsilon$  does not change. This indicates slight energy losses of the primary electrons in the superficial oxide film which occurs on the occasion of the pickling of the germanium. The considerable similarity of the amounts of  $\epsilon$  on the occasion of ionization by electrons and  $\alpha$  particles may apparently be ex-

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PA - 2332

Energy of Ionozation by Electrons in Germanium Crystals.

plained by the fact that in the second case a considerable part of the charge carrier pairs occurs under the effect of relatively fast  $\sigma$ -electrons. (1 illustration)

ASSOCIATION: Not given.

PRESENTED BY: Member of the Academy D.V.SKOBEL'TSYN.

SUBMITTED: 24.10.1956

AVAILABLE: Library of Congress.

Card 3/3



AUTHORS: Vavilov, V. S., ~~Smirnov, L. S.~~, Spitsyn, A. V., 57-28-5-6/36  
Patskevich, V. M., Galkin, G. N.

TITLE: On Defects in a Crystal Lattice in n-Germanium (0 defektakh kristallicheskey reshetki v germanii N-tipa)

PERIODICAL: Zhurnal Tekhnicheskoy Fiziki, 1958, Vol. 28, Nr 5, pp. 960-961 (USSR)

ABSTRACT: In the previous paper the authors communicated the investigation results of germanium crystals of the n- type subjected to an electron bombardment with energies ranging from 0,4 to 1 MeV (Ref 1). There, the experimentally determined modifications of the specific resistance with respect to the energy and the amount of fast electrons, was opposed to the theory of defect formation because of an electron dispersion by means of germanium nuclei by Frenkel'. V. V. Galavanov to whom the authors are indebted, indicated a numerical error. This error was committed in the computation of the integral cross-sections  $\sum_{\theta_{\min}}^{\pi}$  of electron dispersion on a nucleus at all angles from  $\pi$  to the angle  $\theta_{\min}$  at which the electron transfers the minimum energy to the nucleus necessary for the formation of a defect. The newly computed theoretical values of  $\sum_{\theta_{\min}}^{\pi}$  corresponding to

Card 1/2

On Defects in a Crystal Lattice in n-Germanium

57-28-5-6/36

a threshold energy of 500 keV as well as the experimentally determined sections  $\Sigma$  of center formation, which remove the electrons from the conduction zone are given in the table. From this follows, that the experimental values, which have been obtained in the mentioned paper and which were verified by subsequent experiments, do not correspond to the conception that at energies  $W$  varying from the threshold energy ( $W = 0,5$  MeV) to  $W = 0,96$  MeV the constant defects in n-type germanium are produced according to the law  $\sum_{\theta_{\min}}^{\pi} = f(W)$

It is intended to conduct in the near future experiments with n-type crystals with strongly differing Fermi levels and to determine, whether the difference between theory and experiment is dependent upon the low degree of filling of the capture centers. There are 1 table and 1 Soviet reference.

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

SUBMITTED: January 18, 1958

Card 2/2 1. Germanium crystals--Analysis

67391

SOV/181-1-9-9/31

24.7700  
24(2), 21(8)  
AUTHORS:

Smirnov, L. S., Glazunov, P. A.

TITLE:

The Spatial Distribution of Lattice Defects in Germanium Crystals Irradiated by Fast Electrons

PERIODICAL:

Fizika tverdogo tela, 1959, Vol 1, Nr 9, pp 1376 - 1378 (USSR)

ABSTRACT:

The aim of the work under review was to investigate the spatial distribution of the lattice defects due to electron irradiation by measuring the electrical conductivity in the direction of the electron beam incidence. Figure 1 shows a scheme of the experimental setup. The measurements of conductivity were made every 10 - 50  $\mu$  with a probe by the use of a PPTV potentiometer. The defect concentration was sufficiently small so that every change in conductivity was due to a change in the carrier concentration  $\Delta n$  or  $\Delta p$ .  $\Delta n$  is proportional to the defects produced. The  $\Delta n$  distribution in the sample interior must therefore correspond to the distribution of the structural defects, if the properties of the defects do not depend on the electron energy. Surface influences can be eliminated by a corresponding choice of the sample dimensions. The dimension selected for p- and n-Ge was

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67391

The Spatial Distribution of Lattice Defects in Germanium SOV/181-1-9-9/31  
Crystals Irradiated by Fast Electrons

assistance in measurements. There are 3 figures and 2 Soviet references.

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

SUBMITTED: March 7, 1959

Card 3/3

Smirnov, L.S.

82556  
S/181/60/002/007/041/042  
B006/B060

24.6820  
24.7500

AUTHOR:

Smirnov, L. S.

TITLE:

Radiation Disturbances in Crystals

PERIODICAL:

Fizika tverdogo tela, 1960, Vol. 2, No. 7, pp. 1669-1670

TEXT: Irradiation<sup>19</sup> with fast particles affects the physical properties of crystals considerably. In the present paper the author discusses the type and formation of lattice defects of a crystal due to its bombardment with fast electrons. The simplest disturbances are brought about in this case. One may assume that atoms evaporate from their sites and occupy a place between the nodes (formation of vacancies). Experimental results are only in poor agreement with this concept. Another assumption is then thoroughly discussed, which better fits the experimental conditions. If the atom, on collision with a fast particle, acquires an energy of some 10 ev, it will, in all probability, move away from its place for no more than a few lattice constants, and almost its entire energy will be used up for heating the lattice. This heating affects, first of all, the immediate neighbors of the atom considered, and this small region can pass over into

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CIA-RDP86-00513R001651520016-4"

82556

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B006/B060

Radiation Disturbances in Crystals

the molten state. Substances that expand on melting are exposed to local pressures of the order of  $10^4$  kg/cm<sup>2</sup>. As a result of this pressure, atoms may be shifted in the excited region. Some crystals exhibit, when molten, a variation in the short-range order of their atoms, which, for example, leads in the case of silicon and germanium to a decrease in volume. The radiation defect thus consists of a disturbance of the order due both to pressure and variation in the short-range order. The author attempts to estimate the minimum energy necessary for the purpose. For germanium, the minimum is 380 kev, and if the energy required for breaking one atomic bond is assumed to be 0.6 ev, it is found, in a very rough estimation, that the smallest volume in which the order may be re-arranged is equal to the volume of 26 atoms. Similar conditions are found for silicon. If the ideas discussed here are correct the limiting energy is shifted depending on the temperature at which irradiation takes place. If one irradiation is carried out at room temperature and another at 200°C higher, the limit energy of germanium can be shifted by 20 - 30 kev. The author finally thanks V. S. Vavilov for his discussion.

C.

Card 2/3

33096  
S/638/61/001/000/019/056  
B104/B138

24.7700 (1043,1164,1385)

AUTHORS: Smirnov, L. S., Glazunov, P. Ya.

TITLE: Volume distribution of lattice defects in germanium crystals irradiated with fast electrons

SOURCE: Tashkentskaya konferentsiya po mirnomy ispol'zovaniyu atomnoy energii. Tashkent, 1959. Trudy. v. 1. Tashkent, 1961, 153 - 155

TEXT: The determination of defect concentrations in Ge crystals was based on the relation between the defect concentration and the concentration of additional acceptor centers. The variation in the conductivity of irradiated crystals was studied by taking the potential distribution (Fig. 1) with a probe at intervals of 10 - 50  $\mu$ . The defect concentration was so low that it did not affect mobility and the entire variation in conductivity was due to variation in carrier concentrations. The n- and p-type germanium samples had dimensions of 1.0 $\cdot$ 3.0 $\cdot$ 5.0 mm, and  $\rho_0 =$  10 - 15 ohm $\cdot$ cm and 40 - 50 ohm $\cdot$ cm, respectively. The samples were irradiated.

Card 1/32

30769  
S/181/61/003/011/001/056  
B102/B138

26.2421  
AUTHORS:

Plotnikov, A. F., Vavilov, V. S., and Smirnov, L. S.

TITLE:

Kinetics of photoconductivity in p-type neutron-irradiated silicon

PERIODICAL: Fizika tverdogo tela, v. 3, no. 11, 1961, 3253 - 3259

TEXT: The defect formation due to fast-neutron irradiation was investigated in single crystals of p-type silicon. The specimens used had been described by the authors in an earlier paper (FTT, 2, 8, 1961). The defect level system arising due to the fast-neutron irradiation in the forbidden band is shown in Fig. 1. The photoconductivity investigated was that connected with the electron transitions to the levels  $E_v + 0.30$  ev,  $E_v + 0.38$  ev and  $E_v + 0.45$  ev. Temperature was around  $100^\circ\text{K}$ . The electron was excited by steep-sided light pulses with rise and decay times of  $5 \mu\text{sec}$  each. Photoconduction relaxation was studied separately for each level by two independent methods.  $E_v + 0.30$  ev: (1) The build-up time  $\Delta p_{bn}$  of photoconductivity was found at  $\Delta p \sim p_0$  on an ЭНО-1 (ENO-1) oscilloscope. X  
Card 1/4

30769  
S/181/61/003/011/001/056  
B102/B138

Kinetics of photoconductivity in ...

$m_0$ , the initial electron concentration at level M, was found to be  $\approx 8 \cdot 10^{12} \text{cm}^{-3}$  and  $\sigma_p \approx 3 \cdot 10^{-14} \text{cm}^2$  was determined for the hole trapping cross section. (2) The build-up curves  $\Delta p_{bn} = f(t)$  were investigated for  $p_0 \gg \Delta p$ . It was confirmed that the building is governed by an exponential law. The parameters of the centers were found to be  $m_0 \approx 10^{13} \text{cm}^{-3}$ ,  $\sigma_p \approx 3 \cdot 10^{-14} \text{cm}^2$  (first illumination) and  $m_0 \approx 10^{13} \text{cm}^{-3}$ ,  $\sigma_p \approx 2.5 \cdot 10^{-14} \text{cm}^2$  (second illumination).  $E_v + 0.38$  ev: (1) Recording of the relaxation pulses without constant illumination for  $p_0 \approx 8 \cdot 10^8 \text{cm}^{-3}$  and  $\Delta p \approx 3 \cdot 10^8 \text{cm}^{-3}$  yielded:  $m_0 q I \sim 10^9 \text{cm}^{-3} \cdot \text{sec}^{-1}$  and  $\sigma_p \approx 5 \cdot 10^{-17} \text{cm}^2$ . (2) Recording of  $\Delta p_{bn}$  with constant illumination ( $p_0 \approx 6 \cdot 10^9 \text{cm}^{-3}$  and  $\Delta p \approx 3 \cdot 10^8 \text{cm}^{-3}$ ) yielded:  $m_0 q I \sim 10^9 \text{cm}^{-3} \cdot \text{sec}^{-1}$  and  $\sigma_p \approx 7 \cdot 10^{-17} \text{cm}^2$ . (q - capture cross section of a photon by an electron at the level M; I - intensity of exciting light.)  $E_v + 0.45$  ev:  $\Delta p_{bn}$  was studied as a function of time. It was found that for  $t < 0.2$  sec carriers localized at centers with  $E_v + 0.30$  ev X  
Card 2/4

30769

S/181/61/003/011/001/056

B102/B138

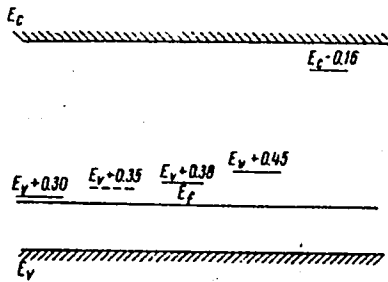
Kinetics of photoconductivity in ...

for remarks, critics and help. There are 10 figures and 5 references:  
4 Soviet and 1 non-Soviet.

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

SUBMITTED: April 29, 1961

Fig. 1



Card 4/4

4



40904

S/181/62/004/009/044/045  
B104/B186

5.4300,

AUTHORS: Smirnov, L. S., Vavilov, V. S., and Gerasimenko, N. N.

TITLE: Kinetics of silicon recombination radiation

PERIODICAL: Fizika tverdogo tela, v. 4, no. 9, 1962, 2628-2629

TEXT: The possibility of studying the kinetics of silicon recombination radiation is examined. Rectangular current pulses were fed into Si crystals with p-n junctions. The recombination radiation from the crystal was taken by a photomultiplier, amplified with a broad-band amplifier and observed with an oscilloscope. The crystals had been produced by diffusion of phosphorus and by fusing aluminum on to the surface. The injection coefficient was assumed to remain constant up to current densities of  $10 \text{ a/cm}^2$ . Results: The attenuation of recombination luminescence can be well described by an exponential law. The time constants of attenuation are approximately 2.7 microseconds for crystals with diffused junctions, 1.5 microseconds for crystals with fused junctions. When the crystal is cooled to liquid nitrogen temperature the pulse amplitude does not decrease in proportion to the change in the

Card 1/2

The theory of radiation defect ...

S/181/62/004/012/016/052  
B104/B102

$$\frac{N_A}{N_{A0}} = \frac{1}{\left( \frac{N_{A0}}{M} \frac{v_e^{-U/kT}}{c_s \cdot c_p} \right)^{t+1}} \quad (7),$$

can be written in the form  $f = 1/(At+1)$ . If A is chosen suitably, curves obtained from (7) agree fairly well with experimental data obtained by W. L. Brown and W. M. Angustyniak (J. Appl. Phys., 30, 1258, 1959) and by G. Bemsy and W. M. Angustyniak (Phys. Rev., 108, 645, 1957). There are 3 figures.

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

SUBMITTED: July 6, 1962

Card 4/4

L 12926-65

ACCESSION NR: AP4046615

plates measuring 7 x 4 x 0.3--0.5 mm and having a surface resistivity 30--40 ohm cm. The measurements were carried out in vacuum at  $\sim 5 \times 10^{-6}$  mm Hg. The current density employed in the measurements was usually  $10^{-8}$ -- $10^{-6}$  A/cm<sup>2</sup>. The surface state was monitored by measuring the stationary photoconductivity of the samples. The schematic diagram of the measuring setup was shown in Fig. 1 of the enclosure, and a typical variation of the photoconductivity during the time of bombardment is shown in Fig. 2 of the enclosure. The results indicate that the processes occurring on the germanium surface can be of two kinds: redistribution of the charge in the surface layer, and outgassing under the influence of the electron beam. The rate of outgassing depends on the electron energy and exhibits a sharp maximum near 12--16 keV. Further study of the surface processes is planned, using combined measurements of the photoconductivity and of the field effect, as well as measurement of infrared photoconductivity during the electron bombardment. "The authors thank corresponding member AN SSSR, A. V. Rzhanov for continuous

Card 2/5

L 12926-65  
ACCESSION NR: AP4046615

interest in the work and for valuable remarks." Orig. art. has:  
7 figures and 7 formulas.

ASSOCIATION: Institut fiziki tverdogo tela i poluprovodnikovoy  
elektroniki SO AN SSSR, Novosibirsk (Institute of Solid State Phy-  
sics and Semiconductor Electronics SO AN SSSR)

SUBMITTED: 20Apr64

SUB CODE: SS

NR REF SOV: 003

ENCL: 02

OTHER: 001

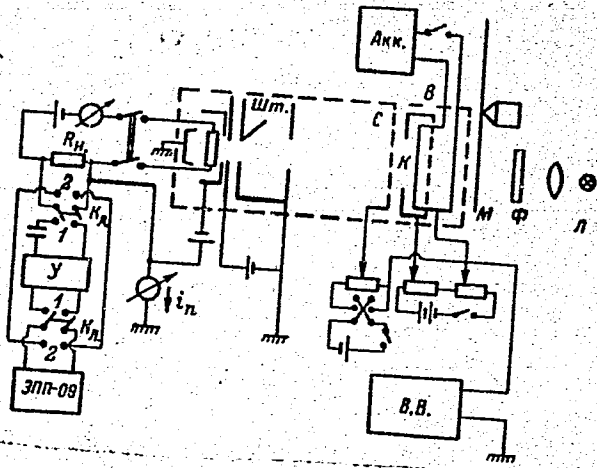
*Institute of Semiconductor Physics  
Novosibirsk Siberia Dept AS*

Card 3/5

L 12926-65

ACCESSION NR: AP4046615

ENCLOSURE: 01



- Л - lamp
- Ф - filter
- К - cathode
- М - light modulator
- В - Wehnelt cylinder
- С - control grid
- ШТ - shutter to cover beam
- В.В. - high volt. rectifier
- Y - amplifier
- ЭПН-09 - automatic potentiometer

Fig. 1. Schematic diagram of measuring set-up

Card 4/5

L 12926-65  
ACCESSION NR: AP4046615

ENCLOSURE: 02

0

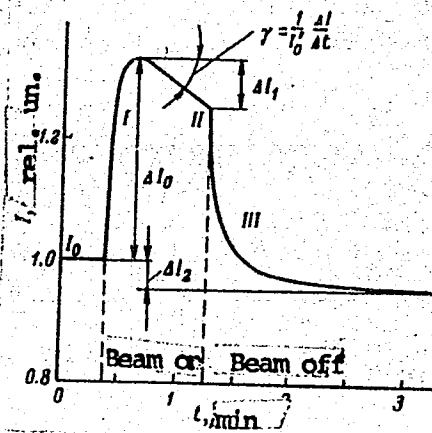


Fig. 2. Typical photoconductivity vs. irradiation time curve

Card 5/5

ACC No AT6033191

SOURCE CODE: UR/3136/83/000/393/0001/0015

44  
31

AUTHOR: Alikhanov, R. A.; Smirnov, L. S.

ORG: none

TITLE: Neutronographic investigation of the low-temperature magnetic transition in chromium

SOURCE: USSR. Gosudarstvennyy komitet po ispol'zovaniyu atomnoy energii. Institut teoreticheskoy eksperimental'noy fiziki. Doklady, no. 393, 1965. Neutronograficheskiye issledovaniya nizkotemperaturnogo magnitnogo prevrashcheniya v khrome, 1-15

TOPIC TAGS: chromium, cryostat, magnetic transition, low temperature magnetic transition, crystal spin structure, chromium crystal, neutron scattering, magnetic scattering

ABSTRACT: A neutronographic study was made of the low-temperature magnetic transition in samples of crystalline chromium and polycrystalline chromium containing equal amounts of impurities but subjected to different thermomechanical treatment. A miniature cryostat (weight 550 g, height 300 mm) was used. The

Card 1/2

L 0900-7  
ACC NR: AT603191

5

study showed that the transition temperature  $T_m$  increases with an increase in metal plasticity, and that the spin density modulation period and its temperature dependence are a universal property of chromium. The authors thank P. L. Kapitsa for his interest in this work and I. O. Panasyuka, D. D. Abanin, T. I. Kostin, and T. I. Kozlov for their assistance. Orig. art. has: 5 figures.  
[Authors' abstract]

SUB CODE: 20/ SUBM DATE: none/ ORIG REF: 009/ OTH REF: 009/

Card 2/2 <sup>5/10</sup>



I 17556-66 EPF(n)-2/EWT(1)/EWT(m)/EWP(t) IJP(g) GG/AT/JD  
ACC NR: AP6006866 SOURCE CODE: UR/0181/66/008/002/0603/0603

51  
B

AUTHOR: Vasil'yev, A. V.; Smirnov. L. S.

ORG: Institute of Semiconductor Physics, SO AN SSSR, Novosibirsk (Institut fiziki poluprovodnikov SO AN SSSR)

TITLE: Infrared quenching of the natural photoconductivity in n-type germanium irradiated with gamma rays 27,55

SOURCE: Fizika tverdogo tela, v. 8, no. 2, 1966, 603

TOPIC TAGS: gamma irradiation, photoconductivity, germanium semiconductor, germanium single crystal

ABSTRACT: An investigation was made of the photoconductivity in n-type germanium irradiated with gamma rays from a  $Co^{60}$  source at room temperature. The specimens were cut from an ingot of n-type germanium with a donor concentration of  $\sim 10^{14} \text{ cm}^{-3}$ . In a series of irradiated specimens the initial donors were almost totally compensated by acceptor centers introduced during irradiation. The following system of radiative defect levels in the forbidden zone was determined from the photoconductivity spectrum taken at the liquid nitrogen temperature:  $E_c - 0.22, -0.25, -0.27, -0.30, -0.33, -0.36, -0.43, -0.49, -0.52, \text{ and } -0.59 \text{ eV}$ . The conductivity in its natural range was quite inertial. Its rise up to a stationary value took  $\sim 12 \text{ sec}$ ; its decrease took  $\sim 10 \text{ min}$ . At constant illumination an infrared quenching throughout

27,44,55

2

Card 1/2

L 17556-66

ACC NR: AP6006866

0

virtually the entire investigated range of wavelengths (1.5—5.5  $\mu$ ) was observed in specimens compensated during irradiation. The quenching spectrum showed three clearly distinguished quenching maxima at 0.47, 0.52, and 0.60 ev. A weak quenching was also observed in the region of 0.2—0.4 ev. The results obtained apparently follow from a series of defects with different cross sections for electron and hole capture produced by irradiation. The quenching maxima at 0.47 and 0.52 ev can be attributed to the transfer of electrons initiated by infrared light from the valence zone to the  $E_C$ —0.27 and —0.22 ev levels, respectively. The maximum at 0.60 ev shows the presence of the  $E_C$ —0.14 ev level in the forbidden zone. Orig. art. has: 1 figure. [JA]

SUB CODE: 20/ SUBM DATE: 09Apr65/ OTH REF: 001/ ATD PRESS: 421/

Card 2/2 nst

L 29959-66 EWT(l)/EWT(m)/I/EWP(t)/EII LJP(c) AI/JD  
ACC NR: AP6012492 SOURCE CODE: UR/0181/66/008/004/1246/1249

AUTHORS: Geytsi, I. I.; Nesterov, A. A.; Barinova, E. Yu.; Smirnov, L. S.

ORG: Institute of Semiconductors, SO AN SSSR, Novosibirsk (Institut poluprovodnikov SO AN SSSR)

TITLE: Temperature dependence of the average ionization energy in germanium and silicon

SOURCE: Fizika tverdogo tela, v. 8, no. 4, 1966, 1246-1249

TOPIC TAGS: germanium, silicon, ionization, temperature dependence, electron bombardment, x ray irradiation, photoelectric property, physical diffusion, minority carrier, forbidden band, GERMANIUM SEMICONDUCTOR, SILICON SEMICONDUCTOR

ABSTRACT: To obtain additional data on ionization occurring in semi-conductors irradiated with electrons and x rays, the authors measured the temperature dependence of the average ionization in Ge and Si. The relative change of the ionization energy with temperature was determined by two procedures. X rays were used for uniform generation of carriers in the volume of the semiconductor and to avoid the influence of irradiation on its surface properties. The x rays range in energy from 30 to 50 kev. The x ray pulses ranged in duration from 10 to 500 μsec, with

Card 1/2

73  
B

C

L 46831-66 EWP(1)/EWT(m)/EWP(t)/ETI/T IJP(c) JD/AT

ACC NR: AP6015464

(N)

SOURCE CODE: UR/0181/66/008/005/1461/1466

AUTHOR: Gerasimenko, N. N.; Loburets, Yu. V.; Polyakov, G. F.; Smirnov, L. S. 58

ORG: Institute of Semiconductor Physics, SO AN SSSR, Novosibirsk (Institut fiziki poluprovodnikov SO AN SSSR) 53  
B

TITLE: Investigation of the recombination emission of cadmium sulfide subjected to electron excitation 27 27

SOURCE: Fizika tverdogo tela, v. 8, no. 5, 1966, 1461-1466

TOPIC TAGS: recombination emission, cadmium sulfide, electron excitation, semiconductor crystal, emission spectrum

ABSTRACT: The purpose of the present work is the investigation of the spectrum and the kinetics of recombination emission (RE) of unalloyed CdS single crystals subjected to excitation by a pulsed beam of high-energy (200-400keV) fast electrons. It is found that the green band is present on irradiated and nonirradiated specimens, moreover, after irradiation the peak of the green band shifts toward the short wavelengths and the half-width of the band decreases. No substantial variations were observed in the intensity, the half-width, or the peak position of the red band of the RE spectrum after irradiation. These results preclude considering some

Card 1/2

ACC NR: AP6037003

(A,N)

SOURCE CODE: UR/0181/66/008/011/3403/3404

AUTHOR: Khaynovskaya, V. V.; Smirnov, L. S.

ORG: Institute of Physics of Semiconductors, SO AN SSSR, Novosibirsk (Institut fiziki poluprovodnikov SO AN SSSR)

TITLE: Interaction between radiation defects and dislocations in germanium

SOURCE: Fizika tverdogo tela, v. 8, no. 11, 1966, 3403-3404

TOPIC TAGS: crystal defect, crystal dislocation phenomenon, germanium semiconductor, radiation effect, plastic deformation

ABSTRACT: To determine conditions for the recovery of the initial properties of germanium following irradiation, the authors observed the motion of dislocations during irradiation of germanium by a flux of 3.5-Mev electrons. p-type germanium with resistivity 5 ohm-cm and initial dislocation density  $10^3 \text{ cm}^{-2}$  was subjected to plastic deformation in vacuum at 700C to introduce dislocations. To protect the introduced dislocations from impurities, the samples were coated with gold prior to deformation. The dislocation position was determined by an etching method. The tests showd that irradiation caused a definite motion of the etch pits relative to the initial position (in the [111] direction), evidencing the climbing of the dislocations as they absorb vacancies or interstitial atoms. The average climbing distance was  $\sim 20 \mu$ , corresponding to absorption of  $10^{12}$  atoms per unit dislocation length. The dislocations were displaced by interaction with point defects only at

Card 1/2

GAVRICHKOV, Fedor Stepanovich; SHILIN, Boris Alekseyevich;  
LYAKHOV, G.M., kand. tekhn. nauk, retsenzent; SMIRNOV,  
L.V., otv. red.

[Miner of horizontal and inclined workings] Prokhodchik  
gorizontal'nykh i naklonnykh gornyykh vyrabotok. Moskva,  
Nedra, 1965. 235 p. (MIRA 18:7)

SMIRNOV, L.V.; SABETSKIY, N.A.; MEZHERITSKAYA, N.P., tekhnicheskiy redaktor.

[Radio vision; aeronautical panoramic radar] Radiovidenie; samoletnyi  
panoramnyi radiolokator. Moskva, Voennoe izd-vo Ministerstva oborony  
Soiuza SSR, 1954. 56 p. (MLRA 8:1)  
(Radar in aeronautics)

AID P - 4597

Subject : USSR/Aeronautics - training

Card 1/1 Pub. 135 - 9/23

Author : Smirnov, L. V., Eng.-Lt. Col.

Title : Training of navigators in the ground trainer prior to the bombing flight in overcast.

Periodical : Vest. vozd. flota, 33, 3, 45-50, Mr 1956

Abstract : Detailed description of a simple bombing ground trainer for the training of navigators in bombing under adverse weather conditions. The aiming procedure is also described. One photo, 2 sketches. The article is of no particular interest.

Institution : None

Submitted : No date



SMIRNOV, L. V.

"The Use of Bituminous Compositions and Cold Filling Compounds for Cable Couplings,"  
"Operation of Cable Networks" (Ekspluatatsiya kabeley i kabel'nykh setey), Gosenergoizdat,  
1949, 384 pp.

SMIRNOV, L.V.; GORITSKIY, A.V., redaktor; SAVIN, M.M., redaktor;  
KOROVENKOVA, Z.A., tekhnicheskii redaktor.

[Loading rock while driving vertical mine shafts] Pogruzka  
porody pri prokhodke vertikal'nykh stvolov shakht. Moskva,  
Ugletekhizdat, 1955. 48 p. (MLRA 9:4)  
(Coal mines and mining)

Искусство, Л. В.

Impregnation, Artificial

Keeping semen of polybred breeding stock Sots. zhiv. 14, No. 5, 1952.

9. Monthly List of Russian Accessions, Library of Congress, August 1957, Uncl.  
2

IVANOV, S.Z.; SMIRNOV, L.V.

Characteristics of colorimetric glass from different sources. Sakh.prom.  
27 no.8:31-33 Ag '53. (MLRA 6:8)

1. Leningradskiy tekhnologicheskii institut pishchevoy promyshlennosti.  
(Glass) (Sugar--Analysis and testing)

IVANOV, S.Z.; SMIRNOV, L.V.; KAMINSKAYA, A.B.

Standardization of the technical unit of chromaticity. Sakh.prom.  
31 no.3:23-25 Mr '57. (MLRA 10:4)

1. Leningradskiy tekhnologicheskii institut pishchevoy promyshlen-  
nosti.

(Sugar--Analysis and testing) (Color measurement)

FILIPPOVA, Ye.S.; YASOV, V.G.; MUSIYENKO, I.A.; ARTSIMOVICH, G.V.;  
EPSHTEYN, Ye.F., prof., doktor tekhn. nauk; USENKO, A.P.;  
SIRIK, V.F.; SMIRNOV, L.V., otv. red.; KOSTON'YAN, A.Ya.,  
red. izd-va; MAKSIMOVA, V.V., tekhn. red.

[Combination drilling of holes with hydraulic drills] Udarno-  
vrashchatel'noe burenie skvazhin gidroudarnikami. Moskva,  
Gosgortekhzdat, 1963. 83 p. (Boring) (MIRA 16:5)

SMIRNOV, L.V. (Leningrad)

"The Simulation of Biological Phenomena"

Report presented at the 3rd Conference on the use of Mathematics in Biology,  
Leningrad University, 23-28 Jan. 1961.

(Primeneniye matematicheskikh Metodov v Biologii. II, Leningrad, 1963 pp 5-11)

SMIRNOV, L.V.

Model study of biological phenomena. Prim. mat. metod. v  
biol. no.2:33-36 '63. (MIRA 16:11)



Smirnov, ~~...~~  
L.V.

4  
✓ Effects of Plastic Deformation of Austenitic Structural Alloy  
Steels on Temper Brittleness. V. Smirnov, E. N. Sokolov  
and V. D. Sadovskii. (Doklady Akad. Nauk SSSR, 1955, 103,  
(4), 609-610). Steel was rolled in the austenitic state and  
immediately quenched to suppress recrystallization. Even  
10-20 sec delay altered the results. Impact strength was  
determined. It is assumed that phase separation changes are  
responsible for the development of brittleness.

3  
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MS MK

Inst. Metallo-Physics, Ural Affil., Acad. Sci. USSR



SOV/137-57-10-20073

Translation from: Referativnyy zhurnal, Metallurgiya, 1957, Nr 10, p 233 (USSR)

AUTHORS. Smirnov, L.V., Sadovskiy, V.D.

TITLE: The Structural Mechanism of Transformations During the Heating of Steel (K voprosy o strukturnom mekhanizme prevrashcheniy pri nagreve stali)

PERIODICAL: Tr. In-ta fiz. metallov. Ural'skiy fil. AN SSSR, 1956, Nr 17, pp 94-110

ABSTRACT: An examination is made of the structural mechanism of the formation of austenite in the heating of steel. The possibility of nondiffusive transformation of martensite into austenite with heating, by suppression of the diffusive processes of decomposition (through raising the rate of heating, or by alloying), in a fashion similar to the supercooling of austenite to the martensite point on cooling, is qualitatively proved. Gradient heating followed by structure study is used on specimens of 37KhNZA steel to investigate austenite formation. It is shown that austenite formation may proceed either by a diffusive

Card 1/2

SOV/137-57-10-20073

The Structural Mechanism of Transformations During the Heating of Steel

reaction of ferrite and carbides or by an intermediate process with partial precipitation of the C from the martensite, in which case the residual  $\alpha$  solution of the alloying elements undergoes a "nondiffusive" ordering transformation, or by a truly nondiffusive reversible martensitic transformation. Various transformation mechanisms may come into play, depending upon the conditions of heating.

A. Z.

Card 2/2

SMIRNOV, L.V.

Abstract

18

Effect of plastic deformation in the austenite state on the character of embrittlement of structural steel alloys developed in tempering / L. V. Smirnov, E. N. Sokolov, and V. D. Sadovskii. *Trudy Inst. Fiz. Metal., Akad. Nauk S.S.S.R., Udal. Filial* 1956, No. 18, 30-56.—The effect of hot rolling on the tendency of steel to develop irreversible (1st-order) and reversible (2nd-order) brittleness was investigated by the following series of expts. with steels contg. besides C 0.37-0.38 and Cr 1.33-1.53% the following: 35 KhGCA, Mn 1.02, Si 1.30, P 0.028, S 0.020%; 37KhN3A, Mn 0.35, Si 0.4, Ni 3.3, P 0.018, S 0.010%. (1) After heating for 30 min. at 1200° the specimens were treated as follows: (a) rolled at 1200° and oil-quenched immediately, (b) oven-cooled to 900°, rolled, and immediately oil-quenched, (c) oven-cooled to 900° and oil-quenched immediately without rolling. The impact strength,  $a_k$ , of (a), (b), and (c) of the 2 alloys were 1.0 and 2.3, 5.5 and 6.5, 0.5 and 1.2 kg./sq. cm., resp. The fracture of (a) was brittle, fine-grained, intergranular, characteristic of the 2nd-order brittleness; that of (b) was amorphous without a trace of brittleness; and that of (c) was coarse-grained, intragranular. The difference between (a) and (b) suggested the possibility of instantaneous austenite recrystn. at 1200°. The difference between (b) and (c) emphasized the effect of hot deformation on brittleness. (2) Specimens held for 1 hr. at 1000° were oven-cooled to 900° and (a) immediately oil-quenched without rolling and (b) hot-rolled to 20% reduction and then oil-quenched. Pieces of both groups were then tempered for 1 hr. in a salt bath at 50° intervals in the range of 200-600°. The hardness as a function of the tempering temp.,  $t$ , were parallel curves decreasing slightly as  $t$  increased. The curve of  $a_k$  vs.  $t$  of (a) passed through a min. at 350°, a max. at 450°, and another min. at 500°. The same curves of pieces

1/3 0

SMIRNOV, LV.; SOKOLKOV, EN.; SADOVSKIĬ, V.D. 1/E 11

(b) dipped slightly at 350-400° and then rose continuously. These variations were more pronounced with 37KhN3A than with 36KhGCA. (3) The effect of the degree of rolling on  $a_2$  was detd. on pieces oven-cooled from 1180° to 900°, rolled to 10, 20, and 30% reduction, and oil-quenched immediately. The max. rise of  $a_2$  was completed at the lowest, 10%, reduction. Further rolling had no effect on  $a_2$ ; in some cases it was slightly decreased. This was an indication that the effect of hot-rolling was not due to the fibrous grain and fracture, for practically all of the elongation, and fibrousness, was completed at 10% reduction. (4)  $a_2$  as a function of the temp. of hot-rolling increased linearly with the temp., passed through a rounded max. at 900-1000°, and then decreased linearly. These expts. were made with alloy 40Kh-

18  
3N4 contg. C 0.34, Mn 0.27, Si 0.21, Cr 3.23, and Ni 4.54%. The other alloys gave similar results. (5) The effect of the time held at the rolling temp. after rolling before water quenching was detd. on pieces preheated at 1200° and rolled at 1200, 1100, 1000, 900, and 800° and held at these temps. for 1, 5, and 20 min. The function  $a_2$  vs. the time held at the rolling temp. decreased exponentially, and this effect increased with the rolling temp. Thus the effect of hot-rolling reducing brittleness was lost when sufficient time for the recrystn. of austenite was allowed. Micrograins of the fractured pieces indicated that at 1200° this recrystn. was practically instantaneous and that it stopped by immediate

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SMIRNOV, L.V.; SOKOLKOV, E.N.; SADOVSKII, V.D.

quenching. (6) The variation of  $\alpha_1$  as a function of the test-  
ing temp. was detd. in the range of +140 to -200°.  $\alpha_1$  be-  
gan to decrease into the brittleness range at 0° when hot-  
rolled and at +100° when not rolled. Conclusion: Hot-  
mech. working reduced both reversible and irreversible tem-  
per brittleness providing recrystn. of austenite was instantly  
arrested. Both types of brittleness are similar processes but  
initiated by different causes.

I. Bencowitz

3/3  
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Smirnov, L.V.

Effect of preliminary superheating of steel on the appearance of reversible temper brittleness. L. V. Smirnov and V. D. Sadovskii. *Trudy Inst. Fiz. Metal. Akad. Nauk S.S.S.R., Orel. Filial* 1956, No. 18, 57-65. — The effect of intragranular texture of superheated steels on the appearance of reversible temper brittleness (at 550°) was studied. The following tests were made with steels 37KhN3A (cf. preceding abstr.): (1) Wedges ground from pieces which had been oil-quenched from 1300° were heated with an elec. current at the rate of 300°/sec. so that the temp. at the pointed edge was at 1350°, above the  $A_{c1}$ - $A_{c2}$  crit. points. The hardness,  $H_{Rc}$ , at 12 evenly spaced sections was detd. and the macro- and micrograins of the same sections examd. The  $H_{Rc}$  of the first 1-5 sections (from the wide edge) where none of the  $\alpha \rightarrow \gamma$  transformation occurred was 38-41 R<sub>c</sub>, whereas that of the sections 6-12 was 52-40 R<sub>c</sub>. The macrostructure (x3) of sections 1-10 remained coarse, unchanged, whereas that of section 11-12 changed abruptly and completely into a fine-grained structure (temp. above  $A_{c2}$ ). The corresponding micrograins (x380) indicated a gradual change: at first annealing of martensite, then the appearance of fine grains of austenite between the original grains (above  $A_1$  at section 5), and finally the formation of an unoriented network of needle-like martensite (section 12). The processes of recrystn. could be explained only by the more recent theories (cf. Arkharov, *et al.*, *C.A.* 44, 4847c). The abrupt change from coarse to fine-grained structures corresponded to Chernov's point  $b$  (cf. *C.A.* 48, 1219g) defined as that crit. temp. below which the fracture surface did not change, i.e. the structure did not change and above which the structure changed appreciably. For steel 37KhN3A this point was at 950-1000°. (2)  $\sigma_A$  of pieces quenched from 1300° and then again quenched from 800 and 1100° was 18 and 17 kg./sq. cm. when tempered for 1 hr. at 650° and then quenched in water and 5.5 and 9.8 kg./sq. cm. when tempered at 650°, water.

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SMIRNOV, LV. SADOVSKII, VD

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quenched, and again tempered at 550° and oven-cooled. The fracture of pieces tempered below Chernov's point *b* was coarse, and that of pieces tempered above point *b* was fine-grained, the fracture passing through the boundaries of the new austenite grains. Heating above point *b* eliminated the effect of superheating. (3) The effect of testing temp. in the range of +20 to -180° was detd. on specimen superheated at 1250° and not superheated and then oil-quenched from 850 and 1050°. specimens of each group were then (a) tempered for 1 hr. at 650° and water-quenched, (b) tempered for 1 hr. at 650°, water-quenched, and then tempered for 20 hrs. at 550° and oven cooled. The values of  $a_2$  of specimen treated in (b) were much lower and decreased more sharply with the testing temp. than those treated as in (a).  $a_2$  of superheated specimens were more drastically affected. In all cases a type of texture brittleness was noted. (4) To det.

the effect of removing the texture the following expt. was made: Specimens superheated at 1250° were kept in a muffle furnace at 630° for 10 hrs. The micrograins (x380) indicated a fine-grain pearlite structure. Conclusion: superheated steels which develop temper embrittleness accompanied by martensite and intermediate austenite transformation can be restored by secondary annealing above the Chernov's point *b* followed by normal tempering above  $A_c$ . Cooling from a high temp., favoring the development of pearlite-troostite structure, may eliminate the need for secondary treatment.  
I. Bencowitz

2/2  
RS 007

SOV/124-58-11-13627

Translation from: Referativnyy zhurnal, Mekhanika, 1958, Nr 11, p 233 (USSR)

AUTHORS: Sadovskiy, V. D. , Malyshev, K. A. , Sokolov, Ye. N. , Smirnov, L. V. ,  
Bogacheva, G. N. , Biryulin, V. T. , Petrova, S. N.

TITLE: The Influence of High-temperature Plastic Deformation on the Temper  
and Aging Brittleness of Quenched Steels (Vliyaniye plasticheskoy  
deformatsii pri vysokikh temperaturakh na khrupkost' pri otpuske i  
starenii zakalennykh staley)

PERIODICAL: V sb. : Issled. po zharoprochn. splavam. Vol 2. Moscow, AN SSSR,  
1957, pp 76-91

ABSTRACT: As a result of tests it was found that the brittleness developed upon  
aging of austenite steel of the 60Kh4G8N8V type, as well as upon aging  
of industrial high-temperature steel, can be held down through the  
application of a combined thermomechanical treatment consisting of  
the quench-hardening of a plastically deformed nonrecrystallized  
austenite. The authors explain the effect of the thermomechanical  
treatment by the sharp localization of the deformation, which at  
elevated temperatures proceeds along the grain boundary, which leads  
to a reduction in the unfavorable effect of the phases that separate out

Card 1/2

The Influence of High-temperature Plastic Deformation (cont.)  
along the boundaries during the tempering and contribute to the development of  
the brittleness.

SOV/124-58-11-13627

D. M. Vasil'yev

Card 2/2

SMIRNOV, L.V.

18  
 Effect of thermomechanical working on the temper brittleness of alloyed constructional steels. B. N. Sokolov and L. V. Smirnov. *Metallurg. i Obrabotka Metal.* 1957, No. 11, 31-5. — Samples of steel 37KhN3A (0.37% C, 0.5 Mn, 0.3 Si, 1.4 Cr, and 3.2 Ni) were austenitized at 1000°, then some were quenched directly and some were cooled to 900°, rolled at 5.7 m./min. (percentage reduction not specified) and quenched within 1 sec. After tempering at temps. from 200 to 650° the hardnesses of the rolled samples were about 1 point  $R_c$  higher and their impact strengths were appreciably higher, especially in the ranges from 300 to 400° and 500 to 650°. The fractures of the rolled samples were fibrous while the others were intercryst. Samples of steel 30KhGSA (0.3 C, 1.0 Mn, 1.0 Si, 1.0 Cr, 0.4 Ni) were austenitized at 1160°, cooled to 900°, reduced 0, 10, 20, or 30% by hot-rolling, immediately quenched and then tempered 1 hr. at 550°. The impact strength rose from 2.5 kg.m./sq. cm. at 0% reduction to 7 at 20% and fell to 6.5 at 30%. Thus, elongation of the grains was not the principal explanation of the beneficial effect of thermomech. working. Samples of steel 35KhGSA (0.35 C, 1.0 Mn, 1.25 Si, 1.25 Cr, 0.4 Ni) were heated to 1200° and then cooled to temps. in the range 700 to 1200° and then cooled to temps. in the range 700 to 1200°. Some samples were quenched directly from these temps. and others were hot-rolled before quenching. The impact strengths of the rolled samples rose from 3.7 at 700° to 5 at 800 and 900°, and then dropped linearly to 2.6 at 1200°. The other samples all had a value of about 2.0. The poor effect of rolling above 900° was attributed to recrystn., and the optimum effect at 800 and 900° was due to localized deformation at grain boundaries.

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SOV/126-6-2-12/34  
AUTHORS: Sokolov, Ye. N., Smirnov, L. V. and Petrova, S. N.  
TITLE: Influence of Thermo-mechanical Treatment Under Conditions  
of Forging on the Impact Strength of Alloy Steels  
(Vliyaniye termomekhanicheskoy obrabotki v usloviyakh  
kovki na udarnuyu vyazkost' konstruktsionnykh  
legirovannykh staley)  
PERIODICAL: Fizika Metallov i Metallovedeniye, 1958, Vol 6, Nr 2,  
pp 276-280 (USSR)  
ABSTRACT: In earlier work (Refs.1-3) it was established that  
combination of hot rolling of steel in the austenitic state  
with a hardening regime such as to eliminate recrystallisation of  
austenite enables to reduce the drop in impact strength  
after tempering at temperatures at which temper  
brittleness develops. The authors considered it of  
interest to study the effect of such "thermo-mechanical"  
treatment under conditions of free forging. The experi-  
ments were effected on the commercial steels 37KhNZA and  
35KhGSA. As blanks, beams of 20 x 20 x 200 mm were used;  
the forging was effected by means of a pneumatic hammer  
with a reduction of 20%. Four differing regimes were  
used, namely: heating to 1150°C, cooling down to 950°C,  
Card 1/4

SOV/126-6-2-12/34

Influence of Thermo-mechanical Treatment under Conditions of Forging on the Impact Strength of Alloy Steels

forging, quenching; heating to 1150°C, forging, quenching; heating to 1150°C, cooling to 950°C, forging, soaking in a furnace (1150°C for 5 minutes), quenching; heating to 1150°C, quenching. The cooling to 950°C was applied as a means of impeding possible recrystallisation during forging. For the same reason the time necessary for obtaining the desired reduction was reduced to the possible minimum and amounted to 4-5 secs which was followed immediately by quenching. After quenching, standard specimens of 10 x 10 x 60 mm were produced by grinding for impact bend tests. All the specimens were tempered at a temperature at which reversible temper brittleness occurs (550°C for four hours). On the finally machined specimens a notch 2 mm wide, 2 mm deep with a curvature radius of 1 mm at the bottom of the notch was produced. The obtained impact strength and hardness values are given in a table, p 276. Micro-structure photographs and photographs of fractures are reproduced. It was found that "thermo-mechanical" treatment under conditions of forging as well as under

Card 2/4

SOV/126-6-2-12/34

Influence of Thermo-mechanical Treatment Under Conditions of  
Forging on the Impact Strength of Alloy Steels

conditions of rolling brings about a reduction of the sensitivity of the steel to develop reversible temper brittleness. In both cases this effect is associated with the localisation of the deformation along the boundaries of the austenite grains of the initial heating, distortions in the crystal lattice of the intergranular transient zones (which are conserved after hardening) and the thereby caused change in the form of the phases and compounds which are responsible for developing temper brittleness. The here described effect of thermo-mechanical treatment can also be observed in other types of hot working as, for instance, stamping and extrusion, under conditions such that recrystallisation of work-hardened austenite is prevented.

Card 3/4

SOV/126-6-2-12/34

Influence of Thermo-mechanical Treatment Under Conditions of Forging on the Impact Strength of Alloy Steels

There are 3 figures, 1 table and 4 references, 3 of which are Soviet, 1 German.

ASSOCIATION: Institut fiziki metallov Ural'skogo filiala AN SSSR  
(Institute of Metal Physics, Ural Branch of the  
Ac.Sc. USSR)

SUBMITTED: November 19, 1956.

Card 4/4    1. Steel--Mechanical properties    2. Steel--Temperature factors  
             3. Steel--Test results



SADOVSKIY, V.D.; BOGACHEVA, G.N.; SMIRNOV, L.V.; SOROKIN, I.P.; KOMPANEYTSSEV,  
N.A.

Investigating phase recrystallization in titanium. Fiz. met. i  
metalloved. 10 no.3:397-403 S '60. (MIRA 13:10)

1. Institut fiziki metallov AN SSSR.  
(Titanium--Metallography)  
(Phase rule and equilibrium)

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18 7500

26567  
also 1160 1482

S/126/61/012/002/019/019  
E073/E535

AUTHORS: Sadovskiy, V.D., Rodigin, N.M., Smirnov, L.V.,  
Filonchik, G.M. and Fakidov, I.G.

TITLE: On the influence of a magnetic field on the martensitic  
transformations in steel

PERIODICAL: Fizika metallov i metallovedeniye, 1961, Vol.12, No.2,  
pp.302-304

TEXT: The authors investigated the effect of a magnetic  
field on martensitic transformations using specimens 3 mm dia.,  
50 mm long, of steel QX2H (9Kh2N) (0.9% C, 1.83% Cr, 0.53% Ni,  
0.27% Si, 0.30% Mn, 0.01% S, 0.018% P). These specimens were  
quenched from 850 and 1000°C in oil (so that they contained  
respectively 11 and 37% residual austenite) and were then  
subjected to a single magnetization by means of super-strong  
magnetic field pulses (200-350 kOe, 3000 c.p.s.). Magnetic  
measurements by a ballistic method did not show any increase in  
the martensite. Experiments at liquid nitrogen temperature also  
did not reveal a decrease [Abstractor's Note: Printing error for  
increase] in the quantity of residual austenite as a result of  
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On the influence of a magnetic field ... S/126/61/012/002/019/019  
E073/E535

applying the magnetic field; only the usual increase in the quantity of martensite corresponding to deep cooling was observed. An increase in the number of magnetization cycles to five also had no influence on the results. Thus, it can be concluded that in the general case pulse magnetization even with very strong fields does not produce transformation of residual austenite in quenched steel. Further experiments were made with steel 50XH23 (50KhN23) (0.52% C, 1.49% Cr, 22.85% Ni, 0.3% Si, 0.19% Mn, 0.068% P). Quenching of this steel from 1200°C yields a purely austenitic structure at room temperature. Martensitic transformation begins at about -100°C and at liquid nitrogen temperature the residual austenite amounts to 40-50%. Fifty pulse magnetization cycles (40-50 kOe) during cooling showed only a very slight effect on the quantity of martensite. Further experiments were carried out on the assumption that the martensitic point is lower for fine grained austenite than for coarse grained. Therefore, another series of experiments was carried out in which steel 50KhN23 was water quenched from 1200°C and cold rolled with a reduction of 60% and then again water quenched from 850, 900, 950 and 1000°C; this

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On the influence of a magnetic field ... S/126/61/012/002/019/019  
E073/E535

material was used for producing magnetometric specimens. At room temperature all the specimens had a purely austenitic structure but their grain size differed. Cooling in liquid nitrogen revealed that specimens quenched from 850, 900 and 950°C contained 1 to 3% martensite but the coarser grain specimens, which were originally quenched from 1000°C, contained 20 to 30% martensite after cooling in liquid nitrogen. However, pulse magnetization at liquid nitrogen temperature produced intensive austenite to martensite transformation even in the fine grained specimens quenched from 850 to 900°C. The increase in the number of magnetization cycles did not have a great influence. It is concluded that pulse magnetization can intensify austenite to martensite transformation. In the investigated case, the austenite was artificially stabilized by its fine grain size and is in a supermetastable state at the liquid nitrogen temperature, being undercooled considerably below its normal martensitic point. Activation of the transformation under the effect of a magnetic field is probably due to magnetostriction effects associated with the presence of a certain quantity of the magnetic phase. The problem

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On the influence of a magnetic field ... S/126/61/012/002/019/019  
E073/E535

requires further study. There are 3 figures and 6 references:  
4 Soviet and 1 English which reads as follows: Metal treatment  
and Drop Forging, 1960, 27, No.180, 362.

ASSOCIATION: Institut fiziki metallov AN SSSR  
(Institute of Physics of Metals AS USSR)

SUBMITTED: May 22, 1961

Card 4/4

SHAPIRO, N.I.; SMIRNOV, L.V.

Efficient method of preparing a solid metal open-hearth furnace charge. Stol' 21 no.9:850-852 S '61. (MIRA 14:9)

1. Giprostal'.  
(Open-hearth furnaces--Equipment and supplies)  
(Scrap metals)

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S/181/62/004/012/010/052  
B104/B102

15 2150  
AUTHORS:

Bogoroditskiy, N. P., and Smirnov, L. V.

TITLE:

Problem of the anomalous polarization of titanium dioxide (rutile)

PERIODICAL:

Fizika tverdogo tela, v. 4, no. 12; 1962, 3418-3421

TEXT: In studies of the anomalous polarization of rutile ceramics (G.I. Skanavi and A.I. Demeshina, ZhETF, XIX, 3, 949; Ya.M. Ksendzov, ZhETF, XX, 1, 117, 1950; L.I. Reymerov, ZhETF, XXVI, 3, 1960; Ya.M. Ksendzov, Izv. AN SSSR, ser. fiz., 22, 3, 287, 1958) the ohmic conductivity was assumed to be low enough in comparison with the capacitive component for it to be neglected. Here the correctness of this assumption is checked. The electric properties ( $\epsilon$ ,  $\tan\delta$ ,  $\epsilon_{eff}$ ) of identically prepared  $TiO_2$  specimens containing  $Nb_2O_5$  impurities, with Ag-Ag and Ag-In electrodes, as well as the volt-ampere characteristic of the Ag- $TiO_2$  contacts were investigated. It became evident that the high-resistance contact layers must be considered. What are called the anomalous effects are attributed

Card 1/2

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E193/E383

The effect of ....

of test pieces was subject to the same heating/cooling cycle without, however, plastic deformation at 800 °C. Creep tests were carried out at 500 °C on test pieces of each series. The results are reproduced in Fig. 3, where the stress

( $\sigma$ , kg/mm<sup>2</sup>) is plotted against time-to-rupture ( $\tau_p$ , hrs),

the continuous and broken curves relating, respectively, to material subjected to TMO and to the pilot test pieces. The rate of steady creep amounting to  $1.1 \times 10^{-1}$  %/hr for the pilot

test pieces was  $3.5 \times 10^{-4}$  %/hr for material subjected to TMO.

Since it could be postulated that the higher creep resistance of specimens subjected to TMO was due to their higher hardness (100 BHN as compared with 60 BHN of nickel quenched from 800 °C), a supplementary series of tests was carried out on specimens given the following treatment: heating to 1 100 °C; quenching; 25% reduction by rolling at 300 °C and 12 hours annealing at 500 °C. The results are reproduced in a table. It will be

Card 2/4



ROMANOV, Ye.P.; SMIRNOV, L.V.; SADOVSKIY, V.D.; VOLKENSHTEIN, N.V.

Critical current of a disperse superconducting phase obtained during aging. Fiz. met. i metalloved. 20 no.3:455-458 S '65.  
(MIRA 18:11)

1. Institut fiziki metallov AN SSSR.

L 62542-65 EWP(z)/EWP(c)/EWP(m)/EWP(b)/T/EWA(d)/EWP(t) MJW/JD

ACCESSION NR: AP5011754

UR/0126/65/019/004/0592/0595  
669.112.227.34:538.69.

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8

AUTHOR: Fokina, Ye. A.; Smirnov, L. V.; Sadovskiy, V. D.

TITLE: Effect of a pulsed magnetic field on the temperature interval of martensitic transformation in steel

SOURCE: Fizika metallov i metallovedeniye, v. 19, no. 4, 1965, 592-595

TOPIC TAGS: martensitic transformation, steel, magnetic treatment

ABSTRACT: Several grades of steel were studied in an attempt to determine the effect which an applied pulsed magnetic field has on the position of the martensitic transformation temperature range. The chemical compositions of the steels studied are given in table 1 of the Enclosure. The magnetometric method was used to determine the martensite points and the quantity of ferromagnetic phase. The amplitude of the field was 400,000 oersteds at a frequency of 5 kc. It was found that the temperature of martensitic transformation in steels and iron-base carbon-free alloys is shifted toward the higher temperature side under the action of a pulsed magnetic field. The amount of this shift at a given supercooling value increases with

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ACCESSION NR: AP5011754

the field strength as does the degree of transformation. In some cases, a strong field causes additional dissociation of residual austenite, however this effect is small and can hardly have any practical significance. "The authors express their gratitude to I. G. Fakinov and E. A. Zavadskiy for help in carrying out the experiments where superstrong pulsed magnetic fields were used." Orig. art. has: 4 figures, 2 tables.

ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of Physics of Metals, AN SSSR)

SUBMITTED: 16Jul64

ENCL: 01

SUB CODE: MM,EM

NO REF SOV: 004

OTHER: 000

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ACCESSION NR: AP5011754

ENCLOSURE: 01

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TABLE 1

Grade of steel	Chemical Composition, %						
	C	Ni	Cr	Mn	Si	Mo	V
50Kh2N22	0.49	21.9	2.04	0.26	0.63	-	-
50KhN23	0.52	22.8	1.49	0.19	0.30	-	-
50Kh2N16	0.52	16.44	2.01	0.47	0.63	-	-
50Kh2N3	0.51	3.21	2.00	0.35	0.11	-	-
25N24M2	0.21	24.10	-	0.22	0.06	2.16	-
N30	0.06	29.72	-	0.15	-	-	-
Kh12F	1.35	-	12.3	0.19	-	-	0.92
ShKh15	1.09	-	1.37	0.30	0.26	-	-
U12	1.25	-	0.2	0.33	0.26	-	-

Card 3/3

L 56075-65 EWT(d)/EWT(m)/EWP(w)/EWA(d)/T/EWP(t)/EWP(k)/EWP(z)/EWP(b)/EWA(e)  
Pf-4/Pad IJP(c) MJW/JD/HW/JG/EM

ACCESSION NR: AP5013810

UR/0126/65/019/005/0722/0725  
669.112.227.34 : 538.69

AUTHOR: Fokina, Ye. A. ; Smirnov, L. V. ; Sadovskiy, V. D.

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54  
B

TITLE: Destabilization of austenite by a powerful pulsed magnetic field

SOURCE: Fizika metallov i metallovedeniye, v. 19, no. 5, 1965, 722-725

TOPIC TAGS: destabilized austenite, stabilized austenite, martensite transformation, pulsed magnetic field, plastic deformation, supercooled austenite, kinetic maximum

ABSTRACT: The authors investigated the effect of a pulsed magnetic field on: austenite, stabilized by plastic deformation in 50Kh2N22 steel (0.49% C, 21.9% Ni, 2.04% Cr, 0.26% Mn, 0.63% Si); austenite stabilized by isothermal exposure to temperatures above the martensite point in N14Kh10 steel (0.05% C, 13.73% Ni, 9.70% Cr, 0.33% Mn, 0.48% Si); martensite transformation in austenite supercooled to the temperature range below the kinetic maximum in N24G4 steel (0.03% C, 23.6% Ni, 3.6% Mn) (0 to -196°C). The amount of martensite in the specimens was controlled by the magnetometric method.

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ACCESSION NR: AP5013810

The pulsed magnetization of the specimens was accomplished in an installation for generating superpowerful pulsed magnetic fields, described by Fakidov and Zavadskiy (Fizika metallov i metallovedeniye, 1958, 6, 569). The field amplitude in the experiments reached 500 k-oersteds and the frequency, approximately 5000 cps. It was established that the application of the pulsed magnetic field in all cases leads to the destabilization of austenite, the degree of martensite transformation being then a function of the intensity of the field applied. The increase in the degree of plastic deformation leads to an increase in the magnitude of the threshold field. The pulsed magnetic field destabilizes austenite following the latter's thermal stabilization. In alloys with isothermal martensite transformation, supercooled to a temperature range below the kinetic maximum (to the temperature of liquid nitrogen) the pulsed magnetic field induces a martensite transformation, the degree of this transformation also being a function of the intensity of the field applied. "The authors consider it their pleasant duty to express their appreciation to I.G. Fakidov and E. A. Zavadskiy for technical assistance in conducting the experiments employing superpowerful pulsed magnetic fields, and to N. A. Borodina and E. I. Estrin for their kindness in providing alloy specimens."

Card 2/3

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ACCESSION NR: AP5013810

Orig. art. has: 4 figures, 1 table.

ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of Metal Physics,  
AN SSSR)

SUBMITTED: 28Jul64

ENCL: 00

SUB CODE: MM, EM

NO REF SOV: 007

OTHER: 000

Heat Treatment 18

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L 4186-66 EWT(m)/EPF(c)/EWA(d)/T/EWP(t)/EWP(z)/EWP(b)/EWA(c) IJP(e)

ACCESSION NR: AP5016535 MJW/JD UR/0126/65/019/006/0932/0933

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72  
B

AUTHOR: Fokina, Ye. A.; Smirnov, L. V.; Sadovskiy, V. D.; Prekul, A. F.

TITLE: On the problem of the effect of a constant magnetic field on the martensite transformation in steel

SOURCE: Fizika metallov i metallovedeniye, v. 19, no. 6, 1965, 932-933

TOPIC TAGS: martensitic transformation, constant magnetic field, strong magnetic field, liquid helium, steel

ABSTRACT: At the Institute of Physics of Metals experiments were performed on 50KhN23 steel in a slowly increasing then constant (for 6 min) magnetic field of 40 kOe in a solenoid with a superconducting winding at liquid helium temperature. Without the magnetic field, this steel does not undergo a martensite transformation on cooling to -196°C, but cooling to the liquid helium temperature causes the formation of 8-9% martensite. When the field was applied, an additional 12% martensite was formed. Similar experiments with the same steel carried out at the Physics Institute gave analogous results. In another steel, 50Kh2N22, in which no martensite is formed on cooling in liquid helium, the application of a constant magnetic

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ACCESSION NR: AP5016535

field of 43.5 kOe caused the formation of 8% martensite. It is concluded that the action of the magnetic field on the martensite transformation should not be attributed to the influence of the mechanical forces arising during pulsed magnetization, since the field used was constant, not pulsed. "The authors thank N. V. Volkenshteyn and V. R. Karasik for affording them the opportunity to carry out the experiments." <sup>44, 55</sup> <sup>44, 55</sup>

ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of Physics of Metals, AN SSSR)

SUBMITTED: 26Feb65

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Card 2/2 *md*

L 26646-66 EWT(m)/EPF(n)-2/T/EWP(t) IJP(c) JD/WW/JG

ACC NR: AP5025333

SOURCE CODE: UR/0126/65/020/003/0455/0458

AUTHOR: Romanov, Ye. P.; Smirnov, L. V.; Sadovskiy, V. D.; Volkenshteyn, N. V. 79 3

ORG: Institute of Metal Physics, AN SSSR (Institut fiziki metallov AN SSSR)

TITLE: Critical current of the superconductive dispersion phase obtained during aging 18

SOURCE: Fizika metallov i metallovedeniye, v. 20, no. 3, 1965, 455-458

TOPIC TAGS: martensitic transformation, zirconium base alloy, niobium containing alloy, superconductivity, metal aging, solid solution, plastic deformation, metal heat treatment, current density

ABSTRACT: A nonsuperconductive alloy at 4.2°K was used which could separate a superconductive dispersion phase during the process of thermal treatment or aging. The alloy used was zirconium with 4% niobium. After preparation, superconductivity was obtained even after short thermal treatment at a temperature of 500°C. Maximum critical density is obtained after heating the sample for 2½ hours. Further heating results in a decrease of critical current density. When heating the zirconium-4% niobium alloy a supersaturated niobium α-solid solution is obtained from the stable β-solid solution as a result of martensite transformation.

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UDC: 537.312.62 2

L 26646-66

ACC NR: AP5025333

Plastic deformation increases considerably the density of lattice defects, and correspondingly increases the density of separations. It can be assumed that because of the above phenomena, increase of critical current density is observed with increase of the degree of cold deformation. The appearance of superconductivity in the alloy is explained only by the separated phase which is independent of the matrix properties. It can be noted that even a slight phase separation will result in a considerable increase of current density. Orig. art. has: 5 fig.

SUB CODE: 11,20 SUBM DATE: 19Mar65/ ORIG REF: 004/ OTH REF: 008

Card 2/2 *h*

L 18730-66 EWT(1)/EWT(m)/EWA(d)/EWP(t) IJP(c) JD/GG

ACC NR: AP6005132

SOURCE CODE: UR/0126/66/021/001/0017/0020

AUTHOR: Romanov, Ye. P.; Sadovskiy, V. D.; Volkenshteyn, N. V.; Smirnov, L. V.

ORG: Institute of the Physics of Metals, AN SSSR (Institut fiziki metallov)

TITLE: Disruption of superconductivity in an alloy with a disperse superconducting phase

21.44.5

18

71  
70  
B

SOURCE: Fizika metallov i metallovedeniye, v. 21, no. 1, 1966, 17-20

TOPIC TAGS: superconductivity, zirconium alloy, magnetic field, solenoid

ABSTRACT: This is a continuation of a previous investigation (Romanov et al. FMM, 1965, 20, 3) with the difference that it presents certain findings on the disruption of superconductivity in the alloy of  $Zr^{21}$  with 4%  $Nb^{21}$  by weight following the decomposition of supersaturated solid solution in a longitudinal magnetic field generated by means of a superconducting solenoid at 4.2°K. The current was introduced at a smoothly increasing rate into the specimens by means of a semiconductor amplifier and the disruption of superconductivity was recorded by means of an automatic-recording millivoltmeter. It is found that for the alloy investigated the transition from superconducting to normal state is abrupt in the absence of the magnetic field and increasingly smooth the greater is the intensity of the magnetic field applied. Plotting of the curves of electric resistance as a function of the current introduced (Fig. 1) revealed that

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UDC: 539.292:537.312.62