GALKIN B.I. Cand Geolog-Mineralog Sci

Dissertation: "Analysis of Variability of Minerals Properties and its Application to Solution of Certain Prospecting Problems." All-Union Sci Res Inst of Mineral Raw Materials. 29 Jan 47

SO: Vechernyaya Moskva, Jan 47 (Proj #17836)

GALKIN, B. I.

Galkin, B. I. - "On the method of revealing quantitative interrelationships among the components of useful minerals", Trudy Vsesoyuz. nauch.-issled. in-ta mineral. syr'ya, Novaya seriya, Issue 1, 1949, p. 22-31.

SO: U-4631, 16 Sept. 53, (Letopis 'nykh Statey, No. 24, 1949).

GALKIN, B.I.; BIRYUKOV, V.I.; KREYTER, V.M.; KULICHIKHIN, S.N.; ORLOVA, Ye.V.; POMERANTSEV, V.V.; RUSETSKAYA, G.G.; YARMOLOVICH, N.V.; MAKEYEV, V.I., red. izd-va; BYKOVA, V.V., tekhn. red.

[Prospecting for stockwork deposits of nonferrous and rare metal ores] Razvedka shtokverkovykh mestorozhdenii tsvetnykh i redkikh metallov. [By] B.I.Galkin i dr. Moskva, Gosgeoltekhizdat, 1962. 233 p. (MIRA 16:6)

1. Moscow. Vsesoyuznyy nauchno-issledovatel'skiy institut mineral'nogo syr'ya.

(Prospecting)

GALKIN, B.I.; GRIGOR'YEV, V.M.; KALIK, A.M.; KARPOV, L.N.; LUR'YE, A.M.; MOMDZHI, G.S.; SMIRNOV, I.A.; KRYZHANOVSKIY, V.A., red.izd-va; PEN'KOVA, S.A., tekhn. red.

[Methods of testing iron ore deposits for germanium and other disseminated elements and the calculation of their resources] Metodika oprobovaniia zhelezorudnykh mestorozhdenii na germanii i drugie rasseiannye elementy i podscheta ikh zapasov. [By] B.I.Galkin i dr. Moskva, Gosgeoltekhizdat, 1963. 58 p. (MIRA 17:2)

LIFSHITS, M.I.; GALKIN, B.Ye.

The C-1 automatic photoelectric pyrometer. Biul.tekh.-ekon. inform. no.1:9-10 '59. (MIRA 12:2)
(Photoelectric measurements) (Pyrometers)

VDC [illegible], V.I.; GALKIN, L.Ya.; [illegible]

Study of complexing in nonaqueous solutions. Part 5: Extraction of trihexylamine nitrate in benzene. Radiokhimiia 3 no.4:447-454 '61. (MIRA 14:7)
(Complex compounds)
(Amines)

PREOBRAZHENSKIY, Leonid Nikolayevich; ALEKSANDR, Viktor Aronovich; GALKIN, Boris Yevgrafovich; FLIS, Il'ya Yevseyevich [deceased]; MISHCHENKO, K.P., red.

[Electrometric control method in the woodpulp and paper industry] Elektrometricheskie metody kontrolia tsellulozno-bumazhnogo proizvodstva. Moskva, Lesnaia promyshlennost', 1965. 255 p. (MIRA 18:4)

GALKIN, David Isayevich; KONONOVICH, Lev Mironovich; KOROL'KOV, Vadim Georgiyevich; KUZ'MINOV,A.I., red.; LARIONOV, G.Ye., tekhn. red.

[Stereophonic broadcasting and sound recording] Stereofonicheskoe radioveshchanie i zvukozapis'. Moskva, Gosenergoizdat, 1962. 126 p. (Massovaia radiobiblioteka, no.436) (MIRA 15:6)
(Radiobroadcasting) (Acoustical engineering)
(Magnetic recorders and recording)

18.5000

77433
SOV/130-60-1-16/22

AUTHORS: Galkin, D. P., Pratusevich, A. Ye.

TITLE: Performance of Rolling Mill on Sliding Surface Bearings

PERIODICAL: Metallurg, 1960, Nr 1, pp 38-39 (USSR)

ABSTRACT: The wear and frequent breakdowns of backing roll journals of sheet metal hot rolling mill, gave reasons for changing the bearings of backing rolls of finishing stands from four-row tapered roller bearings (TsKB-845) to 800 x 480 mm sliding-surface bearings. The diameter of tapered journal was changed from 520 to 710 mm (in the critical section). This increased its bending strength 2.5 times. The bearings work on oil lubrication (bright stock) supplied under a pressure of 2-2.5 atm. In spite of the general improvement, the quality of the sheet metal was not satisfactory due to warping and buckling. During further investigations, it was established that the cause of the defects was the increased wear of the

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roll barrel, which occurred because of heating of the barrel ends adjacent to the journals and hot bearings. The thermal wear of the rolls resulted in a concave surface of the barrel. To decrease the amount of roll changes and to improve the quality of the sheet, the following improvements were made: (1) application of a special collector for cooling the ends (200 mm length) of the backing roll barrel; (2) grinding 0.3 mm camber for upper backing roll and 0.2 mm camber for lower (work) roll. The use of sliding-surface bearing decreases the number of breakdowns and the axial load on the working rolls and improves the quality of rolled sheet.

ASSOCIATION: Magnitogorsk Metallurgical Combine (Magnitogorskiy metallurgicheskiy kombinat)

GALKIN, D.P.; PRATUSEVICH, A.Ye.

Operation of a three-zone heating furnace. Metallurg 5 no.9:24-26 S '60. (MIRA 13:8)

1. Listoprokatnyy tsekh No.1 Magnitogorskogo metallurgicheskogo kombinata.

(Furnaces, Heating)

GALKIN, D.Ye.

Potentiometric determination of sulfur in coals. Trudy TGU 145:67-68 '57. (MIRA 12:3)

1.Kafedra analiticheskoy khimii Tomskogo gosudarstvennogo universiteta imeni V.V. Kuybysheva.
(Sulfur--Analysis) (Coal--Analysis)
(Potentiometric analysis)

GALKIN, D.Ye.

Potentiometric determination of water-soluble sulfates.
Trudy TGU 145:69-72 '57. (MIRA 12:3)

1.Kafedra analiticheskoy khimii Tomskogo gosudarstvennogo universiteta imeni V.V. Kuybysheva.
(Sulfates) (Potentiometric analysis)

GALKIN, D.Ye.

Electrometric method for determining sulfate ions. Trudy TGU 145:163-172 '57. (MIRA 12:3)
(Sulfates) (Potentiometric analysis)

GALKIN, D.Ye., Cand Chem Sci -- (diss) "Electrometric method for detecting sulfate ions." Tomsk, 1958, 15 pp with sketches (Min of Higher Education USSR. Tomsk State Univ im V.V. Kuybyshev) 100 copies (KL, 27-58, 104)

SOV/137-58-10-21818

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 10, p 194 (USSR)

AUTHOR: Galkin, D. Ye.

TITLE: Electromechanical Method for the Determination of Sulfate Ions in the Electrolytes of Nickel-plating Baths (Elektromekhanicheskiy metod opredeleniya sul'fat-ionov v elektrolitakh nikelevykh gal'vanicheskikh vann)

PERIODICAL: Dokl. 7-y Nauchn. konferentsii, posvyashch. 40-letiyu Velikoy Oktyabr'sk. sots. revolyutsii. Nr 2. Tomsk, Tomskiy un-t, 1957, pp 177-178

ABSTRACT: For the determination of SO_4^{2-} contained in the electrolytes (E) of Ni plating baths the author proposes to use the noncompensating electrometric method of titration employing a Pt-Ag pair of electrodes and a ferri-ferrocyanide indicator electrode. The variation in the emf of the galvanic cell in the process of titration is registered with the aid of a galvanometer with a sensitivity of $\sim 10^{-6}$ amp. For the analysis E is transferred into a volumetric flask and diluted 25 - 30 times with water. 25 - 30 cc of the solution are taken for each titration and added thereto are 5 - 7 cc of 0.1-M solution of $K_3Fe(SCN)_6$.

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Electromechanical Method for the Determination of Sulfate Ions (cont.)

0.1 cc of 0.005-M solution of $K_4Fe(CN)_6$ and 25 - 30 cc of 96% alcohol. The Pt-Ag electrodes connected to the galvanometer through a 30,000-ohm resistance are placed into the titration vessel. The titration is carried out with a 0.1N solution of $Pb(NO_3)_2$ which is standardized by the same method with Na_2SO_4. The point of equivalence is determined by the first deviation of the hand of the galvanometer or by the titration curve. The maximum error of the method compared to the gravimetric method is $\leq$ 1%; upon the standardization on the E it is 0.5%.

V. N.

1. Sulfate ions--Determination 2. Electrolytes--Analysis 3. Titration

GALKIN, D.Ye.; ROZANOVA, L.N.; PINAYEVA, N.B.; ALEKSANDROVA, L.V.

Quick and simple electrometric method of determining the sulfate salinization of soils. Pochvovedenie no.2:97-100 F '60. (MIRA 15:7)

1. Tomskiy gosudarstvennyy universitet.
(Saline and alkali soils)
(Soils--Analysis)

GALKIN, E.Ya., kand.tekhn.nauk; IVANOV, M.N., starshiy inzh.

Rapid evolution of square roots by electronic calculating machines.
Izv. vys. ucheb.zav.; prib. no.2:44-51 '58. (MIRA 11:7)

1.Leningradskiy institut tochnoy mekhaniki i optiki.
(Electronic digital computors) (Square root)

28(1,2) SOV/146-59-2-14/23

AUTHORS: Galkin, F.Ya., Docent, and Ivanov, M.N., Engineer

TITLE: Eliminations of Correcting Additions at the Extraction of Square Root in Binary Computing System

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy - priborostroyeniye, 1959, Nr 2, pp 83-91 (USSR)

ABSTRACT: The process of arithmetical extraction of the square root in a binary computing system resembles in many ways the process of division. Both processes go from higher to lower orders. In both cases, the subtrahend value contained in the counter is subtracted from the next remainder. In both cases, the next digit of the result is noted; if the remainder is positive - the digit is "1", if negative - it is "0". In both processes, the positive remainder is shifted after each substraction by one order to the left, or the following subtrahend is shifted by one order to the right, that is, the subtrahend is decreased two times in respect to the minuend. If the remainder is negative, correcting addition is performed before

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Elimination of Correcting Additions at the Extraction of Square Root in Binary Computing System

the shift. Having done the necessary research, the author deduces how to extract the square root without recurring to correcting additions: "In the case where the remainders are positive, the next digit of the root "1" is noted,"01" is added to the determined value of the root, and the shift and subtraction are performed. If the remainders are negative, the next digit of the root "0" is noted, "11" is added to the determined root value, and the shift and addition are made". For extraction of square root without correcting additions, a layout shown in Fig 1 is applied. Recommended by the Kafedra schetno-reshayushchikh priborov (Chair of Computing-Solving Devices). There are 3 tables, 2 diagrams and 1 Soviet reference.

ASSOCIATION: Leningradskiy institut tochnoy mekhaniki i optiki (Leningrad Institute of Precision Mechanics and Optics)

SUBMITTED: March 10, 1959

Card 2/2

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SOV/146-2-4-12/19

~~28(2)~~ 16.6800

AUTHOR: Galkin, F.Ya., Candidate of Technical Sciences, Docent, Ivanov, M.N., Engineer

TITLE: Decimal Translator Circuits (Decades)

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Priborostroyeniye, 1959, Nr 4, pp 91-96 (USSR)

ABSTRACT: Decimal translators or decades are widely used as pulse counters. Such a decade circuit (Figure 1) was already described in a previous article /Reference 1 7. At the Laboratory of the Leningrad Institute of Precision Mechanics and Optics, the authors of the present article developed and tested two new improved decade circuits (Figures 2 and 3) with capacitative coupling whose design and performance are described in detail. The principal advantage of these instruments is that they can be connected up with any triggers, without additional calculations

Card 1/2

Decimal Translator Circuits (Decades)

or investigations, and are very reliable and quick-acting. This article was recommended by the Kafedra schetno-reshayushchikh priborov i ustroystv (The Chair of Computing and Counter Instruments and Devices). There are 3 diagrams and 1 Soviet reference.

ASSOCIATION: Leningradskiy institut tochnoy mekhaniki i optiki (The Leningrad Institute of Precision Mechanics and Optics)

SUBMITTED: June 26, 1959

L 2952-66 EWT(d)/EED-2/EWP(1) IJP(c) GG/BB

ACCESSION NR: AP5021441 UR/0146/65/008/004/0067/0070
518.5

AUTHOR: Galkin, F. Ya. 44

37
B

TITLE: Rounding off decimal fractions on binary digital computers

SOURCE: IVUZ. Priborostroyeniye, v. 8, no. 4, 1965, 67-70

TOPIC TAGS: digital computer, computer theory 44

ABSTRACT: An extremely simple method is proposed for rounding off decimal fractions on digital computers which operate in the binary system of notation. The conclusions are confirmed by specific examples. Some constants used for rounding off are given.

ASSOCIATION: Leningradskiy institut tochnoy mekhaniki i optiki (Leningrad Institute of Precision Mechanics and Optics) 44

SUBMITTED: 10Feb64 ENCL: 00 SUB CODE: DP

NO REF SOV: 002 OTHER: 000

Card 1/1 DP

L 18539-66 EWT(d)/T/EWP(1) IJP(c)
ACC NR: AP6002174 SOURCE CODE: UR/0146/65/008/006/0073/0076

AUTHOR: Galkin, F. Ya.

ORG: Leningrad Institute of Fine Mechanics and Optics (Leningradskiy institut tochnoy mekhaniki i optiki)

TITLE: Arithmetic potentialities of the "2 out of 5" code

SOURCE: IVUZ. Priborostroyeniye, v. 8, no. 6, 1965, 73-76

TOPIC TAGS: error detecting code, binary code

ABSTRACT: The formation is considered of "circular" coding systems which can be obtained from the "2 out of 5" code by means of successive shifts. A code mask fastened to a decimal count wheel and moving against five brushes may realize the shifts. This method yields 100 practical "2 out of 5" systems out of 101 theoretically possible. Any system can be realized either by a count wheel or by an electronic device. A register is possible which would permit counting by the shifting technique directly in the "2 out of 5" code. Hence, all 4 arithmetic operations are possible in the "2 out of 5" code, without conversions. Orig. art. has: 1 table.

SUB CODE: 12, 09 / SUBM DATE: 07Jul64 / ORIG REF: 003 / OTH REF: 002

Card 1/1 UDC: 681.177

GALKIN, G.A.; KISELEV, A.V.; LYGIN, V.I.

Infrared spectrum of benzene adsorbed on a silica surface. Zhur. fiz.khim. 36 no.8:1764-1768 Ag '62. (MIRA 15:8)

1. Institut fizicheskoy khimii AN SSSR i Moskovskiy gosudarstvennyy universitet imeni Lomonosova, khimicheskiy fakul'tet.
(Benzene--Spectra) (Silica)

GALKIN, G.A.; KISELEV, A.V.; LYGIN, V.I.

Infrared spectra and energy of interaction in the adsorption of aromatic compounds on aerosil. Kin. i kat. 5 no.5:935-938 S-O '64. (MIRA 17:12)

1. Institut fizicheskoy khimii AN SSSR i Moskovskiy gosudarstvennyy universitet imeni Lomonosova, khimicheskiy fakul'tet.

GALKIN, G.A.; KISELEV, A.V.; LYGIN, V.I.

Variations in the infrared spectrum of benzene adsorbed on aerosil as a function of coverage and dehydration of the surface. Kin.i kat. 5 no.6:1040-1048 N-D '64. (MIRA 18:3)

1. Moskovskiy gosudarstvennyy universitet imeni Lomonosova, khimicheskiy fakul'tet i Institut fizicheskoy khimii AN SSSR.

L 54777-65 EPA(s)-2/ENT(m)/EPF(c)/EPR/ENP(j)/T Pc-4/Pr-4/Ps-4/Pt-7 WW/RM

ACCESSION NR: AP5014521 UR/0069/65/027/003/0320/0325
541.183

AUTHOR: Borisova, F. K.; Galkin, G. A.; Kiselev, A. V.; Korolev, A. Ya.; Lygin, V. I.

TITLE: Infrared study of the nature of the active adhesion layer on the surface of polytetrafluoroethylene

SOURCE: Kolloidnyy zhurnal, v. 27, no. 3, 1965, 320-325

TOPIC TAGS: polytetrafluoroethylene, surface property, surface treatment, polymer, fluoropolymer, ir spectrum

ABSTRACT: The IR spectra of surface compounds based on polytetrafluoroethylene modified by different methods were studied using polymer films. Modification of the film by three different methods (in sodium naphthalene complex, in liquid ammonia solution of metallic sodium and in molten potassium acetate) produced hydrophobization of the surface and improved the adhesive properties of the polymer. Infrared spectra were studied in surface compounds based on multilayer polymer films before and after modification. Conjugated double bonds were found in the surface

Card 1/2

L 54777-65

ACCESSION NR: AP5014521

layers of films modified by all three treatments, yet each of the methods of modification leads to the formation of different new functional groups (CO, OH, CH_2, CH_3, NH_2). The carbonyl and hydroxyl surface groups are thermally less stable than CH_2 and CH_3 groups. The conjugated double bonds on modified film surfaces are not destroyed by heating in a vacuum up to 300°C. Orig. art. has: 1 table and 4 figures.

ASSOCIATION: none

SUBMITTED: 09Dec63 ENCL: 00 SUB CODE: OC

NO REF SOV: 009 OTHER: 014

Card 2/2

BORISOVA, F.K. (Moskva); GALKIN, G.A. (Moskva); KISELEV, A.V. (Moskva); KOROLEV, A.Ya. (Moskva); LYGIN, V.I.

Infrared spectroscopy in the study of the nature of the adhesive layer on the surface of polytetrafluorethylene. Koll.zhur. 27 no.3:320-325 My-Je '65. (MIRA 18:12)

1. Submitted Dec. 9, 1963.

GALKIN, F.Ya.; KAYUMOV, A.M.

Binary-to-decimal conversions in integral digital computers. Izv. vys. ucheb. zav.; prib. 7 no.4:86-89 '64
(MIRA 18:1)

1. Leningradskiy institut tochnoy mekhaniki i optiki. Rekomendovana kafedroy schetno-reshayushchikh priborov.

GALKIN, G. I., Cand Biol Sci -- (diss) "Beetles in the pinewoods of the Tuvinskaya Autonomous Oblast' and measures in the campaign against them." Krasnoyarsk, 1960. 22 pp; (Ministry of Higher and Secondary Specialist Education RSFSR, Moscow Forestry Engineering Inst); 150 copies; price not given; (KL, 51-60, 117)

GALKIN, G.I.

Biology and ecology of Rhombonyx holosericea F. in Tuva. Zool.zhur. 40 no.7:1039-1045 Jl '61. (MIRA 14:7)

1. Siberian Research Institute of Forest Management and Exploitation, Krasnoyarsk.
(Tuva Autonomous Province—Scarabaeidae) (Forest insects)

GALKIN, G.I., kand.biolog.nauk

Siberian green scarab (subfamily Rutelinae, tribe Rutelini) in pine forests of the Tuva A.S.S.R. Trudy VSNIPILesdrev no.5:76-92 '62. (MIRA 16:5)

1. Nachal'nik laboratorii zashchity lesa ot vrediteley i bolezney Vostochno-Sibirskogo nauchno-issledovatel'skogo i proyektnogo instituta lesnoy i derevoobrabatyvayushchey promyshlennosti.
(Tuva A.S.S.R.--Scarabaeidae--Extermination)
(Tuva A.S.S.R.--Forest--Insects)

GALKIN, G.I., kand.biolog.nauk

Ecologically favorable sections for the development of the tent caterpillar Dendrolimus sibiricus in forests of Krasnoyarsk Territory. Trudy VSNIPIlesdrev no.5:93-97 '62. (MIRA 16:5)

1. Nachal'nik laboratorii zashchity lesa ot vrediteley i bolezney Vostochno-Sibirskogo nauchno-issledovatel'skogo i proyektnogo instituta lesnoy i derevoobrabatyvayushchey promyshlennosti.
(Krasnoyarsk Territory--Tent caterpillars--Extermination)

GALKIN, G.I.

Ecology of tent caterpillars in the reservations of Krasnoyarsk Territory. Vop. ekol. 7:35-37 '62. (MIRA 16:5)

1. Sibirskiy nauchno-issledovatel'skiy institut lesnogo khozyaystva i ekspluatatsii, Krasnoyarsk.
(Krasnoyarsk Territory--Tent caterpillars)

GALKIN, G.I., kand. biolog. nauk

The tent caterpillar Dendrolimus sibiricus in the forests of Krasnoyarsk Territory. Trudy VSNIPILesdrev no.7:74-107 '63. (MIRA 17:2)

GALKIN, G.I., kand. biolog. nauk; GREBENSHCHIKOVA, V.P., nauchnyy sotrudnik

Primary pests of pine stands in Krasnoyarsk Territory. Trudy VSNIPIlesdrov no.11:57-67 '64. (MIRA 18:11)

PA 236T89

USSR/Physics - Semiconductivity Oct 52

"Electric Properties of Sb_2S_3 and Bi_2S_3," G. Galkin, G. Dolgikh and V. Yurkov

"Zhur Tekh Fiz" Vol 22, No 10, pp 1533-1539

Thermal relations of electric conductivity of samples Sb_2S_3 and Bi_2S_3 were studied. Magnitude and sign of temp coeff of electric conductivity of sulfides and thermo-emf of a metal and semiconductor paired essentially depend on thermal treatment of samples and on range of temp. Results of tests are interpreted within frames of zone theory of semiconductors.

Indebted to Z. I. Kir'yashkina and L. I. Barnova.

Received 4 Jun 52.

236T89

236T89

GALKIN, G.N.

GALKIN, G.N.

USSR/Electricity - Semiconductors

G-3

Abs Jour : Referat Zhur - Fizika, No 5, 1957, 12183

Author : Vavilov, V.S., Smirnov, L.S., Galkin, G.N., Spitsyn, A.V., Patskevich, V.M.

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

Title : Formation of Defects of Crystalline Lattice in Germanium Upon Bombardment by Fast Electrons.

Orig Pub : Zh. tekhn. fiziki, 1956, 26, No 9, 1865-1869

Abstract : Thin (50 microns) platelets of single-crystal n-germanium with bombardment of monoenergetic electrons with energies from 400 to 1000 kev. The concentration of the lattice defects arising thereby was calculated from the variation in the specific resistivity ρ of the specimens before and after the irradiation. The threshold value of the energy W_{min}, starting with which ρ increases upon

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GALKIN, G.N.

AUTHOR VUL, B.M., VAVILOV, V.S., SMIRNOV, L.S., 89-7-7/24
GALKIN, G.N., PATSKEVICH, V.M.,
SPITSYN, A.V.

TITLE On the transformation of the energy of β-particles into electric energy in germanium crystals with P-N transitions. (O preobrazovanii energii β-chastits v electroenergiyu v kristallakh germaniya s P-N-perekhodami. - Russian)

PERIODICAL Atomnaya Energiya 1957, Vol 2, Nr 6, pp 533-537 (USSR).

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^{90} - Y^{90} preparations served as sources of β-particles. The total activity of the primary radioactive preparations amounted to 50, 100, and 200 millicuries. As source of β-particles strontium sulphate tablets with 50 and 100 millicurie and strontium carbonate tablets with 200 millicurie were used. A diagram shows the β-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

CARD 1/3

On t he transformation of the energy of β-particles into electric energy in germanium crystals with P-N transitions.

of the transformation of radiation energy depends on the following quantities: energy ξ which must on the average be used for the production of a surplus pair of charge carriers; share of the α-carriers reaching the P-N transition; a reactor which takes the reflection and absorption of β-particles and the geometric conditions of the transformer into account. ξ was determined by a special experiment ($3,7 \pm 0,4$) eV was found. The amount of α (the significance of α is not given) attained 0,65 in the transformers used. A diagram shows the ionization curves for electrons with from 420 to 920 keV. The degree of efficiency of the transformation was determined from the load characteristics: at the source with 200 millicurie it attained the value of 0,06 % with an electromotoric force of 13 millivolts and a short-circuit amperage of 41 microampères. The experimentally ascertained ceasing of the growth of the degree of efficiency of the transformation in the case of strong electron currents ($\sim 0,1$ watts/cm^2) is apparently connected with increased recombination. Defects in the crystal influence the motion of the electrons. With increasing duration of irradiation

89-6-7/24

On the transformation of the energy of β-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

Galkin, G.N.

120-4-14/35

AUTHORS: Galkin, G.N. and Vavilov, V.S.

TITLE: Measurement of the Lifetime of Charge Carriers and their Drift Mobility in Silicon. (Izmereniye vremeni zhizni nositeley zaryada i ikh dreyfovoy podvizhnosti v kremnii)

PERIODICAL: Pribory i Tekhnika Eksperimenta, 1957, No.4, pp. 52 - 56 (USSR)

ABSTRACT: Apparatus is described by which the lifetime and mobility of electrons and holes in mono-crystallic silicon can be measured. The pulse method is used and traps are filled by illumination of the crystal. The apparatus can be used for measurement of lifetimes from 1 μsec.
The method is based on the drift under the action of an applied electric field, of minority carriers introduced into the semi-conductor by a point contact (emitter) to which is applied s short pulse (0.3 μsec). After a time lag, a rectangular pulsed electric field is applied to the specimen. The introduced non-base carriers move along the specimen and on passing the collector, create an opposition pulse (collector response) which is displayed on an oscillograph. The block diagram is given in Fig.1 and the oscillograph display in Fig. 2. By changing the time lag, a different height of the collector response H can be obtained,

Card1/4

Measurement of the Lifetime of Charge Carriers and their Drift Mobility in Silicon.

depending on the maximum concentration of the non-base carriers at the instant they pass near the collector. For a short emitter pulse and with small deviation from equilibrium concentration, H is given by:

$$H \sim (1/\sqrt{t}) \exp(-t/\tau).$$

The first factor corresponds to diffusion and the second to recombination. Here, τ is the lifetime of the minority carriers. Log $(H\sqrt{t})$ is plotted against t giving a straight line with a slope equal to $-1/\tau$. The presence of traps can be detected by the shape of the collector response (Fig.3). The specimen is illuminated until asymmetry of the collector response is eliminated.
The injection level can also be judged by the shape of the collector response, since a large quantity of minority carriers changes the conductivity of the material and causes asymmetrical distortion of the pulse (Fig.4). Thus the method indicates when the traps are filled and when the concentration of the minority carriers is sufficiently low.
Card2/4 To avoid non-linearity of the collector, contact with small

Measurement of the Lifetime of Charge Carriers and their Drift Mobility in Silicon.

concentrations of the non-base carriers near the collector, the intensity is increased by illumination of the surface near the collector by white light (Granville and Gibson method, Refs. 7 and 13).
The mobility u_d was determined by the formula:

$$u_d = L/t \cdot E$$

where L is the distance between the emitter and the collector, t is the time between the application of the pulse and the reception of the response, E is the applied field.
The time t is found by extrapolation of the graph of H against t to H= 0 (Fig.7). L is measured by a measuring microscope, and E is found by backing off an oscillograph displaying the voltage.
The table shows that for measurements $\tau > 3$ μsec., the error does not exceed 10%, and down to 0.2 μsec. 100%. The errors of u_d do not exceed 10% and compare well with values given in the literature. There are 9 figures and 13 references, 5 of which are Slavic.

120-4-14/35

Measurement of the Lifetime of Charge Carriers and their Drift Mobility in Silicon.

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

SUBMITTED: March 2, 1957.

AVAILABLE: Library of Congress

Card 4/4

GALKIN, G.N.

53-1a-8/18

AUTHOR VAVILOV, V.S., MALOVETSKAYA, V.M., GALKIN, G.N., LANDSMAN, A.P.

TITLE Silicon Solar Batteries as Sources of the Electric Feeding of Artificial Earth Satellites
(Kremniyevyye solnechnyye batarei kak istochniki elektricheskogo pitaniya iskusstvennykh sputnikov zemli. Russian)

PERIODICAL Uspekhi Fiz. Nauk, 1957, Vol 63, Nr 1a, pp 123 - 129 (U.S.S.R.)

ABSTRACT For artificial earth satellites it is of advantage to use solar batteries in connection with buffer accumulators because they are effective during the whole time of flight of the satellite (outside of the earth's shadow).

The principle of the effect of a semiconductor transformer with P-N-transitions. In the course of this process the energy of solar radiation is transformed into electric energy as follows: A photon is absorbed and an "electron-hole" pair is produced. In the case of lacking P-N-transition, however, the concentration of the electrons and holes in the semiconductor would increase in the vicinity of the absorption domain of light. The authors here investigated the diagram of the energy states of the electrons and holes in the semiconductor in the vicinity of the artificial produced P-N-transition. This diagram then supplies information concerning the mode of operation of the photoelement. Within the domain of the P-N-transition there exists a potential barrier,

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the height V_k of which can be nearly as great as the width E_g of the forbidden zone (in the case of silicon 1,1 eV). The electrons and holes produced on the occasion of the absorption of light diffuse to P-N--transition. The potential barrier of the P-N-transition then probably "separates" the electrons and holes so that the electrons advance freely to the domain of the electronic (N)-conduction of the crystal to which they then give a negative charge. On the occasion of transition into the domain of the hole-conditioned conduction line the holes charge the crystal positively. As a result of the change of the concentrations of the charge carrier the height of the potential barrier decreases. A diagram shows the dependence of the effective coefficient of a perfect semiconductor transformer with P-N-transition upon the width of the forbidden zone. The effective coefficient at first increases considerably, attains its maximum value at a width of 1,3 eV, and then gradually decreases again. In none of the known cases was the ideal effective useful coefficient of about 22 % attained. The authors developed a method for obtaining P-N-transitions in monocrystals of P-silicon by the thermal diffusion of phosphorus from the gaseous phase. Various details

Silicon Solar Batteries as Sources of the Electric Feeding of Artificial Earth Satellites

of this method are discussed. The construction of an experimental silicon photoelement is shown in an illustration.

The Volt-ampère characteristics and the charge characteristics.

The volt-ampère characteristic of a photoelement with a surface of 0,95 cm^2 irradiated by sunlight is shown in a diagram. For the darkness volt-ampère characteristic in the domain of the direct current a formula is written down. The optimum load resistance R_a can be determined from the load characteristic as well as by computation. The authors here point to the following means of further increasing the effective coefficient of transformation:

1.) Increase of the effective useful coefficient α to one,
2.) Decrease of the resistance $R_{ser} \ll R_a$ which is connected in series (?).
3.) Transillumination (making transparent ?) of the surface at R = 0.
4.) Improvement of the shape of the load characteristic by the application of material of a lower resistance (without changing α).

The evaluation of the fourth possibility requires further experimental investigations. The simultaneous increase from α up to a value near 1 as well as the reduction of the reflection and of R_{ser} to a minimum make it

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Silicon Solar Batteries as Sources of the Electric Feeding of Artificial Earth Satellites

possible to attain an effective useful coefficient of ~15 %

The behavior of temperature in solar batteries. According to theory the electromotoric force developed by a silicon-photoelement must increase on the occasion of the reduction of temperature, a preliminary investigation resulted in $dV/dT = -0,00252$ V/°C. A diagram attached shows the dependence of V on temperature within the domain of from - 70 up to + 90°. If the solar battery is to yield the highest possible efficiency during the flight of the earth satellite, a sufficiently low equilibrium temperature of the solar battery is necessary. Possibilities for the decrease of equilibrium temperature are given. The experimental results for silicon solar batteries obtained at conditions prevailing on the earth confirm their applicability to earth satellits. (With 6 illustrations).

ASSOCIATION Not given
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GALKIN, G.N., KANTOR, V.I., MALOVICHKO, E.M., and LEIBOVICH, A.F.

"Silicon Solar Batteries as Electric Power Sources for Artificial Earth Satellites," Uspekhi Fizicheskikh Nauk, Vol. 63, No. 1-2, p. 181, September 1957.

SO: JPRS Report No. 187

AUTHORS: Vavilov, V.S., Galkin, G.N., Malovetskaya, V.M. SOV/89-4-6-9/30

TITLE: Investigation of Silicon Photoelements as Converters of Solar Radiation (Issledovaniye kremniyevykh fotoelementov kak preobrazovateley solnechnogo izlucheniya)

PERIODICAL: Atomnaya energiya, 1958, Vol 4, Nr 6, pp. 571-575 (USSR)

ABSTRACT: The P-N-transitions are investigated which are produced in silicon of the P-type by the thermal diffusion of phosphorus from the gaseous phase.
It was found that P-silicon with P-N-transitions can be used as converter of solar radiation. These photoelements have the following properties:
1.) The current in the outer circle is produced by the forming of electrons and holes by the light in the N-type and in the P-type along the P-N-transitions
2.) The diffusion length of the electrons in the P-range diminishes after P-N transitions have been obtained to from 20 to 35 μ.
3.) The surface layer produced by phosphorthermodiffusion reduces the reflection coefficient within the most important

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range of operation from 36 to 30% to 12 to 15%. The collective coefficient, on the other hand, is not reduced very much. The result is that the short-circuit current is comparatively high.

4.) Silicon photoelements operate with an insolation of up to 0.5 W/cm^2.

There are 7 figures and 7 references, 3 of which are Soviet.

SUBMITTED: December 14, 1957

1. Silicon--Electrical properties 2. Silicon--Applications
3. Photoemission--Test results 4. Sun--Radiation

GALKIN, G. N.

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 (O defektakh kristallicheskoy 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 π to the angle θ_{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

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a threshold energy of 500 keV as well as the experimentally determined sections Σ 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

GALKIN, G.N.

24(4) PHASE I BOOK EXPLOITATION SOV/3140

Akademiya nauk Ukrainskoy SSR. Institut fiziki

Fotoelektricheskiye i opticheskiye yavleniya v poluprovodnikakh; trudy pervogo Vsesoyuznogo soveshchaniya po fotoelektricheskim i opticheskim yavleniyam v poluprovodnikakh, g. Kiyev, 20-26 noyabrya 1957 g. (Photoelectric and Optical Phenomena in Semiconductors; Transactions of the First Conference on Photoelectric and Optical Phenomena in Semiconductors...) Kiyev, 1959. 403 p. 4,000 copies printed.

Additional Sponsoring Agency: Akademiya nauk SSSR. Prezidium. Komissiya po poluprovodnikam.

Ed. of Publishing House: I. V. Klaina; Tech. Ed.: A. A. Matveyshuk; Resp. Ed.: V. Ye. Lashkarev, Academician, Ukrainian SSR Academy of Sciences.

PURPOSE: This book is intended for scientists in the field of semiconductor physics, solid state spectroscopy, and semiconductor devices. The collection will be useful to advanced students in universities and institutes of higher technical training specializing in the physics and technical application of semiconductors.

COVERAGE: The collection contains reports and information bulletins (the latter are indicated by asterisks) read at the First All-Union Conference on Optical and Photoelectric Phenomena in Semiconductors. A wide scope of problems in semiconductor physics and technology are considered: photoconductivity, photoelectromotive forces, optical properties, photoelectric cells and photoresistors, the actions of hard and corpuscular radiations, the properties of thin films and complex semiconductor systems, etc. The materials were prepared for publication by E. I. Rashba, O. V. Snitko, K. D. Tolpygo, A. P. Lubchenko, and M. K. Sheynkman. References and discussion follow each article.

Table of Contents:

THE ACTION OF HARD AND CORPUSCULAR RADIATIONS ON SEMICONDUCTORS

Card 14/16

S/058/62/000/004/058/160
A058/A101

AUTHORS: Vavilov, V. S., Galkin, G. N., Malovetskaya, V. M.

TITLE: Investigation of silicon phototubes as solar energy transducers

PERIODICAL: Referativnyy zhurnal, Fizika, no. 4, 1962, 22, abstract 4G185 (V sb. "Fotoelektr. i optich. yavleniya v poluprovodnikakh". Kiev, AN USSR, 1959, 345 - 359)

TEXT: Cf. RZhFiz, 1959, no. 3, 6246.

[Abstracter's note: Complete translation]

Card 1/1

VAVILOV, V.S.; VUL, B.M.; GALKIN, G.N.; FRIDMAN, S.A.

Performance of "atomic" sources of current with double transformation of energy. Fiz.tver.tela 1 no.5:826-827 My '59.
(MIRA 12:4)

1. Fizicheskiy institut im. P.N. Lebedeva.
(Semiconductors)

9.4160 24.2600

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67303

AUTHORS: Malovetskaya, V. M., Vavilov, V. S., Galkin, G. N. SOV/181-1-8-8/32

TITLE: On the Reflection Coefficients of a Clarified Surface of Silicon Photocells

PERIODICAL: Fizika tverdogo tela, 1959, Vol 1, Nr 8, pp 1201-1204 (USSR)

ABSTRACT: The efficiency of solar energy transformation may be considerably increased if the surface reflection of a photocell is reduced by clarifying and if in this case surface the recombination rate is not raised. For this clarifying a film of the required optical properties is applied to the surface. Reflection is reduced by interference of the light reflected from the film and from the material under the film. The conditions for a removal of light reflection at the dielectric are given. For this clarifying of optical materials mainly oxides like TiO_2, ZrO_2, ThO_2, SiO_2, SnO_2, etc are used. The refractive indices of these compounds are listed in a table. Various reasons explained in the paper justify the application of SiO_2 films in clarifying although these films because of their high refractive index must have somewhat worse clarifying

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On the Reflection Coefficients of a Clarified Surface of Silicon Photocells

67303

SOV/181-1-8-8/32

properties than the other substances mentioned above. The SiO_2 film is usually applied from the ethyl ether of octosilicic acid. Because of the lacks of this method, however, the authors prepared the SiO_2 film from oxidation of a pure silicon surface. The reflection coefficient was measured in the range 0.45-2.2 μ by means of a reflecting monochromatic illuminator with glass prism. In the range of wavelengths from 1.00 to 2.00 μ reflection coefficients were determined by direct measurement of the regular reflection for small angles of incidence. In both cases measurement was carried out with modulated light. The reflection coefficient curves taken in the spectral ranges 0.45-1.00 μ and 1.00-2.20 μ fit well to one another. The maximum error was 3% of the quantity measured. In the range 0.45-2.2 μ reflection on silicon with film is considerably less than on pure silicon. The minimum value of the reflection coefficient is 7% instead of 30 to 32%. By varying the film thickness by proper choice of the working method, the minimum may be shifted into the desired spectral range. Two figures show the

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On the Reflection Coefficients of a Clarified Surface of Silicon Photocells

families of reflection curves on silicon with a film produced by oxidation in air and with another one produced by oxidation in an oxygen atmosphere. No difference between these spectral curves could be found. SiO which forms by reduction of SiO_2 is unstable under the conditions investigated. Since the SiO_2 film is transparent for the spectral range under investigation, reduction of silicon-photocell surface reflection increases carrier pair production which in turn raises the photo-electric current. The second table contains the values of the short-circuit current of the photocells with and without film. In order to attain a successful operation of silicon solar-energy transformers it is necessary for the clarifying film to remain constant over a long period. The properties of this film practically do not vary for six months. There are 4 figures, 2 tables, and 6 references, 5 of which are Soviet.

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

67303

On the Reflection Coefficients of a Clarified Surface of Silicon Photocells SOV/181-1-8-8/32

SUBMITTED: July 26, 1958

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S/181/60/002/01/02/035
B008/B011

24.7700

AUTHOR: Galkin, G. N.

TITLE: Volume Recombination in p-Type Silicon Submitted to Thermal Treatment at High Temperatures

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 1, pp. 8 - 14

TEXT: An investigation was made of the properties of recombination centers arising on a thermal treatment of p-type silicon above 1200°C. The experimental results were found to agree with the simple model by Shockley - Read (Ref. 7) with a single recombination level. For the purpose of determining the lifetime near the p-n junctions the author made use of the method by S. G. Kalashnikov and N. A. Penin (Ref. 8). The basic circuit diagram for determining the frequency dependence of the rectified current is shown in Fig. 1. The measurements were made on p-type silicon with a resistivity of about 4 ohm·cm and a primary lifetime τ of over 10 μsec. τ was measured at different injection levels in the temperature range -78 ÷ +160°C. Results are shown in Fig. 2. The typical dependence of the lifetime on the injection level at low

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levels is shown in Fig. 3, and the temperature dependence of the lifetime at "zero" level in Fig. 4. The recombination level ascertained lies in the lower part of the forbidden zone at a distance of 0.13 ± 0.01 ev from the valence band. This level is related to the centers developing in p-type silicon after a thermal treatment above 1,200°C. On the said level, the author determined the temperature course of the capture cross section (Fig. 5) and the temperature dependence of the ratios of capture cross sections of electrons to those of holes (Fig. 6). The nature of the centers formed by thermal treatment could not be established. Nor could the absolute values of the cross sections be determined, because the concentration of the injected recombination centers was unknown. The data contained in publications concerning the levels which are at a distance of 0.13 and 0.14 ev from the upper edge of the valence band (Refs. 1 and 11) are not clearly connected with the presence of a certain impurity or of a defect type. Assuming that, according to Ref. 5, the modification of the lifetime in silicon during the thermal treatment is caused by the impurity diffusion from the surface, the diffusion coefficient of this admixture must be of the order of 10^{-5} cm^2/sec.

91752

Volume Recombination in p-Type Silicon Submitted to Thermal Treatment at High Temperatures

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B008/B011

Among admixtures with known diffusion coefficient, copper is the most probable. However, on the strength of data from publications, copper forms no level in silicon, that would be at a distance of 0.13 ev from the valence band. The investigation under review was conducted under the supervision of V. S. Vavilov and in cooperation with V. M. Malovetskaya. Data by E. I. Adirovich and Ye. M. Kuznetsova (Ref. 9) were utilized. The author thanks the Corresponding Members of the AS USSR B. M. Vul, E. I. Adirovich, G. M. Guro, N. A. Penin, and Yu. A. Kontsevoy for their attention and assistance given. There are 6 figures and 11 references: 3 Soviet.

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

SUBMITTED: April 6, 1959

Card 3/3

84061

S/181/60/002/009/002/036
B004/B056

26.1631
26.1512

AUTHORS: Galkin, G. N., Rytova, N. S., Vavilov, V. S.

TITLE: Volume Recombination of Current Carriers in n-Type Silicon Containing Radiative Structural Defects

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 9, pp. 2025-2030

TEXT: The authors experimentally checked G. K. Wertheim's data (Refs. 3,4). According to a method suggested by S. G. Kalashnikov and N. A. Penin (Ref. 6), the change in the parameters of the p-n junction, caused by the changed lifetime of the minority carriers, was investigated in dependence on the alternating voltage applied. Fig. 1 shows the shape of samples made from n-type silicon single crystal, into which aluminum had been melted. The samples were irradiated with beta particles of an $Sr^{90} - Y^{90}$ preparation at room temperature. The lifetime τ was obtained as a function of the injection level $\delta p/n_o$ within the range of 150 - 440°K. $\tau(1+\delta p/n_o)=f(\delta p/n_o)$ develops linearly within a large injection-level range (Fig.2). From $\ln(\tau_o/T^{3/2})=f(1/T)$ at high temperatures, the distance ΔE

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84061

S/181/60/002/009/002/036
B004/B056

26.1631
26.1512

AUTHORS: Galkin, G. N., Rytova, N. S., Vavilov, V. S.

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of the recombination level E_t from the edge of one of the bands was determined. ΔE was found to be 0.16 ± 0.01 ev. By investigating the temperature dependence of τ_∞ / τ_o it was determined in which half of the forbidden band the recombination level was located. If the latter is found to be in the lower half, it is necessary that, at a critical temperature $p_1 = n_o$ and $E_t - E_v = E_c - F$ (F = Fermi level). In the samples investigated $E_c - F$ is about 0.16 ev at 240°K, τ_∞ / τ_o at this temperature equaled 10. Thus, this temperature was not the critical one. The recombination level of the radiative defects was in the upper half of the forbidden band. From the values τ_{n0} and τ_{p0} the trapping cross sections for electrons (σ_n) and holes (σ_p) were calculated as functions of T (Fig. 3), and from these the dependence of τ_o on 1/T was determined (Fig. 4). At 300°K, it was true that $\sigma_p = 4 \cdot 10^{-14}$ cm^2, $\sigma_n = 1 \cdot 10^{-15}$ cm^2. Fig. 5 shows the temperature dependence of n/n_o (ratio of the electron concentration in the irradiated

Volume Recombination of Current Carriers in n-Type Silicon Containing Radiative Structural Defects

sample to the electron concentration n_o in the non-irradiated sample). Within the temperature range investigated, n_o was constant and equal to $1.1 \cdot 10^{15}$ cm^{-3}. Contrary to Wertheim's data, the trapping cross sections were thus different. $E_c = -0.16$ ev is an acceptor level which can be due neither to an insulated vacancy, an interstitial atom, nor due to a "near" pair, but to the presence of oxygen. The authors thank V. M. Malovetskaya and N. A. Penin for critique and advice, and Ye. M. Divil'kovskaya, S. P. Zharov, and E. L. Nolle for their collaboration. There are 5 figures and 11 references: 3 Soviet and 9 US.

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

SUBMITTED: February 10, 1960

Card 3/3

9,4300 (and 1043)
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20146
S/181/61/003/002/044/050
B102/B201

AUTHOR: Galkin, G. N.

TITLE: Carrier recombination in n-type silicon irradiated by gamma rays

PERIODICAL: Fizika tverdogo tela, v. 3, no. 2, 1961, 630-631

TEXT: The present report is intended as a supplement to Ref. 1 (G. N. Galkin, N. S. Rytova, V. S. Vavilov, FTT, 2, No. 8, 2018, 1960) which has dealt with the effect of an irradiation of n-type Si by fast electrons ($\simeq$ 1 Mev) upon the carrier recombination. Similar experiments have now been conducted with gamma rays. The effect is quite similar, since the gamma rays, via Compton effect, lead to the appearance in the substance of fast electrons which in the collision with atoms are able to transfer an energy which is sufficient to form defects. The n-type Si that was examined contained dissolved oxygen in an amount of 10^{17}-10^{18} atoms/cm^3 (because of its preparation in quartz crucibles). Irradiation was performed with a Co^{60} source, and the lifetime measurements were made by a method devised by S. G. Kalashnikov and N. A. Penin. A recombination level

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(acceptors) was found to appear upon irradiation at 0.16 ev below the conduction band like in the case of fast-electron irradiation. The temperature dependence of the absolute electron- and hole trapping cross sections is presented for this level in Fig. 1. At 300°K the electron trapping cross section is equal to $2.5 \cdot 10^{-14}$ cm^2 and the hole trapping cross section is equal to $0.8 \cdot 10^{-15}$ cm^2. Here as well, the values are in good agreement with those obtained in electron irradiation. A deviation of about 25% is related to the inaccurate determination of the defect concentration. Fig. 2 shows the temperature dependence of the trapping cross-section ratios (wherein the defect concentration does not appear). It may be seen from Fig. 2 that the ratios σ_p/σ_n in electron irradiation (a) and gamma irradiation (b) coincide within the measuring accuracy.
V. S. Vavilov is finally thanked for having supervised the work, V. M. Malovetskaya and Ye. M. Divil'kovskaya for their assistance. The specimens were supplied by M. V. Chukichev. There are 2 figures and 3 references: 2 Soviet-bloc and 1 non-Soviet-bloc.

Carrier recombination in ...

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B102/B201

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

SUBMITTED: July 5, 1960

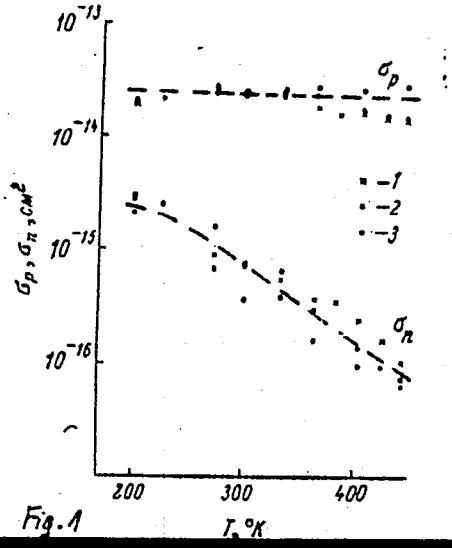

Fig. 1

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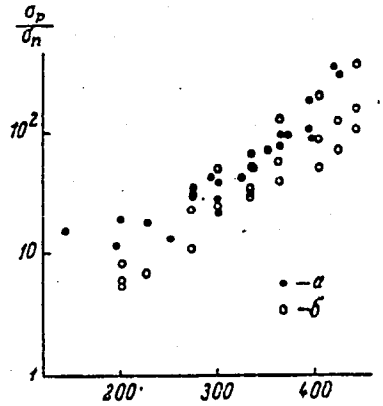

Fig. 2

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27287

S/181/61/003/008/017/034
B102/B202

9.4340

AUTHORS: Nolle, E. L. and Galkin, G. N.

TITLE: Generation centers in diffusion-type p-n junctions of silicon

PERIODICAL: Fizika tverdogo tela, v. 3, no. 8, 1961, 2350-2354

TEXT: The reverse current passing through a p-n junction consists of two components: the diffusion current and the current caused by generation in the region of space charge of the semiconductor. At room temperature, the diffusion component of the reverse current in silicon p-n junctions is considerably lower than the second component. It is known that in silicon with p-n junctions mainly carriers whose levels lie near the center of the forbidden band are generated in the region of space charge. The authors study the carrier-generation centers in the region of space charge which had been generated by heat treatment in diffusional p-n junctions of silicon and determine the relationship between the generation centers and the recombination levels in p-type silicon. On the basis of Shockley's theory for the reverse-current density caused by generation in the space-charge region the authors theoretically obtain: $j_g = qW\, n_i/(\tau_{p_o} + \tau_{n_o})$.

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τ_{p_0} and τ_{n_0} are the lifetimes of the electrons and holes, in a strong p-type and strong n-type semiconductor. The authors experimentally studied the volt-ampere characteristics of the reverse current in p-n junctions produced from thermally treated (1235°C) p-type Si plate In order to reduce the influence of surface effects on the reverse current, the authors chose large diode areas (0.12 cm^2); immediately before the measurements the diodes were etched and the characteristics were measured in a vacuum thermostat (10^{-5} mm Hg). It was found that up to about 100°C the reverse current is voltage-dependent and mainly a generation current. The activation energy of the generation centers was determined from the slope of the straight line $I = f(1/T)$ and a value of 0.6 ± 0.06 ev was obtained. This corresponds to a position of the energy level of the centers in the middle of the forbidden band. At higher temperatures, the reverse current is determined by the diffusion component (activation energy 1.2 ev). The studies showed that a linear relation exists between the generation current and the concentration of the centers which form a recombination level in p-type silicon, that is at a distance of 0.35 ev from the valence band.

It can be assumed that in the p-n junctions studied a donor level of gold impurities acts as an active recombination level and an acceptor level of gold as an active generation level in the space charge region. The former is at a distance of 0.35 ev from the valence band, the latter lies in the middle of the forbidden band. Using the date of Bemski the author compares the reverse-current densities theoretically and experimentally. Good agreement was obtained for the individual samples. The carrier concentrations were calculated from the formula $n_i^2 = 1.5 \cdot 10^{33} T^3 \exp(-1.21/kT)$. The authors thank V. S. Vavilov for directing the studies and B. M. Vul, Corresponding Member AS USSR, for his interest and advice. There are 3 figures, 1 table, and 10 references: 1 Soviet and 9 non-Soviet. The two most important references to English-language publications read as follows: G. Bemski. Phys. Rev. 111, 6, 1515, 1958; D. J. Sandiford. J. Appl. Phys., 30, 12, 1981, 1959.

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

SUBMITTED: March 10, 1961

27288

S/181/61/003/008/018/034
B102/B202

24.7700

AUTHORS: Galkin, G. N., Nolle, E. L., and Vavilov, V. S.

TITLE: Recombination levels in p-type silicon occurring at high-temperature treatment

PERIODICAL: Fizika tverdogo tela, v. 3, no. 8, 1961, 2355-2361

TEXT: Heat treatment of silicon at temperatures above 1200°C leads to a strong increase of the suface recombination rate. The lifetime of the non-equilibrium carriers decreases to values of the order of 1 μsec and less. The nature of the recombination centers occurring in this connection has hitherto not been explained. In a previous paper (Galkin, FTT, II, 1, 8, 1960) it was demonstrated that in p-type silicon the dependence of the carrier lifetime on the injection level (with injection levels of 0.005-0.05 ev) corresponds to the Shockley-Read law. The recombination level is at a distance of 0.13 ev from the valence band. At higher injection levels, however, no linear dependence could be observed. Hence the authors assumed that another level participates in recombination. This problem is studied in the present paper. The authors study the dependence

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Recombination levels in p-type ...

of the lifetime on the injection level in a wide range of the injection levels, the position of the recombination levels (generated by heat treatment) in the forbidden band and also their nature. First, they theoretically study recombination by local levels which lie in the forbidden band. They experimentally study the dependence of the lifetime of the non-equilibrium carriers on temperature and injection level in p-type single crystals with p-n junction by the "frequency" method of S. G. Kalashnikov and N. A. Penin (ZhTF, XXV, 1111, 1955). The p-n junction was produced by diffusing phosphor into p-type Si (20 min, 1230°C). This was made in quartz ampuls. Under the same conditions part of the specimens had been previously subjected to heat treatment (30 min - 2hr) in order to increase the concentration of the recombination levels. Ohmic contacts were obtained by melting Ag onto the n-type side and Al onto the p-type side. In order to keep the current which is due to surface generation and which passes through the p-n junction low, the junction area was chosen sufficiently large (0.12 cm^2) and etched prior to the measurement. The lifetime was determined between -70 and +185°C and the injection levels between 0.01 and 0.6 ev. The initial carrier lifetime was at 50 μsec, resistivity was

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B102/B202

~10 ohm·cm. The ratio between diffusion current and generation current component was determined from the volt-ampere characteristics of the current in forward direction. The characteristics ($v = f(\log I)$) have two linear sections of different slope. The first one (0.26 ev) corresponds to the current due to generation in the space-charge region, at higher voltages, current occurs due to diffusion. The majority carrier concentration p_0 was determined from the Hall-emf. It was constantly equal to $7.5 \cdot 10^{14}$ cm^{-3} in the entire temperature range. It became constant after a 2.5 hour heat treatment (within the limits of measurement accuracy) which indicates a low concentration of the introduced centers. The curves $\tau(1+\Delta n/p_0) = f(\Delta n/p_0)$ of specimens with annealing times of less than 1.5 hr were not liner. They corresponded approximately to formula

$$\tau\left(1+\frac{\Delta n}{p_0}\right)=\left\{\frac{1}{\tau_{01}+\tau_{\infty 1}\frac{\Delta n}{p_0}}+\frac{1}{\tau_{02}+\tau_{\infty 2}\frac{\Delta n}{p_0}}\right\}^{-1}. \qquad (5)$$

Δn is the concentration of the electrons (minority carriers), p_o that of the holes (majority carriers), τ the lifetime of the latter; the subscripts o and ∞ refer to an infinitely small or infinitely large injection level, 1 and 2 number the two existing recombination levels. Only with specimens that had been subjected to heat treatment for more than two hours these curves were linear. Heat treatment at temperatures exceeding 1200°C also leads to the generation of two donor-type recombination levels at distances of 0.1-0.2 and 0.35 $\pm$ 0.02 ev from the valence band. The concentration of the centers with the level E_{t2} = 0.35 ev increases with increasing time of heat treatment so that - in the case of long-lasting heat treatment - recombination by the first level can be neglected. The level E_{t2} = 0.35 ev may be explained by the presence of gold atoms in the crystal which, according to Collins et al., form donor levels in p-type Si which are at a distance of 0.35 $\pm$ 0.02 ev from the valence band. According to Bemski the gold concentration in Si subjected to heat treatment for 2.5 hours, should amount to 10^{13} cm^{-3}. The reason of this gold impurity might be the quartz ampul which contained the Si during the heat treatment. The authors thank

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B102/B202

Recombination levels in p-type ...

B. M. Vul, Corresponding Member AS USSR, and E. I. Adirovich for advice, B. Ya. Yurkov for help. There are 7 figures and 11 references: 4 Soviet and 7 non-Soviet. The three most important references to English-language publications read as follows: M. Lax. Phys. Rev., 119, 1502, 1960; C. B. Collins et al. Phys. Rev., 105, 1168, 1957; G. Bemski. Phys. Rev., 111, 6, 1515, 1958.

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

SUBMITTED: March 10, 1961

X

S/181/62/004/005/050/055
B163/B138

AUTHORS: Malovetskaya, V. M., Galkin, G. N., and Vavilov, V. S.

TITLE: The spectrum of radiation defects in silicon

PERIODICAL: Fizika tverdogo tela, v. 4, no. 5, 1962, 1372-1374

TEXT: After electron irradiation of silicon local energy levels are found in the forbidden band at 0.17 ev and 0.4 ev below the conduction band (acceptor levels) and 0.27 ev above the valence band (donor level). While the two acceptor levels have been shown to correspond to an association of a vacancy with oxygen and phosphorus respectively, the nature of the donor level remained unknown. p-type silicon crystals with varying oxygen content were drawn from quartz crucibles and irradiated with 1 Mev electrons from an electrostatic generator at 17 $\pm$ 1°C. The oxygen concentration was determined from the intensity of the infrared absorption band at 9.1 microns. The position of the energy levels and the defect concentration were determined from the temperature dependence of the charge carrier concentration measured by the Hall effect. This is better than measuring resistivity or life-time at constant temperature, as the latter give less precise

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The spectrum of radiation ...

information on the respective influence of different simultaneously existing defects. In silicon specimens drawn from quartz crucibles with an oxygen concentration of $(2-3)\cdot10^{17}$ cm^{-3}, a donor level was found 0.27 ev above the valence band. It was rather stable and could only be annealed above 300°C. p-type silicon produced by zone melting in vacuum without a crucible with an oxygen concentration of about $5\cdot10^{15}$ cm^{-3} showed mainly other defects at levels of 0.21 ± 0.01 ev above the valence band. This was determined from the position of the Fermi level when half of the defect levels were occupied. The 0.21 ev defects were much less stable than the 0.27 ev ones, and annealing was noticeable at room temperature. The temperature dependence of the hole concentration was measured between 125 and 400°C for specimens annealed between 17 and 120°C, and from this the annealing activation energy was found to be 0.72 ± 0.04 ev. The 0.27 ev defects may be due to interaction between oxygen with interstitial atoms. The much slower rate of formation of the +0.27 ev defects as compared with the -0.17 ev defects is attributed to the fact that interstitial atoms have less mobility than vacancies. 0.21 ev defects were also found in A. P. Plotnikov's investigations on the spectra of stationary photoconductivity. There is 1 figure.

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S/181/62/004/005/050/055
B163/B138

The spectrum of radiation ...

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

SUBMITTED: February 5, 1962

Card 3/3

38951
S/181/62/004/007/033/037
B111/B104

26.2420

AUTHORS: Vavilov, V. S., Galkin, G. N., Malovetskaya, V. M., and Plotnikov, A. F.

TITLE: Photo and thermoionization energies of deep level radiation defects in Si

PERIODICAL: Fizika tverdogo tela, v. 4, no. 7, 1962, 1969-1970

TEXT: Experimental results of thermal and photoionization are compared by utilizing a fact recently discovered in the annealing of p-type Si, namely that the difference in stability of two closely adjacent levels of the centers resulting from 1 Mev electron bombardment amounts to E_v + 0.21 ev. Fig. 1 shows that the raising of the level balances the disappearance of charge carriers (holes) on the donor level (E_v + 0.19 ev). This defect is stable even at 200°C. There are 2 figures and 1 table.

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

Card 1/2

L 24202-66 EWT(1)/T/EWA(h) IJP(c) AT

ACC NR: AP6014611 SOURCE CODE: UR/0386/66/003/009/0361/0365

AUTHOR: Blinov, L. M.; Vavilov, V. S.; Galkin, G. N.

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

TITLE: Photo emf of p-n junction in a strongly excited semiconductor

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 3, no. 9, 1966, 361-365

TOPIC TAGS: silicon, pn junction, photo emf, ruby laser, laser application, electric potential, potential barrier

ABSTRACT: The authors investigated the variation of the photo emf with the radiation power incident on a silicon crystal with a p-n junction. The p-n junctions were obtained either by diffusion of phosphorus in p-type silicon or by bombarding p-type silicon with phosphorus, the latter junctions being shallower. The light source was a Q-switched ruby laser ($\lambda = 0.69\ \mu$). A set of filters calibrated at high and low radiation power made it possible to cover the light intensity range from 10^{-1} to 5×10^{6} w/cm^2. To check whether the photo emf depends on the duration of the pulse, some experiments were made with the laser without Q switching. The

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measurements have shown that the emf tends to saturate with increasing light intensity, that the saturation of the photo emf extends over several orders of magnitude of the radiation power, and in no case does the limiting photo emf coincide with the theoretical value of the contact potential difference, as would be the case with the potential barrier of the p-n junction to be completely lifted. It is therefore concluded that the contact potential difference in silicon p-n junction cannot be determined by measuring the saturation photo emf. The authors thank Corresponding Member of AN SSSR B. M. Vul and V. D. Yegorov for various remarks, and also N. M. Borodina and V. V. Titov for supplying the samples of the silicon with p-n junction. Orig. art. has: 2 figures. [02]

SUB CODE: 20/ SUBM DATE: 07Mar66 ORIG REF: 001/ OTH REF: 003/ ATD PRESS: 4245

L 25483-66 EWA(h)/EWT(1)/EWT(m)/T IJP(c) AT/JD/JG

ACC NR: AP6009683 SOURCE CODE: UR/0181/66/008/003/0908/0911

AUTHOR: Vul, B. M.; Vavilov, V. S.; Galkin, G. N.; Bobrova, Ye. A.

ORG: Physics Institute im. P. N. Lebedev, AN SSSR, Moscow (Fizicheskiy institut AN SSSR)

TITLE: Radiative recombination in gallium-arsenide diodes

SOURCE: Fizika tverdogo tela, v. 8, no. 3, 1966, 908-911

TOPIC TAGS: gallium arsenide, radiative recombination, pn junction, junction diode, recombination emission, forbidden band

ABSTRACT: To clarify the character of recombination processes corresponding to the particular emission band in GaAs (the short-wave band or one of the few long-wave bands), the authors investigated the dependence of the radiation intensity of each of the bands on the density of the current through a p-n junction. The samples tested were GaAs diodes in which the p-n junctions were obtained by diffusion of zinc in n-type material. The radiation was observed in a direction normal to the plane of the junction from the n-region side. Measurements were made of the emission spectrum of the investigated samples, of the dependence of the intensity of the emission of the individual bands on the injection current at various temperatures at high injection levels, and of the dependence of the internal quantum efficiency on the temperature. The results show that the short-wave band, with a quantum energy close to the width of the forbidden band, is connected at high injection levels with

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L 25483-66

ACC NR: AP6009683

2

a bimolecular recombination law; the long-wave band is connected with a monomolecular recombination law. It is concluded that the nonradiative recombination at high injection levels should also obey the bimolecular law. The authors thank Yu. V. Popov and A. I. Frimer for supplying important experimental data. Orig. art. has: 4 figures and 4 formulas.

SUB CODE: 20/ SUBM DATE: 27Jun65/ ORIG REF: 004/ OTH REF: 003

Card 2/2 pb

MANUYLOV, Pavel Ivanovich; GALKIN, Georgiy Semenovich; SHILO, N.A., otv.red.; POTEMKIN, S.V., zam.otv.red.; ALEKSANDROV, P.P., red.; APEL'TSIN, F.R., red.; BEREZIN, V.P., red.; KAIABIN, A.I., red.; KUZHETSOV, G.G., red.; MATSUYEV, L.P., red.; NUZHDIN, I.I., red.; FIRSOV, L.V., red.; FOMENKO, T.G., red.; SHAKHNAROVICH, L.A., red.

[Peat lifting by means of excavating machinery in stripping placer deposits in the Northeastern U.S.S.R.] Vskrysha torfov zemleroinymi mashinami na priiskakh Severo-Vostoka SSSR. Magadan, 1958. 68 p. (Magadan. Vsesoiuznyi nauchno-issledovatel'skii institut zolota i redkikh metallov. Trudy. Gornoe delo no.19) (MIRA 12:5)

(Soviet Far East--Gold ores) (Peat) (Excavating machinery)

GALKIN G.V

137-58-5-9282

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 5, p 71 (USSR)

AUTHORS: Galkin, G.V., Urusova, S.M.

TITLE: A Technological Investigation of Ores From the Sinyukhinskoye Deposits of the Zapsibzoloto Trust (Tekhnologicheskoye issledovaniye rud Sinyukhinskogo mestorozhdeniya tresta Zapsibzoloto)

PERIODICAL: Tr. N.-i. gornorazved. in-ta "Nigrizoloto". 1957, Nr 22, p 166

ABSTRACT: The mineralogical & chemical composition of the ore is shown and a brief characterization of the Au content, including an assay, is given. The results of experiments dealing with methods of extraction of Au are shown. These methods include precipitation, amalgamation, and cyanidation, as well as combinations of these processes. 98-99% of Au were extracted by means of an amalgamation-cyanidation system.

I. D.

1. Gold ores--Analysis 2. Gold ores--Processing

Card 1/1

GALKIN, G.V.; GRANOVSKAYA, A.Yu.; MAKVETSOV, Ye.N.; SPIGLAZOV, Ye.F.; RYAZANKIN, V.N., red.; MAKAROV, M.S., red.

[Punched-card computing machines: P80-5, P80-6, PA80-2 perforators, K80-6, K45-6, KA80-2 controllers, and S80-5, S45-5, S80-5M, S45-5M sorting units] Schetno-perforatsionnye mashiny; perforatory P80-5 P80-6, PA80-2, kontrol'niki K80-6, K45-6, KA80-2 i sortirovki S80-5, S45-5, S80-5M, S45-5M. Moskva, Statistika, 1965. 207 p. (MIRA 18:9)

GAIKIN, I

Innovations in Soviet construction technique. p 1

Vol 7, no. 300, Oct. 1955
CONSTRUCTORUL
Bucresti

Source: East European Accessions List (EEAL), LC, Vol. 5, No. 2
Feb. 1956

GALKIN, I.

The exhibition "Agricultural Construction in Rumania." p. 2

Vol. 7, no. 300, Oct. 1955
CONSTRUCTORUL
Bucresti

Source: East European Accessions List (EEAL), LC, Vol 5, No 2
Feb. 1956

GALKIN, I.

Improvements were made in the organization of grain drying. Muk.
-elev.prom. 22 no.1:28 Ja '56. (MLRA 9:5)

1. Dzhalal-Abadskiy punkt Zagotzerno.
(Grain--Drying)

USSR/Farm Animals. Small Horned Cattle Q-3

Abs Jour : Ref Zhur - Biol., No 11, 1958, No 49990

Author : Galkin I.
Inst : [redacted]
Title : The Types of Dairy Cattle Feeds Used in the Kolkhozes of the Moscow District.

Orig Pub : Molochn. i myasnoye zhivotnovodstvo, 1957, No 7, 42-45

Abstract : No abstract

Card : 1/1

GALKIN, I. (g.Stalinogorsk, Tul'skaya oblast')

A worker goes to the meeting...Sov. profsoiuzy 17 no.15:14-15 Ag '61. (MIRA 14:7)
(Tula Province--Coal miners)

SOKOLOV, B.; GALKIN, I.

Problems in the building of communism. Vop. ekon. no.2:3-12 F '62. (MIRA 15:1)

(Construction industry--Finance)