Zurn eksp.i teor.fis,31, fasc.2, 261-272 (1956) CARD 2 / 2 PA - 1574

electron on the admixture levels For the domain of higher temperatures two temperatures are specially mentioned: Θ_3 corresponds to the equality of the admixture-dependent and independent conductivity, and Θ_4 to independent conductivity. Nearly all results obtained here hold also in the case of hole-semiconductors.

The life τ^* of the charge carriers which are not in equilibrium increases with rising temperature at first to a maximum, after which it again decreases. At $|\varepsilon_F| > \varepsilon_L$ τ^* increases even at $\Theta \to 0$ Here ε_F and ε_L denote the energies of the"trap" and the hole respectively. If, however, the recombination levels are in the middle of the forbidden zone (or, more accurately, if the position of the "trap" agrees with that of the FERMI level in pure germanium), τ^* increases momentarily after which it remains constant. The relaxation of the concentration of electrons which does not correspond to equilibrium is due to two processes: 1.) Recombination of electrons in the empty "traps" which correspond to equilibrium, and 2) Recombination of electrons corresponding to equilibrium with the surplus of empty "traps".

In conclusion three concrete examples are dealt with.

INSTITUTION: Physical Institute "P.N.LEBEDEV" of the Academy of Science in the USSR

Dokl.Akad.Nauk, 108, fasc.3, 417-420 (1956) CARD 2 / 2 PA - 1365

e-type. ($F > 0$). According to the dependence of the life of the holes on the FERMI level F, another heat-dependent emission of holes from the "traps" into the valence zone occurs, and therefore a second maximum exists in the case of such a dependence. In the case of steady operation the recombination of electrons and holes in the "traps" is in equilibrium with the production of pairs. If this pair production is interrupted, uncompensated and approximately equally strong currents of electrons and holes from the zones to the "traps" are produced. The life of unreal charge carriers is introduced into the theory as a fundamental characteristic. In the case of high concentrations of the "traps" the results obtained by the authors agree with those obtained by SHOCKLEY and READ only within a certain interval. If the "traps" are in the lower half of the forbidden zone, the characteristic time of damping is equal to the life of the real current carriers. This is true for all positions of FERMI levels in electronic semiconductors as well as in sufficiently marked hole-semiconductors.

In conclusion the two main methods for the measuring of lives, the impulse method and the photoelectric method, are discussed.

INSTITUTION: Physical Institute "P.N.LEBEDEV" of the Academy of Science in the USSR.

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100320018-6"

AUTHOR: Adirovich, E.I. and Gordonov, A.Yu.

TITLE : A-U Sci Conf dedicated to "Radio Day", Moscow 20-25 May 1957. "Theory and Experimental Investigation of Coefficients of Emitter-Collector Transmission in Junction Transisitors,"

PERIODICAL : Radiotekhnika i Electronika, Vol. 2, No. 9, pp. 1221-1224, 1957, (USSR)

For abstract see L.G. Stolyarov.

ADIROVICH, E.I.

AUTHOR ADIROVICH,E.I., and KOLOTILOVA,V.G. PA - 2535

TITLE Influence of the Emitter Effectiveness on Semiconductor Triod Transition Characteristics. (Vliyaniye effektivnosti emittera na perekhodnyye kharakteristiki poluprovodnikovykh triodov, Russian)

PERIODICAL Zhurnal Tekhn. Fiz., 1957, Vol 27, Nr 3, pp 473 - 477 (U.S.S.R.)
Received: 4 / 1957 Reviewed: 6 / 1957

ABSTRACT With reference to the papers of the author in Doklady Akad. Nauk SSSR, 1955, Vol 105, Nr 4, and 1956, Vol 108, Nr 4, where the transition characteristics for semiconductor triods were found, the dependence of transition characteristics on the efficiency of the emitter γ is investigated by the present paper. First the mathematical formulation of the problem of transition characteristics in the case of an earthed basis is written down for the case $\gamma \neq 1$. The coefficient γ expresses in the last equation of this system the boundary condition on the emitter. The effectiveness of the emitter in this case does not alter the form of the transition characteristic nor the value of the time of adjustment. Also the frequency-characteristic of the triod does not change. Finally the required equation for the transition characteristic of a semi-conductor triod for the case of an earthed emitter is obtained for an arbitrary value of the emitter efficiency γ. Now the most

Card 1/2

ADIROVICH, E. I.

57-6-4/36

AUTHOR: ADIROVICH,E.I., TEMKO,K.V.

TITLE: Transition, Frequency and Phase Characteristics of a Transistor in the Case of a Common Emitter. (Perekhodnaya, chastotnaya i fazovaya kharakteristiki tranzistora pri obshchem emittere, Russian)

PERIODICAL: Zhurnal Tekhn.Fiz. 1957, Vol 27, Nr 6, pp 1174-1181 (U.S.S.R.)

ABSTRACT: The formula given by the authors in Zhurnal Tekhn.Fiz, 1957, Vol 27, Nr 3, pp 473-473 for the transition characteristic of a transistor in the case of a common emittor can not be used for immediate calculation of processes in transistors because of its complex character. Here a formula is deduced which offers an approximation for the transition characteristic of a transistor in the case of a common emittor in its total course which can serve as a basis for a calculation of transition processes and frequency characteristics.
Also the corresponding formulae for the frequency-phase-characteristic of a transistor are deduced and then the approximation formulae for the frequency as well as for the phase characteristic are given.
A comparison is drawn with the detailed formulae and the authors

Card 1/2

ADIROVICH, E. I.

E. I. ADIROVICH, A. YU. GORDONOV: "Frequency-phase and transient characteristics of a semiconductor triode amplifier stage in a circuit with a common base." Scientific Session Devoted to "Radio Day", May 1958, Trudrezervizdat, Moscow, 9 Sep. 58

A computation of the frequency and transient characteristics of an amplifier stage using a semiconductor triode in a circuit with a common base is made on the basis of the theory of the emitter-collector transfer coefficient.

The results are presented in the form of approximate formulas and nomograms which permit engineering computations. Experimental data are obtained and a comparison is made with theory. The agreement established shows the possibility of computing stages in the appropriate regions.

ADIROVICH, Ye.I.

Remarks on the review of V.V.Antonov-Romanovskii and M.V.Fok.
Opt. i spektr. 4 no. 6:807-809 Je '58. (MIRA 11:8)
(Luminescence)

ADIROVICH, E. I.

AUTHORS: Adirovich, E. I., Ryabinkin, Yu. S., Temko, K. V. 57-1-9/30

TITLE: The Equilibrium Distribution of Field Potential and of the Concentration of the Charge Carriers on Fused-In Junctions (Ravnovesnoye raspredeleniye potentsiala, polya i kontsentratsiy nositeley zaryada na vplavlennykh perekhodakh).

PERIODICAL: Zhurnal Tekhnicheskoy Fiziki, 1958, Vol. 28, Nr 1, pp. 55-66 (USSR)

ABSTRACT: First the authors show that the problem of the thermodynamic equilibrium distribution of the potential, of the field and of the concentration of mavable charge carriers in a general case can not be solved according to the method of W. Shockley (ref. i.c. by means of neglecting the concentration of electrons and holes within the range of transition in comparison to the concentration of the dominating admixtures. Then the mathematic formulation and the general solution of the problem are given. The problem of the distribution of the potential, of the field and of the concentration of charge carriers in a semiconductor with one p-n or p-i- transition at thermodynamic equilibrium leads to the finding of a solution for the equation of Shockley $\frac{d^2\Psi}{dx^2} = 2\,\mathrm{sh}\Psi - N(x)$ for the potential (1) under corresponding

Card 1/3

where the degree of alloy of the p-range exceeds that of the n range by more than one order of magnitude, i.e. practically in almost all real cases. For real conditions the semiconductor o the n-type is divided into three ranges and approximation for- mulae are given for them. Diagrams are enclosed for the deter- mination of the position ofp-n transitions in dependence on th concentration of admixtures in semiconductors of the n- andp- type. The more exact solution of the equation (1) and the calc ation of the position of p-n transitions was carried out by me of an electronic computing machine of the "Strela-3" type. The are 9 figures, 4 tables, and 4 references, 2 of which are Slav

SUBMITTED: June 12, 1957

AVAILABLE: Library of Congress

Card 3/3

13 июня

в 17 часов

В. С. Хэлстед (США)

Стереофоническое радиовещание с использованием частотной модуляции

Э. И. Адирович

Рекомбинационные процессы и реактивные свойства плоскостных транзисторов

Л. И. Гутенмахер

Электрическое моделирование как новый раздел радиоэлектроники

Работа секций

1. СЕКЦИЯ ТЕОРИИ ИНФОРМАЦИИ

Руководитель В. И. Сифоров

9 июня

(с 10 до 16 часов)

В. И. Сифоров,
Л. Ф. Бородин

О кодировании телеграммы равномерными корректирующими кодами

Г. Г. Белоногов,
В. Я. Григорьев,
Р. Г. Котов,
Р. И. Яковлев,
В. И. Рассадин

О повышении эффективности использования каналов связи методом автоматического лексического кодирования сообщений

А. М. Полыковский

Исследование некоторых схем гармонического кодирования речевых сигналов

В. Е. Муравьев

Испытания, демонстрация и перспективы усовершенствования схем гармонического кодирования речи.

9 июня

(с 18 до 22 часов)

Л. М. Финк

Пропускная способность симметричных каналов с переменными параметрами при неограниченной полосе частот

Л. Ф. Бородин

О скорости передачи сообщений по симметричным каналам.

report submitted for the Centennial Meeting of the Scientific Technological Society of Radio Engineering and Electrical Communications im. A. S. Popov (VNORIE), Moscow, 8-12 June. 1959

66259

~~24 (3)~~ 24.7700

AUTHOR: Adirovich, E. I.

SOV/181-1-7-15/21

TITLE: Conductivity and Transmission Coefficient of the Voltage of a Semiconductor Diode in the Non-stationary Regime

PERIODICAL: Fizika tverdogo tela, 1959, Vol 1, Nr 7, pp 1115 - 1124 (USSR)

ABSTRACT: In the introductory mention is made of a paper by S. G. Kalashnikov and N. A. Penin (Ref 1) dealing with the investigation of the frequency dependence of the rectified current in a semiconductor diode with small signals and with the predominance of diffusion capacity. Here, the author investigates the frequency-versus-phase characteristics and the transition characteristics of conductivity and of the transmission coefficient of the voltage under the following premises: (1) diffusion approximation; (2) small signals; (3) positive displacement in the p-n transition; (4) extension of the range of the p- and n-type is much larger than the respective diffusion length; (5) the p-range is more strongly alloyed than the n-range. The first part deals with the investigation of the phase-versus-frequency characteristics, proceeding from formula (1) for the total current composed of the diffusion current of the minority carrier in the p- and n-ranges, and the displacement current, and obtaining

Card 1/3

4

PHASE I BOOK EXPLOITATION SOV/5135

Nauchno-tekhnicheskoye obshchestvo radiotekhniki i elektrosvyazi im. A.S. Popova

100 let so dnya rozhdeniya A.S. Popova; yubileynaya sessiya (One Hundredth Anniversary of the Birth of A.S. Popov; Anniversary Session) [Moscow] Izd-vo AN SSSR, 1960. 312 p. Errata slip inserted. 2,800 copies printed.

Sponsoring Agency: Akademiya SSSR.

Chief Ed.: A.L. Mints, Academician; Editorial Board: G.D. Burdun, A.R. Vol'pert, I. Ye. Goron, L. I. Gutenmakher, I.I. Grodnev, N.D. Devyatkov, L.A. Zhekulin, S.I. Katayev, M.S. Neyman, V.I. Siforov, and N.I. Chistyakov; Ed. of Publishing House: L.V. Gessen; Tech. Ed.: S.G. Markovich.

PURPOSE: This collection of reports is intended for scientists and technicians working in radio engineering and telecommunications.

COVERAGE: The reports included in this collection were submitted at the scientific meeting held in 1959 by the Nauchno-tekhnicheskoye obshchestvo radiotekhniki i elektrosvyazi im. A.S. Popova (Scientific and Technical Society of Radio

Card 1/7

AVAILABLE: Library of Congress

TABLE OF CONTENTS:

Relaxation processes...

where V - external potential; l - transition width, n - electron concentration. It follows that the transition capacitance is determined not by variation of the total charge within the n- or p-type region but only by variation of the partial charge of majority carriers. This fact explains the experiment being in agreement with the approximate Schottky-Motta formula for a starved layer. The relaxation processes in junction transistors were analyzed, comparison was made of the characteristic and base minority carriers diffusion and recombination times and their dependence on the type of junction transistor connection was analyzed. It is shown that below the cut-off frequency the critical parameter which determines the reactance of the emitter circuit, is the ratio of the base r_b to the emitter r_e resistance. The input reactance is capacitive for $\frac{r_b}{r_e} < \frac{2}{\pi}$. Above the cut-off frequency the input reactance is always capacitive. 45 references. [Abstracter's note: Complete translation]

Card 2/2

ADIROVICH, E.I.

Theory of the impulse properties of junction transistors. Inzh.-fiz. zhur. no.5:59-66 My '60. (MIRA 13:8)

1. Fizicheskiy institut im. P.N.Lebedeva AN SSSR, Moskva.
(Transistors)

ADIROVICH, E.I.

Input and transfer admittance of a transistor under unsteady conditions. Inzh.-fiz.zhur. no.7:28-36 Jl '60. (MIRA 13:7)

1. Fizicheskiy institut im. P.N.Lebedeva AN SSSR, g. Moskva.
(Transistors)

S/181/60/002/007/006/042
B006/B070

AUTHOR: Adirovich, E. I.

TITLE: Electric Fields and Currents in Dielectrics

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 7, pp. 1410-1422

TEXT: In the introduction, the author discusses some details of the determination of the distribution of current, field, and electron concentration in a dielectric placed between two electrodes. The problem, essentially, is to solve the system of equations (1), $j = \text{const}$; $dE/dx = -n$; $dn/dx + nE = j$, which contains the continuity equation, the Poisson equation, and an expression for the sum of the conduction and diffusion currents. Results of Refs. 1 and 2 are discussed. The author gives a general solution of the system of equations for the distribution of the field and electron concentration, when a current due to thermionic and autoelectronic emission flows through a dielectric. This solution serves, above all, to determine the conditions of validity and the range of application of the formulas derived in Refs. 2 and 3. The distribution

curves obtained theoretically are shown in diagrams: Fig. 1 shows the distribution of electron concentration and electric field strength in the dielectric in thermodynamic equilibrium with the electrodes; Fig. 2 shows these distributions when a current passes through the dielectric; and Fig. 3 shows C(j) in the range $0 \leq j \sim j_{Richardson}$. ($C = n - E^2/2 - jx$). Later, the thermionic emission is investigated in two ranges: 1) the range $u \gg 1$; this corresponds to a slight disturbance of the thermodynamic equilibrium in the system metal-dielectric-metal, that means, the range of small currents. Among others, an expression is also given for C(j) and the current-voltage characteristic. 2) The range $w \equiv iu \gg 1$; this corresponds to currents in the dielectric, which are limited by volume charges ($u = \frac{\sqrt{2}}{3|j|}(C+jx)^{3/2}$). The autoelectronic emission from the cathode is studied in the last part of the work. The system (49) is obtained, which describes the distribution in the dielectric of ϕ, E, and n. It is analogous to the system (33) which gives the same distribution functions for thermionic emission. With $C < 0$ and

$|c|^{3/2}/|j| \gg 2$, (33) also holds for autoelectronic emission. There are 4 figures, 1 table, and 13 references: 6 Soviet, 4 US, and 3 German.

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

SUBMITTED: December 3, 1959

85152

S/181/60/002/009/043/047/XX
B004/B070

9,4300 (1138, 1143, 1144)

AUTHOR: Adirovich, E. I.

TITLE: A New Method for Determining the Cross Sections of Local Centers

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 9, pp. 2248-2251

TEXT: A method for determining the trapping cross sections of electrons and holes by local centers (impurities, defects of structure) is already known (Refs. 1-3). A new method is now proposed which is based on a unipolar disturbance of the crystal, that is, on the formation of minority carriers in a band to which corresponds the intrinsic conductivity of the crystal. The kinetics of the process is studied, which is caused by illumination of the crystal by modulated current $I\exp(i\omega t)$ in the region of impurity absorption (Fig.). On account of the small coefficient of the impurity absorption, the disturbance is assumed to be homogeneous in the direction of Oy. The following equation is written down for the change of potential: $\Delta V = -(V_{ol}/n_o)\{[\sum_k (g_k\tau_{pk})/(1 + i\omega\tau_{pk})]/[1+\sum_k (\tilde{\tau}_{pk}/\tau_{nk})/(1$

Card 1/3

A New Method for Determining the Cross Sections of Local Centers

S/181/60/002/009/043/047/XX
B004/B070

$+ i\omega\tau_{pk})\Big](1 + i\omega\tau_m)\Big\} \exp(i\omega t)$ (1) From this are obtained, $\Delta V = (V_{ol}/n_o)(\beta_r I_r n_{ro}\tau)/(\sqrt{1+\omega^2\tau^2})\exp\Big[i(\omega t + \overline{\pi} - \text{arc tan}\,\omega\tau)\Big]$ and $\Delta V = -(V_{ol}/n_o)\,\beta_r I_r n_{ro}\tau(1 - \exp\big[-t/\tau\big])$. The index r denotes the level studied. $V_{ol} = E_{ol}$, the background voltage drop in the illuminated crystal; p_{ko} and n_{ko} are the steady state concentrations of the vacant and occupied k-levels; $g_k = \beta_k I_k n_{ko}$ is the steady and nonsteady rate of formation of free electrons in k-level; τ_{pk} is the lifetime of the hole, τ_{nk} is the partial lifetime of the conduction electrons; τ_m is the relaxation time of the space charge; and u is the thermal velocity of the conduction electrons. $1/\tau$ is given by $1/\tau_{pr} + 1/\tau_{nr} \simeq S_{er} u n_{ol}\big[1 - p_{ro}/n_o\big]$ Since the concentration N_r of the local centers is not contained in the expression

Card 2/3

A New Method for Determining the Cross Sections of Local Centers

S/181/60/002/009/043/047/XX
B004/B070

for γ, it is not necessary to determine its value. As against this, the steady concentration n_o of the conduction electrons must be known. It can be easily determined from the measurement of the Hall coefficients. There are 1 figure and 5 references: 1 Soviet and 4 US.

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

SUBMITTED: January 20, 1960

Card 3/3

84585

S/181/60/002/010/007/051
B019/B070

9.4300 (1043, 1138, 1143)

AUTHOR: Adirovich, E. I.

TITLE: The Kinetics of Impurity Photoconductivity and the Effective Cross Sections of Local Centers

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 10, pp. 2384-2394

TEXT: A theoretical study of the kinetics of impurity photoconductivity is made which corresponds to the unipolar perturbation of a semiconductor, that is, the photoconductivity is produced only by the nonequilibrium carriers in the main conduction band. The problem is formulated by setting up the kinetic equations of the electron processes in a semiconductor, and an equation for the rate of production of the conduction electrons is given. The following topics are dealt with in the other sections of the paper: space distribution of electrons, current density of the electric field, etc, in the semiconductor, kinetics of impurity photoconduction, the case of singly charged local centers, and the determination of the effective cross sections of local centers according to the nonsteady impurity photoconduction. Expressions are obtained for the distributions of the

Card 1/3

The Kinetics of Impurity Photoconductivity and the Effective Cross Sections of Local Centers

S/181/60/002/010/007/051
B019/B070

field, current, space charge, and the free and bound carriers. A calculation is made of the time dependence of the fall of potential at a semiconductor crystal brought about by the nonsteady photoconductivity. It is demonstrated that even those conditions in which the photoconductivity is due to electron exchange processes between the main conduction band and the levels of only one type can be experimentally realized. A new method is suggested for the determination of the effective cross section of the electron and hole trapping on local levels of singly and multiply charged local centers. This method depends on the fact established here that only those experimental conditions are feasible in which the influence of all kinds of local states on the change of fall of potential on the semiconductor ΔV caused by the modulation of the impurity photoconductivity may be excluded. The method may be applied for the recombination and adhesion levels. E. I. Adirovich and G. M. Guro (Ref. 3) are mentioned. There are 3 figures and 24 references: 12 Soviet, 6 US, 2 German, 1 Dutch, and 1 Australian.

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

84585

The Kinetics of Impurity Photoconductivity and the Effective Cross Sections of Local Centers

S/181/60/002/010/007/051
B019/B070

SUBMITTED: March 19, 1960

X

Card 3/3

80025

S/048/60/024/01/03/009
B006/B014

24.7700

AUTHOR: Adirovich, E. I.

TITLE: The Effect of Autoelectronic Emission Upon the Distribution of Strong Fields in Solids

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1960, Vol. 24, No. 1, pp. 49-57

TEXT: The article under review was read at the Second All-Union Conference on the Physics of Dielectrics (Moscow, November 20-27, 1958). The article continues two lectures by Professor K. W. Boeer (East Berlin) which are published in this periodical, pp. 36 and 43. Boeer has developed a new technique which is used to study the field distribution in a dielectric or a semiconductor. It is based on a shift of the long-wave boundary of fundamental light absorption in the crystal under the action of an electric field E and permits visual observation of the field distribution: Spots having large E are dark, while spots having small E are bright. By means of this method Boeer obtained interesting results concerning the inhomogeneous field distribution and the volume

Card 1/3

The Effect of Autoelectronic Emission Upon the Distribution of Strong Fields in Solids

charge in CdS single crystals. Further, he carried out investigations concerning the theory of the occurrence of a maximum of E inside the crystal and its shift toward the cathode. His concepts include, however, a certain difficulty. Experiments show that the region of maximum field strength forming inside the crystal is shifted toward the cathode, but does not reach it and remains at a certain distance. Instead of a physical explanation of this fact Boeer introduced two formal conditions: the demand that the total resistance of the crystal attain a minimum, and that the field at the cathode be weaker than the maximum volume field. In the article under review, the author studies the problems concerning fluctuations of the region of maximum field strength, with constant potential differences being applied to the crystal. Besides a qualitative study of the nonsteady phenomena - investigation of the effect of autoelectronic emission upon the kinetics of field redistribution - the author demonstrates the calculation of the steady-state distribution of the electric field in a solid. This investigation is not based on Boeer's assumption that two different local levels occur in the band diagram of the solid (CdS), but on the assumption that 1) local levels exist in the crystal, and 2) that the probability of freeing of electrons from local

Card 2/3

ADIROVICH, Emmanuil Il'ich; FAYNBOYM, I.B., red.; ATROSHCHENKO, L.Ye., tekhn. red.

[Atoms] Atomy. Moskva, Izd-vo "Znanie," 1961. 17 p. (Vsesoiuznoe obshchestvo po rasprostraneniiu politicheskikh i nauchnykh znanii. Ser. 9, Fizika i khimiia, no.6)
(Atoms)

ADIROVICH, E.I.

Laws of the electronic polarization and depolarization of crystals. Fiz.tver.tela 3 no.7:2048-2050 Jl '61. (MIRA 14:8)

1. Fizicheskiy institut imeni P.N.Lebedeva AN SSSR, Moskva.
(Electrons) (Crystal lattices)

S/181/61/003/011/014/056
B102/B138

24.7700 (1144, 1035, 1055)

AUTHORS: Adirovich, E. I., and Kuznetsova, Ye. M.

TITLE: The possibility of inverse electron distribution in degenerate semiconductors

PERIODICAL: Fizika tverdogo tela, v. 3, no. 11, 1961, 3339-3341

TEXT: The creation of quantum systems with negative temperatures, i.e. with inverse electron distribution, is of great importance for the generation and amplification of electromagnetic waves in the submillimeter, infrared and optical bands. A method of creating inverse distribution between the bands in a semiconductor could be by injection through the p-n junction in a tunnel diode above the barrier (N. G. Basov, O. N. Krokhin, Yu. M. Popov. ZhETF, 40, 6, 1879, 1961). $F_2 - F_1 = \Delta$ as a critical condition (this corresponds to the demand that the population numbers of the ceiling of the valence band and of the bottom of the conduction band are equal) does not provide for inverse distribution in the final band of rarefied states. A sufficient condition would be $F_2 - F_1 = \Delta + \Delta_1 + \Delta_2$ (1)

Card 1/4

S/181/61/003/011/014/056
B102/B138

The possibility of inverse electron...

(c.f. figure), according to which one band must be degenerate. A p-type semiconductor is considered, with $\Delta_2 = kT$ and $\Delta_1 = \frac{h^2}{2m_p^*}\left(\frac{3p'}{8\pi}\right)^{2/3}$, p' being the total hole concentration. Their recombination with electrons from Δ_2 contributes to negative absorption. With F_1 and F_2 being given as functions of p, n and T etc. and

$$\left(N_1 = 2\left(\frac{2\pi m_p^* kT}{h^2}\right)^{3/2},\ N_2 = 2\left(\frac{2\pi m_n^* kT}{h^2}\right)^{3/2}\right)$$

$$n = N_2 e^{-\sqrt[3]{\frac{9\pi}{16}}\left[\left(\frac{p}{N_1}\right)^{1/3} - \left(\frac{p'}{N_1}\right)^{1/3}\right]+1}, \qquad (2)$$

is found for (1) and

$$n = N_2 e^{-\sqrt[3]{\frac{9\pi}{16}}\left(\frac{p}{N_1}\right)^{1/3}}. \qquad (3)$$

for the condition $F_2 - F_1 = \Delta$. The forbidden band width is not included in these formulas. In (2) and (3) $p = p(N_a, T)$. The explicit function

Card 2/4

The possibility of inverse electron...

depends on the state of the centers of the main impurity in the semiconductor. Three limiting cases are discussed: (1) The acceptor levels remain discrete and do not merge with the valence band. In this case

$$\frac{n}{N_2}\left[\ln\frac{N_2}{n}\right]^{-3/2}=\frac{4}{3\sqrt{\pi}}\frac{N_1}{N_a}e^{\frac{\varepsilon_a-\varepsilon_1}{kT}}, \qquad (4)$$

holds and, also under optimum conditions, inverse distribution may be realized only with very high current densities ($j\simeq 10^4$-10^5 a/cm^2). (2) The acceptor states form an impurity band which does not overlap with the valence band. For band inversion (4) also holds, but inversion is also possible between conduction and impurity bands. For the usual acceptors or donors inverse distribution can only be created relative to the impurity band if the impurity level in highly alloyed semiconductors is broadened considerably and is highly asymmetric. (3) The impurity states merge with the valence band without changing the level density on its upper edge. For $p\equiv N_a$ (semimetals) and all T

Card 3/4

ADIROVICH, E.I.; FRIDKIN, V.M.

Reciprocity law and the quasi-stationary state. Zhur. nauch. i prikl. fot. i kin. 6 no. 3:233-234 My '61. (MIRA 14:5)

1. Fizicheskiy institut im. P.N. Lebedeva AN SSSR i Institut kristallografii AN SSSR.
(Xerography)

S/020/61/136/001/024/037
B004/B056

AUTHOR: Adirovich, E. I.

TITLE: Radical Polymerization as an Energetic Chain Reaction Catalyzed Through an Exciton

PERIODICAL: Doklady Akademii nauk SSSR, 1961, Vol. 136, No. 1, pp. 117-120

TEXT: Experimental data on low-temperature polymerization gave rise to the idea, uttered by N. N. Semenov, that in the case of geometrically favorable conditions, monomeric molecules add to the growing polymer chain not by a sequence of activation barrier passages, but by collective electron interaction which on excitation leads to a re-distribution of the valency bonds in the system (Ref. 1). The present paper is an attempt to explain this concept in terms of quantum mechanics. Reaction of the polymer radical $\dot{R}_\nu$ (ν number of molecules in the polymer) with the A=A monomer molecule is examined, and a three-electron interaction analogous to the K + LM $\longrightarrow$ KL + M reaction (K,L,M = monovalent atoms) is assumed

for $\dot{R}_\nu + A{=}A \longrightarrow \dot{R}_{\nu+1}$. The curves of Fig. 1 illustrate the change in electron energy, ε, during this reaction. The distance between the C atom at the end of the polymer chain and the nearest C atom of the monomer double bond is chosen as the independent degree of freedom x. In the case of separated components (right-hand margin of the graph), the terms 1,2,3,4 refer to the ground state and to the three lower excited states of the system. $\varepsilon_2 - \varepsilon_1$ equals the excitation energy of the unpaired electron in the outermost C atom of $\dot{R}_\nu$; $\varepsilon_3 - \varepsilon_1$ equals the excitation energy of the A=A molecule; $\varepsilon_4 - \varepsilon_1$ equals the energy of the adiabatic π-bond rupture. On the basis of experimental data (Refs. 3,9), 3 kcal/mole = 0.13 ev/molecule are assumed for the height ε_{act} of the activation barrier. $\varepsilon_{act} = 5kT$ at $20^\circ C$, $\varepsilon_{act} = 19kT$ at $-196^\circ C$. Polymerization may take place without energy supply from the medium if a sufficient portion of reaction heat is immediately consumed for activation of the subsequent addition. λ denotes the probability that the entire energy liberated in the reaction

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100320018-6"

is concentrated upon the reaction degree of freedom; ε_o and ε_N denote the energies localized upon the reaction coordinate in the case of polymer length of ν and $\nu+N$ molecules, respectively. From calculation it follows that $\varepsilon_N = \lambda q/(1-\lambda) + \lambda^N \left[\varepsilon_o - \lambda q/(1-\lambda) \right]$ (1). The condition $\varepsilon_{N/N \to \infty} \gg \varepsilon_{act}$ states that polymerization does not cease if $\lambda \geq \lambda_o = \varepsilon_{act}/(\varepsilon_{act} + q) \approx 0.13$ (2). The large number of degrees of freedom, the strong bond between atoms and atom groups of the polymer chain, and heat dissipation render $\lambda < \lambda_o$ which results in ceasing of polymerization. For $\lambda_o = 0.13$, $\lambda = 0.12$, $\varepsilon_o = 10\varepsilon_{act}$ an extension of the polymer chain by only three molecules was calculated. However, Refs. 11-14 favor the assumption that the Coulomb integrals contribute much more to the total energy of interaction in excited-atom reactions than in reactions of non-excited atoms. This is found to lead to a raised attraction in the initial state of the mutual approach of reacting particles and, thus, to a decrease or vanishing of the activation energy of A=A addition on the excited R_ν^*

Card 3/6

(curve 2 of Fig. 1, $\dot{R}^{*}_{\nu}$ = standing for a radical with an excited unpaired electron in the C atom at the end of the polymer chain). In the $\dot{R}^{*}_{\nu} + A{=}A \rightarrow \dot{R}^{*}_{\nu+1}$ process, an excitation-energy transfer to the new terminal C atom occurs together with the transfer of free valency. The $\dot{R}^{**}_{\nu+1}$ state corresponding to excitation of the σ-bonds in the polymer chain is unstable with respect to the non-adiabatic transition to the x_{II} configuration. Thus, the unpaired electron in the $\dot{R}^{*}_{\nu+1}$ radical will be excited and one, two, or more molecules can be added without activation energy. Transfer of excitation energy to the $(\nu+2)$ molecule stabilizes the σ bond of the $(\nu+1)$ molecule. The arrow in Fig. 1 indicates the run of $(\nu+1)$ bond stabilization under the ideal condition of $J_{\nu+1',\,\nu+2} \equiv \mathrm{Re}\int \psi^{+}_{\nu+2} V_{\nu+1,\nu+2} \psi_{\nu+1} d\Omega = \begin{cases} 0, \text{at } x > x_{III} \\ \infty, \text{ at } x = x_{III} \end{cases}$ (5). $\psi_{\nu+1'}$, $\psi_{\nu+2}$ denote the electron wave functions of the system with excited $(\nu+1)$ and $(\nu+2)$ molecules,

Card 4/6

Radical Polymerization as an Energetic Chain Reaction Catalyzed Through an Exciton

S/020/61/136/001/024/037
B004/B056

polymerization is of the order of ~10^5 cm/sec. A chain of 10^4 - 10^5 molecules may form during the life of an exciton ($l \sim 10^{-8} \sim 10^{-9}$ sec). The author thanks Academician N. N. Semenov and Professor N. D. Sokolov for discussions. There are 1 figure and 17 references: 10 Soviet, 7 US, and 1 British.

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

PRESENTED: July 15, 1960, by N. N. Semenov, Academician

SUBMITTED: July 13, 1960

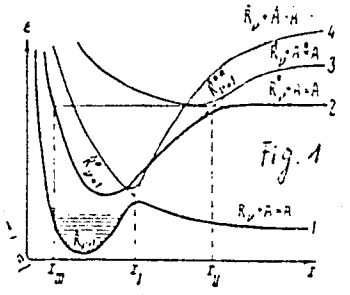


Fig. 1

Card 6/6

23847
S/020/61/137/006/006/020
B104/B201

24.7700 (1043, 1137, 1158)

AUTHOR: Adirovich, E. I.

TITLE: Distribution of heterocharge and of the field in photoelectrets

PERIODICAL: Doklady Akademii nauk SSSR, v. 137, no. 6, 1961, 1335-1338

TEXT: A study has been made of a dielectric, whose band scheme and electron transition scheme are presented in Fig. 1. This model corresponds to a photoelectret; the steady state of this photoelectret is represented by the following system of equations in dimensionless parameters:

$$dn/dx + nE = 0; \quad N = M_2 n/(b + n); \qquad (1),$$
$$dE/dx - \varrho = 0; \quad P = aM_1/(a + n);$$
$$\varrho = P - N - n; \qquad (2).$$
$$E_0 = E_1/\varkappa; \quad E_l = E_1/\varkappa.$$

Equations

Card 1/6

Distribution of heterocharge ...

$$n = n_0 e^{\psi};$$

$$E = \left[E_0^2 + 2M_1 \ln \frac{n_0 + ae^{-\psi}}{n_0 + a} + 2M_2 \ln \frac{b + n_0 e^{\psi}}{b + n_0} - 2n_0 (1 - e^{\psi})\right]^{1/2}; \qquad (3)$$

$$x = \int_0^{\psi} \left[E_0^2 + 2M_1 \ln \frac{n_0 + ae^{-\psi}}{n_0 + a} + 2M_2 \ln \frac{b + n_0 e^{\psi}}{b + n_0} - 2n_0 (1 - e^{\psi})\right]^{-1/2} d\psi.$$

are given as the solutions. The potential difference produced in a photoelectret in the polarizing field E_1 is obtained from the last equation of (3) with the relation $V = -\psi(1)$. The conduction-electron concentration n_0 near the anode is determined with the aid of formula

$$\left[\frac{\left(1 + \frac{a}{n_0} e^{V}\right)}{\left(1 + \frac{a}{n_0}\right)}\right]^{M_1/M_2} \frac{\left(1 + \frac{b}{n_0} e^{V}\right)}{\left(1 + \frac{b}{n_0}\right)} = e^{V + \frac{n_0}{M_2}(1 - e^{-V})}, \qquad (4),$$

which follows from equation (2) and represents the condition for the absence of a homocharge. As may be inferred from experimental data and evaluations,

Card 2/6

Distribution of heterocharge ...

the donors are likely to be weakly excited in most cases ($P \ll M$; $k_1^* M_1^* = d_1$) (Fridkin et al., Fotoelektrety i elektrofotograficheskiy protsess, Izd. AN SSSR, 1960), and acceptors to be poorly filled up ($N \ll M_2$) (Kallman et al., Phys. Rev., 97, 1597 (1955)). Then, $a/n \ll 1$, and $b/n \gg 1$, and the solution has the form

$$n = n_1 e^{\frac{V}{2}+\psi}; \quad N = \frac{M_2 n_1}{b} e^{\frac{V}{2}+\psi}; \quad P = \frac{aM_1}{n_1} e^{-\frac{V}{2}-\psi};$$
$$\rho = -\frac{2}{L^2}\operatorname{sh}\left(\frac{V}{2}+\psi\right); \quad E = \left\{E_0^2 + \frac{4}{L^2}\left[\operatorname{ch}\left(\frac{V}{2}+\psi\right) - \operatorname{ch}\frac{V}{2}\right]\right\}^{1/2}; \qquad (5).$$
$$x = \int_{\psi}^{0} \left\{E_0^2 + \frac{4}{L^2}\left[\operatorname{ch}\left(\frac{V}{2}+\psi\right) - \operatorname{ch}\frac{V}{2}\right]\right\}^{-1/2} d\psi.$$

Parameters

$$n_1 = [aM_1 b/(M_2+b)]^{1/2}; \quad L = [b/aM_1 (M_2+b)]^{1/2} = (n_1+N_1)^{-1/2} \qquad (6)$$

characterize the properties of the crystal during its exposure and in the absence of a polarizing field. They are the concentration of free electrons and the Debye length (L), respectively. The substitution $\exp(-\psi/2) = y$ permits the problem to be reduced to an elliptic integral; this makes it

Card 3/6

Distribution of heterocharge ...

possible for the potential distribution in the photoelectret to be represented with the aid of the Weierstraß' gamma function:

$$e^{-\psi/2} = 1 + \frac{\sqrt{f(1)}\,\wp'(x/2) + {}^1/_2 f'(1)\{\wp(x/2) - {}^1/_{24} f''(1)) + {}^1/_{24} f(1) f''(1),}{2\{\wp(x/2) - {}^1/_{24} f''(1)\}^2 - {}^1/_{48} f(1) f^{IV}(1)} \qquad (7).$$

The difference between the field strength E(x) in the crystal and the field strength E_1 is due to dipole polarization and charge polarization. In the case of a strong charge polarization, if outside of the electrode regions $E \approx E_1/\varkappa$, it is shown that the solutions can be represented in elementary functions. For a real photoelectret $V = 4 \ln\frac{E_0 L}{2}$ (17); the solution

$$\psi = -2\ln\left\{\frac{E_0 L}{2}\sin\left[\frac{2}{E_0 L} + \frac{x}{L}\right]\right\}, \quad E = \frac{2}{L}\operatorname{ctg}\left[\frac{2}{E_0 L} + \frac{x}{L}\right];$$

$$\rho = -2n_1\left(1 + \frac{M_2}{b}\right)\csc^2\left[\frac{2}{E_0 L} + \frac{x}{L}\right]; \qquad (18)$$

$$P = \frac{n_1}{2}\left(1 + \frac{M_2}{b}\right)\sin^2\left[\frac{2}{E_0 L} + \frac{x}{L}\right];$$

$$n = 2n_1\csc^2\left[\frac{2}{E_0 L} + \frac{x}{L}\right]; \quad N = ?\,\frac{M_2}{b} n_1 \csc^2\left[\frac{2}{E_0 L} + \frac{x}{L}\right]$$

Card 4/6

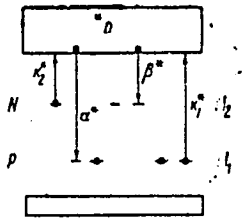
Distribution of heterocharge ...

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

PRESENTED: December 9, 1960, by A. V. Shubnikov, Academician

SUBMITTED: November 29, 1960

Fig. 1



Card 6/6

24048
S/020/61/138/004/008/023
I104/B203

24,7100

AUTHOR: Adirovich, E. I., and Fridkin, V.M.

TITLE: The law of interchangeability and the quasisteadiness of electronic processes in photoelectrets

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 138, no. 4, 1961, 820-823

TEXT: In the introduction, the authors state that the law of interchangeability in electrophotography has been studied in a great number of papers without solving the theoretical problems of the conditions of its realization in photoelectrets. The inequalities $n \ll |P-N|$; $\partial n/\partial t \ll |\partial P/\partial t - \partial N/\partial t|$ $(0 \leq x \leq l)$ (2) were obtained as necessary conditions. n is the concentration of conduction electrons, N that of the electrons on the adhesion levels, P that of the holes on the activator levels, M_1 that of the activator centers, and M_2 the concentration of the adhesion centers. l is the crystal thickness in the x-direction in which the field is applied, K the dielectric constant, ε_i the binding energy of the electrons on the local levels of the i-th type. The

Card 1/6

The law of interchangeability ....

necessary and sufficient conditions were only defined for the case of long exposure times, weakly excited donors, and weakly filled-up acceptors; $n(x,t) \ll N(x,t)$ $(0 \leqslant x \leqslant 1)$ (3). The relations (2) and (3) are different forms of conditions for the quasisteadiness of the concentration of mobile charge carriers. The present paper generally studies the necessary and sufficient conditions for the realization of interchangeability in photoelectrets, and the relationship between the interchangeability and the quasisteadiness of the kinetics of electron processes. The author studies a crystal for which the energy spectrum and the scheme of electron processes are shown in Fig. 1. The kinetics of the electron processes in the exposure of the crystal in an external field E_1 is described by the system

$$\frac{\partial \rho}{\partial t} + \frac{\partial j}{\partial x} = 0; \quad \frac{\partial N}{\partial t} = -k_2 N + \beta n (M_2 - N);$$
$$\frac{\partial E}{\partial x} = \frac{4\pi}{\varkappa}\rho; \quad \frac{\partial P}{\partial t} = k_1 (M_1 - P) - = \alpha n P;$$
$$q\mu n E + qD\frac{\partial n}{\partial x} = j; \quad \frac{1}{q}\rho = P - N - n, \qquad (4)$$

Card 2/6

The law of interchangeability ....

is obtained for (4). On the premise that (a) for all types of local levels the rate of thermal production of free charge carriers is negligibly small as compared to the rate of optical production (s_1 = const; s_2 = const) and that (b) the terms with In may be neglected in (8), the condition for the realization of interchangeability is satisfied : $Q = \int dx \approx q \int [P(x,z) - N(x,z)]\, dx = Q(z)$ (9). The first of the above conditions reads exactly:

$$I \geqslant 2\left(\frac{2\pi mkT}{h^2}\right)^{3/2} e^{-\varepsilon_1/kT}\frac{\alpha}{s_1}, \quad I \geqslant 2\left(\frac{2\pi mkT}{h^2}\right)^{3/2} e^{-\varepsilon_2/kT}\frac{\beta}{s_2}, \tag{11}$$

Card 4/6

S/181/62/004/007/017/037
B102/B104

9.4340

AUTHORS: Adirovich, E. I., Gubkin, A. N., and Kopylovskiy, B. D.

TITLE: Measurement of short lifetimes according to the phase characteristic of the voltage transmission coefficient in a circuit with a p-n junction

PERIODICAL: Fizika tverdogo tela, v. 4, no. 7, 1962, 1853-1862

TEXT: Adirovich (FTT, 1, 1115, 1959) has proposed what is called a phase method for measuring the relaxation times of electron processes in h-f p-n junctions. This method makes it possible to determine τ from purely electrical measurements at frequencies which are two orders lower than $1/\tau$. It is of importance for $\tau \sim 10^{-8}$-10^{-10}, and is free from the disadvantages of the other methods. Here the theory of the method is considered and its application to determine the lifetime of the non-equilibrium carriers at the base of p-n junctions in diodes with thin or thick bases is described in detail. The possibility and the conditions of applying it to measure other relaxation times in p-n junctions are also

Card 1/6 3

Measurement of short lifetimes...

discussed. τ is determined from $\tau = -2\varphi/\omega = 5.56 \cdot 10^{-3} |\varphi^0|/\nu$; φ is the phase angle in radians, φ^0 the angle of the transmission coefficient for the generator voltage in degrees, ν the frequency and ω the cyclic frequency. This relation holds if the inequalities

$$N_{ap} \gg N_{\partial n}, \quad (8)$$

$$|v'| \ll \frac{kT}{q}, \quad (9)$$

$$\frac{p_0}{N_{\partial n}} \ll 1, \quad (10)$$

$$R \gg r_{i0}, \quad (11)$$

$$r_k \ll r_{i0}, \quad (12)$$

$$r_{i0} C_{6.} \ll \frac{\tau}{2}, \quad (13)$$

$$w \gg \sqrt{D\tau}, \quad (14)$$

$$\omega\tau \ll 1. \quad (15)$$

are satisfied. N_{ap} is the acceptor concentration in the emitter region, $N_{\partial n}$ the donor concentration in the base, v' the variable voltage at the p-n junction, q the absolute electron charge, p_0 the hole concentration at the interphase of base and volume charge region, R the load resistance in the a-c circuit, r_{io} the low-frequency differential resistance of the

Card 2/4 2

ADIROVICH, E.I.; FRIDKIN, V.M.

Failure of the reciprocity law in electric photography and forms of isoopacity. Zhur.nauch.i prikl.fot. i kin. 7 no.3:187-194 My-Je '62. (MIRA 15:6)

1. Fizicheskiy institut imeni P.N.Lebedeva AN SSSR i Institut kristallografii AN SSSR.

(Xerography)

24.7700

S/020/62/145/001/008/018
B104/B102

AUTHORS: Adirovich, E. I., Academician AS UzSSR, and Kuznetsova, Ye. M.

TITLE: Effect of adhesion levels on the kinetics of electron processes in p-n junctions

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 145, no. 1, 1962, 67-70

TEXT: A theory of a p-n junction in semiconductors with adhesion levels is developed. The cross section of these levels and the binding energies are assumed to be arbitrary. The minority carrier kinetics in the junction base ($0 \leqslant x \leqslant w$) is described by

$$\frac{\partial p}{\partial t} - D\frac{\partial^2 p}{\partial x^2} = -\frac{p-p_n}{\tau} + Bp_л - Ap(N_л - p_л), \quad \frac{\partial p_л}{\partial t} = Ap(N_л - p_л) - Bp_л. \qquad (1).$$

The complex differential conductivity of a p-n junction is shown to depend on three relaxation times: (1) the recombination time τ of the holes in the valence band; (2) the lifetime $\tau_л$ of the holes in the adhesion levels;

Card 1/3

τ_{eff} in two different frequency ranges:

$$\text{a) } \omega^2\tau_л^2 \ll \frac{\tau_{пр}}{\tau+\tau_{пр}} \quad \text{б) } \omega^2\tau_л^2 \gg \frac{\tau_л+\tau_{пр}}{\tau_{пр}}. \qquad (13).$$

In the former case $\tau_{eff} = \tau(1+\tau_л/\tau_{пр})$, and at these frequencies α and β traps have the same effects on the electron processes. In the latter case $\tau_{eff} = \tau_{пр}/(\tau+\tau_{пр})$. $\tau_{eff} = \tau$ holds for β traps; for α traps the result $\tau_{eff} = \tau_{пр}$ is not consistent with earlier results (F. M. Berkovskiy et al., Fiz. tverd. tela, 3, 230 (1961); S. M. Ryvkin, Sborn. Poluprovodniki v nauke i tekhnike, 2, Izd. AN SSSR, 1958). The deviations are discussed. There is 1 figure.

ASSOCIATION: Fiziko-tekhnicheskiy institut Akademii nauk UzSSR (Physico-technical Institute of the Academy of Sciences UzSSR)

SUBMITTED: March 10, 1962

Card 3/3

ACCESSION NR: AT3012120 S/2504/63/020/000/0126/0171

AUTHOR: Adirovich, E. I.

TITLE: New method for determining short lifetimes of p-n junctions

SOURCE: AN SSSR. Fizicheskiy institut. Trudy*, v. 20, 1963, 126-171

TOPIC TAGS: semiconductor, transistor, semiconductor diode, base junction, pn junction, carrier lifetime, short carrier lifetime, short carrier lifetime determination

ABSTRACT: The work is aimed at developing an experimental method for determining short lifetimes of non-equilibrium carriers in the base region of the p-n junction leading eventually to reduction of the inertia of p-n junctions, extension of the operating frequency of transistors and other semiconductor devices into the millimicrosecond region, and microminiaturization of electronic equipment. The connection between the lifetime of the non-equilibrium carriers and the relaxation properties of p-n junctions are first discussed, and the phase method of determining short lifetimes in the base re-

Card 1/3

ACCESSION NR: AT3012120

gion of p-n junctions is then analyzed theoretically. This phase method was originally proposed by E. I. Adirovich (FTT V. 1, 1015, 1959) and permits measurement of lifetimes to 10^{-9} sec at a registered phase shift of 1°. The possibility of using this method for measurement of other relaxation times in p-n junctions is considered. The influence of the trapping levels on the kinetics of the electronic processes in p-n junctions is also studied. The measurement apparatus based on this principle is then described and the measurement procedure outlined. Experimental results are reported on some germanium diodes. "The theoretical part of the work was carried out by E. A. Adirovich. Ye. M. Kuznetsova participated in the study of the influence of the trapping levels on the lifetime. The apparatus for the measurement of the lifetime was constructed by B. D. Kopy*lovskiy; V. N. Antonov and Yu. A. Yefimov participated in its adjustment. The experimental determination of the lifetime and the diode properties was carried out by A. N. Gubkin with B. N. Matsonashvili, with V. S. Ivanov, V. S. Mashtakov and Yu. Ye. Andreyev participating in the measurement." Orig. art. has: 36

Card 2/3

ACCESSION NR: AT3012120

figures, 93 formulas, and 11 tables.

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

SUBMITTED: 00	DATE ACQ: 01Aug63	ENCL: 00
SUB CODE: PH	NO REF SOV: 020	OTHER: 016

Card 3/3

L 12588-63 EWT(l)/EWG(k)/BDS/EEC(b)-2 AFFTC/ASD/ESD-3 Pz-4 AT/IJP(C)
ACCESSION NR: AP3003218 S/0020/63/150/006/1252/1255

AUTHOR: Adirovich, E. I. (Academician, AN UzSSR)

63

TITLE: On the anomalous Dember effect

SOURCE: AN SSSR. Doklady, v. 150, no. 6, 1963, 1252-1255

TOPIC TAGS: semiconductor, Dember effect, photoeffect

ABSTRACT: In a normal case, the sign of the potential difference between the illuminated and non-illuminated face of a semiconductor is determined by the charge sign of the less-mobile carrier. However, under certain conditions, the opposite sign of the photo-emf may appear. The theory of this effect, which was treated qualitatively by other authors in references quoted, is being quantitatively developed here. An expression for the potential difference is obtained which shows that the latter is given by the direction of the bipolar diffusion. When it is determined by the gradient of the light intensity in the semiconductor (strong absorption), the photodiffusion current is diverted from the illuminated face in the opposite direction. Orig. art. has: 17 equations.

ASSOCIATION: Fiziko-tekhnicheskiy institut Akademii nauk UzSSR (Physicotechnical Institute, Academy of Sciences.

Card 1/2

L 15469-63 EWT(l)/EWG(k)/BDS/EEC(b)-2 AFFTC/ASD/ESD-3 Pz-4 AT

ACCESSION NR: AP3005430 S/0020/63/151/005/1060/1063

AUTHOR: Adirovich, E. I. (Academician, AN UzSSR) 63

TITLE: Valve and diffusion photo-emf 62

SOURCE: AN SSSR. Doklady*, v. 151, no. 5, 1963, 1060-1063

TOPIC TAGS: photocell, diffusion photo-emf, valve photo-emf, semiconductor

ABSTRACT: The author points out that when a current is generated in a closed circuit under the influence of external forces, such as light, an electromotive force cannot generally be attributed to a certain active part of the circuit. An electric circuit containing a source of current must generally be non-linear. The dependence of the emf on current introduces an additional and physically different nonlinearity on top of the possible dependence of the interval resistance and the external agent of the current. These considerations particularly apply to the semiconducting current generators such as

Card 1/2

L 15469-63

ACCESSION NR: AP3005430

the valve and diffusion photo-cells. Thus, the semiconducting current generators are not characterized by a definite emf that depends only upon the nature of the external agent such as light. Orig. art. has: 1 figure and 14 formulas.

ASSOCIATION: Fiziko-tekhnicheskiy institut Akademii nauk UzSSR (Physics engineering institute, Academy of sciences UzSSR)

SUBMITTED: 08Apr63 DATE ACQ: 06Sep63 ENCL: 00

SUB CODE: PH NO REF SOV: 002 OTHER: 006

Card 2/2

both interzonal and capture recombination are taken into account, is replicated. The physical implications of three degenerate cases where the general solution can be reduced to elementary functions are considered in the present article. One degenerate case corresponds to

[illegible] the cube root of the intensity of illumination from both sides. An analogous expression is obtained for the photoconductivity [illegible] and mass of degenerate solutions [illegible]

L 10363-65 EWT(m)/EWP(b) IJP(c)/ESD(dp)/[illegible]

[illegible] ...ovich, L. I.; Rubinov, V. M.; Yaabo[illegible] Y. M.

ACCESSION NR: AP4034029 S/0020/64/155/006/1286/1289

AUTHOR: Adirovich, E. I. (Academician AN UzSSR); Yuabov, Yu. M.

TITLE: Silicon films with anomalously large photoelectric voltages

SOURCE: AN SSSR. Doklady*, v. 155, no. 6, 1964, 1286-1289

TOPIC TAGS: photovoltage, semiconductor, silicon film, anomalous photovoltage, Ohm's Law, solid state physics, transistor

ABSTRACT: The authors have pointed out in a previous communication (DAN 151, no. 5 1060, 1963) that one cannot speak of emf produced by illumination of semiconductors, but only of voltages, since the latter cannot be presented as the difference between the emf and the internal voltage drop. The present paper deals with photoelectric voltages on silicon films. The method of preparation of clean silicon films in vacuum by sublimation and evaporation of silicon crystals is described, and measurements of the short-circuit current under illumination by light of various wavelengths is given. The resistivity of the film was measured as a function of illumination, and the voltages were obtain by electrostatic voltmeter. Without illumination, the resistance of the silicon film obeyed

Card 1/2

ACCESSION NR: AP4034029

Ohm's law. The voltages reached values of about 70 under an illumination of 50,000 lumens. Orig. art. has: 4 figures and 1 table.

ASSOCIATION: Fiziko-tekhnichiskiy institut, Akademii nauk SSSR (Engineering Physics Institute, Academy of Sciences SSSR)

SUBMITTED: 16Dec63 ATD PRESS: 3052 ENCL: 00

SUB CODE: EM, SS NO REF SOV: 012 OTHER: 016

Card 1/2

ACCESSION NR: AP4042017 S/0020/64/157/001/0076/0078

AUTHOR: Adirovich, E. I. (Academician AN UzSSR); Rubinov, V. M.; Yuavob, Yū. M.

TITLE: Investigation of anomalously large photopotentials in thin silicon films

SOURCE: AN SSSR. Doklady*, v. 157, no. 1, 1964, 76-78

TOPIC TAGS: silicon film, silicon film potential, silicon film characteristic

ABSTRACT: Results are given of an investigation of thin silicon films having anomalously large photopotentials (a.p.p.). The dependence of V_{app} on light intensity I, wavelength λ, and temperature T, as well as the effect of a.p.p. in polarized light, were investigated, and the dependence of V_{app} on the orientation of the polarization plane was determined. The electret effect in a.p.p. silicon films was detected at room temperature. All films were prepared by methods described previously (E. I. Adirovich, Yu. M. Yuabov, DAN, 155, no. 6 (1964)). In addition to sufficiently pure ($\rho \sim 1500$ ohm·cm) silicon, a low-

Card 1/2

...effected by passing current through the silicon slab and by sub-

...practical... the ... Scientific Instruments, v. 34, no. 1, 11, 1963) to ... presented

AUTHOR: Fiziko-tekhnicheskiy Institut Akademii nauk UzSSR (Physicotechnical Institute, Academy of Sciences, USSR)

SUBMITTED: 27Mar64 ENCL: 01

SUB CODE: SS, OP NO REF SOV: 004 OTHER: 007

Card 2/3

L 14380-65
ACCESSION NR: AP4045626

ENCLOSURE: 01

O

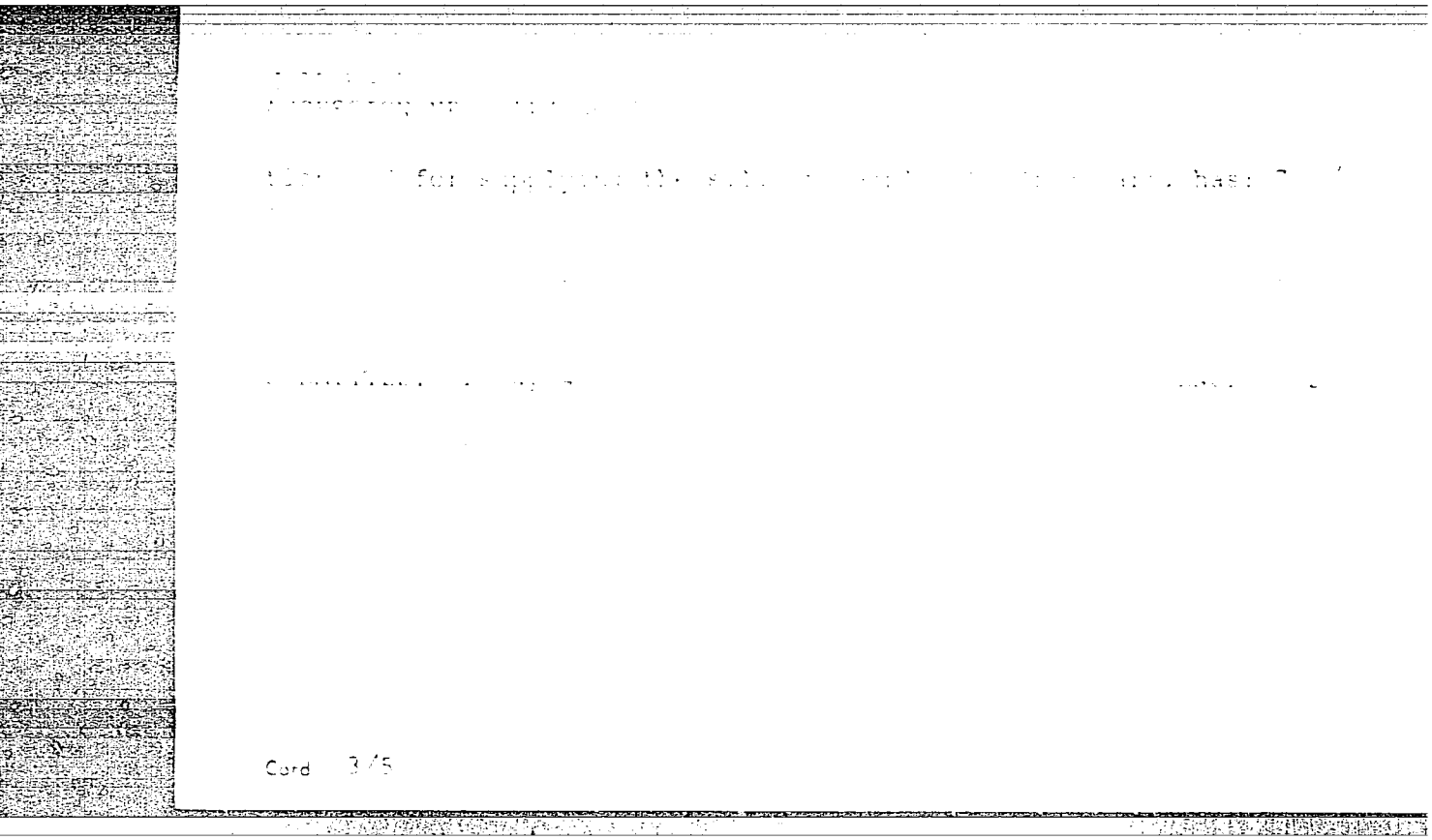
Card 3/3

AUTHOR: Adirovich, E. I.; Knigin, P. I.

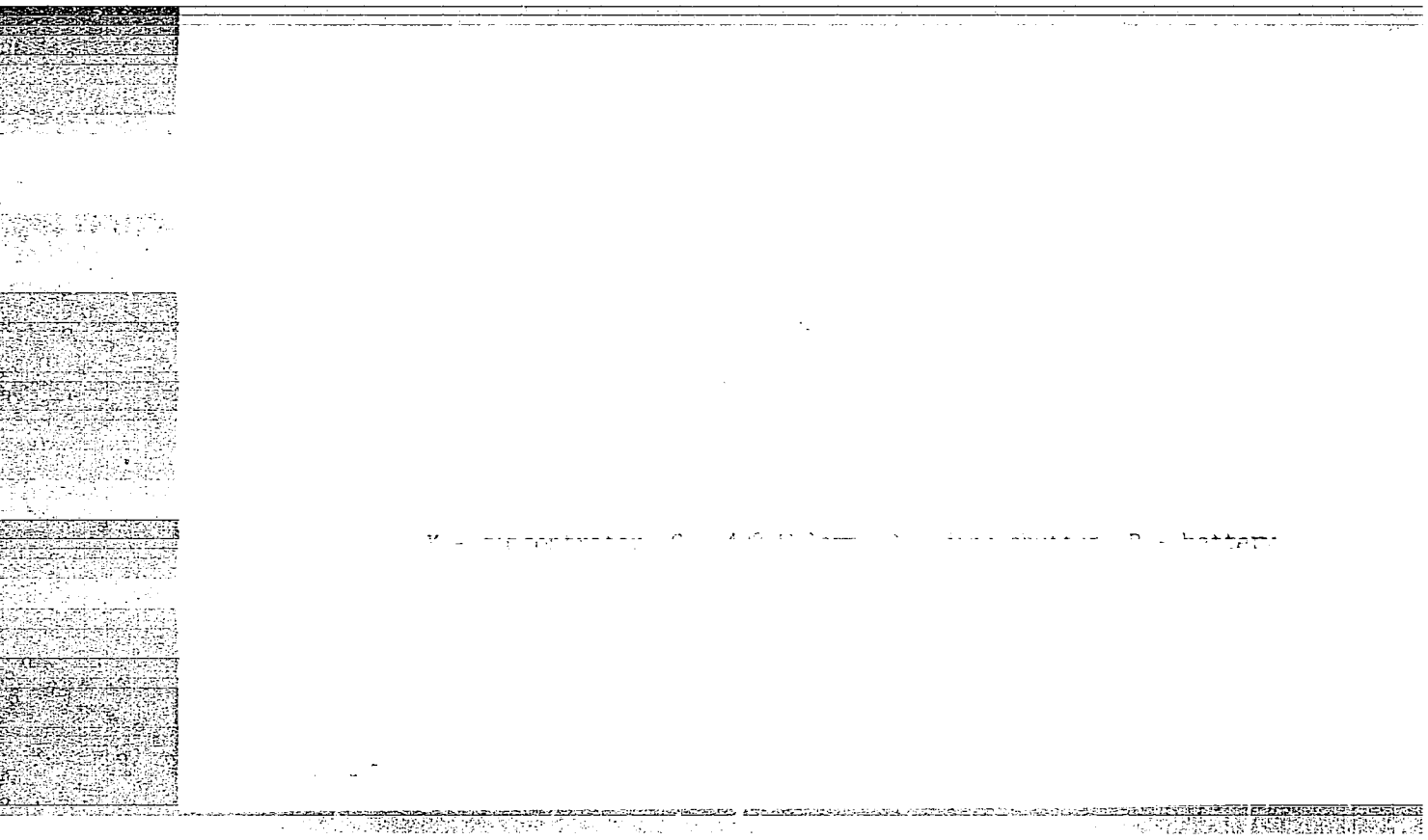
ACCESSION NR: AP4046370

recombination radiation produced

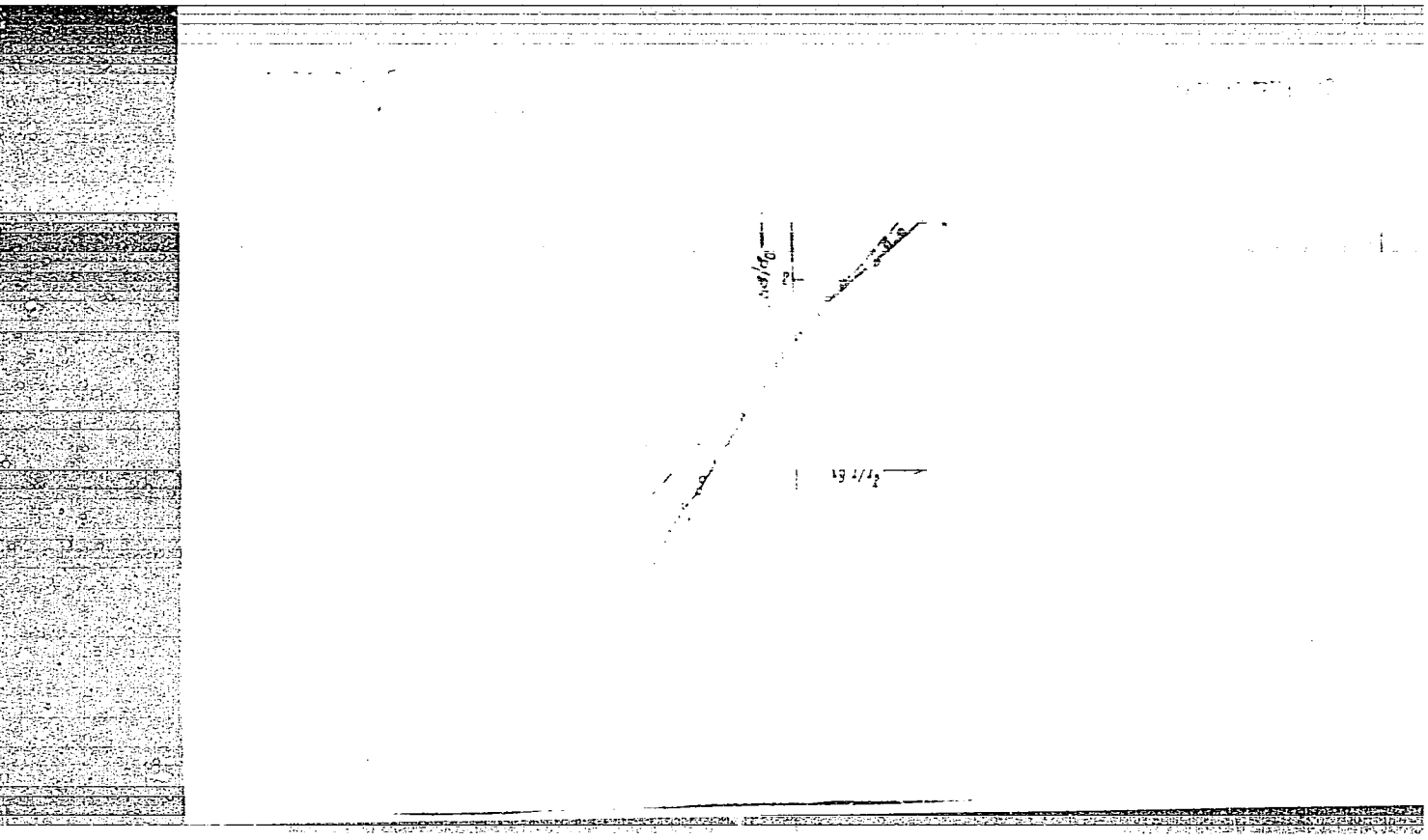
Card 2/5



Card 3/5



APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100320018-6"



[illegible] phase-compensation method of [illegible]
the order of 0.1 nanosecond in p-n junctions

[illegible]

the same equality between the [illegible]

Card 1/2

L 21416-65

[redacted] agreement with the standards within the relaxation time range [redacted]

Card 2/2

ADIROVICH, E.I., akademik; KRUCHINETSKIY, O. Ye.; KURBANOV, O.M.; LUNEZHEV, S.P.

Measuring short lifetimes using the phase-frequency characteristics of the impedance of the pn-junction. Dokl. AN Uz.SSR 21 no. 10:11-14 '64 (MIRA 19:1)

1. Fiziko-tekhnicheskiy institut AN UzSSR. 2. Akademiya nauk UzSSR (for Adirovich). Submitted July 10, 1964.

[illegible]

[illegible]

no. 6, 1964, 63-68

TOPIC TAGS: cadmium telluride, [illegible]

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100320018-6"

ACCESSION NR: AP5003312

ADIROVICH, E.I.; [illegible], U.A.

Theory of the photosensitivity of semiconductors [illegible] by intense illumination. Izv. AN Uz. SSR.Ser.fiz.-mat.nauk 8 no.5:41-52 '64. (MIRA 18:2)

1. Fiziko-tekhnicheskiy institut AN UzSSR.

L 1071-66 EWT(1)/T/EWA(h) IJP(c) AT

ACCESSION NR: AR5014412 UR/0058/65/000/004/E067/E067

SOURCE: Ref. zh. Fizika, Abs. 4E501

AUTHOR: Adirovich, E. I.; Kruchenetskiy, O. Ye.; Kurbanov, O. M.; Lunezhev, S. P.

TITLE: Using frequency-phase characteristics of impedance in the *p-n* junction for measuring short lifetimes

CITED SOURCE: Dokl. AN UzSSR, no. 10, 1964, 11-14

TOPIC TAGS: semiconductor diode, carrier lifetime, semiconductor research

TRANSLATION: A theoretical basis and experimental proof is given for the possibility of using the phase shift between the voltage across a diode and the current through it to measure short lifetimes in semiconductors. In contrast to previously developed methods, this method does not require establishment of limiting operating conditions for the diode (conditions for the current or voltage generator). The method facilitates the measurement of lifetimes less than 10^{-9} sec. An experimental check of the method is made on an electrical analog of a diode. A. Stepanova

SUB CODE: EC ENCL: 00

Card 1/1

L 2995-66

ACC NR: AP5024207 SOURCE CODE: UR/0020/65/164/003/0529/0532

AUTHOR: Adirovich, E. I. (Academician AN UzSSR); Rubinov, V. M.; Yuabov, Yu. M.

ORG: Physicotechnical Institute, Academy of Sciences, UzSSR (Fiziko-tekhnickeskiy institut Akademii nauk UzSSR)

TITLE: Microbattery or photoelement?

SOURCE: AN SSSR. Doklady, v. 164, no. 3, 1965, 529-532

TOPIC TAGS: photovoltage, larger than gap photovoltage, energy gap, space charge, pn junction, thin film

ABSTRACT: It is demonstrated that the larger-than-gap voltages observed in various semiconductors cannot be explained by the presence of a space-charge produced by a nonuniform distribution of trapped minority carriers, as was proposed by Brandhorst and Potter (J. Appl. Phys., 35, 7, 1997, 1964). According to the authors, Brandhorst's and Potter's error consisted in incorrectly applying a formula they had derived to show that the voltage between two points on the semiconductor is directly proportional to the difference in trapped carrier concentration along this line; in fact, what follows from this formula is that the voltage can never be larger than the width of the energy gap and, further, that it is limited by the inequality $V \ll kT/q$. After demonstrating that the larger-than-gap voltages can be explained only by postulating junctions connected like batteries in series, the authors nar-

Card 1/2

L 2995-66

ACC NR: AP5024207 O

rowed the field of further research by obtaining the following data: 1) larger-than-gap voltages cannot result from a surface photoelectric effect, but must be connected with charge distribution inside the film; 2) high voltages arise only if the material is anisotropically deposited, and are not dependent on a film thickness gradient. A more complete theoretical explanation of the phenomenon is being prepared. Orig. art. has: 12 formulas. [ZL]

SUB CODE: SS/ SUBM DATE: 03Apr65/ ORIG REF: 017/ OTH REF: 008/ ATD PRESS: 4124

Card 2/2 hd

L 10897-66 EWT(1) IJP(c) AT

ACC NR: AP6000874 SOURCE CODE: UR/0181/65/007/012/3652/3654

AUTHOR: Adirovich, E. I.; Mirzamakhmudov, T.; Rubinov, V. M.; Yuabov, Yu. M.

ORG: Physicotechnical Institute, AN UzSSR, Tashkent (Fiziko-tekhnicheskiy institut AN UzSSR)

TITLE: Semiconductor films with a narrow energy gap, which generate photovoltages of 5000 v

SOURCE: Fizika tverdogo tela, v. 7, no. 12, 1965, 3652-3654

TOPIC TAGS: photo emf, photoelectric cell, photoelectric effect

ABSTRACT: Anomalous photovoltages reaching nearly 6000 volts at liquid nitrogen temperatures were measured on films made of unidentified semiconductors with a narrow energy gap ($\leq$ 0.5 eV) and with the absorption edge in the infrared range. The experiments showed that in order to increase the useful output of the anomalous photovoltaic effect the films should have low resistivities, particularly at low temperatures, when the highest photovoltages are generated. The volt-ampere characteristics of the investigated materials also showed that at low illumination the anomalous photovoltages increase rapidly with increasing currents. Even at $I = 10^{-6}$ wcm^{-2} photovoltages of the order of 1 volt were measured. It follows from the authors' figures that 1) the described films yield higher photovoltages than any others previously investigated;

Card 1/2

L 10897-66

ACC NR: AP6000874

and 2) that they have a very high negative temperature coefficient and a very low temperature coefficient of the short-circuit current. Orig. art. has: 2 figures and 1 table. [ZL]

SUB CODE: 10/ SUBM DATE: 24Jun65/ ORIG REF: 010/ OTH REF: 002/ ATD PRESS: 4172

HW

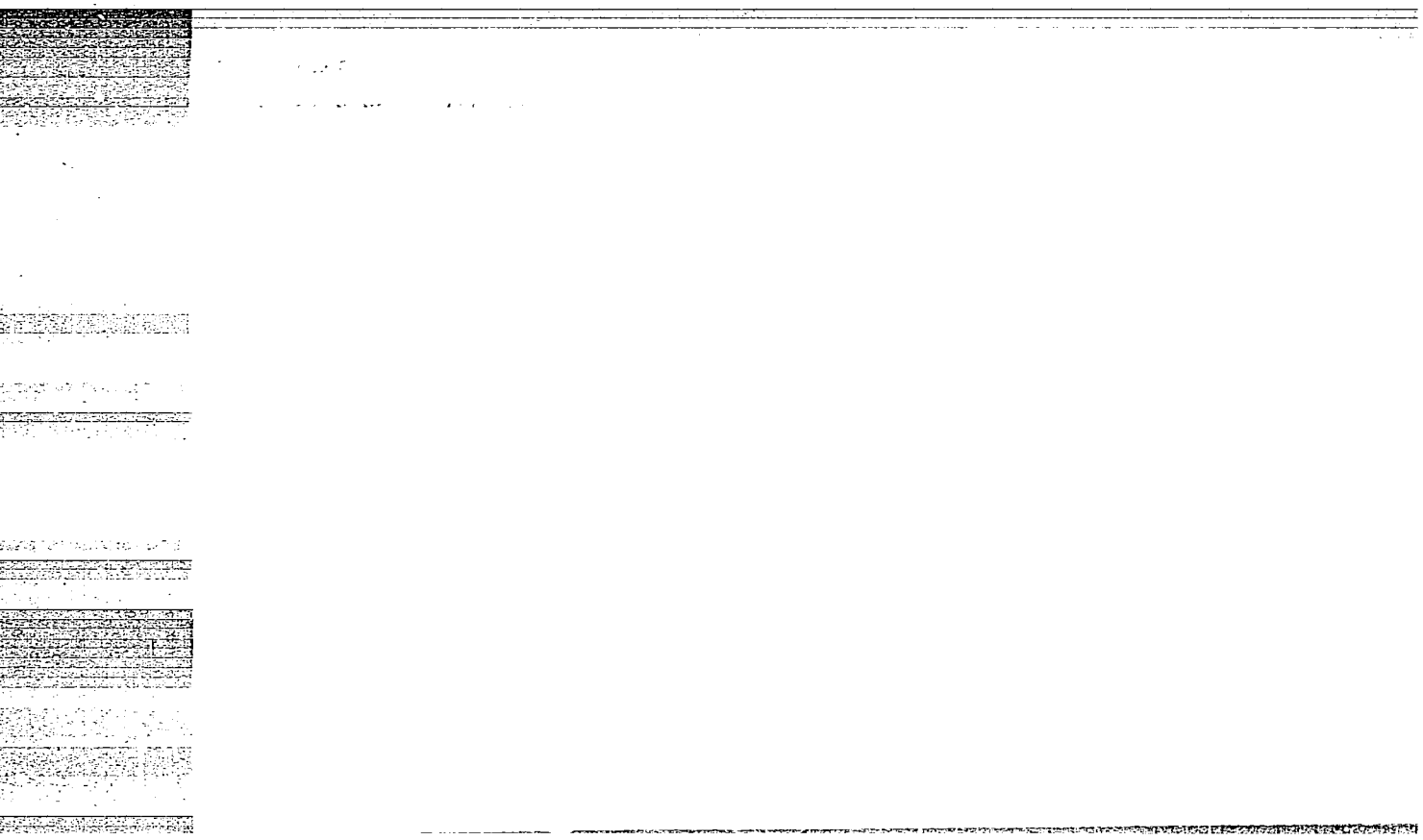
Card 2/2

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100320018-6"

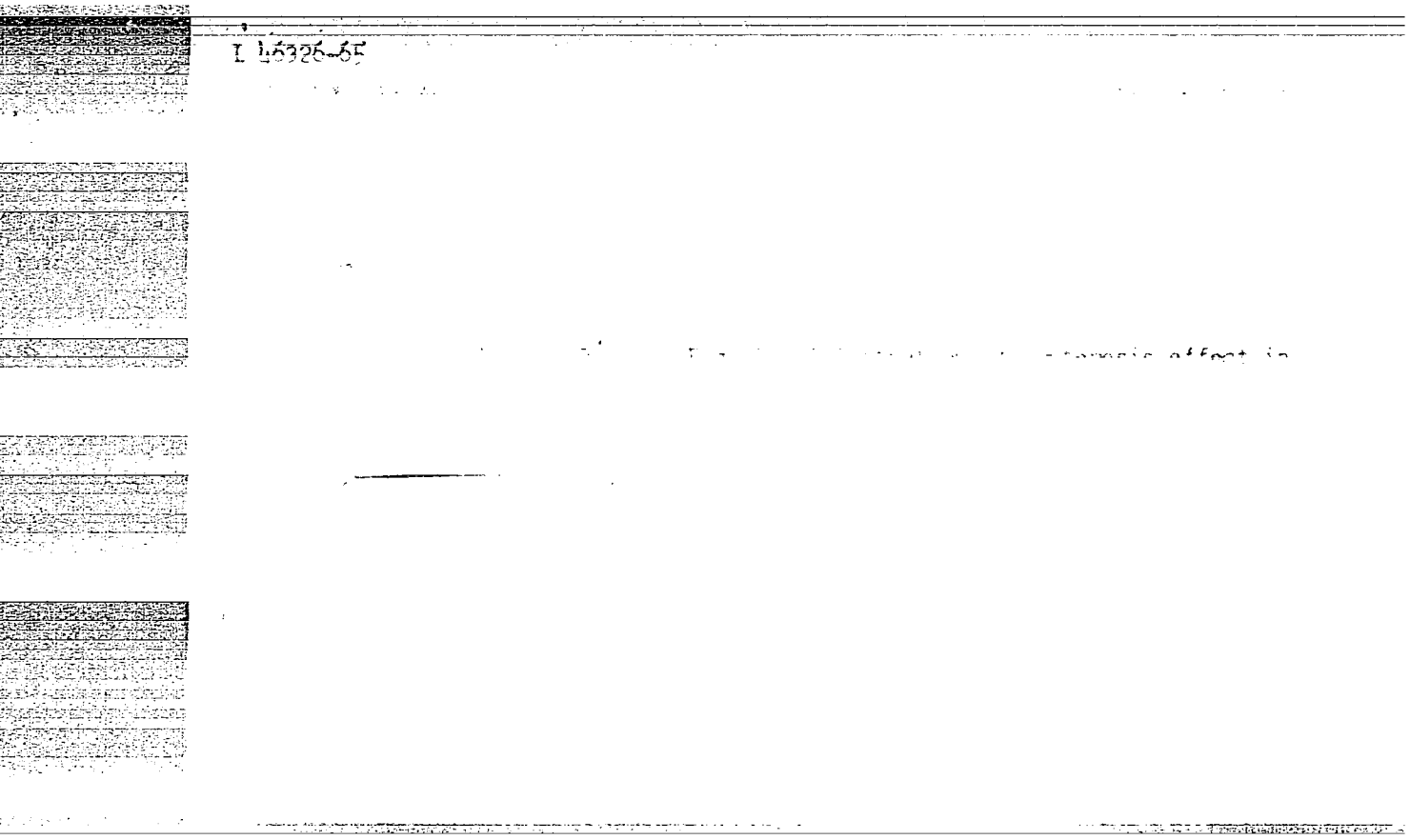
shown in Fig. 1a of the Enclosure. The voltage-current characteristics obtained [illegible] after application of the voltage are shown in Fig.

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100320018-6"

Card 3/3



APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100320018-6"



ADIROVICH, E.I., akademik; RUBINOV, V.M.; YUABOV, Yu.M.

Microphotobatteries or photocells? Dokl. AN SSSR 164 no.3; 529-532 S '65. (MIRA 18:9)

1. Fiziko-tekhnicheskiy institut AN UzSSR. 2. AN UzSSR (for Adirovich).

L 15534-66 EWT(m)/EWP(t)/EWP(b) JD
ACC NR: AP5025855 SOURCE CODE: UR/0020/65/164/004/0771/0774

AUTHOR: Adirovich, E. I. (Academician AN UzSSR); Dubrovskiy, L. A.

ORG: Physics-Engineering Institute, Academy of Sciences SSSR (Fiziko-tekhnicheskiy institut Akademii nauk SSSR)

TITLE: Dielectric electronics and the quadratic law for currents bounded by spatial charg [Paper presented at the All-Union Conference on Thin Films held in Riga in May 1965]

SOURCE: AN SSSR, Doklady, v. 164, no. 4, 1965, 771-774

TOPIC TAGS: dielectric layer, semiconductivity, semiconductor theory

ABSTRACT: The recent rapid development of dielectric electronics prompted various authors to develop a theoretical treatment of currents maintained in a thin dielectric layer between two arbitrary metallic electrodes. N. Mott and R. Gurney (Electronic processes in ionic crystals) derived an expression for a quadratic law for currents bounded by spatial charges of the dielectric. The present paper carries out an analytic estimate of the regions of applicability of the quadratic law. An analysis of the appropriate criteria derived in the paper shows that the quadratic section of the volt-ampere characteristic of emission dielectric currents appears long before the establishment (within the entire dielectric layer)

Card 1/2

L 46712-66 EWT(1) IJP(c) AT

ACC NR: AP6023027 SOURCE CODE: UR/0166/66/000/002/0041/004

AUTHOR: Adirovich, E. I.; Lunezhev, S. P.; Yarullina, F. S.

ORG: Physico-Technical Institute, AN UzSSR (Fiziko-tekhnicheskiy institut AN UzSSR)

TITLE: Phasometric device for the determination of effective cross sections for loc centers in a doped photoconductor

SOURCE: AN UzSSR. Izv. Ser fiz-matem n, no. 2, 1966, 41-46

TOPIC TAGS: photoconductor, infrared quantum generator, relaxation process, phase shift analysis, CURRENT CARRIER, CAPTURE CROSS SECTION

ABSTRACT: An experimental setup for determining the relaxation time τ for the captu of current carriers in a doped photoconductive semiconductor is described. This cha racteristic time can be used to determine the effective capture cross section for cu rent carriers by local doping centers in the semiconductor. The measurement of τ is accomplished by means of phase locked detection of the signal from the sample, the i lumination of which is interrupted by a chopper. The essential purpose of the artic is to describe in detail a method and a practical experimental arrangement for the d termination of τ using a phase locked detection system. Spurious phase shift is eli minated by a calibration in which the infrared source and the semiconductor are repl ed by a lamp and photomultiplier, respectively. An uncalibrated phase shift ampli-

Card 1/2

ACC NR: AP6015607 SOURCE CODE: UR/0020/66/168/002/0310/0313

AUTHOR: Adirovich, E. I. (Academician AN UzSSR); Cordeyev, V. I.

ORG: Physicotechnical Institute, Academy of Sciences UzSSR (Fiziko-tekhnicheskiy institut Akademii nauk UzSSR)

TITLE: Investigation of a regenerative optron with optical feedback

SOURCE: AN SSSR. Doklady, v. 168, no. 2, 1966, 310-313

TOPIC TAGS: light emission, photoresistor, trigger circuit

ABSTRACT: Conditions under which an opto-electronic cell with positive optical feedback provides a bistable volt-ampere characteristic are analytically investigated. An experimental optron was constructed using a GaP-photodiode and a CdS photoresistor. The components were well matched by spectrum and were operated in the vicinity of $\lambda_{max} = 0.6\mu$. Optical coupling between the photodiode and the photoresistor was by direct illumination, without the use of fiber optics. The experimental volt-ampere characteristic of the device had a clearly expressed trigger-type character. Orig. art. has: 4 figures and 14 formulas. [GS]

SUB CODE: 09/ SUBM DATE: 28Jan66/ OTH REF: 006/ ATD PRESS: 4260

Card 1/1 BLG UDC: 539.293:535.215+621.382.001.24

L 00130-67 EWP(e)/EWT(m)/EWP(t)/ETI IJP(c) WW

ACC NR: AP6026707 SOURCE CODE: UR/0181/66/008/008/2467/2469

40
B

AUTHOR: Adirovich, E. I.; Gol'dshteyn, L. M.

ORG: Physicotechnical Institute, AN UzSSR, Tashkent (Fiziko-tekhnicheskiy institut AN UzSSR)

18 27

TITLE: Determination of the forbidden gap width of single-crystal boron by the "intrinsic thermometer" method

SOURCE: Fizika tverdogo tela, v. 8, no. 8, 1966, 2467-2469

TOPIC TAGS: forbidden zone width, boron

ABSTRACT: The "intrinsic thermometer" method, described earlier by the authors (DAN SSSR, 158, 313, 1964) and used for measuring and continuously checking the temperature of a current-carrying silicon wafer serving as the evaporator in the vacuum deposition of silicon films, was applied to the study of single-crystal boron. Measurements over a wide temperature range, up to the melting point of boron (2573°K), were performed by recording the volt-ampere characteristics of crystals heated by the current passing through them. From the values of V and I obtained, the values of ρ were calculated and plotted against the temperature. The resulting function $\rho(V)$ can be used to characterize the temperature of the crystal at a given V, since in the region of intrinsic conductivity the resistivity of the semiconductor is a single-valued function of temperature. The conversion to the absolute temperature scale was made by using the

Card 1/2

ACC NR: AP6021603 SOURCE CODE: UR/0020/66/168/005/1037/1040

AUTHOR: Adirovich, E. I. (Academician AN UzSSR); Rubinov, V. M.; Yuabov, Yu. M.

ORG: Physicotechnical Institute, Academy of Sciences UzSSR (Fiziko-tekhnicheskiy institut Akademii nauk UzSSR)

TITLE: The nature of the effect of anomalously large photovoltages in semiconductor films

SOURCE: AN SSSR. Doklady, v. 168, no. 5, 1966, 1037-1040

TOPIC TAGS: photovoltaic effect, pn junction, physical diffusion, angular dependenc photoconductivity

ABSTRACT: This is a continuation of earlier work by the authors (DAN, v. 164, 529, 1965) and deals with the consequences of two possible hypotheses explaining the nature of the anomalously large photovoltage (apv) effect - that it constitutes either a photovoltaic effect in microscopic p-n junctions, or a photodiffusion (Dember) effect in microscopic regions of like conductivity. The theoretical expressions for the apv-voltage are written out for both cases and all the presently known experimental data are examined from the point of view of reconciliation with the two hypotheses, especially the dependence of the apv-voltage on the light intensity. It is shown that in the case of photovoltaic microelements the linearity of the lux-voltage characteristics should be violated sooner than in the case when the film consists of photodiffusion microelements. It is proposed that a decisive experiment for

Card 1/2 UDC: 539.216.22: 621.315.592: 535.215