FRIDRICH, Josef

A high-frequency germanium mesa transistor. Sdel tech 12
no.5:162-167 My '64.

41765
S/194/62/000/008/033/100
D201/D308

AUTHORS: Hulík, Zdeněk, and Fridrich, Jan

TITLE: Insertion circuit for binary coding devices

PERIODICAL: Referativnyy zhurnal. Avtomatika i radioelektronika, no. 8, 1962, abstract 8-2-184 1 (Czech. pat., cl. 21 a^3 32/20; 21 a^1, 7/01, no. 98854, Mar. 15, 1961).
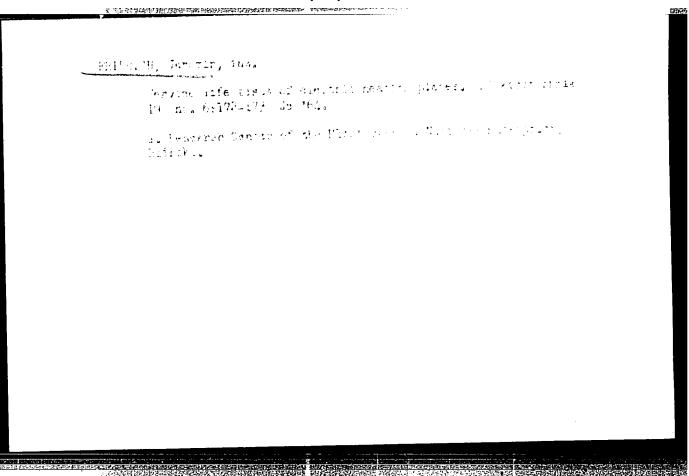
TEXT: A circuit for connecting a binary code encoder device is patented. The device has two systems of input terminals. Each code digit is obtained by the change of potential across a given pair of input terminals, one for each system. The principle of insertion consists in that the number of terminals of the first system is equal to the number of shift digits while the number of terminals of the other system corresponds to the number of basic digits, i.e. of digits no one of which can be transformed into the other by cyclic transposition with any number of places. The description of the device and an example of its application are given. [Abstracter's note: Complete translation.]

Card 1/1

FRIDRICH, Jaromir, inz.

Testing properties of portable electric ovens. Elektrotechnik 18 no.4:100-102 Ap '63.

1. Elektro-Praga Hlinsko, vyzkumne stredisko Praha.

PHILCHIK, Dmitrii, inz.

Serving life span of anodized heating plates, on steel strip
IV no. 6:172-173 Je '64.

1. Research Centre of the Electrical Manufacturing Industry,
Budapest.

z/0039/64/025/006/0320/0327

ACCESSION NR: AP4039419

AUTHOR: Fridrich, J.

TITLE: Effect of drop of impurity concentration in base diffusion layer on mesa transistor parameters

SOURCE: Slaboproudy obzor, v. 25, no. 6, 1964, 320-327

TOPIC TAGS: transistor, mesa transistor, diffused base transistor, semiconductor, solid state physics, solid state circuitry, solid state diffusion, diffusion transistor, junction transistor, diffused p-n junction

ABSTRACT: The article discusses the effects of a drop in the concentration of impurities in the base diffusion layer upon the basic parameters of a mesa transistor. Citing data contained in literature, the author derives the physical relations for cutoff frequency, capacitance, breakdown voltage of the collector junction, base resistance and emitter efficiency. A drop in the impurity concentration creates an electric field which is characterized by the factor m. The transition period of the minority carriers through the base region η depends on the factor m only with low emitter current. The inner electric field fades with high

Card 1/2

ACCESSION NR: AP4039419

emitter currents. In this case, the period B does not depend upon the factor m and is the same for diffusion layer transistors as well as for those with homogeneous bases. The collector capacity and breakdown voltage of the collector junction depend upon the impurity concentration gradient at the junction point. Measurements of transistors with a base diffusion layer showed that, for a voltage of up to 10 volts, the dfffusion is linear whose capacitance drops by the cube root of the collector voltage. The breakdown voltage of the diffusion grows by a power of the diffusion length and is proportional to $8^{0.45}$. These relationships were confirmed experimentally. The maximum of the Q factor is dependent upon the fixed thickness of the base. Original article has: 8 figures and 60 equations.

ASSOCIATION: Vyzkumny ustav pro sdelovaci techniku A. S. Popova, Prague (Research Institute for Communications Engineering)

SUBMITTED: 11Jan64   DATE ACQ: 19Jun64   ENCL: 00

SUB CODE: EC   NO REF SOV: 000   OTHER: 014

Card 2/2

FRIDRICH, Jaromir, inz.

Determination of the wire temperature in electric heating
bodies. Elektrotechnik 19 no.1:12-13 Ja'64.

1. Vyzkumne stredisko n.p. Elektro-Praga, Hlinsko.

FRIDRICH, Rudolf

Czechoslovak experience with anticorrosion protection abroad.
Ropa a uhlie 5 no.6:181 Je '63.

1. Chemoprojekt, Brno.

ACC NR: AP7005008

SOURCE CODE: UR/0054/66/000/003/0141/0143

AUTHOR: L'vov, O. I.; Fridrikh, V. L.

ORG: none

TITLE: On auto-ionization-type transitions involving excitons

SOURCE: Leningrad. Universitet. Vestnik. Seriya fiziki i khimii, no. 3, 1966, 141-143

TOPIC TAGS: exciton, electron transition, inelastic scattering

ABSTRACT: The following expression is derived for the cross section of inelastic scattering of electrons by excitons:

$$\sigma = \frac{2^{13} \pi^3 e^4 n_0 n_{ex} a_0^4 \lambda_0^3}{a^3 (\varkappa T)^2 (a_0^2 + 4\lambda_0^2)^6} \left(\frac{m}{m_{ex}}\right)^{3/2} \cdot \frac{\exp\left[-\frac{\hbar^2 q^2}{2 m_\varkappa T}\right]}{q},$$

where n_0 is the density of lattice points, n_{ex} the exciton concentration, and a_0^{-1} the effective Bohr radius of the s-like function $\phi(0)$. Also, $\lambda_0 = \hbar^{-1}(2mE)^{1/2}$, E being the mean excitation energy of the exciton and q^{-1} the Debye screening radius. The expression

$$W = \frac{2^{17} e^4 n_0 n_{ex} a_0^5 \lambda_0^3 m}{3 a_\varkappa^3 \hbar \varkappa T (a_0^2 + 4\lambda_0^2)^6 m_{ex}}.$$

is obtained for the probability of an ionizing transition in the "collision" of two

UDC: 548.0153

Card   1/2

ACC NR: AP7005008

excitons. The rate constant of auto-ionization of excitons is $\gamma \approx 1.5 \times 10^{-11}$ cm^{-3} sec^{-1}. Authors thank Prof. P. P. Pavinskiy for his interest and attention to this work. Orig. art. has: 6 formulas.

SUB CODE: 20/ SUBM DATE: 27Dec65/ ORIG REF: 003/ OTH REF: 008

Card   2/2

9,730 d

36767
S/141/62/005/001/016/024
E140/E435

AUTHOR: Fridrikh, Z.

TITLE: Quantitative criteria of quantification methods

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy.
             Radiofizika, v.5, no.1, 1962, 155-164

TEXT: The article is concerned with the quantitative
evaluation of quantification (analogue-digital conversion) methods.
For discrete signals, Shannon's measure H frequently termed
the entropy is adequate but for a continuous signal capable of an
infinite number of states the entropy is formally identically
infinite.   The author therefore proposes to apply Kolmogorov's
ε-entropy.   In an infinite ensemble it is necessary to combine
into one group all elements sufficiently close together in
properties.   If the distance at which the elements are combined
into one group is ε,   and S_ε is the minimum number of groups
obtained after this process, then the relative ε-entropy is equal
to

$$H_\varepsilon(D_X, D_T) = \log S_\varepsilon \qquad (2)$$

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Quantitative criteria ...

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The absolute ε-entropy is defined by

$$H_\varepsilon(D_X, D_T)_a = \inf H_\varepsilon(D_X, D_T) \qquad (3)$$

where inf is the lower bound of the relative ε-entropy under all
possible ways of forming the groups of magnitude ε .   The author
goes on to indicate the application of this concept to the
evaluation of the efficiency of quantification methods and to the
efficiency of the digital representation of the signal.   Various
forms of analogue-digital conversion and various forms of digital
representation are examined: quantification by level, with
reading performed each time the signal intersects any of the
quantification levels;   the same, with reading performed only
when a quantification level adjacent to the last one is
intersected;   an incremental method involving an approximating
function due to the author.   It appears that the last is the
most efficient.   In conclusion an appendix explains the calculation
of the relative ε-entropy by a graphical method.
There are 3 figures.
Card 2/3

Quantitative criteria ...

S/141/62/005/001/016/024
E140/E435

ASSOCIATION: Moskovskiy energeticheskiy institut
(Moscow Power Engineering Institute)

SUBMITTED: July 14, 1960 (initially)
July 1, 1961, (after revision)

Card 3/3

FRITRIKH, T.

Theory of discrete readings. Trudy MEI 52:31-46 '65.

Construction of a logical network for discrete transformations.
Ibid.:47-54   (MIRA 18:9)

L-17282-63 ----EWT(1)/BDS/ES(s)-2 --- AFFTC/ASD/ESD-3/LJP(C)/SSD Pt-4
ACCESSION NR: AP3004379   S/0109/63/008/008/1451/1461

64
62

AUTHOR: Serebrov, L. A.; Fridrikhov, S. A.

TITLE: Kinetics of formation and critical potential of positive charge spot on
a dielectric

SOURCE: Radiotekhnika i elektronika, v. 8, no. 8, 1963, 1451-1461

TOPIC TAGS: charge spot, dielectric, critical potential

ABSTRACT:. The process of formation of a positive charge spot on an element of
a dielectric target bombarded by a stationary beam of medium-energy electrons
is considered. The process is subdivided into three stages: (1) full collecting
of secondary electrons by the collector and an almost constant charging current;
the charge-density distribution on the target follows that of the current density
across the beam; (2) accumulation of surface charge and drastic fall of the
charging current; (3) secondary-electron collection is practically halted. During

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ACCESSION NR: AP3004379   2

the reduced collection of secondary electrons, a charge redistribution over the
spot area takes place. The accumulated charge exceeds by approximately 50%
the charge over the full-collection period. This fact permits determining the full
charge of a storage element on the basis of structural data (thickness, permit-
tivity, secondary-emission coefficient of the target, target-grid separation) and
mode of operation (current and size of beam, collector-grid potential). Experi-
mental verification was conducted under the following conditions: beam current,
1.5 microamp; primary-dielectric energy, 1 kev; secondary-emission coefficient;
2; collector-grid potential, 10-100 v; target-grid separation, 200 microns;
square-pulse duration, 100 microsec; target was made from 20-micron mica
single crystals. "We are using this opportunity to thank A. R. Shul'man for his
constant attention and valuable advice, and also A. T. Starovoytov who performed
some measurements." Orig. art. has: 9 figures and 6 formulas.

ASSOCIATION: none
SUBMITTED: 11Jul62   DATE ACQ: 20Aug63   ENCL: 00
SUB CODE: PH   NO REF SOV: 006   OTHER: 002

Card 2/2

FRIDRIKHOV, S. A.

FD-3219

USSR/Physics - Electron Scattering

Card 1/1   Pub. 153-28/28

Authors   : Shulman A. R. and Fridrikhov S. A.

Title   : Inelastic electron scattering in single crystals of NaCl and KCl.

Periodical : Zhur. Tekh. Fiz., 25, No 7, 1344-1345, 1955

Abstract   : The energy distribution of electrons emitted by NaCl and KCl under bombard-
             ment by an electron beam was measured and the results plotted in curves. A
             discrete spectrum of electrons emitted by the crystals under low energy bom-
             barding electrons was revealed. Eight references, including one foreign.

Institution: --

Submitted : March 22, 1955

FRIDRIKHOV, S.A

109-3-4/23

AUTHORS: Shul'man, A.R., Zakirova, I.R., Morozov, Yu.A. and
           Fridrikhov, S.A.

TITLE: The Problem of the Method of Investigation of Secondary
           Electron Emission of Non-metallic Substances (K voprosu
           o metode issledovaniya vtorichnoy elektronnoy emissii
           nemetallicheskikh veshchestv)

PERIODICAL: Radiotekhnika i Elektronika, 1958, Vol. III, No.3,
           pp. 329 - 338 (USSR).

ABSTRACT: Description of a method of the measurement of secondary
            electron emission is given. The method is characterised by
            the following features: reduction in the time necessary for
            the experiments, increased accuracy, good stability of the
            measuring system and the target and elimination of the ternary
            electrons. The main component of the experimental equipment
            used in the measurements is a spherical, glass bulb
            fitted with apertures for a target and an electron gun. Dia-
            meter of the sphere is 145 mm. The electron gun is of the
            standard type and is provided with a focusing electrode; it
            is also furnished with a reflecting diaphragm which eliminates
            the scattered electrons from the beam of the gun. The dia-
            phragm is given a potential near to that of the cathode. The
Card1/4   gun is screened by means of a nickel cylinder. The target is

109-3-4/23

The Problem of the Method of Investigation of Secondary Electron
Emission of Non-metallic Substances

the above mentioned electron gun, the collector and the anti-
dynatron grid and contains the following units: supplies for
the electron gun, a rotary potentiometer, supplies for the
potentiometer, a synchronous motor, a registering instrument,
a delay circuit, a rectangular pulse generator, an amplifier,
a pulse lengthener, an oscillograph with a triggered time base;
an automatic switching device and a synchronous motor driving
the tape of the registering device. The functioning of the
equipment and its applicability to the measurement of the
secondary electron emission was thoroughly investigated. It
was found that the equipment could be used for single-pulse
measurements as well as for the investigation by means of
periodically repeated pulses; in particular, it was possible
to obtain good reproducibility of the secondary emission
coefficient. The effect of the anti-dynatron grid on the
secondary emission current is illustrated by the curves of
Figs. 5, 6, 7 and 8. From these, it is concluded that U_g

should be of the order of 100 V. The stability of the primary
electron current is an important factor in the equipment,
especially when the de-celerating potential U_3 is varied;

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The Problem of the Method of Investigation of Secondary Electron Emission of Non-metallic Substances

It was found that the primary current as a function of U_3 did not vary more than 1 to 2%. Some measurements on the distribution of the secondary electron energies were carried out. The resulting curves are shown in Fig. 12. The Curve 1 of Fig.12 was taken for Ni at $U_3 = - V_p$ (where V_p is the accelerating potential of the primary electrons); this curve is in good agreement with the results obtained by R. Warnecke (Ref.11), which are represented by Curve 2.
There are 12 figures and 12 references, of which 6 are English, 5 Russian and 1 German.

SUBMITTED: February 18, 1957

AVAILABLE: Library of Congress

Card 4/4

AUTHORS: Fridrikhov, S. A., Goryacheva, G. N.   48-22-5-2/22

TITLE: Secondary Electron Emission From Monocrystals of Alkaline-
              Haloid Compounds at Low Energies of the Primary Electrons
              (Vtorichnaya elektronnaya emissiya monokristallov shchelochno-
              galoidnykh soyedineniy pri malykh energiyakh pervichnykh
              elektronov)Data From the VIIIth All-Union Conference on
              Cathode Electronics, Leningrad,October 17-24, 1957 (Materialy
              VIII Vsesoyuznogo soveshchaniya po katodnoy elektronike, Le-
              ningrad, 17-24 oktyabrya 1957 g.)

PERIODICAL: Izvestiya Akademii Nauk SSSR,Seriya Fizicheskaya, 1958,
              Vol. 22, Nr 5, pp. 486 - 493 (USSR)

ABSTRACT: In the publications sufficient data on the interaction of slow
              electrons with the surface of solids are missing. The problem
              is neglected with respect to semiconductors and especially to
              dielectrics. A survey of publications (References 3-6) is
              given. To be able to judge with precision the physical meaning
              of the course of the curve $\sigma = f(E_p)$ in case of low E_p, one

Card 1/4   must have data on the energy spectrum of the secondary electrons.

Secondary Electron Emission From Monocrystals of   48-22-5-2/22
Alkaline-Haloid Compounds at Low Energies of the Primary Electrons

These are absent in publications. The most reliable method of
investigating the secondary electron emission of the dielec-
trics is the method of the single pulses (Reference 7); it
has until now not been used for the last mentioned purpose.
This defiency will be compensated by this work. The device used
for this purpose is described and illustrated (figure 1).
Figure 2 shows the dependences $\sigma = f(E_p)$, which were obtained
for artifically grown monocrystals in the variation range of
from E_p 3,5 —·— 31 eV. The authors come to the following con-
clusions: 1) The mentioned pulse method reduced the phenomena
which are connected with the charge of the surface and with
the changes of the properties of the target in the bombardment
to a minimum. 2) It has been proved that the true secondary
electrons appear in a noticeable quantity in the spectrum if
the energy of the primary electrons of the long wave limit of
the first band corresponds with the proper absorption of the
crystals. 3) From this value of the energy onward the emission
coefficient of the slow electrons δ increases rapidly. The
domain of the steepest increase of δ corresponds with the

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Secondary Electron Emission From Monocrystals of   48-22-5-2/22
Alkaline-Haloid Compounds at Low Energies of the Primary Electrons

domain of the 1st and 2nd maximum of the proper absorption.
4) It has been demonstrated that the fine structure of the
curves $\sigma = f(E_p)$ of the alkaline-haloid monocrystals can be

associated with the periodical field of the crystalline lattice.
5) It was found that a correspondence between the proper
optic and electronic absorption of the alkaline-haloid cry-
stals exists. This once again indicates that the electronic
affinity of such crystals is very low. The theme of this
work was suggested by A. R. Shul'man who advisingly assisted
in the performance as well as in the discussion of the re-
sults. In the discussion of the abstract took part N. D. Mor-
gulis, L. N. Dobretsov and the first author

(Izvestiya Akademii Nauk SSSR Seriya Fizicheskaya, 1958,
Vol. 22, Nr 5, pp. 494 - 495). A discussion on the abstract
of the authors was **held** together with a discussion of the
abstracts by Corodetskiy, D. A. and by Bronshteyn, I. M.
apparently Izvestiya Akademii Nauk SSSR Seriya Fizicheskaya,
1956, Vol. 22, Nr 4). In this took part: K. B. Tolpygo,

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Secondary Electron Emission From Monocrystals of   48-22-5-2/22
Alkaline-Haloid Compounds at Low Energies of the Primary Electrons

L. N. Dobretsov, N. D. Morgulis, I. M. Dykman, A. Ya. Vyatskin
and A. R. Shul'man. There are 8 figures, 1 table and 19 refer-
ences, 9 of which are Soviet.

ASSOCIATION: Leningradskiy politekhnicheskiy institut im. M. I. Kalinina
(Leningrad Polytechnical Institute imeni M. I. Kalinin)

1. Secondary emitters--Properties   2. Secondary emission--Analysis
3. Single crystals--Applications   4. Dielectrics--Properties
5. Alkaline-haloid crystals--Applications

Card 4/4

AUTHORS: Zakirova, I. R., Fridrikhov, S. A.   48-22-5-9/22

TITLE: The Kinetics of the Charge Accumulation by the Surface of
             Dielectrics During Irradiation by an Electron Beam (Kinetika
             nakopleniya zaryada poverkhnost'yu dielektrika pri obluchenii
             elektronnym puchkom) Data From VIIIth All-Union Conference
             on Cathode Electronics, Leningrad, October 17-24, 1957
             (Materialy VIII Vsesoyuznogo soveshchaniya po katodnoy elektro-
             nike, Leningrad, 17-24 oktyabrya 1957 g.)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, 1958,
             Vol. 22, Nr 5, pp. 546 - 555 (USSR)

ABSTRACT: If charged particles strike the surface of a dielectric or
             an insulated metal body, these object become charged. The ve-
             locity of the charge accumulation and the quantity of the charge
                under equilibrium conditions depend on a number of factors
             which are determined by the properties of the surface that is
             to be charged and by the quantity of the impinging and the
             flying off particles. On the one side the charging of the di-
             electric surfaces can be undesired (e.g. in electrovacuum de-
             vices (Reference 1), on the other hand the operation of several
Card 1/4   electrovacuum devices (References 2,3) is based upon the uti-

The Kinetics of the Charge Accumulation by the Surface   43-22-5-9/22
of Dielectrics During Irradiation by an Electron Beam

lisation of the phenomenon of charging. Therefore the interest
in the mechanism of formation and in the behavior of the charge
spot on the surface of the dielectric. A survey of the
publications dealing with the same subject is given. The authors
applied a new pulse method for the investigation of the for-
ming and disappearing kinetics of the charges on the surface
of the dielectrics by a bombardment by electrons. It was found
that from a certain instant (the moment of the disturbance
of the condition of the full decrease of the secondary current)
onward the velocity of the charge accumulation on the surface
of the dielectric decreases. For this the influence of the
fields is responsible, which are caused by the formation of the
charge spot itself. This leads to the fact that in general case
the surface of the dielectric obtains the quantity of electri-
city which would be sufficient for the charging of the target
surface unto the collector potential neither during the occuring
of the quasisteady state t_{qs} nor even less within the period τ.

Card 2/4   The latter cannot be reached at all because of an extremely slow
charge accumulation after the reaching of the quasisteady state

The Kinetics of the Charge Accumulation by the Surface   48-22-5-9/22
of Dielectrics During Irradiation by an Electron Beam

and because of a noticeable role which the leakages can play
in this case. It was proved that the duration τ during which
the conditions of a full decrease of the secondary current
are maintained linearly increases with the intensity of the
collector field. Thus the quantity of electricity which was
accumulated by the surface of the dielectric (at the movements
τ and t_{qs}) depends at the concerned collector potential on the
geometrics of the device. The so called barrier-net also serves
for the increase of the period τ, i.e. for the deepening of the
potential relief and for the acceleration of the process of
charging unto the prescribed potential during the bombardment
of the dielectric by means of an electron beam. The quantities
τ and t_{qs} are independent of the energies of the bombarding
electrons. Under given concrete conditions they are determined
by the quantity of the accumulated charge. This plot was suggest-
ed by A. R. Shul'man who assisted as an advisor. In the perfor-
mance of the work V. V. Bashenko and T.A. Koryakina took part
(measurements). In the discussion on the abstract V. Ya. Upatov,
A. V. Morozov, L. N. Dobretsov, A. A. Mostovskiy and the first

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The Kinetics of the Charge Accumulation by the Surface   48-22-5-9/22
of Dielectrics During Irradiation by an Electron Beam

        author participated. There are 12 figures and 9 references,
        7 of which are Soviet.

ASSOCIATION: Leningradskiy politekhnicheskiy institut im. M. I. Kalinina
        (Leningrad Polytechnical Institute imeni M. I. Kalinin)

        1. Dielectrics--Electrical properties 2. Dielectrics--Surface pro-
        perties 3. Electron beams--Applications

Card 4/4

FRIDRIKHOV, S A.

AUTHORS: Shul'man, A. R., Zakirova, I. R., Morozov,   57-1-13/30
                 Yu. A., Fridrikhov, S. A.

TITLE: Secondary Electron Emission of Nickel (Vtorichnaya
                 elektronnaya emissiya nikelya)

PERIODICAL: Zhurnal Tekhnicheskoy Fiziki, 1958, Vol. 28, Nr 1,
                 pp. 87-96 (USSR)

ABSTRACT: The task of the present work was to close the gaps existing
                 in literature regarding the energy spectra of secondary
                 electrons emitted by metals, as well as to obtain data on the
                 distribution of secondary electrons according to energies in
                 nickel. That is to say of all those which are emitted within
                 the whole range of secondary electron energy at various V_p
                 (energy of primary electrons) of from 2oo to 2ooo V with
                 nickel. Starting from the data on the distribution of
                 secondary electrons according to energies the problem of the
                 importance of the quantities obtained at the investigation
                 of the basic dependence (which characterizes the secondary
                 emission characteristics of the material - of the dependence
                 of the coefficients of the electron emission on V_p) is dealt
Card 1/5   with. The method of spherical condenser with a spheric

Secondary Electron Emission of Nickel   57-1-13/3o

suppressor grid was used. The method of the automatic
recording of measuring results, as described in reference
2, was also used. As result of the investigation the
following can be stated: 1) Tertiary electrons emitted from
the collector exercize an essential influence on the
measuring results of secondary current in the retarding
field. The introduction of the suppressor grid offers the
possibility to essentially decrease the influence of tertiary
electrons and thereby to obtain much more reliable data than
was earlier the case. The distribution of the secondary
electrons according to the energies of from 0 to V_p was
investigated. Complete lag curves for nickel were obtained
at V_p of from 2oo to 2ooo V. 2) In the spectrum of the
secondary electrons it is not possible to draw a limiting
line between the reflected primary and the real secondary
electrons. Apparently both kinds of electrons are represented
in all parts of the spectrum. With small energies of
secondary electrons assumption that real secondary electrons
are of dominating importance is reasoned. For the analysis
of the energy spectrum of electrons (of nickel) an assumed

Card 2/5   border between slow and quick secondary electrons, equal to

Secondary Electron Emission of Nickel

57-1-13/30

loo eV, is chosen. 3) The basic fact resulting from the measurements is that in the spectrum of secondary electrons of metals the relative number of quick electrons can be compared with that of slow electrons. The width of the maximum corresponding to the slow real secondary electrons is a little greater than was earlier assumed. In order to mark the number of quick secondary electrons magnitudes are introduced as follows: γ - the part of quick electrons in secondary current and η - the ratio between the number of quick electrons and the quantity of the primary current. γ increases linearly with the increase of V_p and reaches up to 26% of the total number of secondary electrons at 1600. η is only little dependent on V_p and is equal to 33% of the primary current value at 1600. 4) The retardation curves in relative coordinates coincide with one-another only if V_p is greater than 1200 V. If V_p values are smaller the curves differ. 5) With all values applied for V_p an elastic reflexion of primary electrons takes place. The reflection coefficient at $V_p > 800$ V is not greater than 3% of the total number of primary electrons. 6) When primary current is measured in the circuit of the target in the case of not complete

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Secondary Electron Emission of Nickel   57-1-13/3o

blanking of secondary electrons for the coefficient of secondary emission σ_T a value was obtained which differs from that of total retardation of secondary electrons. 7) In order to mark the emission of slow electrons the magnitudes σ_T and ϑ can be used (coefficient of the emission of slow electrons). As the existing theories only take into account the stimulation of secondary electrons by primary electrons and as inelastic reflection of primary electrons and the formation of slow secondary electrons with the motion of quick secondary and of inelastically reflected primary electrons are not taken into account, the comparison between theoretical and experimental data can not be carried out with sufficient exactness. There are 12 figures and 8 references, 2 of which are Slavic.

ASSOCIATION: Leningrad Polytechnical Institute   imeni M. I. Kalinin
(Leningradskiy politekhnicheskiy institut imeni M. I. Kalinina)

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Secondary Electron Emission of Nickel   57-1-13/3o

SUBMITTED: March 5, 1957

AVAILABLE: Library of Congress

Card 5/5

BAZHANOVA, N.P. [translator]; FRIDRIKHOV, S.A. [translator]; KAPITSA,
     M.L.[translator]; LEPESHINSKAYA, V.N. [translator]; SHUL'MAN,
     A.R., red.; POPOV, R.Yu., red.; KLIMENKO, S.V., tekhn.red.

[Characteristic energy losses of electrons in solids; collection
of articles] Kharakteristicheskie poteri energii elektronov
v tverdykh telakh; sbornik statei. Moskva, Izd-vo inostr.lit-ry,
1959. 270 p.   (MIRA 12:7)

1. Sotrudniki kafedry elektroniki Leningradskogo politekhnicheskogo
instituta (for Bazhanova, Fridrikhov, Kapitsa, Lepeshinskaya).
                    (Electrons)

67312

9 (3), 24 (3)

AUTHORS: Fridrikhov, S. A., Shul'man, A. R.   SOV/181-1-8-17/32

TITLE: Investigation of Secondary Electron Emission of Some
Dielectrics With Low Primary Electron Energies

PERIODICAL: Fizika tverdogo tela, 1959, Vol 1 , Nr 8, pp 1259 - 1267 (USSR)

ABSTRACT: The present paper gives part of the results of the experiments
carried out in the authors' laboratory on secondary electron
emission of some dielectrics and semiconductors (mica, glass,
alundum, fluorite, willemite, stibnite, etc) for low primary
electron energies. Measurements were made by the pulse method,
and an accuracy of 3 to 5% was attained when periodic pulses
were used. The $\sigma = f(V_p)$ curve (V_p denoting primary electron
energy) has a clearly marked minimum with $v_p = 60$ to 70 v. The
first critical potentials of the substances investigated are
summarized in a table. With low primary electron energies the
$\sigma(V_p)$ function depends on elastic and inelastic reflection of
the primary electrons and on the emission of the true secondary
electrons. From some definite V_p values in the range of low

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Investigation of Secondary Electron Emission of Some   SOV/181-1,-8-17/32
Dielectrics With Low Primary Electron Energies

energies onwards the slowing-down curves have a slope which
corresponds to a group of slow, obviously true secondary elec-
trons. In metals elastically reflected electrons play the main
part. If the electron energies are lower than V_p, then the
electrons of the base zone cannot be excited. Therefore, these
secondary electrons seem to be inelastically reflected primary
electrons with an energy $< V_p$. The high values of the reflec-
tion coefficient R and of σ cannot be explained only by reflec-
tion of the primary electrons from the potential barrier on the
surface of the substance. Electron – phonon collisions play the
main part in slow primary electron reflection in the range of
small V_p. This also explains the high R and σ values and the
existence of electrons with energies $< V_p$ in the electron spec-
trum. The $\delta = \delta(V_p)$ curves and, thus, also the $\sigma = f(V_p)$ curves
for the various substances differ considerably from one another
in the V_p range investigated. δ is determined essentially by

Card 2/4   the primary electrons which are inelastically scattered by

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phonons only at very low V_p. With a certain quantity V_p which is characteristic of every substance interactions between primary electrons and the electrons of the substance begin to play the main role. Some conclusions: The first critical potentials V_p^I do not depend on temperature. The coefficient R of elastic electron reflection is relatively great (0.6 to 0.7) in the range of very small V_p (2 to 3 v) for all dielectrics investigated, which is probably caused by quasielastic scattering of primary electrons from phonons. The $R = R(V_p)$ curves differ only slightly from one another in the substances investigated. In this V_p range the σ values are relatively great and do not differ much for the various substances. With increasing V_p, however, secondary electron emission begins to differ considerably for various substances. The σ values for

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Dielectrics With Low Primary Electron Energies

average V_p are not unambiguously determined by the σ values
with small V_p. There are 9 figures, 1 table, and 9 references,
5 of which are Soviet.

ASSOCIATION: Leningradskiy politekhnicheskiy institut im. M. I. Kalinina
      (Leningrad Polytechnic Institute imeni M. I. Kalinin)

SUBMITTED: August 5, 1958

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9. 3120
~~9 (3)~~

AUTHORS: Fridrikhov, S. A., Shul'man, A. R.   67313
                                               SOV/181- 1 -8-18/32

TITLE: Investigation of Secondary Electron Emission of Alkali Halide
             Single Crystals With Low Primary Electron Energies

PERIODICAL: Fizika tverdogo tela, 1959, Vol 1, Nr 8, pp 1268 - 1271 (USSR)

ABSTRACT: The authors report on part of the work carried out in their
             laboratory concerning secondary electron emission of dielec-
             trics with low energies of the bombarding electrons. Measure-
             ments were carried out by pulse methods. The measuring device
             has been described already in an earlier paper. The beam of
             primary electrons came in perpendicularly to the plane (100).
             During the measurements pressure was 2.10^{-7} torr. The results
             of measurements made with various single crystals are illustrat-
             ed in a diagram by curves $\sigma = f(V_p)$. σ denotes the secondary
             electron emission, V_p the counter potential applied to the
             collector. In the case of small V_p σ actually does not in-
             crease monotonely, for the real function $\sigma(V_p)$ has several

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Investigation of Secondary Electron Emission of Alkali   SOV/181-1-8-18/32
Halide Single Crystals With Low Primary Electron Energies

50, 90, 140, 190, and 230 to 240 v. This "fine structure" is
easily reproducible. Each of the alkali halide salts investi-
gated (LiF, NaF, NaCl, KCl, KBr, KJ) has a proper "fine struc-
ture" of the curves. σ increases with decreasing width of the
forbidden zone ΔE_f of the crystals. With $V_p = 240$ v, σ de-
creases about linearly with increasing forbidden zone width.
The lower the ratio $\Delta E_f/\chi$ (where χ denotes electron affinity),
the greater is σ. If V_p is of an order of several hundred v,
then secondary electron emission usually is low in the case of
substances with small forbidden zone width; for on their way
to the surface, secondary electrons may lose much of their
energy when interacting with the electrons of the ground band.
In the single crystals of the alkali halide compounds investi-
gated conditions for secondary electron emission are very
favorable. In the experiments described all the conditions for
the occurrence of secondary electrons are important: The ob-
served σ values are determined by the energy which must be
consumed for the transfer of the lattice electron from the

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forbidden zone into the vacuum. The relation observed between
the variation of σ and the variation of ΔE_f probably applies
only up to such V_p at which the influence of secondary elec-
tron emission from the depth must no longer be neglected. Thus,
the dependence of σ on the forbidden zone width is considerably
more complicated than was assumed before and can hardly be re-
presented in a general form. The periodic "fine structure" of
the curves $\sigma = f(V_p)$ and of their ascending branch requires
further investigations. This type of "fine structure" is ob-
served with $V_p > 40-50$ v. The curves $\sigma = f(V_p)$ may have two
types of fine structure: 1) a fine structure connected with the
band structure and 2) a periodic "fine structure" which has to
be explained by further data. There are 3 figures and 11 ref-
erences, 6 of which are Soviet.

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Investigation of Secondary Electron Emission of Alkali   SOV/181-1-8-18/32
Halide Single Crystals With Low Primary Electron Energies

ASSOCIATION: Leningradskiy politekhnicheskiy Institut im. M. I. Kalinina
(Leningrad Polytechnic Institute imeni M. I. Kalinin)

SUBMITTED: August 5, 1958

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S/194/61/000/012/065/097
D201/D303

AUTHORS: Serebrov, L. A., Fridrikhov, S. A. and Utkin, K. G.

TITLE: The character of the electric field in electron sto-
              rage tubes with cylindrical and oval collectors

PERIODICAL: Referativnyy zhurnal, Avtomatika i radioelektronika,
              no. 12, 1961, 38-39, abstract 12G243 (Nauchno-tekhn.
              inform. byul. Leningr. politekhn. in-ta, 1960, no. 9,
              108-113)

TEXT: The electrolytic tank simulator method was used to determine
the magnitude and distribution of the electric field intensity in
the dielectric target - correcting ring - collector space. The el-
ectrodes, made to a scale of 1:3, corresponded in dimensions to ty-
pical storage cathode ray tubes. Changing over from the cylindrical
to the oval shape of the collector does not influence the field
configuration to a great extent. In the absence of the correcting
ring the target diameter is substantially uneven, the coefficient
of inhomogeneity in the vicinity of e.g. 10% equipotential line

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The character of ...   S/194/61/000/012/065/097
                                         D201/D303

reaching the value of the order of 4. Introduction of the ring at
the collector in the form of a conducting coating at the tube walls,
makes it possible to straighten the field in the region of the 10%
equipotential line only. At greater distances from the target the
field remains substantially distorted. Straightening the field by
increasing the collector-to-target distance is accompanied by a
considerable weakening of the field intensity and is not, there-
fore, recommended. The experimentally obtained field maps for va-
rious shapes of electrodes are given. 3 references. /¯Abstractor's
note: Complete translation._7

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16

AUTHORS: Vasil'yev, G.F., Politova, V.M., Shabel'nikova, A.E., Pervova, L.Ya. and Yasnopol'skaya, A.A.

TITLE: Interdepartmental Seminar on Cathode Electronics (The 11th Meeting) (Mezhduvedomstvennyy seminar po katodnoy elektronike) (11-e zasedaniye)

PERIODICAL: Radiotekhnika i elektronika, 1959, Vol 4, Nr 4, PP 731 - 732 (USSR)

ABSTRACT: A meeting of the seminar took place on December 1, 1958 at the Institut radiotekhniki i elektroniki AN SSSR (Institute of Radio-engineering and Electronics of the Ac.Sc.USSR). During the meeting 8 papers were read. Yu.G. Ptushinskiy read a paper entitled: "Kinetics of the Adsorption of Oxygen on the Surface of Tungsten". The second paper, by I.M. Dykman and S.M. Pekar, dealt with "The Admixture Photo-effect of Semiconductors in the Region of the Exciton Light Absorption". The paper by T.L. Matskevich was devoted to "The Problem of the Secondary Electron Emission of Fine Films of a Number of Organic Substances". The problem of "Surface Ionisation in a Strong Electric Field on a Surface with a Non-homogeneous Work Function" was considered by E.Ya. Zandberg and N.I. Ionov. I.N. Bakulina and N.I. Ionov read a paper entitled "Determination of the Electron Attachment Energy and of the Potentials of Atoms by the Method of Surface Ionisation". N.L. Yasnopol'skiy and A.P. Alekseyev dealt with the problem of "Passage of Steady-state Currents Through a Dielectric When the Current Carriers Are Introduced Through One of the Contacts by Means of Electron Bombardment". The lecture by D.A. Ganichev and K.G. Utkin discussed the following - "The Possibility of the Analysis of the Total-energy Distribution of Electrons in a Quasi-spherical Condenser". The work by M.L. Kapitsa, S.A. Fridrikhov and A.R.Shul'man dealt with 'An Investigation of the secondary electron emission and the characteristic energy losses of a number of dielectrics (glass, mica, fluorite and alkali-haloid monocrystals).

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UDC: DC-60997

S/181/60/002/01/32/035
B008/B014

AUTHOR: Fridrikhov, S. A.

TITLE: Secondary Electron Emission and Elastic Reflection of
Slow Electrons From an NaCl Single Crystal

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 1, pp. 171-173

TEXT: In the article under review, the author reports on a study of
secondary electron emission by NaCl at low primary electron energy E_p.
The results were obtained for a wide range of E_p-values by means of
automatic recording of curves and in a higher vacuum than that described
in Ref. 1. The author used spherical devices with a mobile target.
Measurements were made by means of the pulse method and the automatic
machine described in Ref. 2. The $\delta = f(E_p)$ curves and delay curves of
the secondary current were recorded by means of an ЭПП-0.9 (EPP-0.9)
potentiometer. Fig. 1 shows the $\sigma = f(E_p)$ curve for NaCl single crystal
for E_p-values between 0 and 25 ev. By means of the delay curves of the

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Secondary Electron Emission and Elastic Reflec-   S/181/60/002/01/32/035
tion of Slow Electrons From an NaCl Single   B008/B014
Crystal

secondary current it was possible to split up $\delta = f(E_p)$ into two
components: $R = f_1(E_p)$ and $\delta = f_2(E_p)$. R - coefficient of elastic
electron reflection, δ - emission coefficient of slow (not elastically
reflected and truly secondary) electrons. Fig. 1 shows $R(E_p)$ and $\delta(E_p)$.
The $\delta = f(E_p)$ curve for the range $0 \div 50$ ev is represented in Fig. 2.
It shows a distinctly marked fine structure for NaCl crystal, which is
identical with the one found in Ref. 1. The assumption that the
threshold of the truly secondary electron emission of the NaCl single
crystal has the nature of an exciton was also confirmed. The author
thanks Professor A. R. Shul'man for his helpful advice, and the student
V. P. Belevskiy for his assistance in this investigation. There are
2 figures and 4 references, 3 of which are Soviet.

V/B

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Secondary Electron Emission and Elastic Reflec-
tion of Slow Electrons From an NaCl Single
Crystal

S/181/60/002/01/32/035
B008/B014

ASSOCIATION: Leningradskiy politekhnicheskiy institut
(Leningrad Polytechnic Institute)

SUBMITTED: July 29, 1959

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V/B

81365

S/181/60/002/03/23/028
B006/B017

$\mathscr{2}$ $\mathscr{4}.77\mathscr{00}$

AUTHORS: Kapitsa, M. L., Fridrikhov, S. A., Shul'man, A. R.

TITLE: Characteristic Energy Losses in the Reflection of Electrons
From Single Crystals of Alkali Halide Compounds

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 3, pp. 517-523

TEXT: In a previous paper (Ref. 5) the two last-mentioned authors had
already investigated inelastic electron reflection from alkali halide
crystals, and they had found that the energy spectrum of secondary
electrons (which are emitted by alkali halide single crystals) showed
fine structure (Fig. 1 shows such a spectrum recorded on NaCl with a
primary electron energy of $V_p = 30$ ev). Such curves were also recorded
on KCl, KBr, KI, and LiF. It was the aim of the present paper to conduct
analogous investigations with higher accuracy and with small V_p in order
to find the lower boundary of primary electron energy at which peaks of
the characteristic losses can still be perceived in the secondary electron
spectrum; furthermore, an attempt was made to separate the two possible

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Characteristic Energy Losses in the
Reflection of Electrons From Single Crystals
of Alkali Halide Compounds

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systems of maxima (the so-called right system of primary electrons and
the left system of secondary electrons; the position of the maxima of
the latter is independent of V_p). The measuring technique is described
in detail. The spectrum was measured automatically at a target temperature
of 300 - 350°C, a primary current density of $10^{-7} a/cm^2$, and a pressure of
~$2 \cdot 10^{-7}$ torr; V_p was between 0.5 and 50 ev. Fig. 3 shows the spectra of the
electrons reflected from NaCl single crystals at $V_p = 30$, 32, and 34 ev.
The two systems of maxima can be clearly seen. Fig. 4 shows spectra of
electrons reflected from NaCl at $V_p = 5$, 7, 9, 11, and 13 ev, and Fig. 5
depicts the spectrum at $V_p = 21.5$ ev. Important loss peaks occurred only
at $V_p > 7$ ev. The peaks correspond to energy losses of about 1 - 1.2,
1.7 - 2, 2.6 - 2.8, 3.8 - 4.3, 5 - 5.4, 6 - 6.7, 7.5 - 8.1, 9 - 9.6, and
11 ev. The probability of higher energy losses rises with increasing V_p.
The fine structure proved to be characteristic of the substance investi-
gated. In conclusion, the results are discussed. Although the right system
of maxima can be clearly attributed to the characteristic energy losses
of electrons, the nature of the left system, however, needs further

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Reflection of Electrons From Single Crystals
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investigations. A relationship could be observed between the energy
losses below 12 ev and optical data (cf. Table). Furthermore, it was
established that the least primary electron energy at which character-
istic energy losses still occurred (7 ev) was smaller than the width of
the forbidden zone. There are 5 figures, 1 table, and 14 references:
4 Soviet, 6 US, 2 Japanese, 1 British, and 1 German.

ASSOCIATION: Leningradskiy politekhnicheskiy institut (Leningrad
Polytechnic Institute)

SUBMITTED: June 6, 1959

Card 3/3

SEREBROV, L.A.; FRIDRIKHOV, S.A.

Appearance of a charge spot on the surface of a dielectric target
bombarded by an electron beam. Radiotekh. i elektron. 5 no.10:
1680-1686 O '60.   (MIRA 13:10)
                    (Electron beams)   (Dielectrics)

FRIDRIKHOV, S. A., Cand Phys-Math Sci -- "Study of the interaction between low-energy electrons and dielectrics." Len, 1961 (Acad Sci USSR. Phys Tech Inst im A. F. Ioffe). (KL, 4-61, 185)

Secondary electron emission...

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B102/B104

the secondary electron energy distribution begins to display a maximum
due to true secondary emission, and at which δ begins to rise rapidly.
Measurements were made in pulsed operation at $t < 300^\circ C$ (BaO) and $t < 500^\circ C$
(Y_2O_3) with single pulses, and at $t > \sim 300^\circ C$ (BaO) and $t > \sim 500^\circ C$ (Y_2O_3)

with periodic pulses. BaO and Y_2O_3 were deposited on a nickel and a

tungsten backing, respectively, both ranging between 50 and 100μ. High-
purity conditions were maintained throughout the work. Once the targets were
completed, they were subjected to heat treatment for several hours. The
measuring chamber was evacuated for 3 - 4 days with diffusion pumps until

the residual gas pressure dropped to $3 - 5 \cdot 10^{-9}$ mm Hg. The σ (E_p) curves

of BaO layers displayed a low maximum at $E_p = 3$ ev, a minimum at 5 ev,

and, subsequently, a steep but not monotonic rise to 50 ev. The work
function was found to be (1.6 ± 0.1) ev. δ (E_p) and R(E_p) were determined

from the delay curves of the secondary current. As may be seen, the slow-
electron spectrum begins at $E_p = 5 - 6$ ev. σ, R, and δ as functions of

E_p (Fig. 4) practically displayed no temperature dependence between 20 and

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$350^{\circ}C$. Similar results were obtained for Y_2O_3 layers. Regarding these, $\sigma(E_p)$ was recorded for E_p being between 1 and 90 ev. The maximum was found at ~4 ev, and the minimum at ~7.5 ev, whereupon a nonuniform rise took place again. The work function was (3 ± 0.1) ev. σ did not change between 20 and $1000^{\circ}C$. Here, E_p^* is 6.5 ev. For Y_2O_3, Fig. 8 shows σ, R, and δ as functions of E_p. In a detailed discussion, results are compared with those obtained for other dielectrics, and, above all, a qualitative agreement is found. A study of the energy spectra of elastically and in-elastically reflected electrons yielded relatively high values $(R_{max} \approx 0.5)$ for the reflection factors, compared with those relative to metals. They cannot be explained by the sole assumption of a quantum-mechanical reflec-tion of primary electrons from the potential barrier of the vacuum-di-electric interface. It is necessary also to assume electron scattering within the lattice (e.g., also by phonons). The singularities shown by the curves (e.g., $\sigma(E_p)$ for BaO at $E_p \approx 10$, 15, 20, and 35 ev, for Y_2O_3 at ~15, 25, and 35 ev; the singularities of curves $R(E_p)$ and $\delta(E_p)$ may

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Secondary electron emission...

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be seen in the figures) are associated with the energetic structure of the substances. Professor A. R. Shul'man, whose laboratory was used for the investigation, is thanked for advice and discussions. D. A. Gorodetskiy is mentioned. There are 8 figures, 1 table, and 28 references: 10 Soviet and 18 non-Soviet. The three most recent references to English-language publications read as follows: E. Taft et al. Phys. Rev. $\underline{113}$, 156, 1959; A. Lempicki. Proc. Phys. Soc. $\underline{B66}$, 278, 1953; D. Wright, J. Woods. Proc. Phys. Soc. $\underline{66}$, 1073, 1953.

ASSOCIATION: Leningradskiy politekhnicheskiy institut imeni M. I. Kalinina
              (Leningrad Polytechnic Institute imeni M. I. Kalinin)

SUBMITTED: March 27, 1961

Card 4/5

9, 3120 (1138)

AUTHORS: Bazhanova, N. P., and Fridrikhov, S. A.

TITLE: A method of investigating secondary electron emission of dielectrics at low primary electron energies

PERIODICAL: Fizika tverdogo tela, v. 3, no. 9, 1961, 2620 - 2628

TEXT: The investigation of the interaction of slow electrons with the surface of solids is of considerable scientific and practical interest, but is met with considerable experimental difficulty. In order to avoid them, the authors developed a method for the automatic recording of the characteristics of secondary electron emission (s. e. e.) at low primary energies, E_p, (1 - 100 ev.). The determination of the E_p-dependence of the s. e. e. coefficient σ is based on the measurement of target potential $V_{H.}$, contact potential difference $V_{k.p.n.}$ and current in the target circuit $i_{H.} = i_1 - i_2$ for $\sigma < 1$ (or $i_{H.} = i_2 - i_1$ for $\sigma > 1$) at constant accelerating voltage V_p^o and constant primary current strength. i_1 is the

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primary current, i_2 the secondary current. The following equation is derived: $i_\mu = f(V_p^0 \pm V_{K.p.n.} - V_{H.}) = f(E_p)$ which yields $\sigma(E_p) = i_2/i_1 = 1 \pm f(E_p)/i_1$; ($i_1 = \text{const}$). Fig. 1 shows a diagram of the automatic recording of this curve. The contact potential difference (between the electron-gun cathode and the target) is determined by a modification of the well-known method worked out by Anderson. Accuracy is about $\pm$ 0.1 v. Fig. 4 shows the design of the electron gun, Fig. 3 the arrangement of the apparatus as a whole. The electron gun was fitted with 100-μ tantalum electrodes. The energy spread of the primary electrons emitted from it did not exceed 0.5 - 0.7 ev. To check the operation of the arrangement, particularly that of the electron gun, a series of tests was carried out with automatic recording of the $\sigma(E_p)$-curves. These tests showed that with $U_{a1} < 20v$ σ was independent of U_{a1} and the values received were in good agreement with published data (U_{a1} - potential at the focusing electrode of the gun). The distance between gun and target had practically no effect on the $\sigma(E_p)$ curves between $0 < E_p \leqslant 90$ ev. The automatically

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B102/B138

recorded curves were excellently reproducible. The authors thank Professor A. R. Schul'man for his advice and interest. There are 6 figures and 15 references: 7 Soviet and 8 non-Soviet. The three most recent references to the English-language publications read as follows: H. Jacobs et al. Phys. Rev. 106, 1956; J. Jonxn, K. McKay, Phys. Rev. 91, 582, 1953; E. S. Sternglass, Phys. Rev. 95, 345, 1954.

ASSOCIATION: Leningradskiy politekhnicheskiy institut im. M. I. Kalinina (Polytechnical Institute of Leningrad)

SUBMITTED: March 27, 1961

Card 5/6

9,4150 (1140)

S/109/62/007/003/019/029
D234/D302

AUTHORS: Serebrov, L.A., and Fridrikhov, S.A.

TITLE: Electrostatic properties of an elementary storage unit
             for charges appearing on a dielectric target during
             secondary electronic emission

PERIODICAL: Radiotekhnika i elektronika, v. 7, no. 3, 1962,

TEXT: The authors consider a storage unit consisting of a circular
zone of the target, for the two following cases: 1) The surface
density of free charge on the target is described by Gauss' curve;
2) The surface density is constant. Formulae derived in a previous
paper by the authors are used and results of numerical computations
of the potential are given for characteristic parameters of the sto-
rage tube, in the form of graphs. Influence of principal construc-
tion parameters of the target bloc is also illustrated by graphs.
Experimental verification of the results is described and is sta-
ted to confirm them qualitatively. It is concluded that the dimen-
sions of the elementary storage unit exceed the cross-section of
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Electrostatic properties of an ...   S/109/62/007/003/019/029
                                            D234/D302

the primary electron beam at least 3/2 to 2 times. The polarization of the target weakens the field strength. Charge induced on the collector situated at distances of the order of magnitude of effective radius of the charged element of the target affects the field considerably. The approximation of the elementary storage unit by a plane condenser is stated to be justifiable only when the effective radius is at least twice as large as the distance between the target and the plane collector. The authors express their gratitude to A.R. Snul'man for interest and discussion. There are 8 figures, and 8 references: 6 Soviet-bloc and 2 non-Soviet-bloc.

SUBMITTED: July 7, 1961

Card 2/2

ACCESSION NR: AT4016308

S/0000/62/000/000/0263/0283

AUTHOR: Shul'man, A. R.; Fridrikhov, S. A.

TITLE: Interaction of electrons with alkali halide crystals

SOURCE: Vses. soveshch. po fiz. shchelochnogaloidn. kristallov. 2d, Riga, 1961. Trudy*. Fiz. shchelochnogaloidn. kristallov (Physics of alkali halide crystals). Riga, 1962, 263-283

TOPIC TAGS: alkali halide crystal, dielectric, dielectric surface, elastic electron reflection, crystallography, radiation defect, electron irradiation, crystal physical property

ABSTRACT: For the last seven years, systematic studies of the electron bombardment of alkali halide crystals have been conducted in the Electronics laboratory of the Leningradskiy politekhnicheskiy institut (Leningrad Politechnical Institute). They covered elastic reflection of slow electrons, nonelastic electron reflection, characteristic electron energy losses, secondary electron emission, excited conductivity of NaCl-films, and the behavior of colored crystals. To reduce the charge accumulation on the dielectric surface and the changes in the target composition and structure, the bombardment was effected by an electron beam emitted in the form of a single rectangular 1-10 μ sec pulse. An EPP-09 electron

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ACCESSION NR: AT4016308

potentiometer was used for the 1 min. tape-recordings. A drawing in the article shows the assembly in detail. Most of the results of the studies were of an exploratory nature and may be partially summarized as follows: (1) dielectrics, in contrast to metals, have a relatively high coefficient of slow electron elastic reflection, reaching a maximum of 70-80% for primary electron energies of a few ev; (2) energy spectra of electrons reflected from alkali halide crystals show two different patterns; full and discrete; (3) the threshold of second electron emission is a definition which casts some light on the energy zonal structure of alkali halide crystals; (4) the coefficient of second electron emission of the crystals is high and depends mainly on the energy of primary electrons; (5) a beam of slow electrons is a very sensitive indicator of color centers in the subsurface layer; and (6) the lower the lattice energy the greater the electron absorption; hence, the lower the depth of color penetration in the crystals. The authors make extensive use of references in their discussion of the subject. Orig. art. has: 15 figures and 3 tables.

ASSOCIATION: Leningradskiy politekhicheskiy institut im. M. I. Kalinina (Leningrad Polytechnical Institute)

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ACCESSION NR: AT4016308

SUBMITTED: 00

SUB CODE: GP

DATE ACQ: 06Mar64

NO REF SOV: 023

ENCL: 00

OTHER: 016

Card 3/3

9.3120

S/109/62/007/009/017/018
D409/D301

AUTHORS: Serebrov, L.A., and Fridrikhov, S.A.

TITLE: Field-enhanced secondary emission of thin NaCl-films

PERIODICAL: Radiotekhnika i elektronika, v. 7, no. 9, 1962,
1649 – 1656

TEXT: A new method.is proposed for studying the secondary emission
of charged dielectric- and semiconductor targets. The applicability
of the method is illustrated by the results of measurements conduc-
ted with thin NaCl-films on various bases (platinum, nickel, beryl-
lium, graphite). The new method, developed by the authors, is a
combination of the method of single pulses and of the two-beam me-
thod. This facilitates the experimental work, reduces to a minimum
undesirable effects, and makes it possible to use television con-
trol of the homogeneity of charging of the target, as well as of
the principal beam. The NaCl-films were about 0.5 microns thick;
the beam current was about 1-2 microamp.; the pulse duration of the
primary current was 3 microsec.; the residual-gas pressure in the
vacuum apparatus did not exceed $(1-5) \cdot 10^{-7}$ mm Hg. A diagram shows
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Field-enhanced secondary emission ...   S/109/62/007/009/017/018
                                         D409/D301

the dependence of the secondary-emission coefficient σ (of the NaCl
film on a nickel base) on the time t of irradiation of the target
by the auxiliary beam. A comparison of current-voltage curves
showed that if the target is positively charged, then the primary
current can be considerably amplified. The authors developed a pul-
se method and apparatus for measuring the secondary-emission cur-
rent from dielectric- and semiconductor surfaces, for primary-elec-
tron energies ranging from 2 to 12 kev. The method provides for se-
paration of the investigated effect from extraneous processes. A
practically inertia-less effect of enhancing the secondary emission
by the internal electric field was observed. With primary-electron
energies of 3.5 - 9 kev, gain factors of up to 20 of the primary
current, were recorded. It was found that the scattering properties
of the base material have a considerable part in the field-enhanced
secondary emission of NaCl-films, i.e., with other conditions being
equal, larger gain-factors correspond to targets with a base, made
of a metal with a larger coefficient of inelastic scattering. An
analogous effect should be observed in the case of other emitters,
similar to NaCl. It is evident that (in the cases under considera-
tion), a particular value of the primary-current gain should not
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Field-enhanced secondary emission ...   S/109/62/007/009/017/018
                                          D409/D301
be ascribed to a given emitter, but to a system, one of whose ele-
ments is the charged dielectric- or semiconductor layer. There are
6 figures.

SUBMITTED: March 19, 1962

Card 3/3

ACCESSION NR: AP4011761

AUTHORS: Fridrikhov, S. A.; Ivanov, V. N.; Serebrov, L. A.; Shevtsov, A. A.

TITLE: Secondary electron emission of positively charged dielectric films

SOURCE: Fizika tverdogo tela, v. 6, no. 1, 1964, 236-246

TOPIC TAGS: electron, electron emission, secondary electron emission, dielectric film, positively charged dielectric film

ABSTRACT: By using a technique combining single pulses and two beams, the authors have studied the effect of an internal electrical field with a strength of 10^3-10^6 v/cm on the secondary emission of electrons from thin films (0.5-10 microns) of NaCl, MgF$_2$, glass, and mica in the energy range of primary electrons of 2-10 kev. They discovered an anomalous character of the dependence of emission coefficient amplified by the field on the energy of the primary electrons. For friable films of NaCl, the emission amplification proved to be much greater than for dense films of identical thickness. Increase in the energy of primary electrons was accompanied by a steady increase in the coefficient of emission.

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ACCESSION NR: AP4011761

Experimental curves proved to be in good agreement with the expression for coefficient of current amplification of nonindependent Townsend gas discharge. It has been established that the value of the emission coefficient depends essentially on the density of the dielectric film, that the most probable energy of secondary electron emission is about 10 ev, and that the energy spectrum of these electrons is Maxwellian. "The authors take this opportunity to express their thanks to A. R. Shul'man for his valuable counsel." Orig. art. has: 7 figures and 4 formulas.

ASSOCIATION: Politekhnicheskiy institut im. M. I. Kalinina, Leningrad (Polytechnical Institute)

SUBMITTED: 25Jul63

SUB CODE: PH

DATE ACQ: 14Feb64

NO REF SOV: 006

ENCL: 00

OTHER: 007

Card 2/2

ACCESSION NR: AP4034912

AUTHORS: Fridrikhov, S. A.; Smirnov, P. V.; Serebrov, L. A.

S/0181/64/006/005/1343/1355

TITLE: Some peculiarities of electron excited conductivity in dielectrics

SOURCE: Fizika tverdogo tela, v. 6, no. 5, 1964, 1343-1355

TOPIC TAGS: electron excited conductivity, dielectric, electron contact method, electric contact method

ABSTRACT: The specific features involved in two principal methods of experimental investigation of electron-excited conductivity in dielectrics were examined. It is shown that these features substantially affect the recorded values of excited currents. The electron-contact method does not permit direct observations, and the coefficient of excited conductivity must be determined indirectly, such as by recording the change in surface charge of the target. But measurements are dependent on secondary factors, such as field strength in the sample and the dark current (which cannot be measured independently of the excited current). The electrical-contact method is free from the inadequacies of the electron-contact method, but by this method the original current of electrons acting on the sample is unknown, and errors may result from this. In using the latter method, it is

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ACCESSION NR: AP4034912

advisable to measure the excited current of samples both during continuous electron bombardment and during single pulses with changing field polarity. Results of these measurements will permit the determination of the field strength of the internal space charge ($\simeq 10^5$ v/cm), the concentration of traps ($\simeq 10^{16}$ cm^{-3}), and the product of carrier mobility by carrier lifetime ($\simeq 10^{-8}$ cm^2/v, for electrons). The values given are for a film of NaCl 10 μ thick, a potential difference up to 250 v, and an energy of primary electrons of 10 kev. Experimental volt-ampere characteristics of the excited current obtained during single pulses agree with the theoretical curve for photoconductivity current calculated by Hecht's formula. "The authors express their thanks to A. R. Shul'man for his constant interest and for his valuable advice." Orig. art. has: 7 figures and 12 formulas.

ASSOCIATION: Leningradskiy politekhnicheskiy institut im. Kalinina (Leningrad Polytechnic Institute)

SUBMITTED: 14Nov63

SUB CODE: NP, EM   NO REF SOV: 012   ENCL: 00

Card 2/2   OTHER: 005

ACCESSION NR: AP4039657

AUTHORS: Serebrov, L. A.; Fridrikhov, S. A.

S/0181/64/006/006/1702/1706

TITLE: Some results of studies on strong fields of secondary electron emission of thin sodium chloride films

SOURCE: Fizika tverdogo tela, v. 6, no. 6, 1964, 1702-1706

TOPIC TAGS: electron emission, secondary emission, sodium chloride, primary electron energy, dielectric layer, mean free path, volt ampere characteristic, magnesium oxide, collector grid

ABSTRACT: The authors analyzed experimental data obtained in their own earlier works (Radiotekhn. i electron. 7, 1649, 1962), by S. A. Fridrikhov, V. N. Ivanov, L. A. Serebrov, and A. A. Shevstov (FTT, 6, 236, 1964), and other data available in literature. They estimated the mean free path between collisions with the film surface and compiled the results on strong fields of secondary electron emission by thin films of NaCl. The thickness of film considered in these studies was on the order of $0.5 - 0.6 \mu$, the primary electron energy was on the order of 7-10 Kev, and the field at the dielectric layer was of the order of 10^6 v/cm. The temperatures behind the target were about 50, 100, or 200C. The time for complete

Card 1/2

EWP(b)   EWT(1)/EWG(k)/EWT(m)/EPA(sp)-2/EPF(n)-2/EPA(w)-2/EWA/EWP(q)/T/
ESD(c)/ESD(t)/RAEM(t)   IJP(c)/ASD(a)-5/SSD/BSD/RAEM(a)/AFWL/ESD(gs)/
Pz-6/Pab-24/Pu-4   AT/JW/JD/JG

ACCESSION NR: AP4044651

AUTHOR: Butusov, M.M.; Ganichev, D.A.; Sominskiy, G.G.; Fridrikhov, S.A.

S/0048/64/028/008/1340/1345

TITLE: Increase in the emission of cathodes in crossed fields /Report, Third All-
Union Conference on Semiconductor Compounds held in Kishinov 16-21 Sept 1963/

SOURCE: AN SSSR. Izv. Seriya fizicheskaya, v.28, no.8, 1964, 1340-1345

TOPIC TAGS: magnetron, secondary emission, oscillation

ABSTRACT: The authors investigated the pulsed behavior of a magnetron diode with a
smooth cylindrical copper anode and a cathode system similar to that employed by R.
L.Jepsen and M.W.Muller (J.Appl.Phys.22,1186,1951). The cathode system consisted of
a hot tungsten helical "trigger cathode" and a cold cylindrical cathode from which
secondary emission currents could arise. Findings of earlier investigators were con-
firmed. /Abstracter's note: It is not entirely clear which, if any, of their results
the authors consider new./ The anode of the magnetron diode was approximately 1.8
cm in diameter, and the cathode was 0.7 cm in diameter and 2 cm long. The device
was operated at anode potentials from 2 to 20 kV in magnetic fields up to 2.5 kOe
with 1 microsec pulses at a duty cycle of 1000. Various cathode materials were ex-

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L 6813-65
ACCESSION NR: AP4044651

ployed, including Ni and activated CuBeAl. At sufficiently great anode potentials and magnetic fields, neither the cut-off curves (anode current versus magnetic field at constant anode potential) nor the curves of anode current versus anode potential at constant magnetic field were monotonic, but each had a large peak. The peak an- ode current I_m, the anode potential U_m at peak current, the magnetic field B, and the secondary emission coefficient d_m of the cathode material at peak current con- ditions were found to be related by $I_m = A(d_m-1)U_mB$. High-frequency "noise" with a discrete spectrum was observed in the range between 50 and 5000 megacycles/sec when the enhanced emission occurred. The behavior of these oscillations is not discussed, but it is suggested that they are the cause of the increased electron bombardment of the cathode which gives rise to the enhanced emission. The authors note that they have confirmed the existence of large secondary emission currents in crossed field instruments with no external resonators, and that these currents are associated with self-excited space charge oscillations. "In conclusion, the authors express their appreciation to Prof.A.R.Shul'man for his constant interest in the work and for valuable remarks." Orig.art.has: 1 formula and 9 figures.

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L 6813-65
ACCESSION NR: AP4044651

ASSOCIATION: Leningradskiy politekhnicheskiy institut (Leningrad Polytechnic Insti-
tute)

SUBMITTED: 00

SUB CODE: EC, NP

NR REF SOV: 006

ENCL: 00

OTHER: 004

3/3

ACCESSION NR: AP4013416

S/0057/64/034/002/0288/0296

AUTHOR: Butusov, M.M; Fridrikhov, S.A.

TITLE: On the anomalous violation of the Hull cut-off condition in strong crossed fields

SOURCE: Zhurnal tokhn. fiz., v.34, no.2, 1964, 288-296

TOPIC TAGS: magnetron, Hull cut-ff, Hull cut-off violation, space charge oscilla-tion, crossed fields, strong crossed fields

ABSTRACT: Cut-off curves (anode current vs. magnetic field) were obtained for a 2J32 magnetron and a specially constructed magnetron diode at anode potentials up to 20 kV. The tubes were operated with 1 microsec pulses at a duty cycle of 0.1%. The purpose of the work was to investigate the behavior of magnetrons in the region beyond the Hull cut-off at fields of the order of those commonly employed in prac-tice. At low anode potentials the cut-off curves were smooth and monotonic, as has previously been reported by other authors. At higher anode potentials, however, the anode current began to increase at a magnetic field slightly above the "cut-off" value, reached a maximum, and subsequently decreased with further increase of the

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ACCESSION NR: AP4013416

field. The height and width of the peak increased rapidly with increasing anode po-
tential. For the 2J32, the peak was perceptible at an anode potential of 5 kV. At
16.5 kV the peak current was about six times the zero field current and the full
width of the peak at half maximum was about 600 Oe - roughly half the critical
cut-off field. The peaks were not so high or wide for the magnetron diode, but they
still were very conspicuous. In addition to the peaks, the cut-off curves showed
considerable fine structure. The magnetron diode was provided with a cold cylindri-
cal cathode and a directly heated tungsten cathode, the currents to which could be
measured separately. The cold cathode was slotted, and the particles incident on
the cathode and passing through the slot could be investigated with the aid of an
auxiliary internal electrode. At low magnetic fields the entire anode current was
carried by the hot tungsten cathode. As the magnetic field increased the cold ca-
thode developed a small negative current (the electrode collected electrons) and
bombarding electrons were observed to pass through the slot. At a magnetic field
slightly above the critical cut-off value the cold cathode current changes sign and
became large, and the number and energy of the bombarding electrons increased sharp-
ly. The anomalous current responsible for the peak was carried entirely by the cold
cathode. When the magnetic field was further increased these trends reversed and

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ACCESSION NR: AP4013416

the cold cathode current again became negative. The behavior of the tube in the anomalous region varied with the secondary emission properties of the cathode material. An increase of the "excess noise" (due to space charge oscillations) was observed in the anomalous region. It is concluded that space charge oscillations lead to cathode bombardment by high energy electrons which, by secondary emission, give rise to the anomalous currents observed in the "cut-off" region. "In conclusion the authors express their gratitude to professor A.R.Shul'ny*kh for valuable advice and constant interest in the work, and to student V.V.Sologub, who participated in setting up the apparatus and conducting the experiments." Orig.art.has: 1 formula and 9 figures.

ASSOCIATION: Leningradskiy politekhnicheskiy institut im. M.N.Kalinina (Leningrad Polytechnic Institute)

SUBMITTED: 27Jan62

SUB CODE: PH

DATE ACQ: 26Feb64

NR REF SOV: 005

ENCL: 00

OTHER: 011

Card 3/3

FRIDRIKHOV, S.A.; SMIRNOV, P.V.; SEREBROV, L.A.

Some characteristics of the electron-induced conductivity of dielectrics. Fiz. tver. tela 6 no.5:1343-1355 My '64.

(MIRA 17:9)

1. Leningradskiy politekhnicheskiy institut imeni Kalinina.

SEREBROV, L.A.; FRIDRIKHOV, S.A.

    Some results of studying the field-amplified secondary electron
emission from thin sodium chloride films. Fiz. tver. tela 6 no.
6:1702-1706 Je '64.   (MIRA 17:9)

BUTUSOV, M.M.; GANICHEV, D.A.; SOMINSKIY, G.G.; FRIDRIKHOV, S.A.

Increased cathode emission in crossed fields. Izv. AN SSSR.
Ser. fiz. 28 no.8:1340-1345 Ag '64   (MIRA 17:8)

1. Leningradskiy politekhnicheskiy institut.

L 14375-65   EWT(d)/EWT(1)/EWG(k)/EPA(sp)-2/EPF(n)-2/EPA(w)-2/T/EEC(b)-2/
EWA/EWA(h)   Pn-4/Pz-6/Pab-10/Pac-4/Peb/Pi-4/Pu-4/Pj-4   IJP(c)/BSD/
ASD(a)-5/SSD/AFWL/RAEM(a)/ESD(c)/ESD(gs)/ESD(t)   AT

ACCESSION NR: AP4045278

S/0057/64/034/009/1666/1676

AUTHOR: Sominskiy, G.G.; Terekhin, D.K.; Fridrikhov, S.A.

TITLE: Current-voltage characteristic of a magnetron with a secondary emission
cathode

SOURCE: Zhurnal tekhnicheskoy fiziki, v.34, no.9, 1964, 1666-1676

TOPIC TAGS: magnetron, microwave oscillator, current voltage
characteristic, secondary electron resonance

ABSTRACT: The physical processes occurring in magnetrons are highly complicated
owing to the fact that the electrons in these devices move in a system of fields
consisting of a magnetic field, an electric field and a high-frequency field. In
addition, one cannot ignore the interaction of the electrons with each other. The
authors review the results of several experimental and theoretical studies of mag-
netrons. Then, on the basis of experimental data, they derive an empirical formula
describing the current-voltage characteristic of a magnetron with a se-
condary emission cathode in the region of the peak of the characteristic curve. The
initial step is to normalize the current-voltage characteristics by eliminating the
parameter H (magnetic field intensity); to this end the curves are replotted in re-

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ACCESSION NR: AP4045278

duced coordinates: $(I_a/I_{a\,max})$ versus $(V_a/V_{a\,max})$, where I_a is the anode current and V_a is the corresponding voltage. The formula takes into account not only secondary emission, but also the geometry of the "interaction space". The deduced formula satisfactorily describes the ascending section near the maximum of the current-voltage characteristic of a magnetron. Finally, an explanation is given for some of the anomalies observed in the operation of magnetron type oscillators (enhanced emission, presence of high-energy electrons, etc.); this explanation is based on the theory of secondary electron resonance in the presence of a magnetic field. "In conclusion, the authors express their gratitude to Prof.A.R.Shul'man for his interest in the work and valuable advice." Orig.art.has: 19 formulas and 7 figures.

ASSOCIATION: Leningradskiy politekhnicheskiy institut im.M.I.Kalinina (Leningrad Polytechnical Institute)

SUBMITTED: 11Oct63

SUB CODE: EC   NO REF SOV: 007

ENCL: 00

OTHER: 006

Card 2/2

L 18844-65   EWT(1)   SSD/BSD/RAEM(a)/AFWL/AFETR/ASD(a)-5/RAEM(c)/ESD(c)
ESD(gs)/ESD(t)/IJP(c)
ACCESSION NR: AP4049056   S/0057/64/034/011/2086/2087

AUTHOR: Butusov, M.M.; Fridrikhov, S.A.

TITLE: Reply to the letter of S.Ya.Braude and I.M.Vigdorchik

SOURCE: Zhurnal tekhnicheskoy fiziki, v.34, no.11, 1964, 2086-2087

TOPIC TAGS: electric field, magnetic field, magnetron, history

ABSTRACT: The authors reply to the letter of S.Ya.Braude and I.M.Vigdorchik (ZhTF
34,2085,1964; see Abstract ACC.NR:AP4049055) pointing out that conclusions of
their paper "On the anomalous violation of the Hull cut-off condition in strong
crossed fields"(ZhTF 34,238,1964; see Abstract ACC NR:AP4013416) concerning the
existence of a sharp maximum in the cut-off curve of a magnetron diode at a magne-
tic field greater than the critical cut-off value and the phenomena at the cathode
accompanying this effect have been known for more than 25 years and complaining
that appropriate reference to the older literature were omitted. The authors deny
any attempt to claim discovery of these long-known phenomena but assert that their
investigation was more comprehensive than the previous ones and that some of their
conclusions, particularly those concerning the role of space-charge oscillations,

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ACCESSION NR: AP4049056

are new. They apologize for not citing original sources and explain the omission of a bibliography by the fact that the phenomena are well-known and are now adequately discussed in the monograph and text-book literature.

ASSOCIATION: none

SUBMITTED: 20May64

ENCL: 00

SUB CODE: EM,EC

NR REF SOV: 000

OTHER: 000

2/2

L 23812-65   EWT(1)/EEC(b)-2/EWA(h)   Peb

ACCESSION NR: AP5000841

S/0057/64/034/012/2160/2170

AUTHOR: Butusov,M.M./ Smirnov,N.S./ Sologub,V.V./ Fridrikhov,S.A.

TITLE: Investigation of the properties of the space charge in a magnetron diode

SOURCE: Zhurnal tekhnicheskoy fiziki, v.34, no.12, 1964, 2160-2170

TOPIC TAGS: magnetron, space charge, microwave tube, noise spectrum, secondary omission

ABSTRACT: The tendency to self-oscillation, characteristic of space charge in magnetrons, is well known; some of the oscillation effects, however, are associated (by some authors) with the influence of the resonator system. Hence in the present work there were investigated the properties of the space charge in a magnetron diode, i.e., a system devoid of a cavity component. There were studied the oscillations generated by the space charge under different conditions of operation of the tube, the relative secondary omission of the cathode, and the intensity (power) of back bombardment of the cathode. In some ways the present study was an extension of the earlier comprehensive work of J.Yasuoka (Proc.Phys.Soc.Japan 10,1102,1955), D. Glass, G.Sims & A.G.Stainsby (Proc.IEE(B) 102,81,1955) and R.L.Jepson & M.W.Muller

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L 23812-65

ACCESSION NR: AP5000841

(J.Appl.Phys.22,119G,1951).. Some of the experimental measurements were performed on the equipment described by two of the authors earlier (M.M.Butusov and S.A.Fridri-khov,ZhTF 34,288,1964). A diagram of the main measurement setup is given in a fig-ure, as is a sectional view of the magnetron diode. The results are presented in the form of curves and some reproductions of oscillograms. The principal conclusions are: 1. At appreciable plate voltages there is a magnetic field region in which the electrons returned to the cathode have considerable energies, which gives rise to secondary emission. 2. In the same region there is observed intense emission by the space charge of high-frequency noise at discrete frequencies; analysis of this noise radiation indicates that part of the space charge oscillations are of the ro-tary wave type. 3. The fraction of the power dissipated at the cathode by the back-bombardment electrons, referred to the input power, increases with the strength of the magnetic field (at a constant plate voltage). 4. The mechanism leading to in-tense energy exchange in the electron cloud at the magnetron diode is probably si-milar in many respects to secondary-electron resonance in crossed fields. "In con-clusion, the authors express their gratitude to Prof.A.R.Shul'man for his attention to the work." Orig.art.has: 9 figures.

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L 23812-65

ACCESSION NR: AP5000841

ASSOCIATION: Leningradskiy politekhnichekiy institut im.M.I.Kalinina (Leningrad Polytechnical Institute)

SUBMITTED: 12Dec63   ENCL: 00   SUB CODE: EC

NR REF SOV: 010   OTHER: 012

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L 51998-65   EPF(n)-2/EPA(w)-2/EWT(1)/EWG(m)   Pi-4/Po-4/Pz-6/Pab-10   IJP(c)
AT/WW

ACCESSION NR: AP5012045   UR/0057/65/035/005/0813/0822

AUTHOR: Ganichev,D.A.; Fridrikhov,S.A.; Ashkinadze,B.M.; Solgan,A.B.

TITLE: Investigation of a high frequency resonant discharge in crossed fields

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 35, no. 5, 1965, 813-822

TOPIC TAGS: secondary emission, resonant state, discharge plasma, microwave field, magnetic field, hydrogen

ABSTRACT: High frequency resonant discharge was investigated in the presence of a magnetic field because of the importance of the phenomenon for magnetrons and other high-frequency equipment and the paucity of such studies in the literature. The discharges were produced in a silver-plated oxygen-free copper rectangular wave-guide section of dimensions 25.5 x 12.5 or 28.5 x 4 mm by 1 μsec pulses of 3 cm wavelength H_{10} waves at a repitition rate of 10^3 sec^{-1}. The applied magnetic field was perpendicular to the narrow wall of the waveguide, and in the wide wall were introduced two probes (with aquadag coated electrodes to minimize secondary emission) and a hot cathode. Hydrogen was admitted to the continuously pumped waveguide section. With the uhf oscillator operating at a controlled power level (up to 200

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ACCESSION NR: AP5012045

kW/pulse) the magnetic field was gradually increased to 6000 Oe and the probe
currents, the uhf attenuation, and the luminous intensity were observed. The shape
of the individual light pulses was also observed with a wide-band amplifier and an
oscilloscope. In addition to the uhf intensity (electric field strength) and the
magnetic field strength, the residual hydrogen pressure was varied over a wide range.
Many of the results are presented graphically and are discussed in some detail. At
pressures from 5×10^{-6} to 5×10^{-2} mm Hg resonant discharges with ionization of
the residual gas were observed at the two values of the magnetic field for which
the electron Larmor frequency was equal to the uhf frequency or to half the uhf
frequency. At pressures above 10^{-2} mm Hg a third resonance was observed at a
Larmor frequency one-fourth the uhf frequency. These resonant discharges occurred
only for uhf electric field strengths exceeding a threshold value that depended on
the gas pressure. The probe current increased rapidly with increasing pressure and
reached a maximum at about 3×10^{-3} mm Hg. "In conclusion, the authors express
their gratitude to A.R.Shul'man for his interest in the work and discussion of the
results." Orig. art. has: 3 formulas and 11 figures.

Card 2/3

L 51998-65
ACCESSION NR: AP5012045

ASSOCIATION: Leningradskiy politekhnicheskiy institut im. M.I. Kalinina (Leningrad Polytechnical Institute)

SUBMITTED: 03Jul64   ENCL: 00   SUB CODE: EM, NP

NR REF SOV: 002   OTHER: 003

Card 3/3

L 15798-66   FBD/EWT(1)/EEC(k)-2/T/. . . ./EWP(k)/EWP(b)/EWA(h)/EWT(m)   SCTB/IJP(c) -
ACC NR: AP6007095 . , ./ .
                                                SOURCE CODE: UR/0057/66/036/002/0394/0397

AUTHOR: Terekhin, D. K.; Fridrikhov, S. A.

ORG: Leningrad Polytechnic Institute im. M. I. Kalinin (Leningradskiy
politekhnicheskiy institut)

TITLE: The effect of a longitudinal magnetic field on the operation of an
He-Ne laser at λ = 0.6328 μ .

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 36, no. 2, 1966, 394-397

TOPIC TAGS: laser, gas laser, helium, neon, laser, longitudinal magnetic field, gas discharge
tube, photo multiplier

ABSTRACT: The effect of a longitudinal magnetic field on the operation of an
He-Ne laser at λ = 0.6328 μ was investigated experimentally. A discharge tube
85 cm long and 4.4 mm in internal diameter, terminated with glass windows mounted
at the Brewster angle, was filled to a pressure of 0.85 mm Hg with a neon-
helium mixture at a ratio of 1:5.6. The discharge was excited at fixed current
values. The magnetic field, which was parallel to the laser axis, could be varied
from 0 to 2000 oe. A semi-confocal resonator was used with dielectric-coated
mirrors (R ≈ 99.2%) placed at 120 cm. The laser power was measured in relative
units by means of an FEU-22 photomultiplier. Curves of the laser power P_1 as a
Card 1/2

L 15798-66

ACC NR: AP6007095

function of field intensity at various values of discharge current were plotted
and analyzed. Three distinct regions could be observed: 1) a region in which a
rapid initial increase in generation power occurred when the field intensity
increased from 0 to 10—15 oe; 2) a region in which there was a subsequent,
smoother increase in the signal, which may be preceded by a short sloping interval;
and 3) (after a distinct power maximum at $H \simeq 150$ oe) a region in which a
corresponding gradual decrease in laser output power occurred until the dis-
ruption of generation. The relative power increase in the first region was approx-
imately equal for all values of discharge current and amounted to 150—200%. The
rise in power in the second region was attributed to an increase in population
inversion due to suppression by the magnetic field of generation at the $3s_2 - 3p_4$
transition ($\lambda = 3.39$ μ). The smooth decrease in power in the third region was
attributed to the separation of Doppler-broadened σ^+—components of radiation
(both at 1.15 μ and 3.39 μ) and to a decrease in the overlap region with an in-
crease in H. The form of the function $P_1 = P_1(H)$ changed when the parameters of
the active medium varied sharply from the optimal. The longitudinal magnetic field
$H < 15$ oe re-established laser action at $\lambda = 0.63$ μ when generation was disrupted
because of an increase in the content of dopants in the discharge. Orig. art.
has: 2 figures.

[YK]

SUB CODE: 20/ SUBM DATE: 03Jul65/ ORIG REF: 001/ OTH REF: 007/ ATD PRESS:
Card 2/2

L 23267-66   FBD/EWT(1)/EWT(m)/EEC(k)-2/T/EWP(t)/EWP(k)/EWA(h)   IJP(c)   WG/JD

ACC NR: AP6011406   SOURCE CODE: UR/0057/66/036/003/0560/0563

AUTHOR: Fotiadi, A. E.; Fridrikhov, S. A.

ORG: Leningrad Polytechnic Institute (Leningradskiy politekhnicheskiy institut)

TITLE: The effect of a longitudinal magnetic field on the output energy of an He—Ne laser at λ = 1.15 μ

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 36, no. 3, 1966, 560-563

TOPIC TAGS: gas laser, helium neon laser, laser output, magnetic field effect, longitudinal magnetic field

ABSTRACT: A detailed study was made of the effect of a magnetic field, parallel to the laser axis, on the output power of an infrared (1.15 μ) He—Ne laser at various gas-mixture pressures and pumping energies. The laser consisted of a semi-confocal resonator with external dielectric mirrors and a glass tube 100 cm long and 8 mm in diameter with Brewster-angle windows. The ratio of partial pressures inside the tube was 10:1 and the tube was placed inside and along the axis of a 70-cm-long solenoid in which fields from 0 to 1000 oe could be set up. Radiation was recorded by an FEU-22 photomultiplier placed at the output of an IKS-12 monochromator. The device could be excited by high-frequency a-c and/or d-c sources. Results indicate that at pressures of 1 mm Hg, a monotonic increase in output power at zero magnetic field occurs with an increase in the discharge current (from 15 to 70 ma, which corresponds

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ACC NR: AP6011406

to a variation in the pumping from 38 to 175 w). This also involves broadening of
the H region, in which laser action is possible. In the $0 < H < 15$ œregion an 8—15%
increase in laser output occurs, which is followed by a maximum ($15 < H < 115$) and a
slow, Gaussian-like decrease ($H > 115$). Similar results were obtained at other partial
pressures and in the case of h-f excitation. This indicates that a change in the
halfwidth $\Delta H_{1/2}$ is directly related to changes in the characteristics of the Doppler
circuit in the same manner as the laser output is at $H = 0$. The experimental
results are in a good agreement with a theory advanced by M. I. D'yakonov (ZhETF, 49,
1173, 1965). Additional studies must be made before the ultimate explanation of the
effect of magnetic fields on laser action at $\lambda = 0.63$ and 1.15 μ can be made. Orig.
art. has: 3 figures.   [YK]

SUB CODE: 20/ SUBM DATE: 03Jul65/ ORIG REF: 002/ OTH REF: 006/ ATD PRESS:
4231

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ACC NR: AP7001315

4 mm Hg, and 10 to 22 kv for pressures from 6 to 12 mm Hg) shows, under pressures up to 4 mm Hg, monotonically rising curves to about 30 kv. In the higher pressure range, a narrowing of the emission zone occurs and the curves take the shape of sharp peaks which shift with pressure toward higher or lower values and tend generally toward higher output values at higher pressures. For a full explanation of these relationships further investigations are felt necessary. The observations of the cross-sectional intensity distribution within the output beam revealed an multimode structure. Under certain conditions (pressure 4 mm Hg, pumping voltage 14 kv) the beam cross section in the near zone took the form of a ring 12 mm in outside diameter and 5 mm in inside diameter. At higher pressures and higher pumping voltages, a delay and widening of the emission pulse as observed and explained earlier by Yegorov and others (Optika i spektroskopiya, 18, 1965, 719; ibid, 15, 1963, 839) took place. Attempts to obtain emission from the same tubes on the 6328 Å wavelength were un-successful at pressures of 1 to 8 mm Hg and pumping voltages of 6 to 30 kv. The authors thank A. R. Shul'man for his interest in the work and D. K. Terekhin and A. E. Fotiadi for useful discussions. Orig. art. has: 2 figures. [WA-14]

SUB CODE: 20/ SUBM DATE: 13Oct65/ ORIG REF: 004/ OTH REF: 005/

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ACC NR: AP7001315   SOURCE CODE: UR/0057/66/036/012/2188/2190

AUTHOR: Perchanok, T. M.; Russov, V. M.; Fridrikhov, S. A.

ORG: Leningrad Polytechnic Institute im. M. I. Kalinin (Leningradskiy politekhni-cheskiy institut)

TITLE: Some operational characteristics of the pulse emission of an He-Ne laser

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 36, no. 12, 1966, 2188-2190

TOPIC TAGS: laser, laser pulse, laser pulsed emission, He-Ne laser, He-Ne laser pulsed emission, gas laser, discharge tube, phototube

ABSTRACT: The dependence of the output power of an He-Ne laser on its various parameters was experimentally investigated under conditions of short (0.5-µsec) pulses in rapid (2000 pulses/sec) succession. A gas discharge tube with quartz windows installed at the Brewster angle in a semi-confocal resonator was used. An FEU-22 multiplication phototube served as the receiver. The output pulse shape of the 6-mm and 15-mm discharge tubes was recorded by an IO-4 oscillograph. The dependence of output light pulses with a duration of 30—100 µsec on the pumping power and pressure of the mixture was investigated. The optimal Ne and He ratios in the tube were 1 to 15 and 1 to 30 for 6- and 15-mm tubes, respectively. More powerful emission occurred from 15-mm tubes (about 1 wt), with pulse power about three orders higher than that under continuous emission. The average and peak output power of this tube, plotted against pumping voltage (varied from about 10 to 30 kv at pressures up to

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FRIDOLIN, G., inzh.; CHISTYAKOV, N.I., otv. za vypusk

[Operating cathode-ray oscillographs] Tekhnika raboty
s elektronno-luchevymi ostsillografami. Moskva, Profizdat,
1958. 14 p.   (MIRA 13:12)

1. Nauchno-tekhnicheskoye obshchestvo priborostroitel'noy pro-
myshlennosti.
        (Cathode ray oscillograph)

Fridkin, G.O.

9(4)   PHASE I BOOK EXPLOITATION   SOV/2889

KUPEL, Moskovskiy ekonomicheskiy administrativnyy rayon. Sovet
narodnogo khozyaystva

Poluprovdnikovyye diody i ikh primeneniye; sbornik
stotey. (Semiconductor Diodes and Triodes and Their Uses;
Collection of Articles) Moscow, Tsentr. byuro tekhn. inform.,
1958, 102 p. (Series: Dostizheniya nauki i tekhniki)
1,700 copies printed.

Consulting Engineer: Ye.Z. Korobeynikova; Ed.: O.P. Osma.

PURPOSE: This book may be useful to engineers in the field of
semiconductor electronics.

COVERAGE: The articles in this collection discuss problems in the
design, manufacture, and application of new types of semi-
conductor devices. The double-base diode is described and
results of the calculation of its characteristics are given,
and the characteristics of the type 314 fused-junction triode
and the characteristics of the type 314 fused-junction triode
are presented. The effect of feedback in transistor amplifiers
on nonlinear distortions is covered. Operation of low-frequency
transistor amplifiers for individual units of multichannel
communication systems is explained and a discussion of
transistor units of the KPP 30/60 system is presented. Attention
is given to the problems of cooling transistor devices. There
is a review of Soviet and Western magazines and patents for
1956-1957 concerned with semiconductor devices and their
applications. There are no references.

TABLE OF CONTENTS:

Burdiyan, A.O., and O.M. Mikirtichan. Transistor Amplifiers
for Individual Units of Multichannel Communication Systems
The authors discuss the operation and characteristics
of a low-frequency transistor amplifier used in a
standard twelve-channel high-frequency system and derive
formulas for calculating amplifier performance. A
discussion of a transistor audio amplifier and a control-
signal receiver is also presented.   61

Safronov, N.V. Cooling of Semiconductor Devices
The author describes a transistor chassis absorbing
heat from transistor circuits and derives expressions
that may be used in the design of transistor cooling
elements.   71

Fridkin, G.O. Review of Certificates of Inventorship,
Foreign Journals, and Patents for 1956 and 1957 Concerned with
Semiconductor Devices and Their Applications
I. Transistor generators of sinusoidal oscillations   81
II. Flip-flop circuits and pulse generators   81
The author reviews Soviet and Western patents and magazines
concerned with transistor circuits. He discusses the
operation of various transistor oscillators, frequency
dividers, modulators, and multivibrators.   97

AVAILABLE: Library of Congress (TK7872.T73 P58)

FRIDOLIN, G. G.

9(6)   PHASE I BOOK EXPLOITATION   SOV/1778

Mekhno-tekhnicheskoye obshchestvo priborostroitel'noy promyshlennosti. Moskovskoye pravleniye

Tranzistornaya elektronika v priborostroyenii; sbornik trudov konferentsii (Transistor Electronics in the Instrument-making Industry; Collection of Conference Transactions) Moscow, Oborongiz, 1959. 289 p. 1,400 copies printed.

Ed.: M.I. Chistyakov, Doctor of Technical Sciences, Professor; Ed. of Publishing House: S.D. Khametova; Tech Ed.: V.P. Rumin; Managing Ed.: A.S. Zaynovskaya, Engineer.

PURPOSE: The book is intended for scientific and engineering personnel of the instrument-making and radio industries engaged in the development of electronic and radio equipment.

COVERAGE: The authors of this collection of articles discuss the theory, principle of operation, calculation and application of electronic circuits using transistors. They also describe transistor application in measuring circuits, computers, radio and automatic and remote control circuits. The book is based on transactions of the Scientific and Engineering Conference organized by NTO in Moscow in December 1956. The conference discussed 54 papers on transistors, photocells, thermocouples, cooling elements, nonlinear capacitors, crystal diodes, and transistors. A considerable number of these papers have been included in the present book. No personalities are mentioned. References appear at the end of each article.

TABLE OF CONTENTS:

The author describes the operating prin-ciple of monostable multivibrators using junction-type transistors and discusses the factors causing instability. He also dis-cusses the effect of temperature on pulse width and describes temperature stabilization by means of diodes and thermistors. There are 3 references of which 2 are Soviet and 1 English.

The author briefly describes the operation and application of the following transistor circuits:

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oscillators with inductive capacitive feedback, based oscillators, tetrode transistor oscillators, frequency multipliers, frequency- and phase-mod-ulated oscillators, blocking oscillators, inverters, crystal-controlled oscillators, relaxation oscillators, oscillators converting sinusoidal signal into rectangular and triangular wave. There are 12 ref-erences of which 2 are Soviet, 7 English, 2 French and 1 German.