

FRANK, G.M.

PHASE I BOOK EXPLOITATION

SOV/5294

Akademiya nauk SSSR. Institut biologicheskoy fiziki.

Issledovaniye rannikh reaktsiy organizma na radiatsionnoye vozdaystviye (Study of Early Reactions of the Organism to Radiation Effects) Moscow, Izd-vo AN SSSR, 1960. 220 p. Errata slip inserted. 3,000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Institut biologicheskoy fiziki.

Resp. Ed.: G.M. Frank, Corresponding Member, Academy of Sciences USSR; Ed. of Publishing House: B.V. Garian; Tech. Eds.: V. Volkova and Ye.V. Makuni.

PURPOSE: This book is intended for radiobiologists.

COVERAGE: This is a collection of nine articles by different authors on the effects of radiation on life processes. The following are discussed: the relationship between reflector mechanisms and disturbances in hemodynamics; the marked diminution or total absence of hemodynamic reactions under soft irradiation upon preliminary treatment of the skin with novocain; reflector-induced changes in the central nervous system and the almost instantaneous advent of fine physico-chemical reactions following irradiation; changes in the stability of the

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Study of Early Reactions (Cont.)

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erythrocyte level during the first several hours after irradiation; blood albumin changes after irradiation, occurring earlier than believed heretofore by scientists; and new and important data on tissue breathing and disturbances in the physicochemical properties of erythrocytes. N.N. Livshits, Doctor of Biological Sciences, is mentioned. Each article is accompanied by references.

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Study of Early Reactions (Cont.)

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AVAILABLE: Library of Congress

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JA/rn/gmp
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FRANK, G.M., red.; VARSHAVER, G.S., red.; DANTSIG, N.M., red.;
SOKOLOV, M.V., red.; MANIKOV, M.Ye., red.; ZUYEVA, N.K.,
tekh. red.

[Transactions of the Conference on the Biological Effect of
Ultraviolet Radiation] Trudy konferentsii po biologicheskomu
deistviu ul'trafiol'tovogo izlucheniia. 6th, Leningrad, 1958.
Moskva, Medgiz. Vol.3. [Ultraviolet radiation; biological ef-
fect, therapeutic, preventive, and hygienic uses, and measure-
ment] Ul'trafiol'tovoe izluchenie; biologicheskoe deistvie, le-
chebno-profilakticheskoe i gigienicheskoe primeneniie, izmerenie.
Pod red. G.M.Franka i dr. 1960. 271 p. (MIRA 15:3)

1. Konferentsiya po biologicheskomu deystviyu ul'trafiol'tovogo
izlucheniya. 6th, Leningrad, 1958.

(ULTRAVIOLET RAYS—THERAPEUTIC USE)
(ULTRAVIOLET RAYS—PHYSIOLOGICAL EFFECT)

FRANK, G.M.

Some problems in biological physics. Izv. AN SSSR. Ser. biol.
no.2:177-196 Mar-Apr '60. (MIRA 13:6)

1. Institute of Biological Physics, Academy of Sciences of
the U.S.S.R., Moscow.

(BIOPHYSICS)

VHYZE, L.G.; FRANK, G.M.

Structural lability and questions on the autoregulation of
cellular processes. *Biofizika* 5 no.1:34-39 '60. (MIRA 13:6)

1. Institut biologicheskoy fiziki AN SSSR, Moskva.
(CYTOLOGY)

FRANK, G.M.; VLADAVETS, I., starshiy nauchnyy sotrudnik; TUMANDV, I.I.;
DANISHEVSKIY, G.M., prof.

Biometeorology. Znan.sila 35 no.1:25-27 Ja '60.
(MIRA 13:5)

1. Chlen-korrespondent AMN SSSR (for Frank). 2. Institut fizi-
cheskoy khimii AN SSSR (for Vladavets). 3. Chlen-korrespondent
AN SSSR, direktor fitotrona Instituta fiziologii rasteniy AN
SSSR (for Turanov).
(Metereological research) (Bioclimatology)

FRANK, G. M.

"About Two Types of Muscle Contraction."

Paper submitted for International Biophysics Congress Stockholm
31 Jul - 4 Aug '61.

Inst of Biophysics, AS USSR, Moscow

LIFSHITS, N.N.; FRANK, G.M., *otv. red.*; TSUZMER, T.S., *red. izd-va*;
SUSHKOVA, L.A., *tekhn. red.*

[Influence of ionizing radiation on central nervous system
function] Vlianiye ioniziruiushchikh izlucheni na funktsii
tsestral'noi nervnoi sistemy. Moskva, Izd-vo Akad. nauk SSSR,
1961. 179 p. (MIRA 14:10)

1. Chlen-korrespondent AN SSSR (for Frank).
(RADIATION—PHYSIOLOGICAL EFFECT) (NERVOUS SYSTEM)

RAZUMOVA, L.L.; FRANK, G.M.

X-ray studies of muscle structure using different fixation
methods. Biofizika 6 no. 1:24-29 '61. (MIRA 14:2)

1. Institut biologicheskoy fiziki AN SSSR, Moskva.
(MUSCLE) (MICROSCOPY—TECHNIQUE)

FRANK, G.M.,

S/194/62/000/006/109/232
D256/D308

AUTHORS: Borshchev, V.B., Kaminir, L.B., Larionov, M.G.,
Litinskaya, L.L., Orlovskiy, G.N., Rokhlin, F.Z.,
Urbakh, V.Yu., and Frank, G.M.

TITLE: Automatic analyzer of biological structures AS -1
(AB-1)

PERIODICAL: Referativnyy zhurnal. Avtomatika i radioelektronika,
no. 6, 1962, abstract 6-5-17 i (Biofizika, 1961, 6,
no. 6, 745-747)

TEXT: Large number of measurements are required to obtain reliable information concerning the mean values of biological parameters. A description is given of AB-1 type automatic analyzer of biol. structures capable of producing the mean arithm. value of the area of 1024 micro-objects with an accuracy not less than $\pm 7\%$ at a speed of operation of ~ 100 micro-objects per second. The image of a micro-object is scanned by lines. The mean value of the area is obtained from the known spacing of the scans, the length of the chord of the object and the number of counted objects. The length of the
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Automatic analyzer of biological ...

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chord is converted into a train of standard pulses; their number being proportional to the length. The number of counted objects is obtained by comparing the signals from the scanned line with the delayed signal from the preceding line; if the signal from the preceding line is the only one present, there being no signal from the scanned line, then it is understood that the scanning of the object is completed and a signal is sent to the counter. Nipkow-disk scanning with a simultaneous shifting of the apparatus was employed in the electro-optical converter. The flux of light which depends upon the brightness of the object, falls onto a photomultiplier tube, the output pulses being fed into the counter after amplification and shaping. Results of tests of the analyzer are presented, carried out with measurements of mean radius of erythrocytes. 8 references. [Abstracter's note: Complete translation.]

Card 2/2

FRANK, G.M., AZHIPA, YA.I., KAYUSHIN, L.P.

"Free radicals in a skeletal muscle."

Report submitted, but not presented at the 22nd International
Congress of Physiological Sciences.
Leiden, the Netherlands 10-17 Sep 1962

FRANK, G.M.

(4)
Radiation-Induced Changes of Cell Ultrastructure and of Rhythmic Oxidation Processes

G. M. Frank, A. G. Gamburtseva and A. D. Snejko

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It was shown in previous investigations using polarographic methods *in vivo* that the O₂ concentration in animal and plant tissues was not constant but changed rhythmically. One can observe this phenomenon *in vivo* and also in freshly isolated tissue preparations. The rhythm was connected with the utilization of O₂ by living cells. Irradiation induced changes not only of the absolute level of the O₂ tension in tissue but also of the rhythm. New investigation in this field extended our knowledge of the significance of the rhythmic utilization of O₂.

Changes in the type of periodicity were correlated with particular steps in the chain of oxidizing processes. The same phenomenon was observed with mitochondria. Radiation and pharmacological agents influenced the periodicity. The phenomenon was correlated with damage to the inner mitochondrial membranes. Several hours after irradiation the periodic changes reappeared, indicating repair of mitochondrial ultrastructures. Further comparison of the rhythm of oxidizing processes, of mitochondrial ultrastructure and of submicroscopic mobility

(observed by the interference method) allows us to bring these three processes together and to discuss some new features of the autoregulation of cell processes, their radiation disturbance, and the repair mechanisms after irradiation.

Institute of Biophysics, Academy of Sciences, Moscow, USSR

report presented at the 2nd Intl. Congress of Radiation Research,
Harrogate/Yorkshire, Gt. Brit. 5-11 Aug 1962

BOROVYAGIN, V.L.; FRANK, G.M.:

Submicroscopic organization and functional characteristics of the
Mullerian cells of the retina. Biofizika 7 no.1:42-50 '62.
(MIRA 15:5)

1. Institut biologicheskoy fiziki AN SSSR, Moskva.
(RETINA)

SAMOSUDOVA, N.V.; FRANK, G.M.

Structural reorganization of the transversostriated muscles during contraction. Biofizika 7 no.4:411-416 '62. (MIRA 15:11)

1. Institut biologicheskoy fiziki AN SSSR. Moskva.
(MUSCLES—MOTILITY)

FRANK, G.M.

Cell is a self-regulating system. Nauka i zhizn' 29 no.4:27-30
Ap '62. (MIRA 15:7)

1. Chlen korrespondent AN SSSR.
(CELLS)

BIRYUZOVA, Valentina Ivanovna; BOROVYAGIN, Valeriy Leonidovich;
GILEV, Vladimir Petrovich; KISELEV, Nikolay Andreyevich;
TIKHONENKO, Anna Sergeyevna; CHENTSOV, Yuriy Sergeyevich;
FRANK, G.M., otv. red.; SHMELEV, I.P., red.izd-va; RYLINA, Yu.V.,
tekhn. red.

[Electron-microscopic methods for studying biological objects]
Elektronnomikroskopicheskie metody issledovaniia biologicheskikh
ob'ektov. [By] V.I. Biryuzova i dr. Moskva, Izd-vo Akad. nauk
SSSR, 1963. 203 p. (MIRA 16:6)

1. Institut radiatsionnoy i fiziko-khimicheskoy biologii AN SSSR (for Biryuzova, Tikhonenko).
2. Institut biologicheskoy fiziki AN SSSR (for Borovyagin).
3. Laboratoriya elektronnoy mikroskopii AN SSSR (for Gilev).
4. Institut kristallografii AN SSSR (for Kiselev).
5. Institut morfologii zhivotnykh AN SSSR (for Chentsov).
6. Chlen-korrespondent AN SSSR (for Frank).
(Biological research) (Electron microscopy)

FRANK, G.M., otv. red.; ALADZHALOVA, N.A., doktor biol. nauk, red.;
DEMIN, N.N., doktor biol. nauk, red.; KOLOMEYTSEVA, I.K.,
red.izd-va; SHUNGSKAYA, V.Ye., red. izd-va; SIMKINA, G.S.,
tekh. red.

[Primary and initial processes of the biological effect of
radiation] Pervichnye i nachal'nye protsessy biologicheskogo
deistviia radiatsii. Moskva, Izd-vo AN SSSR, 1963. 277 p.
(MIRA 16:10)

1. Akademiya nauk SSSR. Institut biologicheskoy fiziki.
 2. Chlen-korrespondent AN SSSR (for Frank).
- (RADIATION—PHYSIOLOGICAL EFFECT)

AMBARTSUMYAN, V.A., akademik; ASRATYAN, E.A.; BOGOLYUBOV, N.N., akademik; VINOGRADOV, A.P., akademik; GINETSINSKIY, A.G.; KNUDANTS, I.L., akademik; KOCHETKOV, N.K.; KURSANOV, A.L., akademik; MEL'NIKOV, O.A.; NESMEYANOV, A.N., akademik; NESMEYANOV, An.N., doktor khim. nauk; OBRIMOV, I.V., akademik; POLIVANOV, M.K., kand.fiz.-mat.nauk; REUTOV, O.A.; RYZHKOV, V.L.; SPITSIN, V.I., akademik; TAMM, I.Ye., akademik; FESENKOV, V.G., akademik; FOK, V.A., akademik; SHCHERBAKOV, D.I., akademik; FRANK, I.M.; FRANK, G.M.; KHOKHLOV, A.S., doktor khim. nauk; SHENYAKIN, M.M., akademik; ENGEL'GARDT, V.A., akademik; SHAPOSHNIKOV, V.N., akademik; BOYARSKIY, V.A.; LIKHTENSHTEYN, Ye.S.; VYAZEMTSEVA, V.N., red.izd-va; KLYAYS, Ye.K., red.izd-va; TARASENKO, V.M., red.izd-va; POLYAKOVA, T.V., tekhn. red.

[As seen by a scientist: From the Earth to galaxies, To the atomic nucleus, From the atom to the molecule, From the molecule to the organism] Glazami uchenogo: Ot Zemli do galaktik, K iadru atoma domolekuly, Ot molekuly do organizma. Moskva, Izd-vo AN SSSR, 1963. 736 p. (MIRA 16:12)

1. Akademiya nauk SSSR. 2. Chlen-korrespondent AN SSSR (for Asratyan, Ginetsinskiy, Kochetkov, Mel'nikov, Reutov, Ryzhkov, Frank, I.M., Frank, G.M.)
(Astronomy) (Nuclear physics) (Chemistry) (Biology)

FRANK, G.M., otv. red.

[Problems of biophysics; materials] Voprosy biofiziki; materialy. Moskva, Nauka, 1964. 286 p. (MIRA 17:8)

1. International Biophysical Congress. Stockholm, 1961.
2. Chlen-korrespondent AN SSSR.

FRANK, G.M., otv. red.; KUZIN, A.M., otv. red.; KUZNETSOV, I.V.,
doktor filos. nauk, red.; LIVSHITS, N.H., doktor biol.
nauk, red.; VEDENOV, M.F., kand. filos. nauk, red.;
SHATALOV, A.T., mlad. nauchn. sotr., nauchn. red.;
KREMYANSKIY, V.I., mlad. nauchn. sotr., nauchn. red.

[The essence of life] O sushchnosti zhizni. Moskva, Nauka,
1964. 350 p. (MIRA 17:8)

1. Akademiya nauk SSSR. Nauchnyy sovet po filosofskim vop-
rosam yestestvoznaniya. 2. Institut filosofii AN SSSR (for
Kremyanskiy, Shatalov). 3. Chlen-korrespondent AN SSSR (for
Frank, Kuzin).

VAZINA, A.A.; LEMAZHIKHIN, B.K.; FRANK, G.M.

Discrete dispersion of rays at small angles on a concentrated actin
solution. Biofizika 9 no.2:237 '64. (MIRA 17:12)

1. Institut biologicheskoy fiziki AN SSSR, Moskva.

FRANK, G.M.

Structural and functional correlations in live cells in the light
of recent methods of research. Vest. AMN SSSR 19 no.2:27-33 '64.
(MIRA 18:1)

1. Institut biologicheskoy fiziki AN SSSR, Moskva.

GABELOVA, N.A.; A EYNIKOVA, E.S.; FRANK, G.M.

Unusual remodeling of the striated structure of myofibrils
with shortening of the anisotropic disks. Dokl. AN SSSR 155
no. 5:1192-1193 Ap '64. (MIRA 17:5)

1. Institut biologicheskoy fiziki AN SSSR. 2. Chlen-korrespondent AN SSSR (for Frank).

RAZUMOVA, I.I.; UEMAZHIMIN, B.K.; MEL'NIKOV, I.I.; FRANK, G.M.

X-ray study of structural reconstructions in a striated muscle following changes in its length. Dokl. AN SSSR 157 no.3:688-691 JI '64. (MIRA 17:7)

1. Chlen-korrespondent AN SSSR (for Frank).

VAZINA, A.A.; LEMAZHIKHIN, B.K., FRANK, G.M.

Discovery of an actin polymer differing from the F-form. Dokl.
AN SSSR 159 no.4:921-922: D '64 (MIRA 18:1)

1. Institut biologicheskoy fiziki AN SSSR. 2. Chlen-korres-
pondent AN SSSR (for Frank).

FEDORENKO, N.P., akademik; SUKACHEV, V.N., akademik; KARAKHEYEV, K.K.; FRANK, G.M.; KONSTANTINOV, B.P., akademik; ASTAUROV, B.L.; YEFIMOV, A.N.; SHUMILOVSKIY, N.N.; ISHLINSKIY, A.Yu., akademik; GERASIMOV, I.P., akademik; KAZARNOVSKIY, I.A.; BYKHOVSKIY, B.Ye., akademik; ZHEBRAK, A.R., akademik

Discussion of the annual report. Vest.AN SSSR 35 no.3:95-112
Mr '65. (MIRA 18:4)

1. Prezident AN Kirgizskoy SSR (for Karakeyev).
2. Chleny-korrespondenty AN SSSR (for Frank, Astaurov, Yefimov, Kazarnovskiy).
3. AN Kirgizskoy SSR (for Shumilovskiy).
4. AN BSSR (for Zhebrak).

RAZUMOVA, I.L.; MEL'NIKOV, L.A.; IEMAZHIKHIN, B.K.; FRANK, G.M.

Shortening glycerinated muscles with a damaged two-dimensional lattice of filaments. Biofizika 10 no.1:194 '65.

(MIRA 18:5)

1. Institut biologicheskoy fiziki AN SSSR, Moskva.

VAZINA, A.A.; LEMAZHIKHIN, B.K.; FRANK, G.M.

Liquid crystalline structure in nonoriented gels and F-actin solutions. Biofizika. 10 no.3:420-423 '65. (MIRA 18:11)

1. Institut biologicheskoy fiziki AN SSSR, Moskva. Submitted July 6, 1964.

FRANK, C. M.

Some basic physical and physicochemical problems concerning muscle contraction. Izv. AN SSSR Ser. biol. no.3:335-358 My-Je '65.
(MIRA 18:5)

1. Institut biologicheskoy fiziki AN SSSR.

VAZINA, A.A.; BOLOTINA, I.A.; VOL'KENSHTEYN, M.V.; LYASOTSKAYA, I.;
FRANK, G.M.

Configuration of a polypeptide chain in G- and F-actin.
Biofizika 10 no.4:567-570 '65. (MIRA 18:8)

1. Institut biologicheskoy fiziki AN SSSR, Moskva, i Institut
vysokomolekulyarnykh soyedineniy AN SSSR, Leningrad.

VAZINA, A.A.; FRANK, G.M.; ZHELEZNAYA, L.A.

Intermediate actin polymer. Biokhimiya 30 no.4:721-726
Jl-Ag '65. (MIRA 18:3)

1. Institut biologicheskoy fiziki AN SSSR, Moskva.

VLADIMIROV, Yuriy Andreyevich; FRANK, G.M., otv. red.; UMERIKHINA,
A.V., red.

[Photochemistry and luminescence of proteins] Fotokhimiia
i liuminestsentsiia belkov. Moskva, Nauka, 1965. 231 p.
(MIRA 19:1)

BERKINOLIT, M.B.; BURSHEYN, E.A.; L'VOV, K.M.; PULATOVA, M.K.;
ROZOVA, L.V.; FRANK, G.M., red.; PLYSHEVSKAYA, Ye.G.,
red.

[Cell biophysics] Biofizika kletki; sbornik statei pod
red. G.M.Franka. Moskva, Nauka, 1965. 294 p
(MIRA 19:1)

1. Akademiya nauk SSSR. Institut biologicheskoy fiziki.
2. Chlen-korrespondent AN SSSR (for Frank).

BURSHTEYN, E.A.; L'VOV, K.M.; ROZOVA, L.V.; FRANK, G.M., red.;
PLYSHVSKAYA, Ye.G., red.

[Molecular biophysics] Molekuliarnaia biofizika. Moskva,
Nauka, 1965. 251 p. (MIRA 19:1)

1. Chlen-korrespondent AN SSSR (for Frank).

L. H. 7-66 AG (R)-7/SWP(1)/PCG/PSS-2 SCPE TT, DP, RI, GN

ACC NR: AP6031663

SOURCE CODE: UR/0216/66/000/005/0625/0643

AUTHOR: Frank, G. M.; Livshits, N. N.; Arsen'yeva, M. A.; Apanasenko, Z. I.;
Belyayeva, L. A.; Golovkina, A. V.; Klimovitskiy, V. Ya.; Kuznetsova, M. A.;
Luk'yanova, L. D.; Meyzerov, Ye. S.

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69
B

ORG: Institute of Biological Physics, AN SSSR (Institut biologicheskoy fiziki AN SSSR)

TITLE: The combined effect of spaceflight factors ² on some functions of the organism

SOURCE: AN SSSR. Izvestiya. Seriya biologicheskaya, no. 5, 1966, 625-643

TOPIC TAGS: central nervous system, biologic oxidation, biologic metabolism, reflex activity, brain tissue, radiation effects, ~~ionizing~~ radiation biologic effect, *ionizing radiation*

ABSTRACT: Results of experiments studying the combined effect of spaceflight factors (acceleration, vibration, and radiation) on some functions of the organism (brain hemodynamics, CNS functions, and cell division of hematopoietic organs) are discussed. Tolerance of the CNS to accelerations depends significantly on changes of brain hemodynamics during accelerations. Brain blood flow in rabbits subjected to centrifugal accelerations in the head-foot direction (5 G in head region and 10 G in pelvis region) for 12 to 60 sec decreased. This reaction was insignificant during the first exposure, sharply increased during repeated exposure, and weakened after chronic exposure, thus indicating that tolerance to accelerations can be

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ACC NR: AP6031663

increased by training. Participation of CNS reflex mechanisms in these processes is probable. The 15-min exposure of guinea pigs to radial accelerations (8 G), centrifuged twice with a one-day interval, increased the spontaneous bioelectrical activity of extensor muscles; however, the effect was not lasting. It was lowered the day after the second centrifugation and was essentially the same as the control from the sixth day. The 15-min exposure of the animals to vibrations (70 cps, 0.4 mm amplitude), twice with a one-day interval, produced less distinct but more stable changes, with normalization more than 25 days after the first vibration exposure. Changes in myoelectric activity during spaceflight (Sputnik-4) incorporated features of both acceleration and vibration effects, appreciably exceeding them in intensity. Oxidation processes in brain tissues, judged by PO₂ and "oxygen test" results, were initially increased in intensity by the effect of vibrations (using the above parameters), and subsequently underwent phase changes, including depression of oxidation metabolism during the aftereffect period. Changes in unconditioned defense and vestibulotonic reflexes and upper nervous activity were observed later than 12 days after vibration. Inhibition of food-procuring conditioned and defensive unconditioned reflexes in the majority of animals, with pronounced paralytic phenomena, was also found. Exposure to 8-, 10-, and 20-G accelerations and vibration (700 cps, 0.005 mm, 60 min) resulted in decreased mitotic activity of bone-marrow cells for 30 days. Disturbances of cell division involved chromosomal stickiness and increase in the number of chromosomal aberrations. Ionizing radiations and the above dynamic factors produced a similar effect on oxidation metabolism in brain tissues and cellular division in hematopoietic organs. They differed

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ACC NR: AP6031663

only in the level and dynamics of changes caused. The combined effect of irradiation and dynamic factors either did not exceed or was less than the effect of each of the indicated factors separately, a phenomenon seen as a radioprotective action of dynamic factors. The relations observed are similar to phenomena of dominance and parabiosis. Typical radiation reactions were intensified when irradiation was combined with factors having directly opposed effects. The variation and complexity of results of the combination of dynamic factors and irradiation are explained by the multiplicity of the mechanisms of the combined effect of radiation and nonradiation factors. The combined exposure to vibration and whole-body acute irradiation at a lethal dose showed that in a majority of cases the vibration effect on metabolism and CNS function was dominant at early stages, while that of irradiation prevailed at later stages. At the latest stages of exposure, the combined effect of vibration and irradiation was diverse and complicated. According to some indices, the trend of changes corresponded to the effect of one of the factors while the dynamics of the processes reflected the effect of the other one. Under the uniform action of both factors, the phenomena of partial summation of weakening of the radiation effect, and in several cases of a sharp increase of radiation effect by the opposite action of the vibration effect, were observed. Probable mechanisms of the phenomena described are considered. Orig. art. has: 13 figures.

[SW]

SUB CORE 06/ SUBM DATE: 14Dec65/ ORIG REF: 032/ OTH REF: 008/ ATD PRESS:

5995

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ACC NR: AP6015647

(N)

SOURCE CODE: UR/0413/66/000/009/0057/0058

INVENTOR: Bagryantsev, A. L.; Frank, G. P.

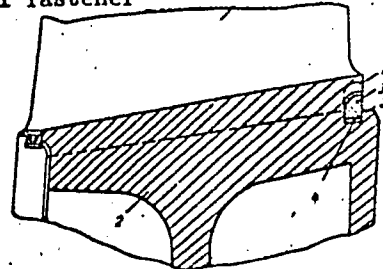
ORG: None

TITLE: Turbine working blade mounting assembly. Class 27, No. 181230

SOURCE: Izobreteniya, promyshlennyye obraztsy, tovarnyye znaki, no. 9, 1966, 57-58

TOPIC TAGS: turbine blade, axial compressor, mechanical fastener

ABSTRACT: This Author's Certificate introduces a turbine working blade mounting assembly for wheels in axial compressors. The blades are fixed in an axial direction in the rotor grooves by a split lock ring. Reliability is improved by setting the lock ring in a groove in the disc. This groove forms a continuous support collar. The blade roots are equipped with lugs for limiting the radial motion of the ring.



1—blade; 2—rotor; 3—lock ring; 4—groove; 5—collar; 6—blade root lugs

SUB CODE: 13, 21/ SUBM DATE: 17Apr65

Card 1/1

UDC: 621.515-226.2

FRANZ, H.

437-1124
View to study a specimen of iodine, stored in a glass
tube in the laboratory of the Physics Department in the
University of Prague. H. FRANZ, *Semiconductor Obs.*
Ab. 194-202 (Sept., 1952) in Czech.
Monocrystals of hexagonal Se were produced by
vacuum distillation. Great care was taken to repre-
sent as accurately as possible the conditions which
existed in the experiments of Brown (1915). It was
found that the Brown effect, i.e. the photoelectric
phenomenon caused by illumination of the Se crystal
inside the interelectrode space, is due to the diffusion
of i.r. light inside the crystal. The same phenomenon
was also observed in the case of other semiconductors
which are transparent to i.r. radiation, e.g. needle-like
crystals of natural antimonite (Sb_2S_3). On testing
two composite monocrystals the Brown effect was
found to extend beyond the boundary of the first
crystal, but is weakened to a quarter of the original
intensity on passing from one crystal to the other.
This is the main reason why the Brown effect was not
observed in grey polycrystalline Se. By measuring
the spectral differences between the normal photo-
electric effect and the Brown effect it was found that
the grey modification of hexagonal Se is transparent
to i.r. radiation in the 0.8-1.0 micron region.

SO: Physics Abstracts, Vol. 56, No. 664, Page 328, April 1953

FRANK, H.

621.383 : 537.51...3

1652. Photoelectric conductivity of lead sulphide.
H. FRANK. *Slaboproudý Obzor*, 14, No. 6, 243-57
(1953) in *Czech*.

Electrical Engineering Abst.
Vol. 57 No. 676
Apr. 1954
Electronics

A brief survey of internal photoelectric phenomena is given and the photoelectric effect in PbS is explained in terms of the energy band model. The properties of natural galena are briefly discussed, the conclusion being that natural PbS is unsatisfactory for the manufacture of photoresistors. Artificially, PbS is prepared (a) by a direct synthesis of Pb and S; (b) by a chemical reaction of a solution of Pb acetate and H₂S. The photoelectric resistors are prepared either by depositing PbS on a glass base as a result of the chemical reaction between the solutions of Pb acetate, CS(NH₂)₂, and NaOH, or by the evaporation of pure PbS in vacuum on to a piece of glass. Three types of photoresistors are made (in Czechoslovakia) by the latter method; one of these is externally cooled by dry ice; the other two have sensitive surfaces of 1.5 and 16 mm², respectively. Their properties are as follows: operating voltage 40 V; load resistance 0.1-2 MΩ; internal resistance of non-cooled photocells 1-10 MΩ; lowest detectable energy ~ 10⁻⁸ W, or even less in the case of ice-cooled resistors; uniform spectral sensitivity down to 2.5 μ; efficiency of the non-cooled photocells is ~ 0.1 A/W, this figure being 10 times higher for the cooled resistors; frequency response 10 kc/s; good stability after initial ageing. The properties of the PbS photocells are illustrated by a number of graphs and tables. The photoresistors have been successfully employed for film sound reproduction; other applications such as infrared telephony, are suggested. 54 refs.

R. S. SIDOROWICZ (R)

9/2/34

FRANK, H.; SHEJDAR, V.

This country's germanium diodes. p. 2.
(SDELOVACI TECHNIKA, Vol. 2, no. 1, Jan. 1954, Praha)

SO: Monthly List of East European Accession, (EEAL), LC, Vol. 4,
No. 11, Nov. 1955, U₁cl.

FRANK, H.

Oscillographic method for recording characteristics of germanium diodes, p. 40, SLOVACI TECHNIKA (Ministerstvo strojirenstvi) Praha, Vol. 2, No. 2, Feb. 1954

SOURCE: East European Accessions List (EEAL) Library of Congress, Vol. 4, No. 12, December 1955

FRANK, H.

Effect of temperature on static characteristics of germanium diodes,
p. 71, SDELOVACI TECHNIKA (Ministerstvo strojirenstvi) Praha, Vol. 2,
No. 3, Mar. 1954

SOURCE: East European Accessions List (EEAL) Library of Congress,
Vol. 4, No. 12, December 1955

HELMAR, FRANK

✓ Photoelectric conductivity of cadmium sulfide, Helmar Frank (Výzkumný ústav pro elektrotechn. fyziku, Prague). *Slaboprůmysl (Absor 15, 371-4, 435-43(1951).*—P. describes the basis of the internal photoelec. effect, indicates the relation between the absorption of light and photoelec. cond., and attempts to explain all the phenomena on the basis of the energy-level model of semiconductors. The theory of exceeding the quantum equiv. is studied and the frequency dependence of the photoelec. effect is discussed. The technological procedure for obtaining photoelectrically sensitive CdS is examd. The properties of cryst. CdS are surveyed, with particular attention to the photoelec. properties in the visible, ultraviolet, and x-ray bands. The influence of O is discussed. In conclusion P. presents his own experiences with photoelec. CdS and indicates possible applications, particularly for the detection of x-rays. 58 references. Petr Schneider.

Smw 44

CZECH

537.312.5 : 537.311.33

2763. Photoconductivity of cadmium sulphide. H.

FRANK. Slaboproudý Obzor, 15, No. 8, 371-7 (1956)

in Czech.

Internal photoelectric effect in crystals is explained, it being pointed out that photoconductivity can take place only when the absorption of light by crystals results in the appearance of free electrons. The photoconductivity of crystalline CdS is explained by means of the energy-band model proposed by Riehl-Schön. The large quantum yield (10⁶ electrons/photon) observed in CdS is due to an immediate capture of holes by the activator levels. Photoelectric current in CdS crystals shows a considerable inertia, this being caused by mono- or bi-molecular, or combined recombination of the electrons and holes. A mathematical theory of this effect is presented, describing both the rise and decay of the photoconductivity. The paper is illustrated by a number of experimental curves taken from various sources.

BB R. S. SIDOROWICZ
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FRANK, H.; SNEJDAR, V.

Germanium rectifiers with P-N junctions. p. 2

SDELCOVACI TECHNIKA. Praha, Czechoslovakia, Vol. 3, No. 1, Jan. 1955

Monthly List of East European Accessions (EEAI), LC. Vol. 8, No. 8, August 1959
Uncl.

FRANK, H.

Use of flat germanium rectifiers for measuring low voltage. p.4

SDELOVACI TECHNIKA. Praha, Czechoslovakia, Vol. 3, No. 1, Jan. 1955

Monthly List of East European Accessions (EEAI), LC. Vol. 8, No. 8, August 1959
Uncl.

FRANK, H.

FRANK, H. Problem of static characteristics of P-N transition in germanium. p. 201.

Vol. 5, no. 2, Mar. 1955
CESKOSLOVENSKY ČASOPIS PRO FYZIKU
SCIENCE
Czechoslovakia (Praha)

So: East European Accessions, Vol. 5, no. 5, May 1956

FRANK, H.

Industrial utilization of germanium.

p. 154

Vol. 5, no, 4, 1955

ZA SOCIALISTICKOU VEDU A TECHNIKU

Praha, Czechoslovakia

Source: Monthly List of East European Accessions, (EEAL), LC, Vol. 5, no. 2
February 1956, Uncl.

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FRANK HELMAR

CZECHOSLOVAKIA/Electricity - Conductors

G-3

Abs Jour : Ref Zhur - Fizika, No 3, 1958, No 6283

Author : Frank Helmar
Inst : Institute of Electro Technical, Prague, Czechoslovakia
Title : Photoelectric Measurements of the Internal Field in Inhomogeneous Semi-Conductors

Orig Pub : Ceskosl. casop. fys., 1955, 5, No 5, 536-544

Abstract : The inhomogeneous distribution of impurities in the crystal is connected with the occurrence of an internal electric field. The latter plays the role of an external voltage source. The application of an external photo-emf of opposite polarity can cause the photocurrent to stop flowing upon illumination. The photocurrent is observed with the aid of an ac amplifier using a modulated light to eliminate the dc component of the current in the crystal. By passing dc through the crystal it is possible to observe that the photoeffect vanishes at a definite value of compensating current. Thus by using point-illumination of the crystal at various distances it is possible to establish the distribution of the internal field over the

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CZECHOSLOVAKIA/Electricity - Conductors

CIA-RDP86-00513R000413530012-2"

G-3

Abs Jour : Ref Zhur - Fizika, No 3, 1958, No 6283

crystal and to observe consequently its inhomogeneities. Corresponding experiments have been performed and have shown the correctness of the Taus theory of the volume photoeffect.

Card : 2/2

F. HINK, H.

CZECH

3992. Germanium junction rectifiers. H. HINK
and F. HINK. *Radio Engng. Electron. Phys.* 1964, 9, (1155) 1a Czech.

The constructional details of two types of junction power (50 V and 0.5 A) Ge rectifiers are given: (1) a diode enclosed in plastic, and (2) a metal-cased Ge valve. It is found that the current-voltage characteristics of the junction rectifiers can be closely expressed by a theoretical formula. A number of curves shown illustrate the effect of temperature and frequency on the electrical parameters of the diodes in various circuits. It is thought that the diodes will find application primarily in rectifying circuits owing to their exceptionally high efficiency (up to 80%). A table listing various relevant data of some American and German Ge junction diodes is given in an appendix.

FRANK, H

621.383.4

5275. A new type of PbS (photo-cell) photoelectric resistor. H. FRANK, R. LADMAH AND E. PÁNYL. *Stahoprůmysl*, 16, No. 5, 269-74 (1955) In Czech. EL

Gives a detailed description of the production technology of a PbS photocell and reports its electrical

properties. The photosensitive material, prepared by a direct synthesis of Pb and S, is deposited by evaporation on the inner surface of a glass bulb between two graphite electrodes. The PbS layer is sensitized by oxidation and the bulb is then evacuated. The resulting photocell, after a preliminary ageing, has the following characteristics: (1) dark resistance of several MΩ; (2) optimum d.c. operating voltage of 40 V; (3) time constant of 100 μsec; (4) sensitivity at the room temperature 10^{-10} W; (5) spectrum practically uniform over the whole visible range and over the upper part of the infrared (down to 2.2 μm). Physical aspects of a PbS photocell were discussed by H. Frank in a previous paper [Abstr. 1652 (1954)].

R. S. SUDHAWICZ

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FRANK, H

621.314.7

5055. Point-contact transistors. H. FRANK, V. SNEIDAR AND V. ILBERG. *Slabopromyshlennyye*, 16, No. 7, 350-7 (1955) in Czech. EE

Technology and constructional details of point-contact transistors are discussed, the physical principles of the transistor action are explained and the electrical properties of two types of the Czechoslovak point-contact transistors are described in detail. The glass-encapsulated transistors (NT40) have the following parameters: (1) power dissipation 100 mW, (2) max. collector and emitter currents of -2 mA and 5 mA, respectively, (3) $r_{11} = 500 \Omega$, $r_{22} = 120 \Omega$, $r_{12} = 30-40 \Omega$, $r_{21} = 12-20 \Omega$ and $\alpha = 1.5-2$, (4) power amplification of 13-17 db, and (5) max. operating temperature of 50°C. The transistors can be employed at frequencies up to and over 300 kc/s as amplifiers and up to 10 Mc/s as oscillators. Since the transistors are embedded in plastic, their mechanical stability is satisfactory. Tolerances in the electrical characteristics are sufficiently low to guarantee a successful mass production. The metal-encased transistors

operate with max. collector current of -2 mA, collector voltage of -7 to 10 V and emitter current of 0-5 mA. The paper is illustrated by a substantial number of experimental characteristics.

R. S. SIDOROVITZ

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FRANK HEI MAR

...methodically present some of the ...
...by using a Ge single crystal with a ...
impurity concn. A method for the direct measure ...
the inner elec. field is discussed by which it is possible to ...
...crystal ...

AST

FRANCK, H.

Problems of glass technology. p.197. EPITOANYAG. Budapest.
Vol. 8, no. 6, June 1956.

SOURCE: East European Accessions List (EEAL), Library of Congress
Vol. 6, No. 12, December 1956

FRANK HELMAR

CZECHOSLOVAKIA/Electronics - Photocells and Semiconductor Devices H-8

Abs Jour : Ref Zhur - Fizika, No 6, 1958, No 13666

Author : Frank Helmar
Inst : Higher Institute of Electrotechnical Physics, Prague,
Czechoslovakia
Title : Junction Germanium Transistors.

Orig Pub : Slaboproudny obzor, 1956, 17, No 12, 680-187

Abstract : After indicating the basic properties of transistors and modern possibilities of their applications, the author considers briefly the physical fundamentals of junction transistors. Particular attention is paid in this case to the influence of minority carriers on the electric properties of the semiconductor, to the carrier-injection processes in semiconductor, and the role of the p-n junction as an emitter and collector. There is a brief analysis of methods for connecting transistors in circuits. The technology of the manufacture and the properties of junction transistors of Czechoslovak manufacture are described, with a maximum dissipation power of 20

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13666 devices H-8

and a limiting frequency up to 500 kc. Parameters, the temperature and frequency dependence of certain Czechoslovak transistors, are given in the form of tables and graphs. Bibliography, 12 titles.

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Card : 2/2

FRANK, H.

A junction transistor checker. p. 10. (Sdelovaci Technika. Vol. 5, no. 1, Jan. 1957.)

FRANK HELMAR

~~FRANK~~

CZECHOSLOVAKIA/Electricity - Semiconductors

G-3

Abs Jour : Ref Zhur - Fizika, No 6, 1958, No 13500

Author : Frank Helmar, Hurger Antonin

Inst : Not Given

Title : Measurement of the Lifetime of Minority Carriers in Ger-
manium

Orig Pub : Slaboproudy obzor, 1957, 18, No 10, 643-649

Abstract : A survey of the method for measuring the lifetime of carriers
in germanium.

Card : 1/1

AUTHOR: Frank, Helmar CZ/37-58-5-14/19
TITLE: The Orientation of Single Crystals of Germanium and Silicon by an Optical Method (Orientace monokrystalů germania a křemíku optickou metodou)
PERIODICAL: Československý Časopis pro Fysiku, 1958, Nr 5, pp 614-617 + 1 plate (Czech)
ABSTRACT: The orientation of single crystals of germanium or silicon has to be determined for various applications with an accuracy better than 1°. This can be achieved by X-ray methods which are, however, time-wasting and dangerous. Our optical method is based on older work (Refs 2,3,4) which has been rediscovered by Wolff, Wilbur and Clark (Ref 5). We have modified this method by using a convergent beam of light, thus making the reflected image bright enough for crystals to be oriented in weak daylight. The optical method described here is very fast and is suitable for production control. For the orientation of germanium crystals into a direction parallel to a (111) plane, the crystals were etched by the etch "W ag" (formula: 20 ml HNO₃ conc. + 40 ml HF 48% + 2 g AgNO₃ + 40 ml H₂O), which preferentially attacks the

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CZ/37-58-5-14/19

The Orientation of Single Crystals of Germanium and Silicon by
an Optical Method

(111) surfaces (Ref 6). Fig.1 shows the characteristic triangular etch pits; Fig.2 shows the light reflected from such an etched (111) surface. The reflection pattern has triangular symmetry. Fig.3 shows the optical arrangement used for orienting the crystals. The light source is a 1 mm diaphragm 3 illuminated by a 30 Watt bulb 1 through a condenser 2. An achromatic lens 4 ($f = 200$ mm, 60 mm diameter) images the light source onto the crystal 6. The reflected light is observed on a white screen 5, 200 mm in diameter. The illuminating beam passes through a 10 mm hole in the centre of the screen. The distance from the crystal to the screen is approximately 60 mm. The crystal is rotated until the triangular reflected image is centrally symmetrical round the opening in the screen. A rotation of $15'$ of the crystal is observable as a 0.5 mm shift in the reflected image. Further details about the mechanical arrangements used for holding and rotating the crystals are given. A suitable arrangement for measuring the deviation of the crystal surface from a Card 2/3 (111) plane is also described. Silicon crystals are etched

CZ/37-58-5-14/19

The Orientation of Single Crystals of Germanium and Silicon by
the Optical Method

in a 10% solution of KOH warmed to 70°C. After 1-2 mins
the (111) surfaces with triangular symmetry of etch pits
become visible; after about 5 mins of etching the (100)
surfaces with square etch pits also become noticeable.
The described optical method for orientating crystals is
equally suitable for silicon.

There are 6 figures and 6 references, one of which is
Czech, 2 German and 3 English.

ASSOCIATION: Výzkumný ústav pro elektrotechnickou fyziku, Praha
(Research Institute for Electrotechnical Physics, Prague)

SUBMITTED: April 14, 1958.

Card 3/3

CZECHOSLOVAKIA/Electronics - Electrocells and Semiconductors
Device

H

Abs Jour : Ref Zhur Fizika, No 9, 1959, 20783

A thor : Frank, Helmar; Vinopal, Jaromir

Inst : -

Title : Silicon Junction Rectifiers

Orig Pub : Slaboproudy obzor, 1958, 19, No 10, 639-643

Abstract : After a examination of various types of rectifiers, the authors describe the properties of silicon junction diodes. Comparison of the properties of silicon and germanium diodes is accompanied by a brief explanation on the basis of the band theory. Data are given (including curves for the equations and tables for the parameters), which characterize the properties of silicon junction diodes (types 111 - 124 NP70), designed for voltages up to 300 and currents up to 1 amp, particularly their behavior at higher temperatures. Bibliography, 13 titles.

Card 1/1

CZECH/37-59-2-8/20

AUTHOR: Helmar Frank

TITLE: A Four-electrode Probe with Mercury Contacts for
Determining the Resistivity of Silicon

PERIODICAL: Ceskoslovensky Casopis Pro Fysiku, 1959, Nr 2,
pp 173-177 (+ 1 plate)

ABSTRACT: For the rapid determination of the resistivity of semi-conductors, the four-probe method is commonly used (Ref 1). One of the conditions of this measurement is that the contacts must be ohmic. This can be achieved in Ge by slight abrasion of the surface and light pressure of tungsten probes on to it. With silicon, ohmic contacts are not achieved in such a simple way. As an alternative to the existing methods of either electrically formed contacts or alloyed contacts, we have tried mercury as a contact material. The contact between a drop of mercury and a ground surface of silicon is non-linear and unstable. If, however, we form this contact by passing a current pulse of sufficient intensity through it, the resistance drops from 10^6 ohm to a few ohm, the contact becomes stable and practically linear until it is mechanically interrupted. The forming pulse was a

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CZECH/37-59-2-8/20

A Four-electrode Probe with Mercury Contacts for Determining the Resistivity of Silicon

discharge from 1-4 μF condenser at 70-100 V. This pulse leaves the crystal undisturbed and the surface clean. A measuring probe containing 4 contacts was prepared and it is shown in Fig 2. The mercury is contained in a pool inside a plate of insulating material. Four holes of 1 mm diameter are drilled into the plate. The distance between the contacts is $s = 3.5$ mm and the current is carried through iron plates. For measurements, a flat surface of the crystal is pressed into contact with all four holes by a spring. By rotating the instrument around its axis, we let the mercury run into the holes and thus make contact with the crystal. A self-contained conventional measuring circuit was constructed and is described in Fig 3. The circuit included provision for the forming pulses. For thin layers, certain corrections to the usual 4-probe method have to be applied (Refs 2, 3). According to Smits, the resistivity of a thin plate, with diameter "d" and thickness "w", or with length "a", width "d" and thickness "w", is given by Eq (2). Here "R" is the resistance measured in the 4-probe measurement ✓

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CZECH/37-59-2-8/20

A Four-electrode Probe with Mercury Contacts for Determining the Resistivity of Silicon

and "CF" are geometrical correction factors. For very thin and narrow rectangular plates, Eq (2a) applies. In our case, this means that the rectangle must be less than 4 mm wide, more than 15 mm long and less than 1.5 mm thick, if we wish to keep the error to 0.2%. Fig 4 contains nomograms for the rapid calculation of ρ for circular discs. The described apparatus measures resistivities between 10^{-4} and 10^4 ohm cm. The error is not more than 2%, but depends on the accuracy of the geometrical measurements. There are 4 figures and 3 English references.

ASSOCIATION: Výzkumný ústav pro sdělovací techniku, Praha
(The Telecommunications Research Institute, Prague)

SUBMITTED: November 20, 1958



AUTHOR: Frank, Helmar

CZECH/37-59-3-8/29

TITLE: ~~Determination~~ of Resistivity of Very Pure Polycrystalline Silicon

PERIODICAL: Ceskoslovenský časopis pro fysiku. 1959, Nr 3, pp 263-266

ABSTRACT: The DC resistivity of high-purity polycrystalline silicon is not a characteristic of the material but of the barriers present in it. To obtain the resistivity characteristic of the silicon, a high-frequency measurement of resistivity was undertaken. The measurements were made on a polycrystalline sample with dimensions 9.1 x 4.6 x 0.6 mm. Approximately ohmic contacts were made with an eutectic alloy of gallium and zinc. Figure 1 shows the real component of the impedance of the sample as a function of frequency. The curve in Figure 1 was calculated from the equivalent circuit (Figure 2), while the points were measured. The limiting value of 30 k Ω at a frequency of 30 m.c. may be considered as the real resistance of the silicon. The resistivity is given by :

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CZECH/37-59-3-8/29

Determination of Resistivity of Very Pure Polycrystalline Silicon

$$\rho = R \cdot \frac{F}{d} \cdot k_1 \cdot k_2 \quad (2) .$$

A is the area of the specimen, d its thickness and k_1 a correction factor due to the fact that the silicon does not actually fill the whole volume of the sample. k_2 is a correction due to the fact that the mobility of carriers is reduced by the small dimensions of the crystallites. Figure 3 shows the model on which the equivalent circuit is based. The surface layers S_1 between crystallites are represented by R_2 and R_3 , with C_2 and C_3 in parallel. R_1 and C_1 are due to the barrier J at the contact. R_0 is due to the resistance of the silicon. k_1 is given by Eq (3) and can be evaluated from Eq (4) if we measure C_0 and calculate C from the dimensions of the sample and the dielectric constant of

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CZECH/37-59-3-8/29

Determination of Resistivity of Very Pure Polycrystalline Silicon

silicon ($\epsilon = 12$) . For k_2 the value 0.01 is taken as a reasonable estimate. From this ρ is calculated to be approximately 1 000 Ω cm . This result is supported by the fact that a single crystal grown from the same material had, after extensive zone refining, the same resistivity.

The orders of magnitude of R_2 and R_3 are such as to suggest that the grain boundaries consist of Schottky barriers, rather than of SiO_2 . No evidence for the presence of oxygen was found from the infra-red absorption spectrum. The thermo-electric effect shows that the material was n-type. The conductivity was plotted against temperature (Figure 4) and from this plot an activation energy of 1.1 eV was derived. All the evidence shows that the material was near-intrinsic.

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Determination of Resistivity of Very Pure Polycrystalline Silicon

CZECH/37-59-3-8/29

There are 4 figures.

ASSOCIATION: *Výzkumný ústav sdělovací techniky, Praha*
(Telecommunications Research Institute, Prague)

SUBMITTED: November 14, 1958

Card 4/4



06630

AUTHOR: Frank, Helmar

CZECH/37-59-5-6/13

TITLE: Measurement of Hall Mobility on Whole Germanium and Silicon Crystals

PERIODICAL: Československý časopis pro fysiku, 1959, Nr 5, pp 499 - 503

ABSTRACT: The Hall mobility $\mu = R_H \cdot \sigma$ (R_H - Hall constant, σ - conductivity) is usually measured on thin rectangular samples by measuring the Hall voltage (W. Shockley - Ref 1):

$$U_H = R_H \frac{i B}{d} \quad (1)$$

Here, i is the current through the sample, B the magnetic field and d the thickness of the sample. It is often desirable to measure the variations in mobility along the axis of a large crystal. Cutting it into slices for subsequent measurements is extremely wasteful and it will be shown in this paper that the measurements can be carried out without any shaping of

Card1/5

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CZECH/37-59-5-6/13

Measurement of Hall Mobility on Whole Germanium and Silicon Crystals

the crystal. For a plate of cross-section $2r.d$, we obtain:

$$\begin{aligned}
 U_H &= R_H \cdot B \cdot \frac{i}{d} = \\
 &= R_H \cdot B \cdot \frac{I \cdot d \cdot 2r}{d} = R_H \cdot B \cdot I \cdot 2r
 \end{aligned}
 \tag{3}$$

where I is the current per unit area.
 For a cylinder of diameter r , with current flowing along it, we obtain:

$$\begin{aligned}
 U_H &= R_H B \cdot \frac{2i}{r\pi} = \\
 &= R_H \cdot B \cdot \frac{I \cdot 2r^2\pi}{r\pi} = R_H \cdot B \cdot I \cdot 2r
 \end{aligned}
 \tag{4}$$

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Measurement of Hall Mobility on Whole Germanium and Silicon Crystals

which is identical to Eq (3). The only conditions for this identity are: equal density of current I , no barriers in the crystal, reasonable uniformity of the density of carriers.

The Hall mobility is measured by measuring the Hall voltage U_H between electrodes 3 and 4 (Figure 1), the electric field $E_x = U_{5,6}/\Delta x$ in the direction of the current flow, the magnetic field B and the distance between the Hall electrodes:

$$\mu = \frac{U_H}{B \cdot E_x \cdot 2r} \quad (6) .$$

The measurements were carried out on a holder shown in Figure 2. The crystal is fixed on a slide made of insulating material. The crystal is held on the slide by two wire loops between two brass L pieces, which are covered with a Ga-Zn alloy. These provide the contacts

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Measurement of Hall Mobility on Whole Germanium and Silicon Crystals

for the current along the crystal. The slide can move on an insulating base plate. The base plate carries the four further contacts, all made of thin bronze springs coated with Ga-Zn alloy. The two Hall contacts are shown as 6 and 8 (Figure 2); the contacts for measuring E_x are 12 and 13. All contacts can be withdrawn on two auxiliary slides to allow the crystal to move. Usually, the contacts are made by pressure of approx. 100 to 300 g on the springs. On high-resistivity silicon crystals a condenser has occasionally to be discharged through the contacts. The base plate is fixed to one of the pole pieces of an electromagnet. The resistivity can be measured simultaneously. There are 2 figures and 2 references, 1 of which is English and 1 a private communication.

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06630

Measurement of Hall Mobility on Whole Germanium and Silicon Crystals

CZECH/37-59-5-6/13

ASSOCIATION: Výzkumný ústav pro sdělovací techniku A.S. Popova,
Praha (Popov Institute of Telecommunications Research,
Prague)

SUBMITTED: March 27, 1959

Card 5/5

CZECH/14-59-6-11/60

9(2,3)
AUTHOR:

Frank, Helmar, Doctor

TITLE:

Tuning IF Filters by Means of a Wobbler With a Si Junction Diode

PERIODICAL:

Sdělovací Technika, 1959, Nr 6, pp 213-214 (Czechoslovakia)

ABSTRACT:

The author deals with the various applications of silicon junction diodes and mentions first the automatic tuning of radio sets. The junction diode introduced into the circuit of the oscillator, changes the frequency according to the size and phase of the IF signals, so that the station tuned in automatically adjusts itself to the frequency of the emitter. Further, the junction diode can be used as a frequency modulator of the signal generator for the rapid and clear presentation of resonance curves on the screen of the cathode oscillograph. New silicon junction diodes type 111NP70 were recently developed and tested in the Výzkumný ústav pro sdělovací techniku A.S. Popov (Research Institute of Telecommunication Techniques) ✓

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CZECH/14-59-6-11/60

Tuning IF Filters by Means of a Wobbler With a Si Junction Diode

A.S. Popov) with very satisfactory results. A small tuning device was constructed (as presented in figure 7) composed of 2 electron linked oscillators. The oscillator with the electron E_1 provides the comparative frequency and for this reason the small condenser C_2 is gauged directly in Kc/s for a range of 430-490 Kc/s. The size of the signal can be regulated by the potentiometer P_1 . The frequency modulated oscillator with the electron E_2 is similarly connected with the only difference that the si-diode D is connected parallel to the oscillator circuit $L_2 C_{11}$. The condenser C_0 prevents the high frequency voltage from entering the circuit of the modulation voltage. It is necessary to avoid a reciprocal influence between the coils. For this installation the oscillograph type Krizik T531 was used. The described device is simple and likely to speed up and guarantee the optimal tuning of IF filters. In his conclusion, the author mentions the application of si-junction diodes as simple fre- ✓

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Tuning IF Filters by Means of a Wobbler With a Si Junction Diode

CZECH/14-59-6-11/60

quency modulators. There are 2 photographs, 2 graphs,
3 circuit diagrams and 3 references, 2 of which are
Czech and 1 American. ✓

Card 3/3

FRANK, H.

Four-electrode probe with mercury contacts for determining the resistivity of silicon. p. 173.

CESKOSLOVENSKY CASOPIS PRO FYSIKU. (Ceskoslovenska akademie ved. Ustav Technicke fyziky) Praha, Czechoslovakia. Vol. 9, no. 2, 1959.

Monthly List of East European Accessions (EEAI) LC. Vol. 9, no. 2, February 1960.

Uncl.

FRANK, H.

Measurement of the hall mobility on whole germanium and silicon crystals.
p. 499.

CESOSLOVENSKY CASOPIS PRO FYSIKU. (Ceskoslovenska akademie ved. Ustav
Technicke fysiky) Praha, Czechoslovakia. Vol. 9, no. 5, 1959.

Monthly List of East European Accessions (EEAI) LC. Vol. 9, no. 2, Feb. 1960
Uncl.

FRANK, H.: KRIZEK, J.

National conference on semi-conductors in Roznov pod Radhostem. p. 598

SLABOPROUDY OBZOR (Ministerstvo vsebenibe strojirenstvi, Ministerstvo spoju
a Ceskoslovenska vedecko-technicka spolecnost, sekce elektrotechnika) Praha,
Czechoslovakia, Vol. 20, no. 9, Sept. 1959

Monthly List of East European Accessions (EEAI), LC. Vol. 9, no. 2,
Feb. 1960

Uncl.

FRANK, Helmar, dr.

Compound semiconductors. Slaboproudy obzor 21 no.7:426-432 J1'60.
(EEAI 10:1)

1. Vyzkumny ustav pro sdelovaci techniku A.S.Popova, Praha.
(Semiconductors)

Z/039/60/021/011/003/003
EO24/E335

AUTHOR: Frank, H., Doctor

TITLE: International Conference on the Physics of
Semiconductors, Prague, 1960

PERIODICAL: Slaboproudý obzor, 1960, Vol. 21, No. 11,
pp. 658 - 660

TEXT: The conference was held from August 29 to September 2,
1960, with 700 foreign and 150 domestic participants.
At the opening session A.F. Yoffe discussed the present state
of solid-state physics and W. Shockley discussed some outstanding
problems of the p-n junction theory.

The main sessions of the conference were divided into four
simultaneous sections.

Compared with the Amsterdam Conference in 1954, large advances
have been made in the theoretical evaluation of the band
structures of semiconductors with the aid of fast computers.
Both the one electron and many electron approximations were
discussed in detail. Much progress has been made in the theory
of transport such as multiphonon scattering, strong scattering

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E024/E335

International Conference

on impurities, transport in high magnetic fields, etc. A new effect of the modulation of minority carrier mobility by majority carriers at low temperatures was discussed. Negative mobility has been predicted for InSb at low temperatures by Maclean and Paige. Shockley and Hubner reported an experiment in which the momentum of phonons can be directly measured by the interaction with free electrons (transmitted phonon drag effect). A number of problems on thermal and electrical conductivity are still unsolved, particularly in semiconductors with complicated structures containing several components (Yoffe). A number of new effects were reported in the galvanomagnetic sections such as the incompletely understood negative magnetoresistance effect in InSb and germanium (Sasaki et al). The newly discovered tunnel diodes gave rise to a number of basic theoretical investigations. The effects of inhomogeneity on various transport properties were discussed by several authors. Though a number of investigations have been carried out regarding the thermal conductivity of semiconductors, the

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dependence upon temperature of this conductivity has remained somewhat obscure.

Aigrain discussed a new type of propagation of electromagnetic waves in a semiconductor within a magnetic field, called "helicon". The energy states of various impurities and imperfections were discussed along with radiation damage in semiconductors.

Optical effects were discussed in great detail. B. Lax gave an introductory lecture on magnetospectroscopy in semiconductors and several papers dealt with various aspects of optical investigations in semiconductors. These included recombination radiation and absorption spectra.

The question of long lifetimes and large diffusion distances of excitons is still a controversial one.

Photoconductivity was discussed by R.A. Smith, A. Rose and others.

In the field of surface effects, the techniques of obtaining a clean surface have now been established. A number of authors dealt with the influence of various environments on the

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surfaces of semiconductors.

Resonance effects were discussed by Feher, Roth, Williams, Dousmanis, Rosenblum and others.

In the section dealing with ionic crystals, interest was centred on the band structure of such crystals.

In the section on semiconducting compounds, Garrett and Hannay reviewed the organic semiconductors.

Morin discussed fluorides, oxides and sulphides of transition metals.

Group A^{III}B^V semiconductors were discussed by a number of workers, while some Soviet workers (Zhuze, Regel and others) discussed unusual alloys such as In₂Te₃, etc.

Discussion groups dealt with the classical semiconductors, selenium, tellurium and with selenides and tellurides. CdS and ZnS also proved very popular.

Ternary systems were discussed mainly from the point of view

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of thermo-electric materials, together with solid solutions of ZnSb and CdSb, etc.

In the concluding session Dr. Tauc, Professor Bardeen and Academician V.M. Vul gave a critical evaluation of the scientific value of the conference and Doctor Matyas, the Secretary of the conference, dealt with organizational aspects. Professor Zachoval acted as Chairman.

The conference was a great success from all points of view.

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303-9
Z/039/62/023/005/001/004
D291/D301

18.8100

AUTHORS: Frank, Helmar, Doctor of Natural Sciences, and
Viktora, Bohuslav, Engineer

TITLE: Determining the average impedance of conductors and

PERIODICAL: Slaboproudý obzor, v. 23, no. 5, 1962, 252 - 257

TEXT: The article deals with solutions of Maxwell equations for a homogeneous cylinder with arbitrary electrical conductivity which is inserted into the RF field of a simple coil. Relations are derived for the variation of the Q factor when the cylinder is inserted into the coil, and simple formulae are given for quick calculation. The derived values indicate the possibility of determining the average impedance of homogeneous cylindrical specimens by measuring the Q factor of a coil on a simple measuring instrument with minimum adjustment. Experimental measurements were made with a TESLA Brno type BM211A Q-meter on a 10 Mc coil, consisting of 9 turns of 1-mm silver-plated copper wire, 17 mm in diameter, having an inductivity of 0.9 μ H. The tested specimen was polycrystalline GaAs. The validity of the method was also corroborated by measuring various
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Determining the average impedance ... Z/039/62/023/005/001/004
D291/D301

other conductors and semiconductors. It is pointed out that the described method is especially suitable for contactless measuring of the average impedance of semiconductors since it is very quick and surfaces are not contaminated, namely when specimens are wrapped in polyethylene foil. This measuring method in the field of a coil is applicable to low impedances, up to 100 Ω cm and frequencies below 100 Mc. The accuracy of this method depends only on the accuracy of the Q-meter used. In case very sensitive Q measurements are made, the method can be used to determine the homogeneity of alloys, for measuring the temperature coefficient of metals and alloys, to check the diameter of metal rods, to measure the quality of silver-plated surfaces, etc. There are 8 figures and 3 tables. The English-language reference is: N.W. McLachlan: Bessel functions for Engineers. Oxford, Clarendon Press 1955. ✓

ASSOCIATION: Výzkumný ústav pro sdělovací techniku A.S. Popova,
Praha (A.S. Popov Research Institute for Communication
Engineering, Prague)

SUBMITTED: January 25, 1962
Card 2/2

Z/037/63/000/001/002/008
E140/E135AUTHOR: Frank, HelmarTITLE: Contactless measurement of semiconductor resistance
by eddy currents

PERIODICAL: Československý časopis pro fysiku, no.1, 1963, 13-19

TEXT: Probe measurements of GaAs polycrystalline samples display very great inhomogeneity. Fig.1 gives the equipotential curves on a particular inhomogeneous sample, 36 mm long. DC measurements cannot be used since the material is not subject to Ohm's law, due to the intercrystal boundary surfaces. A method has been developed in which GaAs ingots are introduced into RF coils and the resistance is determined from the change in Q, measured on an ordinary commercial Q-meter, using the following relation:

$$e = \frac{Q_0 \cdot Q_1}{Q_0 - Q_1} \frac{r_1^4 \omega \mu_0}{8r_0^2} \quad \text{where } r_1 \ll r_0 \quad (14)$$

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Contactless measurement of ...

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The method shows high reproducibility, but the absolute precision depends on the accuracy with which the ingot dimensions are known, as well as on the precision to which the ingot and coil are cylindrical.

There are 4 figures and 1 table.

ASSOCIATION: Výzkumný ústav pro sdělovací techniku A.S. Popova,
Praha
(Telecommunications Research Institute A.S. Popov,
Prague)

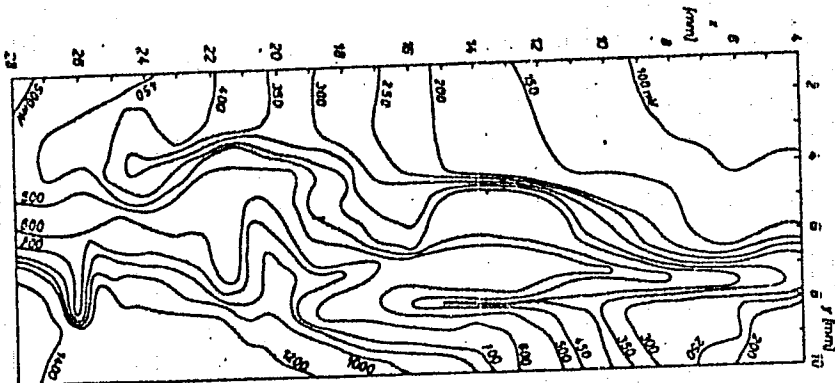
SUBMITTED: September 13, 1961

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Contactless measurement of ...

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Fig. 1



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FRANK, Helmar, RNDr.

A simple very high-frequency receiver with a tunnel diode.
Sdel tech ll no.7:261-263 J1 '63.

FRANK, H., dr.

"Junction transistors" by K. Otto and H. Muller. Reviewed by
H. Frank. Slaboproudý obzor 24 no.1:Suppl.: Literatura 24
no.1:L5,L7 '63.

FRANK, H.

"Germanium alloy diffusion transistors" by M.M. Samochvalov
[Samokhvalov, M.M.]. Reviewed by H. Frank. Slaboproudy obzor:
Suppl.:Literatura 24 no.5:139 '63.

ACCESSION NR: AP4015898

Z/0039/64/025/001/0025/0033

AUTHOR: Frank, Helmar (Doctor)

TITLE: Measuring the lifetime of minority current carriers in nonhomogenous semiconductor crystals by the phase compensation method

SOURCE: Slaboproudy obzor, v. 25, no. 1, 1964, 25-33

TOPIC TAGS: electronic measurement, minority current, current carrier, semiconductor, crystal, phase compensation, monocrystal

ABSTRACT: A phase compensation method is described for ascertaining the lifetime of minority carriers as a means of controlling the quality of Si, Ge and other monocrystals. The measuring equipment based on this principle (shown in Fig. 2 of Enclosure 01) was developed by the VUST, Prague, and is described in detail in Zpravodaj VUST, Vol 1, No 1, 1959. As long as the crystals are homogeneous, the measurement is unambiguous and the results are reliable. Difficulties arise in measuring nonhomogenous crystals, even in case of pure intensity modulation of the light. It is shown that the volume photoeffect is superimposed on the normal photoeffect. Because of illumination and the voltage applied to

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ACCESSION NR: AP4015898

the crystal, there may be a difference between the reading on the phase comparator and the actual lifetime. Reasons for these variations are pointed out. On the basis of derived equations and their practical verification, a procedure is described for measuring nonhomogeneous crystals. To get proper results it is necessary to carry out two measurements: in addition to the values recorded on the phase compensator, it is necessary to determine also the values of the photoelectric signals, and then to evaluate the measured results as shown in Fig. 14 of Enclosure 02. The described method is simple and fast, and the errors do not exceed 10 percent. Orig. art. has 14 figures, 33 formulas, and 3 tables.

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

SUBMITTED: 29May63

DATE ACQ: 03Feb64

ENCL: 02

SUB CODE: GE, PH

NO REF SOV: 000

OTHER: 015

Card 2/42

FRANK, I.

The rotation of crops. p. 6. (Magyar Mezőgazdaság, Vol. 11, no. 2, Jan. 1956 Budapest)

SO: Monthly List of East European Accession (FEAL) IC, Vol. 6, no. 7, July 1957. Uncl.

FRANK, I.

Bearings made of artificial material for rolling mills. p. 100.
On technical books. p. 104.

KOHASZATI LAPOK. (Magyar Banyaszati es Kohaszati Egyesulet) Budapest.
Vol 11, no. 3, Mar 1956.

SOURCE: EEAL, Vol 5, no. 7, July 1956.