ANDROSOV, G.B., vtoroy mekhanik; FROLOV, V.K., gruppovoy inzhener

Efficiency promoters of the motorship "Lesozavodsk." Biul. tekh.-ekon.inform. Tekh. upr. Min. mor. flota 7 no.5:39-49 '62. (MIRA 16:3)

1. Teplokhod "Lesozavodsk" (for Androsov). 2. Chernomorskoye parokhodstvo (for Frolov).
(Motorships--Technological innovations)

FROLOV, V. K.

Cand Tech Sci - (diss) "Effect of low-valent vanadium oxides on the electrical properties of several vanadium-containing glasses." Moscow, 1961. 15 pp; (Ministry of Higher, Secondary Specialist, and Professional Education Belorussian SSR, Belo Polytechnic Inst imeni I. V. Stalin); 180 copies; price not given; bibliography at end of text; (KL, 10-61 sup, 219)

5.5200
15.2120

69875
S/032/60/026/04/06/046
B010/B006

AUTHORS: Kitaygorodskiy, I. I., Frolov, V. K.

TITLE: Oxidimetric Determinations of Vanadium Oxide in Glass 15

PERIODICAL: Zavodskaya laboratoriya, 1960, Vol. 26, No. 4, pp. 418 - 422

TEXT: Vanadium containing types of special glass can be divided into three groups - glass containing V_2O_5 and V_2O_4, glass containing V_2O_4 and V_2O_3, and glass containing V_2O_3 and VO. Oxidimetric methods for the determination of the two first-mentioned types of glass were developed. The vanadium oxides are dissolved by treatment with sulfuric- and phosphoric acids, and 48% sulfuric acid (the latter for V_2O_5) (Table 1, solubilities of vanadium oxides). It was found that oxidimetric determinations of V_2O_3 and VO in glass of the third type are not possible. This is due to the instability of VO in acid solutions. Before analyzing the glass, its type must be determined, i.e. if addition of phenylanthranilic acid to the glass solution produces a red-violet color, the glass belongs to the first type, if however, the glass solution is blue from the out- 4

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69875

Oxidimetric Determinations of Vanadium Oxide in Glass

S/032/60/026/04/06/046
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set, the glass belongs to the second type, while solutions of the third type of glass are green. The oxidimetric determination of V_2O_5 and V_2O_4 (first glass type) can be carried out in two modified forms: either (after corresponding pre treatment), V_2O_4 is titrated with 0.05N $KMnO_4$ solution, and then (after addition of phosphoric acid), V_2O_5 with 0.05N Mohr's salt solution using phenylanthranilic acid as indicator, or V_2O_5 is titrated before V_2O_4 (2nd modification). The procedure is described. In the case of the second glass type, V_2O_4 is also titrated with $KMnO_4$ solution, and V_2O_3 with Mohr's salt solution, but a special method must be employed, since part of the V_2O_3 does not dissolve (or only partly together with V_2O_4). Glass of this type can only be analyzed if its Fe^{2+} content is low. The method described was tested by using silicate- and vanadium phosphate semiconductor glass (Table 2, composition). The relative error of the method was 0.3% (Table 3). Publications by A. I. Tsvetkov (Ref. 3), V. I. Smirnova and B. F. Ormont (Ref. 4), and M. A. Gurevich are mentioned in the paper. There are 3 tables and 5 Soviet references.

Card 2/3

6[illegible]875

Oxidimetric Determination of Vanadium Oxide in Glass

S/032/60/026/04/06/046
B010/B006

ASSOCIATION: Moskovskiy khimiko-tekhnologicheskiy institut im. D. I. Mendeleyeva (Moscow Institute of Chemical Technology imeni D. I. Mendeleyev)

4

Card 3/3

86453

S/072/60/000/012/001/008
B021/B058

15 2120 1156 1155

AUTHORS: Kitaygorodskiy, I. I., Professor, Frolov, V. K., Kuo Cheng

TITLE: Electrical Properties of Glass of the System $V_2O_5 - V_2O_4 - P_2O_5$

PERIODICAL: Steklo i keramika, 1960, No. 12, pp. 5 - 7

TEXT: The determination of the quantitative dependence of the specific electrical conductivity of vanadium glass on the content of vanadium ions of low valency is described as being important, since it is assumed that the specific electrical conductivity of glass is considerably increased when increasing the content of these ions. For the purpose of investigating this dependence, V_2O_5 in glass of the initial composition 80% V_2O_5, 20% P_2O_5, was partially reduced by means of carbon black (V_2O_4 content: 2.61 - 23.60%). N. V. Petrovykh, Candidate of Technical Sciences, participated in measurements and in the analysis of the results. The electrical

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Electrical Properties of Glass of the System $V_2O_5 - V_2O_4 - P_2O_5$

S/072/60/000/012/001/008
B021/B058

conductivity of the samples was determined by means of the bridge УМ-3 (UM-3), and the thermo-emf by means of the potentiometer ППТВ-1 (PPTV-1). Results of the chemical analysis of the glass samples are mentioned in Table 1. The X-ray structural analysis was made by means of the device УРС-50И (URS-50I). The determination of the specific electrical conductivity of glass of the system $V_2O_5 - V_2O_4 - P_2O_5$ at a temperature of 160° is illustrated in Fig.1. In the system $V_2O_5 - V_2O_4 - P_2O_5$, L. A. Grechanik, V. G. Karpechenko, and N. V. Petrovykh obtained glass with a negative thermo-emf and the following chemical composition (in wt%): 22.70 V_2O_5, 38.42 V_2O_4, 38.88 P_2O_5. It results therefrom that both n-type and p-type conductivity exist simultaneously in glass of the system $V_2O_5 - V_2O_4 - P_2O_5$. The tendency of oxides with semiconductor properties to polymerization greatly affects the specific electrical conductivity of oxide semiconductor glass. The renewed increase of the specific electrical conductivity with an increase of the V_2O_4 content from 17.77 to 23.60% was

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86453

Electrical Properties of Glass of the System $V_2O_5 - V_2O_4 - P_2O_5$

S/072/60/000/012/001/008
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ascribed to an ordering of the glass structure and to the beginning of crystallization. This is proved by an anomalous increase of the activation energy in glass with a V_2O_4 content above 19%, as well as by the X-ray structural analysis which showed the existence of a crystalline phase in glass with a content of 23.60% V_2O_4. There are 3 figures, 1 table, and 8 references: 6 Soviet, 1 US, and 1 Japanese.

X

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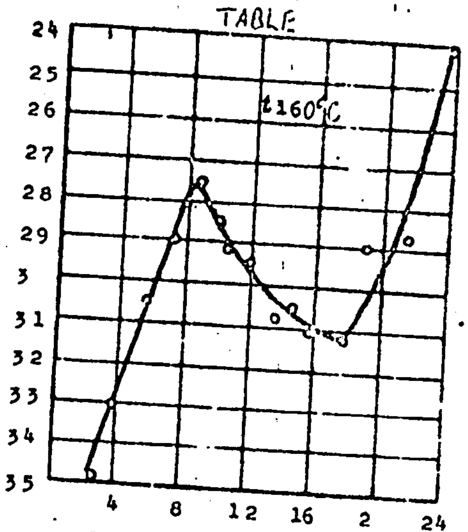
B021/B058

TABLE



Card 4/4

V_2O_4 in % by weight

PARTASH, T.Z.[translator]; NILENDER, R.A., prof., red.; FROLOV, V.K., red.; BORUNOV, N.I., tekhn. red.

[Vacuum technology; properties and treatment of glass] Vakuumnaia tekhnika; svoistva stekla i ego obrabotka. Moskva, Gos. energ. izd-vo, 1961. 158 p. (MIRA 15:2)
(Glass blowing and working)

VEKLICH, P.M.; OSHCHIPKOV, F.P.; FROLOV, V.K.; NILENDER, R.A., prof., red.; YENYUTIN, V.V., red.; BORUNOV, N.I., tekhn. red.

[Manufacture of glass for electronic vacuum devices] Tekhnologiia elektrovakuumnogo stekla. Pod obshchei red. R.A.Nilendera. Moskva, Gos.energ.izd-vo, 1961. 261 p. (MIRA 15:1)
(Glass manufacture) (Electron tubes)

OSHCHIPKOV, F.P.; FROLOV, V.K.; Prinimali uchastiye: SAVKINA, G.A., inzh.; LYAKHOVETSKAYA, M.A., inzh.; SLIVINSKIY, I.G., inzh.; PARASHINA, Z.V., tekhnik; NIKIFOROVA, Z.V., tekhnik

Founding of ZS-4 glass in pot furnaces. Stek. i ker. 18 no.7:5-8 Jl '61. (MIRA 14:7)

(Glass manufacture)

SEMENOV, M.Ye.; FROLOV, V.K.

Rare case of crystal growth. Lit. proizv. no.1:34 Ja '63.
(MIRA 16:3)

(Crystals--Growth)

[illegible]

[illegible] razv. [illegible]
[illegible] prospecting. [illegible]
(MIRA 15:8)

1. [illegible] geofiziki i mineral'nogo syr'ya, [illegible]

FROLOV, V.Kh.

Statistical method for the interpretation of electric-sounding curves. Geol. i geofiz. no.6:106-108 '63. (MIRA 19:1)

1. Sibirskiy nauchno-issledovatel'skiy institut geologii, geofiziki i mineral'nogo syr'ya, Novosibirsk. Submitted June 25, 1962.

FROLOV, V.Kh.

Method for using calculation data for the graphic interpretation of the curves of electric sounding. Geol. i geofiz. no.3:132-140 '65. (MIRA 18:6)

1. Sibirskiy nauchno-issledovatel'skiy institut geologii, geofiziki i mineral'nogo syr'ya, Novosibirsk.

FROLOV, V.Kh.

Characteristics of the geoelectric cross section of Paleozoic sediments in the southern part of the West Siberian Plain. Geol. i geofiz. no.7:91-[illegible] '65. (MIRA 18:9)

1. Sibirskiy nauchno-issledovatel'skiy institut geologii, geofiziki i mineral'nogo syr'ya, Novosibirsk.

FROLOV, V. M.

FROLOV, V. M. and Krylov, O. V. present comprehensive review of present research on chemosorption of the surfaced of Ge and similar [illegible] semiconducting substances such as Si and the compounds $A^{III}B^{V}$ and [illegible] $A^{II}B^{VI}$.
SO: Zhurnal vsesoyuznogo shimicheskogo obshchestva im D I Mendeleyeva, v. 5, No.5 1960, pp 535-43.

[illegible]

FROLOV, V.M.

report presented at the 1st All-Union Congress of Theoretical and App.ied Mechanics, Moscow, 27 Jan - 3 Feb '60.

268. L. N. Stavraki (Kuibishev): Strain design and general stability of structures.

269. L. N. Stavraki (Kuibishev): A general method of solving non-linear problems of structural mechanics.

270. S. D. Stepanov (Moscow): A contribution to the non-linear problem of plate flutter.

271. L. G. Stepanskii, I. P. Shkrev (Moscow): On the use of variational principles for the approximate solution of some problems of plastic equilibrium.

[illegible]. A. I. Strelbitskaia (Kiev): Experimental investigation of the oblique bending of steel beams beyond the elastic limit.

A. S. Stroganov (Moscow): Strength and visco-plastic flow of soils.

274. G. I. Ter-Stepanian (Erevan): The relation between pore pressure and rate of creep of slopes.

275. L. A. Tolokonnikov (Tula): Finite plastic strains of non-linearly deformed bodies.

276. A. D. Tomlenov (Moscow): Piercing of metals by a spherical punch considering contact friction.

277. Ie. L. Torchinskaia (Moscow): An asymptotic method of designing flexible blades of variable pitch at high speeds of rotation.

278. R. V. Torner (Moscow): Application of similarity methods to the analysis of the flow of rubber compounds.

279. A. A. Trapeznikov, T. G. Shalopalkina (Moscow): Dependence of the maximum elastic and discontinuous strains of aluminum-naphthenate gels on strain rates.

280. S. A. Tumarkin (Moscow): An asymptotic method for the design of toroidal shells.

281. V. K. Turkin (Moscow): Some problems of soil dynamics.

282. N. V. Tiabin (Kazan): The flow in the boundary layer of an elastic, visco-plastic medium.

283. A. G. Ugodchikov (Gorkii): Some problems concerning the analysis of stresses in shrink fits.

284. G. V. Uzhik (Moscow): On strength and rupture criteria for metals in the presence of stress concentrations.

285. I. I. Ulitskii (Kiev): Some problems of non-linear creep.

286. A. A. Umanskii (Moscow): Analogy and model methods in problems of structural mechanics concerning bars and thin-walled structures.

287. M. T. Urazbaev (Tashkent): The problem of seismic strength of fluid supported hydraulic structures.

288. Ia. S. Ufliand (Leningrad): Application of integral transformations to the solution of some problems concerning an elastic wedge.

289. E. S. Fadeeva (Moscow): Deformations of plastic clays in moulding.

290. I. V. Fadeev (Moscow): Elastic-plastic equilibrium of an acute granular wedge.

291. M. L. Feldman (Dnepropetrovsk): Stability and vibrations of orthotropic plates of variable thickness.

292. A. P. Filippov (Kharkov): Extensional vibrations of turbine discs.

293. M. M. Filonenko-Borodich (Moscow): On the possibility of generalising the Mohr and Huber-Mises-Hencky theories of rupture.

294. N. P. Fleishman (Lvov): Some problems concerning the bending of plates and shells with stiffeners.

295. L. M. Flitman (Moscow): On the impact of a wave on a heavy rigid sphere embedded in an elastic medium.

296. V. A. Florin (Leningrad): Some problems concerning rock formations of hydraulic structures.

297. V. A. Florin (Leningrad): Present state and problems of soil mechanics.

298. V. A. Florin (Leningrad): Flow conditions for saturated sands.

299. E. V. Florina (Leningrad): Experimental study of real and apparent friction in vibrating soils.

300. B. M. Fradlin, S. M. Shakhnovskii (Kiev): On the construction of Green's functions for the equilibrium problem of shallow shells.

301. I. E. Fraifeld (Kharkov): Further development of the initial rheological equation.

302. V. M. Frolov (Moscow): Temperature stresses in cantilever plates and their effect on stiffness.

FROLOV, V.M. (Moskva)

Using L.V. Kantorovich's variation method for solving problems in the applied elasticity theory. Inzh.sbor. 24:174-182 '56.
(MLRA 10:5)

(Elasticity) (Calculus of variations)

BAGDASAR'YAN, A.Kh.; FROLOV, V.M.; TINYAKOVA, Ye.I.; DOLGOPLOSK, B.A., akademik

Electric conductivity of alkyllithium solutions in connection with the polymerization process. Dokl. AN SSSR 162 no.6:1293-1296 Je '65.
(MIRA 18:7)

1. Institut neftekhimicheskogo sinteza im. A.V.Topchiyeva AN SSSR.

FROLOV, V.M.; BADCHABLI, S.K.; ROGINSKIY, S.Z.

Catalytic properties of silicon. Dehydrogenation of formic acid. Kin. i kat. 6 no.4:747-748 Jl-Ag '65. (MIRA 18:9)

1. Institut khimicheskoy fiziki AN SSSR.

[illegible]; PASHA-BEI, E.K.; ROGINSKIY, S.Z.

Dehydrogenation of isopropyl alcohol and formic acid on germanium. Kin. i kat. 6 no.3:502-509 My-Je '65.

(MIRA 18:10)

1. Institut khimicheskoy fiziki AN SSSR.

FROLOV, V.M.

Catalytic properties of germanium films obtained by pyrolysis of GeH_4. Kin. i kat. 6 no.2:342-345 Mr-Ap '65. (MIRA 18:7)

1. Institut khimicheskoy fiziki AN SSSR.

FROLOV, V.M.

Dependence of acid-defensive conditioned and unconditioned reflexes in dogs on the force of unconditioned stimuli. Zhur. vys. nerv. deiat. 12 no.2:267-272 Mr-Ap '62. (MIRA 17:12)

1. Voyenno-meditsinskaya akademiya imeni S.M. Kirova, Leningrad.

L 44131-65 EPF(c)/EPR/EWP(j)/EWT(m) Pc-4/Pr-4/Ps-4 WW/RM
ACCESSION NR: AP5011686 UR/0195/65/006/002/0342/0345

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27
B

AUTHOR: Frolov, V. M.

TITLE: Catalytic property of germanium films deposited by pyrolysis of GeH_4

27

SOURCE: Kinetika i kataliz, v. 6, no. 2, 1965, 342-345

TOPIC TAGS: germanium film, germanium powder, pyrolytic deposition, germanium hydride pyrolysis, film electric property, film catalytic property, catalytic dehydrogenation

ABSTRACT: The previously established difference in catalytic properties between n- and p-germanium powders prompted a comparative study of the catalytic properties of germanium films deposited by pyrolysis of GeH_4 and germanium powder prepared from single crystal germanium having intrinsic conductivity. The purpose was to establish the effect of the preparation method of the active Ge surface on the catalytic activity of Ge. The experimental data for Ge powder were obtained earlier by the author (Kinetika i kataliz, 5, 1076, 1964). In the present study determination of the catalytic activity of Ge

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L 44131-65
ACCESSION NR: AP5011686

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films and activation energy of chemical reactions on these films was made or attempted in dehydrogenation of absolute ethyl alcohol and decomposition of hydrazine. Preliminary steps, including synthesis of germanium hydride, preparation of Ge films 100—150 Å thick, and measurement of electric conductivity of the films were described. Germanium films were deposited on powdered quartz by decomposing GeH_4 at 300C in a quartz reactor and were dehydrogenized by evacuating the reactor at 500C. Electrical resistance of the films deposited by pyrolysis of GeH_4 on a glass substrate varied with temperature, atmosphere (vacuum or krypton), and other [undefined] operating conditions. The temperature dependence of the resistance of the films indicated a similarity with Be single crystals with intrinsic conductivity. The activation energy of electric conductivity of the films was 0.30—0.38 ev in the 50—250C range and up to 0.50 ev at higher temperatura. The kinetics of the catalytic reactions on Ge films were studied by the previously described methods. Tabulated data showed that the apparent activation energy of dehydrogenation on Ge films was about 10 kcal/mol higher and specific catalytic activity of the films at 235C 4 times lower than the corresponding values for powdered germanium. These differances are comparable with those

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ACCESSION NR: AP5011686

obtained by changing the conductivity type of powdered germanium single crystals. The attempt to study the kinetics of hydrazine decomposition on Ge films gave nonreproducible results. Orig. art. has: 3 figures and 1 table. [JK]

ASSOCIATION: Institut khimcheskoy fiziki AN SSSR (Institute of Chemical Physics, AN SSSR)

SUBMITTED: 04Mar64 ENCL: 00 SUB CODE: GC,SS

NO REF SOV: 003 OTHER: 006 ATD PRESS: 3246

BJB
Card 3/3

KRYLOV, O.V., kand.khimicheskikh nauk; FROLOV, V.M.

Chemical reactions on the surface of germanium, silicon, and their electronic analogues. Zhur. VKHO 5 no. 5:535-543 '60.

(MIRA 13:12)

(Germanium) (Silicon) (Semiconductors) (Chemical reactions)

FROLOV, V.M.; KRYLOV, O.V.; ROGINSKIY, S.Z.

Catalytic properties of germanium. Probl. kin. i kat. 10:102-107 '60. (MIRA 14:5)

1. Institut fizicheskoy khimii AN SSSR.
(Germanium)

FROLOV, V.M. (Leningrad)

Activity of the gastric glands in certain disorders of the higher nervous activity. Pat.fiziol.i eksp.terap. 4 no.2:62-65 Mr-Ap '60. (MIRA 14:5)

1. Iz kafedry normal'noy fiziologii (nachal'nik - prof. I.T.Kurtsin) Voyenno-meditsinskoy ordena Lenina akademii imeni S.M.Kirova.
(CONDITIONED RESPONSE) (GASTRIC JUICE)

Frolov, V.M.

AUTHOR: Frolov, V.M. 132-58-2-14/17

TITLE: The Repair of Drilling Tube Socket Joints (Restavratsiya zamkov k buril'nym trubam)

PERIODICAL: Razvedka i Okhrana Nedr, 1958, Nr 2, pp 56-57 (USSR)

ABSTRACT: A simple device for the repair of socket joints is described. There is one figure.

ASSOCIATION: Kiyevskoye Geolupravleniye (The Kiyev Geological Administration)

Card 1/1 1. Drilling tools-Maintenance

FROLOV, V.M.

6

7 21

4E4j

4E4c

Catalysis on semiconductors. Catalytic properties of metallic germanium. O. V. Krylov, S. Z. Roginskii, and V. M. Frolov. *Doklady Akad. Nauk S.S.S.R.* 111, 623-5 (1957).—The catalyst was a cryst. Ge powder made by grinding a single crystal in an agate mortar weighing 2 g. and having an area of 200 sq. cm./g. A stoichiometric mixt. of 2 H_2 + O_2 at a few mm. pressure was led into the app. at 200-400°, and the water formed was condensed in a trap cooled with liquid N_2. The pressure dropped to 1/2 of the original value in the course of a few min. at 200°, and during a few sec. at 300°, which was, however, attributed to a selective adsorption of O_2 on Ge. CO + O_2 mixt. behaved similarly. Dehydration study of MeOH and $CH_3CHOHCH_3$ showed that the MeOH dehydration began at a temp. 150° lower than without Ge, whereas the iso-PrOH was dehydrated at a measurable velocity as low as 170°. Ge catalytic activity was destroyed after a few min. contact with O_2, but restored by an evacuation at high temp. or by heating in H_2. Considering the small Ge surface, its activity was deemed high. W. M. Sternberg.

5 (3)

AUTHORS: Frolov, V. M., Krylov, O. V., Roginskiy, S. Z., Corresponding Member, AS USSR

SOV/20-126-1-29/62

TITLE: Catalytic Dehydrogenation of Ethanol on Germanium (Kataliticheskoye degidrirovaniye etanola na germanii)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 126, Nr 1, pp 107 - 110 (USSR)

ABSTRACT: Germanium is able to catalyze several redox reactions (Refs 1,2). The authors wanted to investigate the kinetics of some of these reactions in the case of various Ge-samples with different conductivity in the case of a concentration change of the current carriers within a wide range. This can facilitate the understanding of the mechanism of the semiconductor catalysis. The kinetics of the reaction mentioned in the title was investigated under static vacuum conditions in a quartz reactor. Powder with a specific surface of 0.05 - 0.1 m^2/g obtained by pulverization in the mortar in air served for this purpose. The Ge-powder was trained before the experiment at 850° or at 650°

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and at 10^{-5} - 10^{-6} torr. The mentioned dehydrogenation was investigated at 200-270°. A reduction of the reaction rate (Figs 1:1-4 cursive) took place in the case of subsequently carried out ethanol compositions on Ge, trained at 850°. This was stopped after the fourth experiment. Beside hydrogen and acetaldehyde also ethylene was found to exist in the gas phase. Its content was reduced from experiment to experiment. The hydrogen pressure was in all experiments equal to the summed pressure of acetaldehyde and ethylene (accuracy 2-3%). The authors assume that the fresh Ge-surface adsorbs an oxygen molecule from ethanol (reaction I) thanks to its great affinity to oxygen. The covering of the Ge-surface with adsorbed oxygen leads to the breaking-off of the reaction (I). As late as from the fourth experiment on only the process of the catalytic dehydrogenation takes place on the Ge-powder. The chemosorption of oxygen was carried out after the fourth experiment in order to clarify the effect of a complete covering of the Ge-surface with oxygen. The curves 5-8 (Fig 1) belong to the subsequently carried out experiments. They describe the kinetics of the hydrogen separation under the given conditions. Since the pressure of the acetaldehyde formed on the oxidized surface surpasses considerably the hydrogen pressure the removal of the adsorbed oxygen according to the reaction (III) is to be assumed. The catalytic reaction (II) proceeds then on the surface free from oxygen. Thus, adsorbed oxygen can in the case of the system germanium--ethanol approach to the stationary activity of the catalytic dehydrogenation from the side of the surface free from oxygen as well as from the side of the surface completely covered by the adsorbed oxygen. Figure 1 shows the electronic characteristics of the alloyed Ge-samples, the logarithm of the pre-exponential multiplier (k_0) and of the seeming activation energy (E) of the catalytic ethanol dehydrogenation. The results described clarify to a certain extent the often discussed problem of the catalytic equivalence of the p- and n-semiconductors. The authors assume with a certain security with respect to the reaction mentioned in the title that the activation energies on the p-germanium are considerably lower than on n-germanium. This conclusion does, however, not hold in the case of all other reactions (Refs 6,7). The range of the investigated systems is to be widened and the catalytic processes are to be more the-

Catalytic Dehydrogenation of Ethanol on Germanium SOV/20-126-1-29/62

roughly investigated. Data concerning the change of the electronic characteristics of the surface during the reaction process are to be used. There are 3 figures, 1 table, and 7 references, 4 of which are Soviet.

ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR (Institute of Physical Chemistry of the Academy of Sciences,USSR)

SUBMITTED: January 28, 1959

Card 4/4

FRoLov V M

PHASE I BOOK EXPLOITATION SOV/3921

Akademiya nauk SSSR. Institut fizicheskoy khimii

Problemy kinetiki i kataliza. [t] 10: Fizika i fiziko-khimiya kataliza (Problems of Kinetics and Catalysis. [vol.] 10: Physics and Physico-Chemistry of Catalysis) Moscow, Izd-vo AN SSSR, 1960. 461 p. Errata slip inserted. 2,600 copies printed.

Eds.: S.Z. Roginskiy, Corresponding Member of the Academy of Sciences USSR, and O.V. Krylov, Candidate of Chemistry; Ed. of Publishing House: A.L. Bankvitser; Tech. Ed.: G.A. Astaf'yeva.

PURPOSE: This collection of articles is addressed to physicists and chemists and to the community of scientists in general interested in recent research on the physics and physical chemistry of catalysis.

COVERAGE: The articles in this collection were read at the conference on the Physics and Physical Chemistry of Catalysis organized by the Otdel khimicheskikh nauk AN SSSR (Section of Chemical Sciences, Academy of Sciences USSR) and by the Academic Council on the problem of "the scientific bases for the selection of catalysts." The Conference was held at the Institut fizicheskoy khimii AN SSSR (Institute of Physical Chemistry of the AS USSR) in Moscow, March 20-23, 1953. Of the great volume of material presented at the conference, only papers not published elsewhere were included in this collection.

II. CATALYSIS OVER METALS

FROLOV, V.M.

EXCERPTA MEDICA Sec.2 Vol.10/2 Physiology.etc Feb57

822. FROLOV V.M. Dept. of Norm. Physiol., Milit. Med. Acad., Leningrad. *Change of gastric secretion in the dog during formation of conditioned reflexes (Russian text) FIZIOL.Z. 1956, 42/7 (546-552) Tables 4

The latent period of gastric secretion after feeding with 200 g. meat, 600 ml. milk or 200 g. bread increases during formation of conditioned reflexes (conditioned stimulus metronome beat; unconditioned stimulus acid ingestion), and decreases during formation of differential inhibition in the majority of experiments. Changes of the volume of gastric secretion, collected for 6 hr., occurred in all 4 dogs during formation and inhibition of conditioned reflexes but were not uniform. The individual differences are explained on the different individual type of the nervous system. Simonson - Minneapolis, Minn.

Country : USSR
Category : Human and Animal Physiology, The Nervous System

Abs. Jour. : Ref Zhur Biol, No. 2, 1959, No. 8510

Author : Frolov, V. M.
Inst. : The Military Medical Academy
Title : Functional Disturbances in the Gastric Glands of Dogs Following a Shock to the Nervous Processes of the Cerebral Cortex Resulting from Collision
Orig Pub. : Tr. Voyen.-med. akad., 1957, 74, 93--100

Abstract : The disturbances in the functional state of the cortex were paralleled by disturbances in the compound-reflex and neurochemical phases of gastric secretion, which varied with the type of central nervous system in the animals and the form of the disturbance in higher nervous activity (in disturbances in excitation, anacidity ensued; when inhibition was disturbed, there was an increase in secretion). With the recovery of higher nervous activity, gastric secretion was also restored, more rapidly and completely in dogs of the strong, balanced type,

Card: 1/2

Frolov, Vladimir Moiseyevich

PHASE I BOOK EXPLOITATION 349

Frolov, Vladimir Moiseyevich

Primeneniye metoda korrektiruyushchey funktsii v raschetakh deformatsiy konsol'nykh plastin (Application of the Corrective-function Method to Calculation of the Deformation of Cantilever Plates) Moscow, Oborongiz, 1957. 34 p.

Sponsoring Agency: Tsentral'nyy aero-gidrodinamicheskiy institut, im. prof. N. Ye. Zhukovskogo, Trudy, vyp. 705. Number of copies printed not given.

Ed.: Grigor'yev, Yu. P., Candidate of Technical Sciences: Chief Editor: Latynin, Ye. V., Engineer; Ed. of Publishing House: Sheynfayn, L. I.; Tech. Ed.: Pukhlikova, N. A.

PURPOSE: This monograph is intended for engineers concerned with stress analysis of wings with low aspect ratio and of turbine blades, and for scientific workers specializing in the applied theory of elasticity and structural mechanics.

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Application of the Corrective-function (Cont.)

COVERAGE: A method is described for calculating deflections and stresses in rectangular and triangular cantilever plates, on the assumption that the transverse cross sections of the plates parallel to the fixed end are distorted under loading. The calculation method described permits the values of the deflection functions and of the functions of several stress components to be determined more exactly than is possible by the beam theory. The results obtained by the proposed method of calculation are compared with the results of calculations of other authors and with experimental data. In the case of transverse bending of a rectangular plate the magnitudes of the deformations of the cross sections and the law of their variation along the length depend on the relative length of the plate. When the loading is uniform and the root section is fixed along its entire length, these deformations are negligibly small compared to the overall deflections of the plate. For triangular plates the deformations of the cross sections have only a local effect. For a plate with an entirely fixed root section the cross section deformations are small compared to the basic magnitudes of deflections, both in constant loading and in the case of a concentrated force applied at the tip. In the case of skewed attachment, the strength-of-materials formulae for a wedge-shaped beam are unsuitable for determining the deflections of a triangular plate. In all the examples considered, the magnitudes of deflections coincide well with experimental values. The curves obtained by analysis for the bending stresses for rectangular plates of various lengths showed that near the fixed end there exists a certain redis-

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tribution of stresses caused by the end fixity and not essential for overall strength. Formulae for calculating bending stresses along the cross sections of a triangular plate are given. In triangular skewed plates, an obrupt stress redistribution takes place near the fixed end. For instance, in certain skew-fastened plates, for elastic deformations, the increase of stresses at the fixed end may exceed by 2 - 5 times the mean stress at the trailing edge obtained according to the strength-of-materials theory. The character of the stress distribution and the magnitude of the stresses obtained by calculation agree with the experimental data. The author mentions particularly S. I. Galkin and L. M. Krushin as having obtained solutions for certain problems in transverse bending of rectangular plates by methods other than those described in this monograph. The monograph contains 9 tables and 32 figures. There are 4 bibliographic references, 2 Soviet and 2 in English.

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Application of the Corrective-function (Cont.) 349

TABLE OF CONTENTS:

AVAILABLE: Library of Congress

IS/eag
6-30-58

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ACC NR: AP7001450 (N) SOURCE CODE: UR/0413/66/000/021/0186/0186

INVENTORS: Zolkin, A. V.; Nakhimovich, I. Ye.; Frolov, V. M.; Krugov, V. S

ORG: none

TITLE: A shock-absorbing device. Class 47, No. 188225 [announced by Central Scientific Research, Design, and Construction Institute of Mechanization and Power Engineering of the Forest Industry (Tsentral'nyy nauchno-issledovatel'skiy i proyektno-konstruktorskiy institut mekhanizatsii i energetiki lesnoy promyshlennosti)]

SOURCE: Izobreteniya, promyshlennyye obraztsy, tovarnyye znaki, no. 21, 1966, 186

TOPIC TAGS: shock absorber, hydraulic device, hydraulic equipment

ABSTRACT: This Author Certificate presents a shock absorbing device consisting of a two-stage hydraulic cylinder with a shock absorbing chamber and an axial throttle. The throttling chamber of the latter is connected with the second stage of the hydraulic cylinder (see Fig. 1). To change automatically the hydraulic resistance in respect to the dynamic load on the shock absorber, the shock absorbing chamber is connected to the fore-valve chamber of the throttle. The throttle valve is spring-loaded with a calibrated spring.

UDC: 621-752.2

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ACC NR: AP7001450

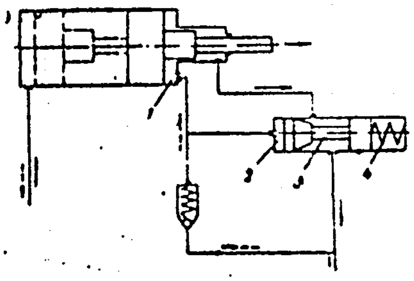

Fig. 1. 1 - shock absorbing chamber;
2 - throttle chamber; 3 - throttle;
4 - spring

Orig. art. has: 1 figure.

SUB CODE: 13/ SUBM DATE: 10Aug65

Card 2/2

SOV/6581

PHASE I BOOK EXPLOITATION

Frolov, Vladimir Moiseyevich

Primeneniye metoda korrektiruyushchev funktsii v raschetakh deformatsiy konsol'nykh plastin (Application of the Correction-Function Method in Strain Analysis of Cantilever Plates) Moscow, Oborongiz, 1957. 34 p. (Series: Moscow. Tsentral'nyy aero-gidrodinamicheskiy institut. Trudy, no. 705) Errata slip inserted. No. of copies printed not given.

Ed.: Yu. P. Grigor'yev, Candidate of Technical Sciences; Ed. of Publishing House: L. I. Sheynfayn; Tech. Ed.: N. A. Pukhlikova; Managing Ed.: Ye. V. Latynin, Engineer.

PURPOSE: The book is intended for engineers concerned with the strength design of low-aspect-ratio wings and turbine blades and for scientific workers specializing in applied elasticity theory and structural mechanics.

COVERAGE: A method of calculating deflection, stresses, and strain of cantilever rectangular and triangular plates is presented; the design is based on the assumption that the cross sections of plates parallel to the root cross section

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are distorted. This method gives more exact values than the beam theory for the function of deflections and of some stress components. The method consists of modifying the beam theory function by corrective functions which are determined by a variational method of successive approximation. Sample calculations are given for designing rectangular and triangular constant-thickness plates; the results obtained are compared with those received by other authors and with empirical data. Applying the described method to plates of variable thickness requires the integration of differential equations with more complicated variable coefficients. No personalities are mentioned. There are 4 references: 2 Soviet and 2 English.

TABLE OF CONTENTS:

Application of the Correction-Function (Cont.) SOV/6581

AVAILABLE: Library of Congress

SUBJECT: Mechanical Engineering

GE/VK/zp/ec
3-12-64

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L 48324-65 EWT(m)/EPF(c)/EPR/EWP(j)/EWP(t)/EWP(b) Pc-4/Pr-4/Ps-4 IJP(c)
JD/WW

ACCESSION NR: AP5006779 S/0195/65/006/001/0149/0154

AUTHOR: Frolov, V. M.

30
29
B

TITLE: Catalytic decomposition of hydrazine on germanium

21

SOURCE: Kinetika i kataliz, v. 6, no. 1, 1965, 149-154

TOPIC TAGS: catalytic activity, decomposition, germanium, kinetics

ABSTRACT: The kinetics of the decomposition of hydrazine on alloyed samples of germanium of different types of conductivity was studied. The catalytic decomposition of hydrazine on germanium powder occurs at a zero order with an activation energy of 20-22 kcal/mol. The decomposition products are ammonia and nitrogen. The type of conductivity of germanium does not affect its catalytic properties, which can be explained by one of the following probable causes: 1) the high concentration of surface states due to hydrazine adsorption; 2) the presence of a limiting stage not connected with the localization of free current ca[illegible] surface; and 3) the position of the localized electron level of the adso[illegible]razine beyond the limits of the forbidden zone. "The author expresses deep gratitude to S. Z. Roginskiy and O. V. Krylov for their interest in this work and their valuable advice and hints." Orig. art. has: 5 figures, 2 tables, 3 equations.

Card 1/2

L 40204-65

ACCESSION NR: AP5006779

ASSOCIATION: Institut khimicheskoy fiziki AN SSSR (Institute of Physical Chemistry, Academy of Sciences SSSR)

SUBMITTED: 04Mar64	ENCL: 00	SUB CODE: GC
NO REF SOV: 003	OTHER: 007	

Card 2/2

FROLOV, V.M.

Kinetics of catalytic dehydrogenation of alcohols on germanium.
Kin.i kat. 5 no.6:1076-1085 N-D '64. (MIRA 18:3)

1. Institut khimicheskoy fiziki AN SSSR.

FROLOV, V. M.

Cand Chem Sci - (diss) "Catalytic properties of germanium and their relationships with semiconductor properties." Moscow, 1961. 16 pp; (State Committee of the Council of Ministers for Chemistry, Order of Labor Red Banner Scientific Research Physical Chemistry Inst imeni L. Ya. Karpov); 150 copies; price not given; (KL, 6-61 sup, 200)

IKONNIKOV, Sergey Alekseyevich, dots., kand. tekhn. nauk; KRAKOVSKIY, Ivan Ivanovich, prof., doktor tekhn. nauk; MAL'TSEV, Vasiliy Nikolayevich, dots., kand. tekhn. nauk; CHACHKHIANI, Igor' Konstantinovich, dots., kand. tekhn. nauk. Prinimal uchastiye RUSIN, V.N.; LAKHANIN, V.V., prof., doktor tekhn. nauk, retsenzent; FROLOV, V.M., dots., kand. tekhn. nauk, retsenzent; KHOZE, A.N., kand. tekhn. nauk, retsenzent; KOTIN, A.F., dots., kand. tekhn. nauk, retsenzent; MYASNIKOV, N.V., red.; SHLENNIKOVA, Z.V., red. izd-va; BODROVA, V.A., tekhn. red.

[Power plants on ships] Sudovye silovye ustanovki. By S.A.Ikonnikov i dr. Moskva, Izd-vo "Rechnoi transport," 1961. 519 p. (MIRA 14:11)

1. Sotrudniki konstruktorskikh byuro Ministerstva rechnogo flota (for Lakhanin, Frolov, Khoze, Kotin).

(Marine engines)

SOV/124-58-1-771

Translation from: Referativnyy zhurnal, Mekhanika, 1958, Nr 1, p 98 (USSR)

AUTHOR: Frolov, V.M.

TITLE: The Heat-transfer Coefficient in Surface Condensers for Ships (Koeffitsiyent teploperedachi v sudovykh poverkhnostnykh kondensatorakh)

PERIODICAL: Tr. Novosibir. in-ta inzh. vod. transp., 1956, Nr 2, pp 167-181

ABSTRACT: The author offers a simple calculation formula which appears to be the result of a revision of the general equation for the heat-transfer coefficient from condensing steam to cooling water relative to the particular operating conditions of ship condensers. The revision consists of a number of simplifications, particularly the replacement of certain difficult-to-determine quantities by mean numerical values. All of the simplifications are substantiated by calculations and are illustrated by graphs. The applicability of the formula is limited to those specific values of the operational and design parameters which corresponds to the operating conditions of piston-type steam powerplants.

A. A. Gukhman

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9,4300 (1143, 1150, 1160)
5.1190 2209, 1274, 1153

20617

S/063/60/005/005/006/021
A051/A029

AUTHORS: Krylov, O.V., Candidate of Chemical Sciences, Frolov, V.M.

TITLE: Chemical Reactions on the Surface of Germanium, Silicon and Their Electronic Analogues

PERIODICAL: Zhurnal Vsesoyuznogo Khimicheskogo Obshchestva im. D.I. Mendeleyeva, 1960, No. 5, Vol. 5, pp. 535-543

TEXT: Although the chemical reactions, which take place on the surface of semiconductors, are of great practical significance, these surface properties have not been investigated, as well as those of the bulk. The following processes are included in chemical reactions taking place on the surface of a solid body: 1) chemical adsorption (chemosorption), 2) catalysis, 3) formations of new phases. The present article is dedicated to the analysis of chemosorption, formation of new phases connected with the aspects of chemosorption, and to a lesser degree to the catalytic reactions. A discussion is given on the electronic processes in chemosorption on semiconductors.

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Chemical Reactions on the Surface of Germanium, Silicon and Their Electronic Analogues

It is said that Soviet works (Ref. 6-9) have been published on this subject. The main aspects in this connection are listed: 1) A free electron (or free electron "hole") of the semiconductor lattice is the center of chemosorption. 2) Adsorption atoms and molecules are regarded as admixtures, destroying the strictly periodic structure of the lattice. 3) The adsorption ability and the catalytic activity of the semiconductor surface is determined by the mutual distribution of the local level of the adsorption particle and by the Fermi level (level of chemical potential) on the surface. 4) The position of the Fermi level on the semiconductor surface ε depends on the position of the Fermi level in the volume ε_0, and on the bend of the zones at the surface, i.e., the difference of potentials between the surface and volume $\Delta\varepsilon$ viz., $\varepsilon = \varepsilon_0 + \Delta\varepsilon$. 5) The position of the volume Fermi level (ε_0) at low temperatures is determined by admixtures introduced into the semiconductor. 6) The bend of the zones on the semiconductor surface ($\Delta\varepsilon$) is determined by its charging during adsorption and also by the non-adsorp-

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tion surface states (Tamm levels, surface defects). Several conclusions are drawn from these aspects, which were confirmed experimentally: The dependence of the adsorption and catalytic ability on the electroconductivity σ and the work of the electron escape φ of the semiconductor, and the reverse phenomenon: a change in σ and φ in the adsorption process and that of catalysis; the effect of admixtures introduced into the lattice of the semiconductor, i.e., so-called "modification" on the adsorption and catalysis, the opposite effect of the donor and acceptor admixtures, the appearance of kinetic anomalies in the adsorption and catalysis, etc. The authors refer to the question of the connection between the surface properties of semiconductors and the electronic structure of the atoms which constitute the surface, stating that this aspect has been only slightly investigated. Comments are made of Dowden's theory (Ref. 14) on this subject and that of Goryunova (Ref. 13). It is stated that most authors, with regard to the processes of chemosorption and catalysis, classify semiconductors according to their ability to capture some admixtures (semiconductors of the n- and p-

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type). Others consider the anomalous behavior with regard to the adsorption and catalysis of semiconductors with transition metals in their composition. It is pointed out that if the limiting stage of the surface chemical reaction is the interaction of the adsorption molecule and the free electron of the semiconductor, semiconductors of the n-type will speed up this reaction primarily, and then all the factors, which increase the concentration of the free electrons in the semiconductor, will increase the rate of reaction (Ref. 15). The conclusion is drawn from data derived in Ref. 15 that electrons of the lattice participate in the limiting stage of the reaction. Hauffe (Ref. 16) thinks that this stage may be the desorption of hydrogen:

$$\left.\begin{aligned} H_2(\text{gas}) &\rightleftarrows 2H^+_{\text{ads.}} + 2e \\ D_2(\text{gas}) &\rightleftarrows 2D^+_{\text{ads.}} + 2e \end{aligned}\right\} \quad \text{fast}$$

$$H^+_{\text{ads.}} + D^+_{\text{ads.}} + 2e \longrightarrow HD(\text{gas}) \qquad \text{slow.}$$

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The interest expressed by workers in recent years in the processes taking place on the surface of elementary semiconductors not containing d-electrons is pointed out (Ref. 17). It is further stressed that more research has been carried out on the subject of germanium, since it is widely used in semiconductor electrical appliances. A brief historical review of the development of scientific interest in chemosorption on germanium is given mentioning the early works of 1930 (Ref. 18) on the reaction of germanium nitride formation, also Ref. 19 on the decomposition of german (GeH_4) with the formation of dispersed germanium. Chemists showed interest in clarifying the interconnection between the chemical surface properties of the semiconductor with its electronic, volume and surface properties. Since Ge is covered with an oxide film in air, it is pointed out that prior to a chemosorption investigation a thorough purification of the Ge surface must be initially undertaken. Surface cleaning is based on combining the ionic bombardment with subsequent heating in a vacuum of 10^{-10} mm Hg. Other methods are: crushing single crystals in a vacuum (Ref. 21), reduction with hydrogen (Ref. 22,21), produc-

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tion of Ge films by evaporation in a vacuum (Ref. 23), cathode atomizing (Ref. 24) and decomposition (Ref. 25) of GeH_4. The compact single crystal samples are considered to be the most appropriate for measuring electrical properties, but difficulties arise due to the small surfaces. Ref. 26 is one of the first works on the investigation of the changes of the electrical properties as a result of contact of the sample with some gas at various pressures over a certain period of time. It was established that the contact potential of the surface can change reversibly between two extreme values differing by about 0.5 v with a change in the gas medium. Experimental results proved the existence of a layer of a space charge on the semiconductor surface determined by the surfaces states. The experimental results showed that even the most thorough purification of the surface by available methods does not lead to the disappearance of surface states. According to Handler (Ref. 27) the existence of surface states is determined by unsaturated bonds of the surface atoms of Ge. Fig. 2 shows the surface distribution of the Ge

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atoms for a crystallographic plane (III). The surface Ge atom becomes in the electrical respect similar to the atom with 5 electrons in the outer shell. The surface Ge atoms fulfill the role of acceptor levels. Any discrepancies in the results of the evaluation of the density of the surface states for the processed Ge surface by different methods is explained by the different densities of the unsaturated chemical bonds of the surface. An investigation of the electrical properties of the Ge surface, processed with a CP-4, (SR-4) scouring agent, showed the presence of a more complex structure of the surface states as compared to pure surfaces (Ref. 30). Several works were published on the acceptor nature of the first layer of adsorbed oxygen (Ref. 27,32,33). Ref. 33 showed that the contact of a pure Ge surface with oxygen at a pressure of 10^{-6} mm Hg causes an increase in the work performed by the escaping electron by 0.2 ev, whereby the equilibrium value of the work is reached within a few minutes. A study of the adsorption on single crystalline samples proved the electron-graphical methods using slow

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electrons to be very promising (Ref. 20). The authors of this work obtained a relationship for the connection of the intensity of the beam with a coating: $I/I_0 = (1 - \theta)^2$ (2), where I and I_0 are the intensities of the beam for the partially covered and pure surfaces, respectively, θ is the specific filling. If the kinetics of the adsorption is described by the expression: $\theta = 1 - e^{-\alpha Spt}$ (3), where α is the number of impacts of the gas molecules on the surface per second at 1 mm Hg relative to one surface atom of Ge, S the probability of adsorption in the impact of the gas molecule against the pure surface, p the pressure and t the time. Combining this expression with the previous one, the authors could trace the kinetic adsorption according to the change in the intensity of the electronic beam with time. These data correspond to the postulation of the constant activation energy and to the rate of adsorption being proportional to the products of the adhesion coefficient and part of the uncovered surface. Further reference is made to the work of Green (Ref. 28), where equation 3 is used for the description of the chemosorption kinetics of oxygen on germanium. A mano-

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metric study was made of the chemosorption kinetics of oxygen on Ge powder obtained by crushing in a high vacuum (Ref. 21). Green's publication (Ref. 28) assumes that the slow adsorption of oxygen described by the Roginskiy-Zel'dovich equation: $dN/dt = ae^{-bN}$ (6), where N is the amount of oxygen adsorbed at the time moment t, a and b are constants for the given temperature and pressure, begins with the filling. It is stated that on the basis of the kinetics of the slow adsorption of oxygen by Ge, it is difficult to form a conclusion of the exact mechanism of this process, since various types of mechanisms of interaction between a solid body and a gas may lead to the law of logarithms. In studying the kinetics of the chemosorption of oxygen on single crystal plates of Ge by the weight method data were obtained which coincided with Green's results (Ref. 35). It was found that the drop in the adsorption heat of the oxygen with filling according to Green was determined by repulsion forces between the adsorbed atoms. Other investigations undertaken are listed as follows: The adsorption of N_2, H_2, CO and CO_2, at —196, —78 and 25°C on single crystal Ge rods by the spark method; the high tem-

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perature oxydation of Ge, the chemosorption of hydrogen on Ge at high temperatures; the chemosorption of ammonia at 278°C on a Ge film; the adsorption of H_2, CO and O_2 on Ge powders; the adsorption of a number of gases in the crushing of single crystal Ge of the n-type results of the latter are given in Table 1 (Refs. 38,39,40,41,42,43,22,44). In all cases where adsorption was observed, it took place quickly before filling close to the monolayer. The cause of gas adsorption (except of pyridine and dioxane) is assumed to be the electrostatic interaction between the dipoles of the molecules of the adsorbate and the Ge surface. The authors exclude the possibility of valency bond formation in the adsorption of the investigated gases on Ge, since the latter calls for the dissociation of the gas molecules which invariably leads to $\theta < 1$. An analysis is given of the chemosorption on silicon and other electronic analogues of Ge. An investigation was made of the O_2 chemosorption on thread-like single crystal samples of silicon by the spark method (Ref. 46,48). Recently in semiconductor electronics semiconductors

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have been applied in addition to Ge and Si, which also did not contain d-electrons and were formed by elements equidistant from the fourth group: $A^{III}B^{V}$, $A^{II}B^{VI}$. The processes of gas etching of this type of semiconductor were investigated (Ref. 52). Synorov (Ref. 54) studied the electrical properties of the surface of the $A^{III}B^{V}$ compounds. By measuring the effect of the field in samples of single crystals AlSb, InSb and GaSb of the n-type, it was shown that inversion layers are formed on the surface of these semiconductors connected with the presence of surface acceptors (Fig. 1). Certain facts, such as the high value of the field effect on the AlSb in a vacuum as compared to air, indicate a high influence of the adsorption on the electrical properties of semiconductors of this type. No definite answer has as yet been obtained on the difference in the chemosorption properties of n- and p-semiconductors. It was shown (Ref. 55,56) that additions of Li_2O and Ga_2O_3 to ZnO hardly affect the rate and energy of activation of the H_2 chemosorption. Similar results were obtained for the catalytic activity of the latter in the dehydration of C_4H_8. Reference is also made to the works of

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Chizhikova (Ref. 57), Kutseva (Ref. 58), on the study of the chemosorption of CO and O_2 on ZnO and NiO. Several examples are listed when the limiting stage of the chemosorption in catalysis is not the electronic interaction of the adsorbed molecule with the semiconductor. Some authors assume that the limiting stage is the movement of the active centers - structural defects - from the volume to the ZnO surface. Finally, the author discusses the catalytic reactions of the Ge surface and that of its analogues. The catalytic properties of Ge are mentioned quoting Refs. 25, 59. Conclusions were formed that the rate of reaction of the auto-catalytic decomposition of GeH_4 on a Ge film is controlled either by the dissociation of adsorbed radicals of GeH_x ($x = 2$ or 3) or by the desorption of oxygen when the surface is completely covered by the GeH_x radicals and hydrogen. The kinetics of the reaction $H_2 - D_2$ exchange on Ge powders obtained by crushing of single crystals in air with subsequent reduction by hydrogen were studied (Ref. 60,61). The ortho-para conversion of hydrogen and $H_2 - D_2$ exchange on Ge films produced by the cathode atomization in an interval of 77 - 175°C was investi-

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gated (Ref. 24). A comparison of the rates of these two reactions led the authors to the conclusion that the first one is of a magnetic or chemical nature. The authors of this article and Roginskiy investigated the catalytic properties of Ge on an example of dehydration of alcohols, cyclohexane, decomposition of hydrazine reactions on powders and films. The results showed that Ge is an active catalyst in the respective reactions. A study was also made of the kinetics of the catalytic reactions on n- and p- Ge with various admixture contents (Sb or Ga). Fig. 3 shows the relationship of the apparent activation energy of dehydration of C_2H_5OH to the concentration of the main charge carriers. From Refs. 65, 66 regarding the hydration reaction of ethylene and formic acid decomposition, it was also found that the hole samples were more active in the catalytic sense and were characterized by a lower activation energy than the electronic ones. A study was made of the decomposition of HCOOH on AlSb and InSb. The hole sample had a lower activation energy than the electronic ones. Fig. 4 shows the relationship of the catalytic activity at 200°C relative to a unit of surface for the decom-

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position of C_3H_7OH to the width of the forbidden zone. Data obtained from chemical reactions on the surface of Ge and its electronic analogues point to the faulty deductions presented in Refs. 14, 16, maintaining the all-important role of transition elements in chemosorption and catalysis. There are 3 tables, 2 diagrams, 2 figures and 73 references; 24 are Soviet, 42 are English, 7 are German.

FROLOV, V.M.

Evaluating crepuscular phenomena on Venus for three-layer structure of model atmosphere. Uch.zap.LGU no.190:62-73 '57. (MIRA 10:7)
(Venus (Planet))

VINOKUROV, D.Ya.; SHIROTSKIY, I.P.; FROLOV, V.N.; KOGAN, A.S., spets. red.; KAMENSKAYA, Ye.A., red.; POLUYEKHINA, N.I., tekhn.red.

[Brief manual for the ship repair worker]Kratkoe posobie dlia rabochego-sudoremontnika. Moskva, Rybnoe khoz., 1962. 121 p. (MIRA 16:4)

(Ships--Maintenance and repair)

77938
SOV/109-5-3-12/26

9.3260, 9.4310

AUTHORS: Kontorovich, M. I., Pellikan, S. G., Frolov, V. N.

TITLE: Investigation of a Transistorized LC Oscillator

PERIODICAL: Radiotekhnika i elektronika, Vol 5, Nr 3, pp 439-449 (USSR)

ABSTRACT: For investigations of transistor self-oscillators, the triode is sometimes substituted by an equivalent scheme with constant parameters, but this is possible only for small oscillations; hence, the investigation of the most important aspects of transistor oscillators is excluded. Another group of scientists applied the approach used for tube oscillators, thus, considering the transistor oscillators as a nearly conservative system, which is also possible only for limited conditions, because the voltage changes of the transistor oscillator must be close to sinusoidal. The present paper investigates the oscillator operating with nonsinusoidal oscillations and with certain limitations. Notwithstanding a certain idealization, it is possible

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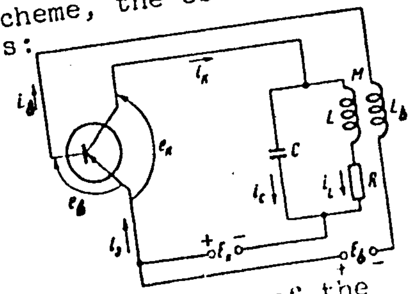
Investigation of a Transistorized LC Oscillator

to determine the frequency of self-oscillations, the voltage and magnitude of the induced currents. All these investigations were made for plane triodes, under operating conditions where it is possible to ignore the inertia of the transistor. The experimental data agree very closely with the theoretical calculations. 2. Setting of the Problem and Basic Relations. Figure 1 shows a self-oscillator with a plane transistor (triode). For this scheme, the oscillator equation can be written as follows:



$$\left.\begin{aligned} E_b - e_b &= \frac{d}{dt}(L_b i_b + M i_L), \\ E_k - e_k &= \frac{d}{dt}(M i_b + L i_L) + i_L R, \\ i_k &= i_L - C\frac{de_k}{dt}. \end{aligned}\right\} \quad (1)$$

Fig. 1. Schematics of the oscillator: (b) base; (k) cathode; (c) capacitance.

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To these equations the following relations giving the characteristics of the triode have to be added:

$$\left.\begin{aligned} i_{\text{к}} &= i_{\text{к}}(e_{\text{к}}, e_b), \\ i_b &= i_b(e_{\text{к}}, e_b). \end{aligned}\right\} \qquad (2)$$

For practical application, the most important case is when $L_b \ll |M| \ll L$ (the base currents are ignored here), and the previous equation can be rewritten:

$$\left.\begin{aligned} E_b - e_b &= M\frac{di_L}{dt}, \\ E_{\text{к}} - e_{\text{к}} &= L\frac{di_L}{dt} + i_L R, \\ i_{\text{к}} &= i_L - C\frac{de_{\text{к}}}{dt}, \end{aligned}\right\} \qquad (3)$$

$$i_{\text{к}} = i_{\text{к}}(e_{\text{к}}, e_b). \qquad (4)$$

Excluding i_L and e_k from these expressions the differential equation can be set up:

$$\frac{d^2e_b}{dt^2}+\omega_0^2e_b=\omega_0^2E_b-\left(2\alpha\frac{de_b}{dt}+\omega_0^2M\frac{di_k}{dt}\right), \qquad (5)$$

where

$$\omega_0^2=\frac{1}{\sqrt{LC}};\quad \alpha=\frac{R}{2L};$$

i_k can be determined from (4); $M<0$. It is further assumed that R is very small, and therefore the respective term of second Eq. (3) is ignored. The following relation is thus established:

$$L(E_b-e_b)=M(E_k-e_k). \qquad (6)$$

which permits rewriting the differential Eq. (5) in one unknown e only:

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$$\frac{d^2 e_b}{dt^2} + \omega_0^2 e_b = \omega_0^2 E_b - \left(2\alpha + \omega_0^2 M \frac{dI_1}{de_b}\right) \frac{de_b}{dt}, \qquad (7)$$

here:

$$I_1 = i_k\left[e_b, E_k - \frac{L}{M}(E_b - e_b)\right] \qquad (8)$$

Equation (7) can be applied not only to semiconductor triodes, but also to tube oscillators, but the function (8) determines the characteristics of the triode as shown on Fig. 2.

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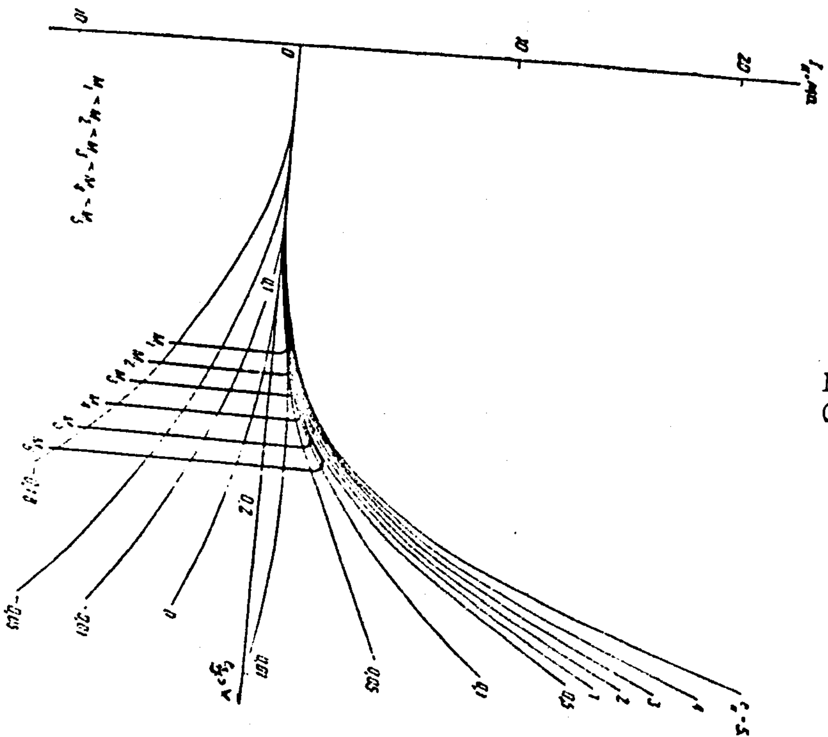

Fig. 2. Caption on Card 7/23.

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Fig. 2. Family of static characteristics of a semiconductor triode and of characteristics $i_k = f_1(e_b)$ (heavy lines).

The curves areshown for constant E_k and E_b for different M. The abruptly falling branches of the heavy curves are characteristic of transistors, and are absent for tubes where the anode current cannot drop below zero. The voltage in a transistor can be considered as following approximately a sinusoid only as long as condition $e_b < e_a$ is approximately satisfied (e_a is voltage on the base, corresponding to the maximum of the curve $i_k = f_1(e_b)$, that is, in the vicinity of point a on Fig. 3.

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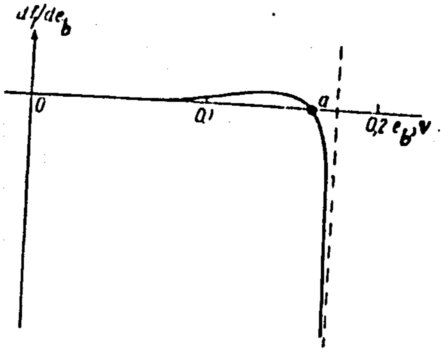

Fig. 3

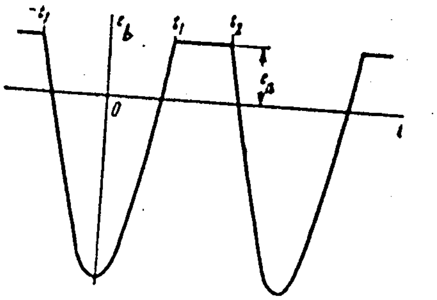

Fig. 4

Fig. 3. Relation of df_1/ de_b from voltage on base e_b.

Fig. 4. Shape of base voltage.

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For $e_b > e_a$ the voltage e_b can change but little, and in the first approximation can be considered constant and equal e_a. Thus, the shape of voltage curve in Fig. 4 consists of sinusoids and straight lines. Dividing the oscillation period into two parts, and taking the moment corresponding to e_b as the beginning of the time counting, it can be stated in the first approximation:

$$\left.\begin{aligned} e_b &= -A\cos\omega_0 t + E_b \text{ for } |t| \leqslant |t_1|. \\ e_b &= e_a \text{ for } t_1 \leqslant |t| \leqslant t_2, \end{aligned}\right\} \qquad (9)$$

where e_a is taken from curves of Fig. 2. The terms A, t_1 and t_2 are not known yet. From (6) the collector voltage can be determined as

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$$\left.\begin{aligned} e_{\text{к}} &= E_{\text{к}} - \frac{L}{M} A \cos \omega_0 t \text{ for } |t| \leqslant t_1, \\ e_{\text{к}} &= E_{\text{к}} - \frac{L}{M} (E_b - e_a) \text{ for } t_1 \leqslant |t| \leqslant t_2. \end{aligned}\right\} \tag{10}$$

For moment t_1 from the continuity condition of voltage, using (10), it can be stated that:

$$A \cos \omega_0 t_1 = E_b - e_a. \tag{11}$$

the current in the inductive part of the circuit for $|t| \leqslant t_1$ is:

$$i_L = -i_C = C \frac{de_{\text{к}}}{dt} = \frac{A}{\omega_0 M} \sin \omega_0 t; \tag{12}$$

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but for $t_1 < |t| < t_2$

$$i_L = \frac{1}{L}\int (E_{\text{н}} - e_{\text{н}})dt = \frac{1}{M}(E_{\text{б}} - e_{\text{а}})t + D, \tag{13}$$

where D is the integration constant. Due to the continuity of current i_L, making (12) and (13) equal, it can be stated for $t = t_1$:

$$\frac{A}{\omega_0 M}\sin\omega_0 t_1 = \frac{1}{M}(E_{\text{б}} - e_{\text{а}})t_1 + D. \tag{14}$$

This equation for time t_2 gives:

$$\frac{1}{M}(E_{\text{б}} - e_{\text{а}})t_2 + D = I. \tag{15}$$

Similarly for $t = t_1$ from (12) and (13), it follows that:

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$$-\frac{A}{\omega_0 M}\sin\omega_0 t_1=\frac{1}{M}(E_b-e_a)\,t_2+D. \qquad (16)$$

This system of equations permits finding all needed data. From (11), (15) and (16):

$$A=\sqrt{(E_b-e_a)^2+(\omega_0 MI)^2}. \qquad (17)$$

t_1 can now be determined from (11). From (14), (15), and (16):

$$\frac{1}{M}(E_b-e_a)(t_2-t_1)=2I$$

and

$$_2-t_1=2I\,\frac{M}{E_b-e_a}=2I\,\frac{|M|}{e_a-E_b}. \qquad (18)$$

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Determining D and substituting it into (13), the current

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$$i_L = \frac{1}{|M|}(e_a - E_б)(t - t_1) - I. \qquad (19)$$

is found. Equation (17) can now be rewritten as:

$$A = (e_a - E_b)\sqrt{1 + \left[\frac{\omega_0}{2}(t_2 - t_1)\right]^2}. \qquad (20)$$

and the current (12) amplitude is:

$$B = \frac{A}{\omega_0 |M|} = \frac{1}{\omega_0 L}(E_к - e_к)\sqrt{1 + \left[\frac{\omega_0}{2}(t_2 - t_1)\right]^2}, \qquad (21)$$

where e_k is determined by the second formula of (10). The amplitude:

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$$T = \frac{2}{\omega_0}\arccos\frac{E_b - e_a}{A} + 2I\frac{|M|}{e_a - E_b}. \qquad (22)$$

Taking into consideration that the jumps of current on the collector occur at low voltages (see Fig. 2), Eqs. (17), (21), and (22) can be simplified, and it may be assumed that $e_k = 0$. Now Eq. (6) takes shape of:

$$L(E_{\text{б}} - e_{\text{э}}) = -|M| E_{\text{н}}, \tag{23}$$

$$e_{\text{э}} = E_{\text{б}} + \frac{|M|}{L} E_{\text{н}}. \tag{24}$$

Substituting (24) into (18)

$$t_2 - t_1 = \frac{2IL}{E_{\text{н}}}. \tag{25}$$

The base voltage amplitude is now:

$$A = \frac{|M|}{L} \sqrt{E_{\text{н}}^2 + \rho^2 I^2}, \tag{26}$$

where $\rho = \omega_0 L$ is characteristic resistance of circuit. The amplitude of current in the inductive branch

$$B = \frac{E_{к}}{\rho}\sqrt{1+\left(\frac{\rho I}{E_{к}}\right)^2} \qquad (27)$$

and the period of self-oscillations

$$T = \frac{2}{\omega_0}\arccos\left(-\frac{|M|\,E_{к}}{LA}\right) + \frac{2IL}{E_{к}}\,. \qquad (28)$$

It is of interest to note that for many types of triodes, in particular those of П1, П2, П6, П13, П14, the current maxima I are located on one of the static characteristics, namely, on the one for $e_k = 0.4$ v. This greatly simplifies the calculations, since it eliminates the necessity of determining the family of static characteristics. Using characteristic $i_k = i_k\,(e_b)$ for $e_k = 0.4$ v and e_a which is determined

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from (24), the respective I is calculated; this value is substituted into (25) through (28). 3. Comparison of Experiments with the Theory. Experiments were conducted with triodes of types П1, П6, П13, П14 at oscillatory circuit frequencies from 10 to 15 kc. Self-inductance of the coil was approximately 30 mh, while the inductance of the coupling coil was 30 μ. The coupling variometer permitted a variation of mutual inductance M within limits of 0-0.32 mh. Ambient temperature was 20° C. Oscillation frequency was measured by comparison to an audio signal generator, but the oscillation shapes were observed and analyzed with electron oscillograph. The experimental curves do reasonably agree with the theoretically calculated curves. The difference can be explained by the assumptions of absence of losses in the circuit and the base current. The influence of operating conditions on the amplitude and frequency of oscillations and magnitude and shape of the currents in the base and collector, small active resistances (up to 30 ohm) were

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added into the capacitive and inductive branches of the circuit, and the voltages measured with an electron-ray tube. For weak coupling the oscillation frequency is almost equal to the frequency of the oscillatory circuit. With increase of regeneration the frequency drops (Fig. 6). From Figs. 7 and 8, it may be seen that a change of E_k, contrary to the influence of E_b, practically does not change the self-oscillation frequency.

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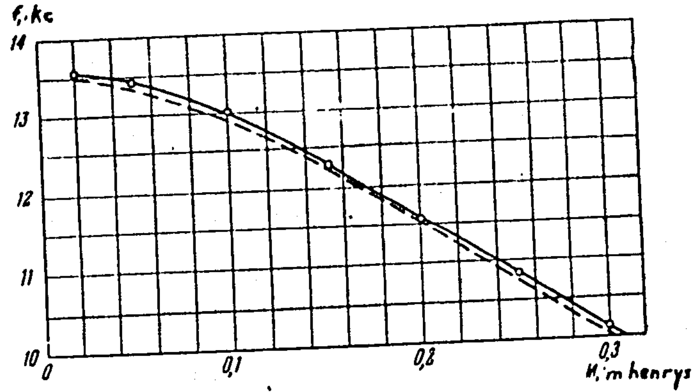

Fig. 6. Experimental (full lines) and theoretical (dotted lines) self-oscillation frequencies vs coefficient of mutual inductance (triode П13: $E_k = 5$v, $E_b = 0.13$ v).

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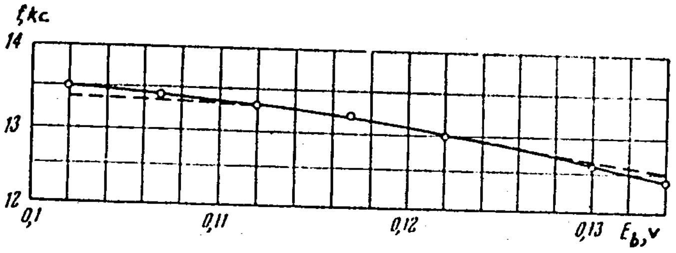

Fig. 7.

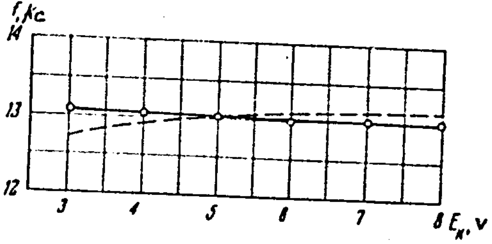

Fig. 8.

Fig. 7. Dependence of self-oscillation frequency on the bias voltage on the base (dotted lines-theoretical); triode II13:E_k = 5v, M = 0.115 mh.

Fig. 8. Frequency of self-oscillation vs collector voltage (triode II13:E_b ≈ 0.122v, M ≈ 0.115 mh).

Follow Figs. 9-11, showing influence of regeneration, and also voltage at the collector and base on the voltage oscillation amplitude of the circuit A'.

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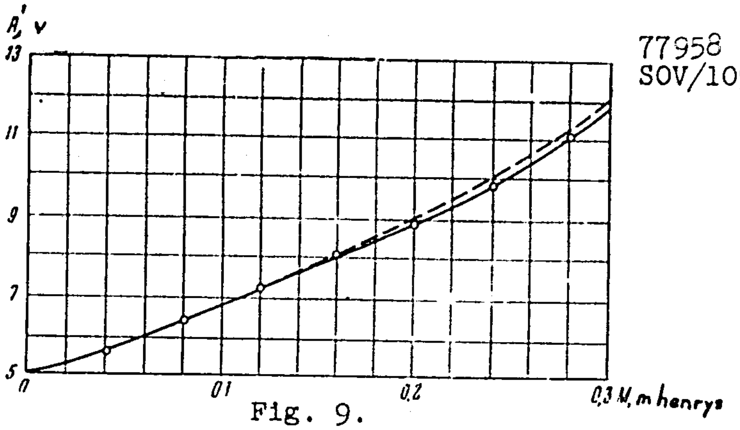

Fig. 9.

Fig. 9. Dependence of the oscillation amplitude of the circuit on the magnitude of mutual inductance (dotted lines-theoretically calculated; triode П13: $E_k = 5v$, $E_b = 0.13v$).

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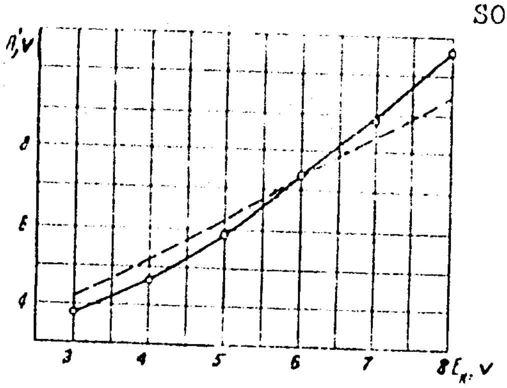

Fig. 10. Oscillation amplitude of the circuit vs voltage on the collector (dotted lines-theoretical; triode II13: $E_b = 0.122$v, $M = 0.115$ mh).

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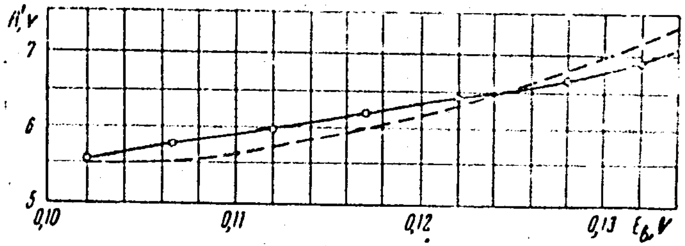

Fig. 11. Oscillation amplitude of the circuit vs bias voltage on the base (dotted lines- theoretical; triode П13: E_k = 5v, M = 0.115 mh).

The errors of theoretical calculations of E_b for magnitudes below or equal 0.13v do not exceed 8%. For greater bias the errors sharply increase. Conclusions. The presented method permits a comparatively simple calculation of the amplitude and frequency of a low-frequency oscillator, or also the

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reverse problem of determining the operating conditions of the oscillator for given frequency and amplitude. The most advantageous operating conditions are those at low bias (E_b) on the base junction, that is, in the part of characteristic where the theoretical results are closest to the experimental. Since it is not necessary to determine the curve family of static characteristics, this theory can be easily applied. It seems the new method could be applied, with some modifications, to the investigation of transient processes in auto-oscillators, blocking-generators, relaxation systems, and other devices. It is mentioned also that experiments proved the validity of the theory for auto-oscillators with inclusion of a transistor in a circuit with common base. There are 12 figures; and 5 references, 3 Soviet, 1 U.S., 1 German. The U.S. reference is: G. C. Chengi, Frequency Stability of Point-Contact Transistor Oscillators, Proc. I.R.E., 44, 2, 219 (1956).

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