On Particular Features of Electrolytic Oxidation Reactions on a Germanium Anode

(referred to normal hydrogen electrode) on the current density of an n- and p-germanium anode with a specific resistivity of 1.5 ohm·cm and a diffusion length of 0.4 - 0.5 mm. The introduction of potassium oxalate into the solutions decreases the potential of n-germanium. This phenomenon is particularly marked in the case of high current densities at which for the anodic dissolution of the n-Ge the limiting current of the diffusion of the holes occurs. By the addition of the oxalate ion this limiting current vanishes. The oxidation of the oxalate, which occurs simultaneously with the dissolution of the Ge, increases the latter within the potential range, in which it is otherwise limited by diffusion of the holes to the surface of the semiconductor. The impression is conveyed that the anodic oxidation of $C_2O_4^{2-}$ increases the concentration of the holes on the surface and thus facilitates dissolution. This is explained by the authors by the fact that the oxidation of the oxalate ion is not due to the holes but to the penetration of electrons

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into the Ge-anode. In the case of p-Ge the lowering of the potential by oxidation of the oxalate ion occurs only at low current densities. If current densities are higher, an anodic dissolution of Ge, which is not influenced by the presence of the $C_2O_4^{2-}$ occurs. In a similar manner the oxidation of KJ (Fig 2) develops. Here a further process is added, which accelerates the anodic dissolution of Ge, viz. the reduction of J on the anode by the capture of electrons from the valence zone. This reduction could also be visually confirmed because the discoloring of the solution, which is characteristic of iodine, did not occur. Iodine in this case probably plays the part of a current carrier and promotes the exchange of electrons between the valence zone and the zone of conductivity. Herefrom the authors draw the following conclusions: Only the reaction of the anodic dissolution of Germanium, which is connected with the destruction of the crystal lattice, is limited by the diffusion of the holes to the surface. Other oxidation reactions develop without the assistance of the holes, but by the penetration of electrons into the anode. There are 2 figures and 8 references, 4 of which are Soviet.

S/076/60/034/012/017/027
B020/B067

AUTHORS: Yefimov, Ye. A. and Yerusalimchik, I. G., Moscow

TITLE: Hydrogen Evolution on a Germanium Cathode

PERIODICAL: Zhurnal fizicheskoy khimii, 1960, Vol. 34, No. 12, pp. 2804-2807

TEXT: In contrast to the results obtained by W. Brattain and C. Garrett (Ref. 1) the authors found no difference in the course of the polarization curves (η -logI) which were taken on p- and n-type germanium at current densities of 10^{-5} to 10^{-1} a/cm^2 after previous long-lasting polarization (Ref. 2). The authors attempted to study the reasons of the absence of a distinct electron diffusion boundary current on the polarization curves. The curves potential - current were taken by a quick method which permitted the polarization measurements to be made at a low hydrogen overvoltage. In the experiments the voltage was applied to the electrolyzer by a special generator of sawtooth pulses which allowed the voltage supply to be changed from 30 to 10^{-4} sec. The potential of the germanium electrode was measured in 0.1 N HCl at current densities of 10^{-3} to 3.10^{-2} a/cm^2

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and 20° as referred to a hydrogen electrode in the same solution (Fig. 1). Curve 1 corresponds to n-type germanium and curve 2 to p-type germanium. The curves were taken within three seconds. At a potential more negative than 0.6 v the curves η - I for n- and p-type germanium cathodes diverge. At $I = 3.10^{-2}$ a/cm^2 the polarization of the p-type germanium electrode increases by 0.3 v compared to that of n-type germanium. When measuring the potential after preceding cathodic polarization of the electrode to a constant potential no deviation was found between the curves of p-type and n-type germanium. The difference in the kinetics of the electrolytic evolution of hydrogen on p- and n-type germanium becomes manifest only at current densities exceeding 3.10^{-3} a/cm^2 and in a very short initial range. This phenomenon is connected with the bending of the energy zones on the semiconductor surface during adsorption and the entrance of the hydrogen atoms into the crystal lattice. Fig. 2 shows the φ - I curves for a solution of 0.1 N HCl + 0.1 N $(NH_4)_2S_2O_8$ which were taken within three seconds on n-(curve 1) and p-(curve 2) type germanium, whereas curve 3 corresponds to the hydrogen evolution in 0.1 N HCl on n-type germanium. At current densities exceeding 10^{-1} a/cm^2 the potential of the p- and

n-type germanium electrode rose strongly and anomalously (Fig. 3). This was not the case in degenerate semiconductors because of their ohmic fall of potential in the impoverished layer on the germanium surface and in the semiconductor mass. The electron diffusion from the mass of p-type germanium to its surface reduces the rate of electrochemical reaction neither in hydrogen evolution nor in the reduction of the persulfate ion. There are 3 figures and 8 references: 3 Soviet, 3 US, and 2 British.

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SOV/20-130-2-31/69

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AUTHORS: Yefimov, Ye. A., Yerusalimchik, I. G.

TITLE: On the Particular Features of the Electrochemical Dissolution of n-Type Silicon

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol 130, Nr 2, pp 353 - 355 (USSR)

ABSTRACT: This paper is an experimental confirmation of the assumption made by J. Flynn (Ref 4), according to which, unlike what is the case with germanium, mainly the holes are used up in the electrochemical dissolution of Si which are formed in the space charge layer on the boundary between semiconductor and electrolyte, and where only an insignificant number of holes is formed by generation within the semiconductor. The method employed is described in reference 3. The experiments were made by means of an n-silicon lamella (resistivity about 3 ohm.cm). On one side of the lamella a p-n junction with an area of 0.03 cm^2 was produced by melting aluminum, and on the same side an ohmic contact was connected. The lamella was insulated by means of silicon-varnish and paraffin with the exception of the

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place opposite the p-n junction. The thickness of the n-Si layer between the boundary of the p-region and the electrolyte was 20-25 μ. The experiments were made at 20° in 2.5n HF. Figure 1 shows the polarization curves of the anodic dissolution of Si in the interval of current densities from 10^{-6} to $5 \cdot 10^{-4}$ a/cm^2. Curve 1 was obtained with an open circuit of the p-n junction and connection of the positive pole of the current source to the ohmic contact. Curve 2 was obtained by connection of a back bias of 100 v to the p-n junction. Both curves are in full agreement. For comparison, curves are introduced, which were obtained with ordinary Si-electrodes with a specific resistance of 3 ohm.cm and 10 ohm.cm. The change in electrode thickness in the case of the same specific resistance exerts no influence on the anodic dissolution of Si, which is in contradiction to the results obtained with germanium (Ref 3). Thus it has been proven that the holes necessary for the anodic dissolution of Si are essentially formed within the region of the space charge on the boundary

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between semiconductor and electrolyte, but not within the semiconductor. A further confirmation of this opinion was provided by the experiments made with reduced ($C_2O_4^{2-}$) and oxidizing ($K_3Fe(CN)_6$)-additions to the electrolyte (Refs 6,7). There are 1 figure and 7 references, 3 of which are Soviet.

PRESENTED: September 8, 1959, by A. N. Frumkin, Academician

SUBMITTED: September 8, 1959

Card 3/3

S/020/60/134/006/023/031
B004/B054

AUTHORS: Yefimov, Ye. A. and Yerusalimchik, I. G.

TITLE: Investigation of the Surface State of Anodically Polarized Germanium in Alkaline Solutions

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 134, No. 6, pp. 1387-1389

TEXT: The authors studied the state of anodically polarized germanium by recording the curve of charge. To exclude semiconductor effects, they used degenerate polycrystalline germanium. The experiments were made in 0.1 N KOH at 20°C. The germanium electrode was anodically polarized at various current densities for a certain period. Then, the curve of charge was recorded at a current density of 10^{-3} a/cm^2 by means of an ЭНО-1 (ENO-1) oscilloscope. Fig.1 shows the curves of charge after anodic polarization at the potentials -0.350 v and -0.330 v, and a duration of 10, 20, 60, and 120 sec. In all cases, the authors observed, at about -0.75 v, a retardation of the potential increase which is due to the oxygen discharge on the germanium surface. In anodic polarization φ = -0.35 v, the amount of electricity needed is about $4.5 \cdot 10^{-4}$ coulomb/cm^2, and does

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not depend on the time of polarization. The potential of about 1.4 v corresponds to the potential of hydrogen separation on a pure germanium surface in 0.1 N KOH at $I = 10^{-3}$ a/cm^2. The amount of chemically adsorbed oxygen depends on the potential of anodic polarization. It is completely eliminated by cathodic polarization at $\varphi < -0.35$ v. With an increase in the potential to -0.330 v, a horizontal step appears in the curve of charge at $\varphi \approx -0.75$ v. The total amount of electricity needed to remove the oxygen rises by one order of magnitude, and now depends on the duration of the preceding anodic polarization (10^{-3} coulomb/cm^2 at $\tau = 10$ sec, $7 \cdot 10^{-3}$ coulomb/cm^2 at $\tau = 120$ sec). The observed step makes the authors conclude that with anode potentials higher than -0.35 v, part of the electrochemically adsorbed oxygen is bound more closely to the surface. A monomolecular GeO layer is formed. Fig. 2 shows that the retardation at $\varphi = -0.75$ v can only be observed at anodic potentials below $\varphi = -0.180$ v. At higher potentials or after longer polarization, the horizontal step disappears. Fig. 3 shows the curve of charge at anodic polarization with $I = 2.5 \cdot 10^{-2}$ a/cm^2 ($\varphi = -0.03$ v). After longer duration of polarization, the potential of the electrode rises to +0.6 v due to slow diffusion

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B004/B054

of OH^- ions to the electrode surface, and a new retardation appears on the curve of charge at φ = -0.25 v. The experimental data show that the total amount of O adsorbed to Ge may attain more than 10 monomolecular layers. In the case of anodic dissolution, an oxide layer forms which is cathodically reduced at φ = -0.75 . There are 3 figures and 3 non-Soviet references.

PRESENTED: June 8, 1960, by A. N. Frumkin, Academician

SUBMITTED: June 8, 1960

Card 3/3

S/076/61/035/003/006/023
B121/B203

54600 1043, 1145, 1273

AUTHORS: Yefimov, Ye. A. and Yerusalimchik, I. G.

TITLE: Anodic dissolution of germanium in the presence of reducing agents

PERIODICAL: Zhurnal fizicheskoy khimii, v. 35, no. 3, 1961, 543-547

TEXT: The authors studied the mechanism of anodic dissolution of thin germanium electrodes on addition of reducing agents such as $C_2O_4^{2-}$ or I^-. The electrode used was a germanium lamina with a resistivity of 20 Ωcm and a diffusion length of 1 mm. The germanium lamina was 200 μ thick. On one side of the germanium lamina, a p-n electron transition was produced by alloying with indium. The potential of this germanium electrode with respect to a saturated calomel electrode was determined for various current densities at 20°C. All polarization curves obtained in the presence of reducing agents showed a distinct limiting current with potentials more positive than 0.5 v. The authors discussed the mechanism of accelerated germanium dissolution on addition of a reducing agent. Experimental data showed an additional supply of holes from the lower semiconductor layers to its surface in the

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presence of reducing agents. Electrons are injected in germanium during the oxidation of reducing agents. This produces an electric field permitting the supply of holes from the interior of the semiconductor to the surface. This accelerates anodic dissolution. The increase in the saturation current is higher on addition of I^- ions than of $C_2O_4^{2-}$ ions to the solution.

This circumstance is due to partial reversibility of the reduction of molecular iodine according to Gerisher and Beck's mechanism (Ref. 3: J. Phys. Chem. (N. F.), 13, 389, 1957). There are 3 figures and 4 references: 2 Soviet-bloc and 2 non-Soviet-bloc. The two references to English-language publications read as follows: Gerisher, Beck, J. Phys. Chem. (N. F.), 13, 389, 1957; Shockley, Bell, System Tech. J., 28, 435, 1949.

SUBMITTED: June 19, 1959

Card 2/2

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S/076/61/035/002/011/015
B107/B220

5.4600 1043 1164 1151

AUTHORS: Yefimov, Ye. A. and Yerusalimchik, I. G. (Moscow)

TITLE: Anodic dissolution of silicon in hydrofluoric acid

PERIODICAL: Zhurnal fizicheskoy khimii, v. 35, no. 2, 1961, 384-388

TEXT: The process of anodic dissolution of p-type and n-type silicon with specific resistance of about 10 Ω cm in 2.5 N hydrofluoric acid at 20°C has been studied. The investigation is of practical interest for the electrochemical etching of silicon. The silicon samples tested were toward (111); the minority carriers have an average lifetime of 30-40 μsec. Polarization and differential capacity were measured referred to a saturated calomel electrode; the potential-versus-time curves were measured with an ЭНО-1 (ENO-1) oscilloscope. The method has been described by the authors in a previous paper on the dissolution of germanium (Zh. fiz. khimii, 33, 441, 1959). Fig. 1 shows the potential for anodic dissolution at current densities between 10^{-6} and 10^{-2} A/cm^2. n-type silicon shows a clearly marked limiting current which is still increased by adding potassium ferricyanide to the

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solution. For p-type silicon, however, φ is a linear function of log I between 10^{-6} and $5 \cdot 10^{-3}$. It follows therefrom that the dissolving process is determined by the number of holes at the silicon-electrolyte interface. The dissolution causes the formation of an oxide layer which is dark on p-type silicon and dissolves hardly in concentrated hydrofluoric acid, but with vigorous evolution of hydrogen in cold potassium hydroxide. The oxide layer on n-type silicon is much thinner and reacts hardly with potassium hydroxide, but is dissolved in concentrated hydrofluoric acid. Apparently, the oxide layer on p-type silicon consists mainly of bivalent, and that on n-type silicon of tetravalent silicon compounds. Differential capacity was measured at 200, 1000, and 10,000 cps. (Figs. 2 and 3); the curves correspond to those for germanium, but the capacity is lower. For p-type silicon it is about one order of magnitude higher than for n-type silicon; this is due to the fact that in the latter the impoverished carrier band is broader. The change of the electrode potential after reversing from cathode to anode direction is shown in Fig. 4. Conclusions: The first stage of anodic dissolution is the electrochemical oxidation of the electrode surface; then, the hydrofluosilicic compounds formed on the surface enter the solution; this process

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is, however, limited by the number of holes at the semiconductor-electrolyte interface. If there is an insufficient number of holes (as in the case of n-type silicon), the dissolution of the silicon oxide compounds formed on the surface is rendered difficult and electrochemical oxidation of the electrode surface continues unimpeded. Probably, this is the reason why tetravalent and bivalent silicon compounds are formed on n-type and p-type silicon, respectively. There are 4 figures and 5 references: 1 Soviet-bloc and 4 non-Soviet-bloc. The references to the three English-language publications read as follows: Uhlir, Bell System Techn. J., 35, 333, 1956; Turner, J. Electrochem. Soc., 105, 402, 1958, Flynn, J. Electrochem. Soc., 105, 715, 1958.

SUBMITTED: June 10, 1959

Legend to Fig. 1: Anode polarization in the dissolution of silicon: (1) n-type silicon in 2.5 N HF; (2) p-type silicon in 2.5 N HF; (3) n-type silicon in 2.5 N HF + 0.05 N $K_3Fe(CN)_6$.

Legend to Fig. 2: Differential capacity for p-type silicon: (1) 200 cps; (2) 1000 cps; (3) 10 000 cps.

Legend to Fig. 3: Differential capacity for n-type silicon: (1) 200 cps; (2) 1000; (3) 10,000 cps.

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B107/B220

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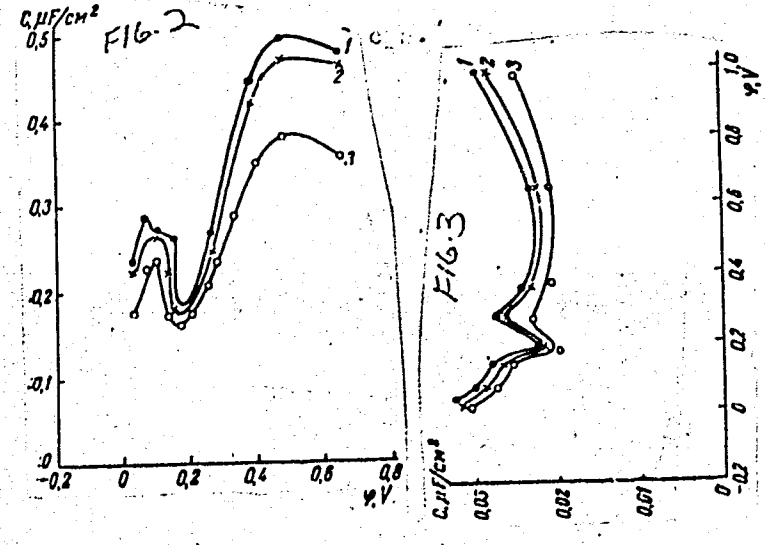

Fig 2

Fig 3

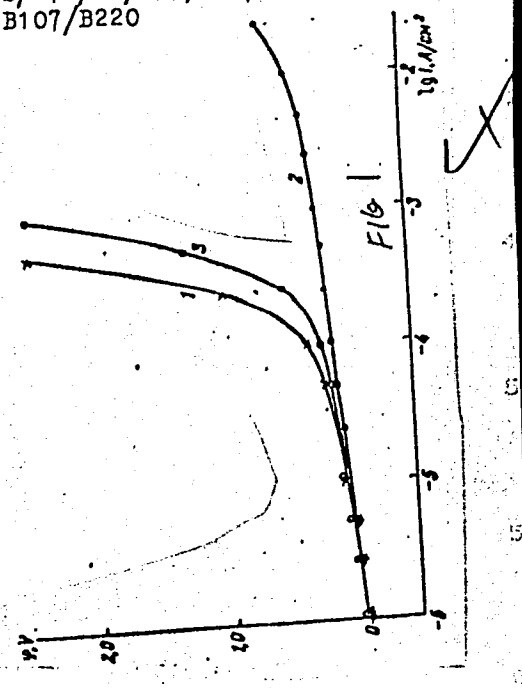

Fig 1

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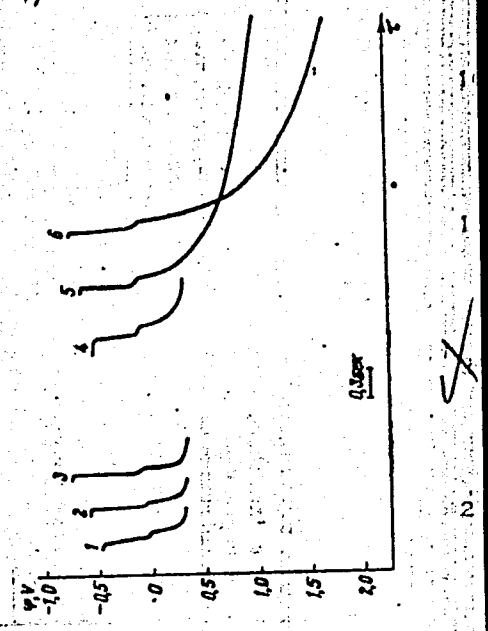

Legend to Fig. 4: Electrode potentials for the reversal of current direction: (1) p-type silicon, $I = 10^{-4}$ A/cm^2; (2) p-type silicon, $I = 2 \cdot 10^{-4}$ A/cm^2; (3) p-type silicon, $I = 5 \cdot 10^{-4}$ A/cm^2; (4) n-type silicon, $I = 10^{-4}$ A/cm^2; (5) n-type silicon, $I = 2 \cdot 10^{-4}$ A/cm^2; (6) n-type silicon, $I = 5 \cdot 10^{-4}$ A/cm^2.

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S/076/62/036/001/008/017
B107/B110

AUTHORS: Yefimov, Ye. A., and Yerusalimchik, I. G. (Moscow)

TITLE: Study of the surface condition of anodically polarized germanium in acid solutions

PERIODICAL: Zhurnal fizicheskoy khimii, v. 36, no. 1, 1962, 98 - 102

TEXT: The surface condition of a germanium anode has been studied at a current density of 10^{-5} to 10^{-1} a/cm^2 in 0.1 N H_2SO_4 at 20°C. All the experiments were made with polycrystalline, non-semiconductive, degenerate germanium with an impurity concentration of nearly 0.01%. Preliminary tests have shown that germanium of this type behaves in anodic dissolution like p-type germanium. The charge curves were measured with an ЭНО-1 (ENO-1) oscilloscope. The germanium electrode was anodically polarized at different current densities for some time, whereupon the φ-Q curve was recorded at a cathode current density of 10^{-3} a/cm^2. The germanium electrode was etched in СР-4 (SR-4) before each experiment. In addition,

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its resistance and capacitance were determined between 60 and 5000 cps. It has been found that an electrochemically adsorbed layer of oxygen is formed on the germanium surface at a potential less than 0.38 v. The layer has a thickness of about 2 - 13 oxygen atoms, which is independent of the potential and of the time of polarization. A monomolecular layer of a defined compound of one germanium atom per oxygen atom starts forming above 0.38 v. This monomolecular layer exhibits a high resistance and can be entirely dissolved cathodically. At 0.57 v and more, thick, macroscopically detectable layers of GeO, the thickness of which grows with the potential and with the duration of polarization, are formed on the germanium surface. The oxide is not completely dissolved by cathodic polarization. The potential required for the separation of oxygen on it is higher than on pure germanium. There are 5 figures and 5 references: 1 Soviet and 4 non-Soviet. The two references to English-language publications read as follows: D. Turner, J. Electrochem. Soc., 103, 252, 1956; J. Law, P. Meigs, Semiconductor Surface Physics, N. Y., 1957, p. 383.

SUBMITTED: April 6, 1960

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S/076/62/036/004/005/012
B101/B110

AUTHORS: Yefimov, Ye. A., Yerusalimchik, I. G., and Sokolova, G. P. (Moscow)

TITLE: Oxidation of germanium surface during chemical etching

PERIODICAL: Zhurnal fizicheskoy khimii, v. 36, no. 4, 1962, 765-769

TEXT: A report is given on experiments for the purpose of studying, by means of charging curves, the oxidation of the surface of polycrystalline Ge, which was treated with various etching agents. The Ge contained a maximum of 0.01% impurities. The following substances were used as etching agents: (1) CP-4, consisting of 50 cm^3 HNO_3, 30 cm^3 CH_3COOH, 30 cm^3 HF, and 0.6 cm^3 Br_2; (2) etching agent no. 5 of S. G. Ellis (J. Appl. Phys., 29, 1262, 1957); (3) etching agent no. 8 of Ellis; (4) 20 cm^3 H_2O_2, 1 mg KOH; (5) 20 cm^3 HF, 10 cm^3 HNO_3, 5 cm^3 H_2SO_4, 50 cm^3 H_2O, 1.5 g $K_2Cr_2O_7$, and 1 g NaCl. The charging curves were plotted at 20°C in 0.1 N H_2SO_4 and cathodic current density of 10^{-3} a/cm^2 (Fig. 1). The stationary potentials

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of the Ge electrode after etching for 15 sec were measured, and also the quantity of electricity (coulomb/cm^2) required for removal of the oxygen bound to the Ge surface after etching the sample for 5, 10, 15, 30 or 60 sec. Results: (a) on the germanium surface, each of the etching agents formed oxide films of a structure and composition specific to the etching agent; (b) the most homogeneous film is formed by the H_2O_2 etching agent no. 4; the charging curve of Ge treated with this etching agent shows a clearly horizontal course for $\varphi = -0.3$ v; (c) with the exception of the etching agent no. 4, the specific effect of all etching agents is lost after 1-4 hrs exposure to air. The quantity of electricity necessary for reducing the oxide film was $4.3 \cdot 10^{-3}$ after 1 hr exposure to air; $5.0 \cdot 10^{-3}$ after 2 hrs; and $5.8 \cdot 10^{-3}$ coulomb/cm^2 after 4 hrs, from which the formation of GeO_2, which is reduced at $\varphi \approx -0.2$ v, may be inferred, this being in good agreement with R. J. Archer (J. Electrochem. Soc., 104, 619, 1957). There are 4 figures and 1 table.

SUBMITTED: : June 30, 1960

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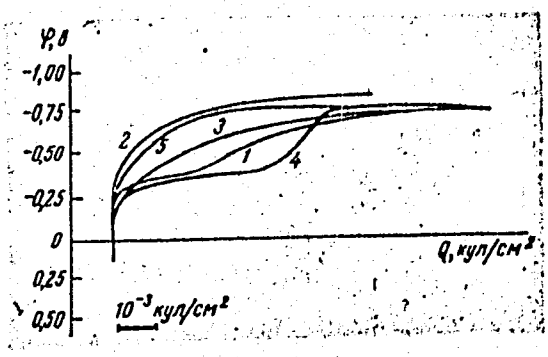
Oxidation of germanium surface ...

Fig. 1: Charging curves of Ge after 15 sec etching. (1), (2), (3), (4) and (5) etching agents seen in the body of the abstract.
Legend: ordinate φ, v; abscissa Q, coulomb/cm^2.



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B101/B110

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AUTHORS: Yefimov, Ye. A., Yerusalimchik, I. G., and Sokolova, G. P.

TITLE: Electrochemical evolution of hydrogen on monocrystalline silicon in hydrofluoric acid solution

PERIODICAL: Zhurnal fizicheskoy khimii, v. 36, no. 5, 1962, 1005 - 1009

TEXT: The authors studied the electrochemical reactions of p-and n-type Si in 2.5 N HF and measured (a) the H_2 overvoltage at $2.5\cdot10^{-6}$ - $5\cdot10^{-2}$ a/cm^2 with preceding 1-hr cathodic polarization at $I_c = 10^{-2}$ a/cm^2; (b) the oscillograms for current insertion with Si as cathode; (c) the anodic charging curve at $I_a = 5\cdot10^{-5}$ a/cm^2 with preceding cathodic polarization at various potentials. Results: (1) Slowly taken cathodic polarization curves $\eta = f(\log I)$ are equal for n- and p-type at $\eta > -0.7$ v and obey Tafel's equation, $b \sim 0.17$ v. With more negative η the potential rises quickly: for p-type Si at 10^{-3} a/cm^2, for n-type Si at 10^{-2} a/cm^2.

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Electrochemical evolution of...

(2) Oscilloscopic measurement of the potential by an ЭНО-1 (ENO-1) oscilloscope, synchronously connected with a sawtooth pulse generator, showed no change of the polarization curve for n-type Si, and an increase of the potential by 0.35 v for p-type Si. (3) The oscillograms for current insertion are equal for both types at $I_c = 10^{-4}$ a/cm^2. At $I_c = 10^{-3}$ a/cm^2, the curve for p-type Si shows a distinct peak 2 v high. (4) The anodic charging curves for Si polarized at -0.5 v show a retardation of the potential at $I_c \geqslant 5 \cdot 10^{-5}$ a/cm^2. This suggests the formation of a surface compound from Si and H at -0.5 v. Two processes are possible for H_2 evolution: (A) $Si + e^-_{val} + H^+ \rightarrow SiH$; $SiH + e^- + H^+ \rightarrow Si + H_2\uparrow$. The second reaction is much retarded for p-type Si. (B) Hydrogen forms dipoles with outward-directed negative poles on the Si surface. With n-type Si, the negative charge of the surface is compensated by the positive charge of the surface barrier, and further hydrogen adsorption is restricted. With p-type Si, the positive pole of the dipole is a hole. As p-type dipoles do not reach into the body of the semiconductor the formation of

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Electrochemical evolution of...

further dipoles and further hydrogen adsorption is possible. There are 4 figures.

SUBMITTED: July 27, 1960

Card 3/3

YEFIMOV, Ye.A.; YERUSALIMCHIK, I.G.; SOKOLOVA, G.P. (Moscow)

State of the surface of anodically polarized silicon in hydrofluoric acid solutions. Zhur. fiz. khim. 36 no.6:1219-1221 Je '62 (MIRA 17:7)

40044

S/076/62/036/008/005/011
B101/B144

24.7700

AUTHORS: Yefimov, Ye. A., and Yerusalimchik, I. G.

TITLE: Effect of the bichromate ion on the anodic dissolution of germanium

PERIODICAL: Zhurnal fizicheskoy khimii, v. 36, no. 8, 1962, 1791 - 1794

TEXT: Proceeding from observations made by F. Beck, H. Gerischer (Z. Electrochem., 63, 943, 1959), the behavior of p- and n-type Ge (resistivity 1.0 ohm.cm, diffusion length 0.5 mm) in 0.1 N H_2SO_4 was studied in the presence of 0.15 - 0.03 M $K_2Cr_2O_7$ at room temperature. Results: (1) With p-type Ge, the potential of anodic dissolution increased in the presence of the bichromate by ~0.2 v for the whole range investigated (0 - 1.6 ma/cm^2). (2) With n-type Ge, the potential of anodic dissolution increased whereas the saturation current dropped to nearly one-half. Exposure of the Ge electrode to light eliminated the bichromate effect. (3) On thin Ge electrodes with p-n junction a small bichromate effect with reverse bias and a reduction of the saturation

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Effect of the bichromate ion...

current with open p-n circuit were observed. Conclusion: The $Cr_2O_7^{2-}$ anion is adsorbed on the positively charged Ge surface. Since the valence electrons of the ion are drawn to the oxygen atoms, the Cr^{6+} center attracts electrons and repels holes. This inhibits the anodic dissolution and reduces the saturation current. On exposure to light, this effect is compensated by the intense generation of holes on the surface. There are 3 figures.

SUBMITTED: December 8, 1961

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PHASE I BOOK EXPLOITATION SOV/6448

Yefimov, Yevgeniy Aleksandrovich, and Josif Grigor'yevich Yerusalimchik

Elektrokhimiya germaniya i kremniya (Electrochemistry of Germanium and Silicon) Moscow, Goskhimizdat, 1963. 180 p. Errata slip inserted. 5000 copies printed.

Ed.: A. T. Kochnev; Tech. Ed.: V. V. Kogan.

PURPOSE: The book is intended for scientific workers, engineers, and technicians working in the semiconductor industry. It may also be useful to advanced students specializing both in semiconductor engineering and in electrochemistry.

COVERAGE: The book is a generalization of investigations carried out by Soviet and non-Soviet scientists in a new area of physical chemistry, the electrochemistry of semiconductors such as germanium and silicon. It offers a systematic outline of the structure of the electric double layer at the semiconductor-electrolyte interface and the kinetics of the anodic dissolution of germanium and

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Electrochemistry of Germanium and Silicon SOV/6448

silicon and provides data on other electrochemical reactions occuring on germanium and silicon electrodes. A special chapter has been devoted to a discussion of electrochemical operations performed in the production of semiconductor devices. The authors thank Ye. N. Paleolog, Candidate of Chemical Sciences, for his valuable comments. Each chapter is accompanied by references.

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Ch. I. Structure of the Semiconductor-Electrolyte Interface 7
1. Surface properties of a semiconductor 7
2. Charged layers at semiconductor-electrolyte boundary 12
Bibliography 22

Card 2/ 8

[redacted], Ye.A.; SAPKO, V.N.; GREBENYUK, V.P.; PIORO, E.Ch.; SHCHASTNYY, P.M.; KSENZUK, F.A.; SHIRINSKIY, D.I.; TOLSTYKH, V.I.

Rapid top pouring of rimmed steel into ribbed ingot molds. Metallurg 8 no.11:17-19 N '63. (MIRA 16:12)

ACCESSION NR: AP4033398 S/0076/64/038/003/0589/0592

AUTHOR: Yefimov, Ye. A. (Moscow); Yerusalimchik, I. G. (Moscow)

TITLE: Effects of electric and structural heterogeneities on the anodic dissolution of germanium.

SOURCE: Zhurnal fizicheskoy khimii, v. 38, no. 3, 1964, 589-592

TOPIC TAGS: germanium, anodic dissolution, polarization, anodic polarization, hole, electric heterogeneity, structural heterogeneity

ABSTRACT: The purpose of this investigation was to find the cause of the discrepancies between the theoretically calculated limiting current for the anodic dissolution of germanium and the much greater experimentally observed current. Since the ordinary single crystals of germanium are not strictly homogenious, specially grown crystals of n-germanium with $\rho = 3$ ohm·cm and length of the order of 0.7 mm, containing a minimum amount of impurities and the density of dislocations of 50 disloc./cm^2 and also germanium with the same electric and physical parameters but having a density of dislocations $\sim 6 \cdot 10^4$ disloc./cm^2 were used for this investigation. The anodic polarization curves were obtained by the potentio-

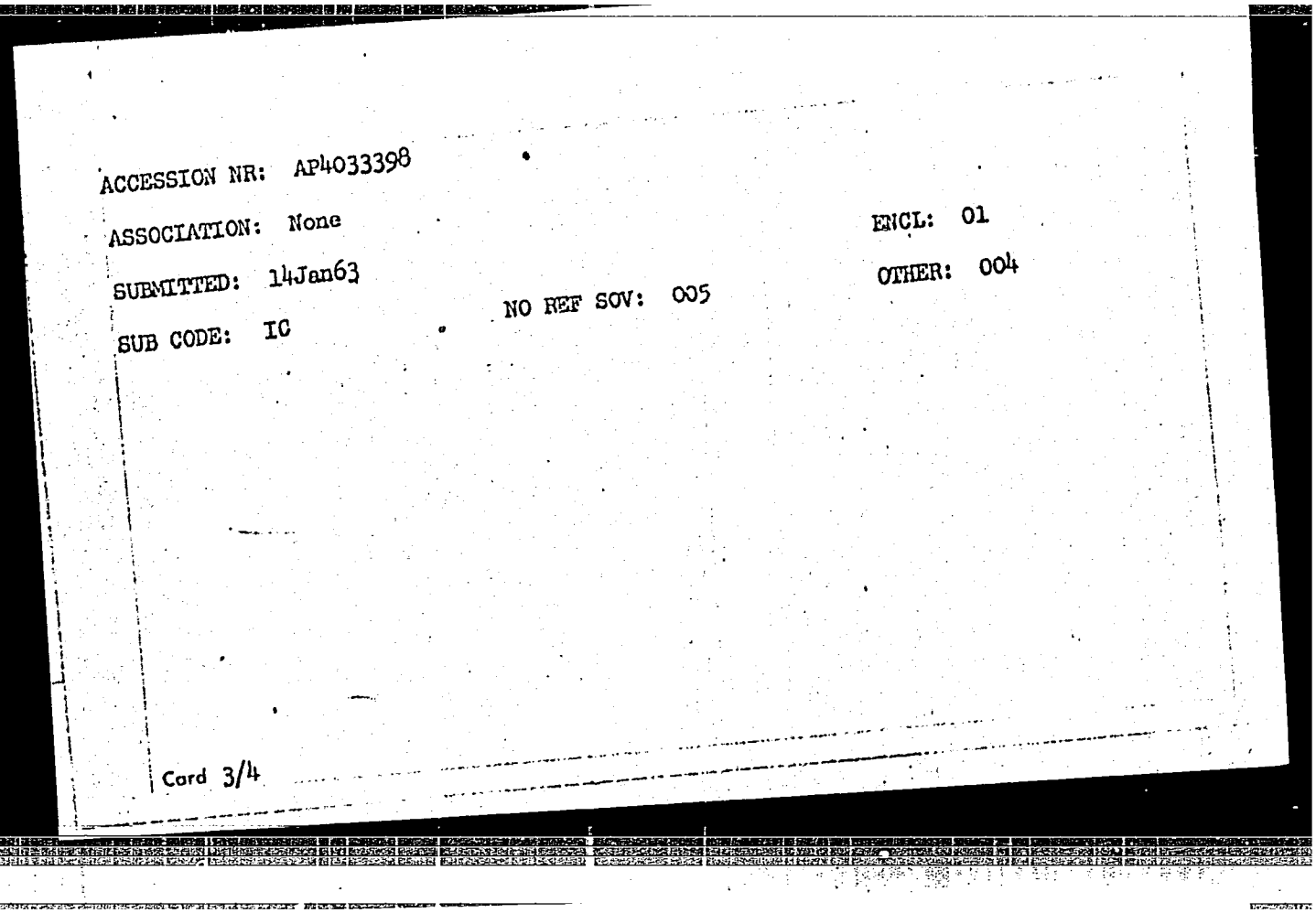
Card 1/4

ACCESSION NR: AP4033398

static method in 0.1 N H_2SO_4 (Fig. 1). The experimental results show that the increase of the limiting current during the anodic dissolution of germanium is associated with an additional generation of holes on some parts of the electrode surface. A higher concentration of Cu and Ni on such parts of the electrode may lead to the formation of the high resistance micro regions where the acceptor impurities compensate for the main part of donor impurities or it may lead to segregation of Cu and Ni into a separation phase, primarily at the places of disruption of the crystal lattice. In the areas of germanium on which the conductivity is close to the bulk conductivity, the limiting current due to holes is much greater than on bulk n-germanium. Upon increase of anodic polarization these zones may completely change the type of conductivity. The p-regions which occur at the n-germanium electrolyte interface will carry a large fraction of current, thus individual areas of the electrode surface dissolve more rapidly than others. A segregation of Cu and Ni in a separate phase in the germanium crystal may be produced due to break-through and local generation. This was verified by measuring the photoelectric potential as a function of the potential of germanium electrode in 0.1 N H_2SO_4. "The authors express their gratitude to L. I. Kolesnik and Yu. A. Kontsevoy for their help and valuable suggestions during discussion of the results."

Orig. art. has: 2 figures.

Card 2/4



ACCESSION NR: AP4033398

ASSOCIATION: None

ENCL: 01

SUBMITTED: 14Jan63

OTHER: 004

SUB CODE: IC

NO REF SOV: 005

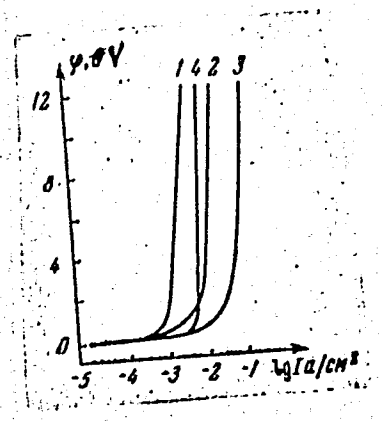
Card 3/4

ENCLOSURE: 01

ACCESSION NR: AP4033398

Fig. 1. Anodic polarization curves obtained by the potentiostatic method in 0.1 N H_2SO_4 with n-germanium electrodes. Resistivity of germanium was 3 ohm·cm.

1) L = 0.7 mm, 50 disloc./cm^2
2) L = 0.7 mm, $6 \cdot 10^4$ disloc./cm^2
3) L = 0.03mm, 10^7 disloc./cm^2
4) L = 0.03mm, (specimen 2 after removal of Cu & Ni impurities



Card 4/4

ACCESSION NR: AP4033404 S/0076/64/038/003/0720/072 3

AUTHORS: Yefimov, Ye.A.; Yerusalimchik, I.G.; Gorgoraki, Ye.I.

TITLE: Reduction of persulfate ion at a germanium cathode

SOURCE: Zhurnal fizicheskoy khimii, v. 38, no. 3, 1964, 720-723

TOPIC TAGS: persulfate ion reduction, reduction, germanium cathode, n type germanium, p type germanium

ABSTRACT: Because of the contradictory data given in literature on the reduction of persulfate ion at germanium electrod-, this reaction was studied by the potentiostatic polarization method and also via measurement of the photoelectric potential of the germanium electrode. This permitted determination of the magnitude of the curvature of the energy zone on the electrode surface. Electrodes from n- and p-type germanium with specific resistance of 1.5 ohm. xcm and diffusion zone length of 0.7 mm were used. A series of experiments were made on a degenerated polycrystalline germanium which does not have semiconductor properties and also using electrodes with p-n transition. Polarization curves taken in 0.001 N $K_2S_2O_8$

Card 1/3

ACCESSION NR: AP4033404

on n- and p-degenerated germanium show that under given conditions the reduction process does not depend on the type of electrode conductivity and that a limiting current of ~0.35 ma/cm^2 is the normal specific current for persulfate ion diffusion to the electrode surface. The addition of an indifferent electrolyte to a 0.001 N $K_2S_2O_8$ solution decreases somewhat the inhibition of the electrochemical reaction. It was found that on increasing the concentration of the persulfate ion in the solution, the polarization curves for p- and n-germanium begin to differ and at φ = -0.2 to -0.1v the rate of reaction increases. With increase of the concentration of ammonium persulfate the photopotential increases and the value of the potential of flat zone is displaced toward the more positive potentials for the p- and n-type germanium electrodes. Since the polarization curves on n- and p-germanium corresponds to potentials -0.2 to -0.1v, it was concluded that in both cases the reaction is inhibited. On the basis of the lack of limiting current for the diffusion of electrons in the p-germanium it was assumed that electrons of the valence zone take part in the reduction or the rate of surface recombination at the electrolyte boundary is very great. Orig. art. has: 7 figures.

Card 2/3

ACCESSION NR: AP4033404

ASSOCIATION: None

SUBMITTED: 14Jan63 DATE ACQ: 15May64 ENCL: 00

SUB CODE: GC, GP NR REF SOV: 003 OTHER: 002

Card 3/3

YEFIMOV, Ye.A.; YERUSALIMCHIK, I.G.; SOKOLOVA, G.P. (Moskva)

Electrochemical behavior of the silicon electrode in solutions of oxidation agents. Zhur. fiz. khim. 38 no.9:2172-2175 S '64. (MIRA 17:12)

L 628.04-65 EWT(m)/EWI(t)/EWP(b) IJP(c) JD

ACCESSION NR: AP5018454

UR/0364/65/001/007/0818/0821
541.13:621.315.592

AUTHOR: Yefimov, Ye. A.; Yerusalimchik, I. G.

25
24
B

TITLE: Anodic dissolution of gallium arsenide

SOURCE: Elektrokhimiya, v. 1, no. 7, 1965, 818-821

TOPIC TAGS: gallium arsenide, electrochemistry, anodic dissolution, photoelectric semiconductor, oxidation

ABSTRACT: The anodic dissolution of gallium arsenide proceeds with the participation of holes. For this semiconductor with a wide forbidden zone the main potential jump takes place in the space charge region. This investigation was carried out by means of anodic polarization curves, measurements of photoelectric potential, differential capacitance, cathodic charging curves and current efficiency. Single crystals of n-type gallium arsenide (doped with tellurium) were used as electrodes. The electron concentrations in these crystals were 10^{18} and $8 \cdot 10^{16}$ cm^{-3}. Some electrodes were made from p-type gallium arsenide (doped with zinc) in which the concentration of holes was $5 \cdot 10^{18}$ and 10^{18} cm^{-3}, oriented along the III plane. The potentiostatic curves (Fig. 1 of the Enclosure) indicate that the dissolution of n-type

Card 1/4

L 62804-65
ACCESSION NR: AP5018454

gallium arsenide is retarded at current density of 10^{-6} a/cm^2. At 1.2-1.3 V a breakthrough at the electrolyte boundary takes place, and the avalanche of current carriers is produced. In 1 N H_2SO_4 the potential of gallium arsenide is independent of the concentration of gallium ions in solution, and for *n*-type it is 0.3 V more negative than for *p*-type. Analogous curves are obtained in 0.1 N H_2SO_4. In 0.1 N KOH and 1 N KOH the curves for *p*-type gallium arsenide are shifted 0.70-0.75 V more positive as compared with acid solutions. In these solutions the potential of *n*-type is more positive than of the *p*-type. Illumination of the electrode surface causes a large shift of the potential of *n*-type gallium arsenide in the negative direction and essentially results in elimination of the retardation of the anodic reaction due to hole deficiency. Illumination of *p*-type gallium arsenide results in potential shift in the positive direction. Analyses of anodic dissolution products in the electrolyte indicate that gallium arsenide in acid and in alkaline solutions dissolves producing trivalent arsenic and gallium compounds. Gravimetric studies indicated that the oxidation current efficiency is 100% both in acid and in alkaline solutions, considering 6 electrons per mole of GaAs. It has been shown that oxidation of the surface of gallium arsenide takes place during its anodic dissolution. The experimental part of this work was carried out with the participation of L. A. Chupina. Orig. art. has: 7 figures.

Card 2/4

L 1804-65

ACCESSION NR: AP5018454

ASSOCIATION: none

SUBMITTED: 20Jan65 ENCL: 01 SUB CODE: EM, IC

NO REF SOV: 001 OTHER: 002

Card 3/4

L 62804-65

ACCESSION NR: AP5018454

ENCLOSURE: 01

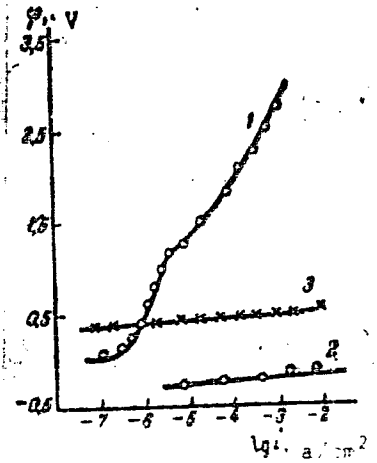


Fig. 1. Anodic polarization of gallium arsenide in 1 N H_2SO_4. 1--*n*-type ($8 \cdot 10^{16}$ electron cm^{-3}; in darkness); 2--*n*-type ($8 \cdot 10^{16}$ electrons cm^{-3}; illuminated); 3--*p*-type (10^{18} electrons cm^{-3}; in darkness)

Card 4/4

YEFIMOV, Ye.A.; YERUSALIMCHIK, I.G.

Electrochemical processes on an arsenic electrod-. Elektr-.
khimiia 1 no.9:1133-1137 S '65. (MIRA 18:10)

YEFIMOV, Ye.A.; YERUSALIMCHIK, I.G. (Moscow)

Reduction of organic compounds on the germanium cathode. Zhur. fiz. khim. 38 no.12:2868-2874 D '64. (MIRA 18:2)

YEFIMOV, Ye.A.

Completeness of reparation in the regeneration of the skin in rats. Biul. eksp. biol. i med. 60 no.9:102-106 S '65. (MIRA 18:10)

1. Laboratoriya rosta i razvitiya (zav. - prof. L.D. Liozner) Instituta eksperimental'noy biologii (dir. - prof. I.N. Mayskiy) AMN SSSR, Moskva.

SOV/110-59-9-20/22

AUTHOR: Yefimov, Ye.D. (Engineer)

TITLE: Concerning the Article by Engineer G. I. Khan "Packaged Transformer Sub-stations for Urban Distribution Systems'.

PERIODICAL: Vestnik elektropromyshlennosti,1959,Nr 9, p 77 (USSR)

ABSTRACT: This is discussion of an article published in Vestnik Elektropromyshlennosti, 1959, Nr 4, and offers comments based on operating experience with packaged transformer substations manufactured by the Chirchik works. At least one of the isolators should be capable of operation with an urban cable or overhead line. The ventilation of existing packaged substations is inadequate. Fuses are required between the busbars and the current transformers. Three-phase and not single-phase wattmeters should be used. Provision should be made for installation of power-factor correction capacitors.
There are no figures, no references.

Card 1/1

YEFIMOV, P.F.

BC

8 III 1

ENRICHMENT OF FODDER THROUGH USE OF MINERAL FERTILISERS. E.F. Efimov (Probl. Animal Husbandry, U.S.S.R., 1936, No. 3, 45-56).—The % protein in hay was doubled by application of 100-200 kg. of $(NH_4)_2SO_4$ per hectare. Ch. Abs. (p)

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

L 7035-66

ACC NR: AP5026797 SOURCE CODE: UR/0286/65/000/017/0078/0078

AUTHOR: Yefimov, Ye. G.

ORG: none

TITLE: A multitrack magnetic head unit. Class 42, No. 174394 [announced by All-Union Scientific Research Institute of Magnetic Recording and Radio and Television Broadcasting Technology (Vsesoyuznyy nauchno-issledovatel'skiy institut magnitnoy zapisi i tekhnologii radioveshchaniya i televideniya)]

SOURCE: Byulleten' izobreteniy i tovarnykh znakov, no. 17, 1965, 78

TOPIC TAGS: recording equipment, magnetic recording tape, tape recorder

ABSTRACT: This Author's Certificate introduces: 1. A multitrack magnetic head unit which contains recording and playback heads and a cylindrical housing. The working gaps of the recording and playback heads are kept parallel to one another and exactly perpendicular to the direction in which the magnetic tape moves by making the housing of the unit in two semisections with half the core for each head built into each section. The working gaps for the recording and playback heads are located diametrically opposite one another. 2. A method based on this unit in which one of the semisections is divided and the other has a groove along the axis of the cylindrical housing so that inserts of varying thickness can be used.

UDC: 681.84.083.8

Card 1/2

L 7035-66
ACC NR: AP5026797

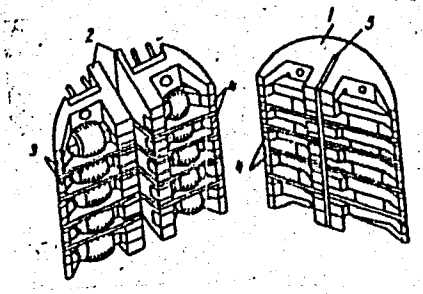


Fig. 1. 1--semisection; 2--split semisection; 3--recording head; 4--playback head; 5--groove

SUB CODE: EC/ SUBM DATE: 14Sep64/ ORIG REF: 000/ OTH REF: 000

EC

Card 2/2

27602
S/187/61/000/004/002/003
D053/D112

AUTHOR: Yefimov, Ye.G.

TITLE: A new design of miniature magnetic heads

PERIODICAL: Tekhnika kino i televideniya, no. 4, 1961, 61-64

TEXT: The author describes the design and performance of newly developed miniature recording and reproducing magnetic heads. The new heads have a cylindrical shape and are 10 mm in diameter and 21 mm long. The body is made of ЛС-59-1 (LS-59-1) brass; the laminated core of the reproducing head is made of 79НМ (79NM) alloy and that of the recording head - of 50НХС (50NKhS) alloy. The laminations are 0.1 mm thick and glued together by a special glue on a base of ЭД-6 (ED-6) epoxy resin. The symmetrically arranged core windings are made from ПЭВ (PEV) wire, 0.06 mm in diameter. The basic parameters of the new magnetic heads were determined with the use of a method recommended by the VNAIZ. A comparison of the basic parameters of the new ГЗ (GZ) and ГВ (GV) heads with the old З-02 ГМ 5.000 (Z-02 GM 5.000) and В-03 ГМ 5.000 (V-03 GM 5.000) ring-type heads, employed in

A new design of miniature....

the M33-28A (MEZ-28A) tape recorders, indicated that the new heads are considerably less sensitive to interference than the ring-type heads, have a better Q-factor and a slightly higher shunting factor. A comparison of the low-frequency response (Fig. 4) of the new and ring-type heads, taken at recording speeds of 76.2 and 19.05 cm/sec, showed that the ripple of the new head in the low-frequency region is relatively small. The new magnetic heads can readily replace the M4 (M4) and GM5 (GM5) ring-type heads in M33-6 (MEZ-6), M33-13 (MEZ-13), M33-15 (MEZ-15) and MEZ-28A tape recorders, without substantially changing their frequency response. When utilizing the new reproducing head in recorders having other switching circuits, however, it should be remembered that its resistance is somewhat higher than that of the ring-type head. It is also possible to design similar miniatrue universal heads for single and double-track recording. There are 5 figures and 1 table.

ASSOCIATION: Eksperimental'nyy zavod GKRT pri Sovete Ministrov SSSR (Pilot Plant of the GKRT at the Council of Ministers of the USSR.

Card 2/3

YEFIMOV, Ye.G.

[Magnetic pickup heads for sound recorders in radiobroadkasting] Magnitnye golovki dlia zvukozapisyvaiushchei apparatury v radioveshchanii. Moskva, Gos. kom-t Soveta ministrov SSSR po radioveshchaniiu i televideniiu, 1963. 42 p. (MIRA 17:7)

GRODNEV, I. I. and YEFIMOV, E. I.

"Communications Wires and Cables with Polichlor-vinyl Insulation," Publ. by the State Publ. House of Lit. Pertaining to the Problems of Communications and Radio, 99 p., Moscow, 1950.

L 58847-65

ACCESSION NR: AP5014004 UR/0119/65/000/005/0023/0025
681.142.67:003.1

4/B

AUTHOR: Yefimov, Ye. I. (Engineer); Sedykh, O. A. (Candidate of technical sciences)

TITLE: Estimating the economic effect of using ELM magnetic logical elements

SOURCE: Priborostroyeniye, no. 5, 1965, 23-25

TOPIC TAGS: magnetic logical element / ELM magnetic logical element

ABSTRACT: These ELM elements have been produced by Soviet industry: AND, OR, NOT, Storage, and Delay. The authors estimate economic expedience of replacing the conventional contact-type relays by the above contactless elements, in automatic-control systems. The first cost, energy-consumption cost, maintenance cost, and the losses caused by failure of one element are evaluated; the latter item is determined by comparing the reliabilities of the relays and contactless elements. As a result, a curve of equal costs of both variants has been plotted which shows the zones of preferential use of relays or contactless elements depending on the frequency of operations and life of equipment. Orig. art. has: 4 figures, 6 formulas, and 1 table.

Card 1/2

L 58847-65

ACCESSION NR: AP5014004

ASSOCIATION: none

SUBMITTED: 00 ENCL: 00 SUB CODE: DP, EC

NO REF SOV: 005 OTHER: 000

Card 1/2

YEFIMOV, Ye.S.; KOSTROMIN, N.O.

Skilful organization of painting work. Stroi. pred. neft.prom. 2 no.1:23-24 Ja '57. (MLRA 10:3)
(Painting, Industrial)

NIKOLAYEV, V.N., kapitan 1-go ranga; YEFIMOV, Ye.S., kapitan 1-go ranga

Some information on the basic training exercises of the naval forces of the U.S.A. and NATO in 1964. Mor. sbor. 48 no.7: 80-86 Jl '65. (MIRA 18:8)

YEFIMOV, Ye.Ye. [IEfimov, IE.IE]

Study of the conditions of influenza virus adsorption by permutite. Mikrobiol. zhur. 25 no.5:24-28 '63 (MIRA16:12)

1. Nauchno-issledovatel'skiy institut epidemiologii i mikrobiologii im. Mechnikova, Odessa.

YEFIMOV, Ye.Ye. [IEfimov,, IE. IE.]

Comparative evaluation of some laboratory methods of the specific diagnosis of influenza. Mikrobiol. zhur. 25 no.6:23-28'63 (MIRA 17:7)

1. Odesskiy nauchno-issledovatel'skiy institut epidemiologii i mikrobiologii imeni Mechnikova.

YEFIMOV, Yu.

Unusual stone. Vokrug sveta no.9:32 S '54. (MLRA 7:10)
(Asbestos)

L 08971-67 EWT(d)/EWP(c)/EWP(v)/EWP(k)/EWP(h)/EWP(l) IJP(c)

ACC NR: AP6029792 SOURCE CODE: UR/0119/66/000/008/0022/0023

AUTHOR: Bukhalev, V. A. (Engineer); Yeremin, G. V. (Engineer); Yefimov, Yu. A. (Engineer) 33

ORG: none

TITLE: Digital-code tolerance control 14

SOURCE: Priborostroyeniye, no. 8, 1966, 22-23

TOPIC TAGS: quality control, digital system, measuring instrument

ABSTRACT: A digital scheme of tolerance 14 (product quality) control is considered. The measured parameter value is compared with preset values in two steps: (1) Each measured digit is separately compared with the corresponding preset limits for each digit and (2) On the basis of this comparison, signals "pass" or "reject" are shaped. Boolean formulas for the "pass" signal are set up, and

Card 1/2 UDC: 681.142.621

L 08971-67

ACC NR: AP6029792

O

logic diagrams are drawn. The final diagram contains 10 OR-gates, 7 AND-gates, 6 NOT-gates, and 2 emitter followers (before the last AND-gate). The claimed advantages of the digital quality-control scheme are: (1) The error of the preset tolerance is one in the lowest digit place; (2) Parameters having the sign + or − are tolerance-controllable; (3) The tolerance is checked practically instantaneously; (4) The scheme can work in conjunction with any digital measuring instrument. Orig. art. has: 4 figures and 11 formulas.

SUB CODE: 13, 09 / SUBM DATE: none

Card 2/2 nst

L 7978-66 ETC(m) WW

ACC NR: AP5026544 SOURCE CODE: UR/0286/65/000/019/0087/0087

AUTHORS: Levitskiy, N. P.; Yefimov, Yu. A.

ORG: none

TITLE: Pulsed pressure gauge. Class 42, No. 175277

SOURCE: Byulleten' izobreteniy i tovarnykh znakov, no. 19, 1965, 87

TOPIC TAGS: pressure gage, pressure measuring instrument, vibration frequency

ABSTRACT: This Author Certificate presents a pulsed pressure gauge consisting of a casing and a sensitive element (see Fig. 1). To increase its resistance to high

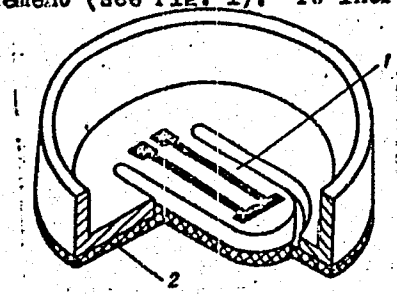


Fig. 1. 1- bracket; 2- polymer film seal

Card 1/2 UDC: 531.787.91

L 7978-66

ACC NR: AP5026544

temperature and its specific vibration frequency, the sensitive element is formed as a bracket in a slit at the bottom part of the gauge casing. The slit is sealed by a polymer film. Orig. art. has: 1 figure.

SUB CODE: IE/ SUBM DATE: 30Dec63

Card 2/2

YEFIMOV, Yu.I., inzh.; KUVSHINOVA, A.I., inzh.; SOFIYEV, A.E., inzh.

Automatic emergency blocking system of the process of ethylene polymerization. Mekh. i avtom. proizv. 18 no.9:24-25 S '64. (MIRA 17:11)

YEFIMOV, Yuriy

One who moves ahead. Starsh.-serzh. no.4:36 Ap '62. (MIRA 15:4)

(Military education)

YEFIMOV, Yu. F.,

"The effect of rare-earth metals on the ductility of vanadium"

report presented at the Conf. on New Trends in the Study and Application of Rare Earth Metals, Moscow, 18-20 Mar 63

S/142/62/005/003/005/009
E140/E435

9,7100

AUTHOR: Yefimov, Yu.N.

TITLE: The conditions for self-excitation of a parametron with variable inductance

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Radiotekhnika, v.6, no.3, 1962, 347-355

TEXT: The author obtains an analytic theory for the Goto parametron, approximating the core characteristic by an odd polynomial of the third degree. An experimental verification using "Oksifer 1000" cores gave reasonable agreement between the calculated and measured results. There are 5 figures.

VB

ASSOCIATION: Kafedra vychislitel'noy tekhniki, Taganrogskiy radiotekhnicheskiy institut (Computer Technique Department, Taganrog Radioengineering Institute)

SUBMITTED: September 4, 1961

Card 1/1

L 29574-66 EWI(1)
ACC NR: AP6009176 SOURCE CODE: UR/0146/65/008/005/0072/0074

32
B

AUTHOR: Yefimov, Yu. N.

ORG: Taganrog Radiotechnical Institute (Taganrogskiy radiotekhnicheskiy institut)

TITLE: Capacitive pentastable parametron 45

SOURCE: IVUZ. Priborostroyeniye, v. 8, no. 5, 1965, 72-74

TOPIC TAGS: parametron, ~~capacitive parametron~~, capacitor, electronic component

ABSTRACT: As the inductive pentastable paramotron is not suitable for operation at high frequencies (because of high core losses), a capacitive type is theoretically considered for high-speed applications. Based on a similarity of equations of the inductive and the capacitive parametrons, design formulas for stationary conditions are developed. The pentastability requires the use of nonlinear capacitors having a symmetrical voltage-charge characteristic; when diodes are used as capacitors, they are connected in two pairs, each in opposition. Theoretical and experimental $U_m = f(I_m)$ characteristics of a D-811-diode 300-kc parametron are in good agreement. Orig. art. has: 2 figures and 14 formulas.

SUB CODE: 09 / SUBM DATE: 13Oct64 / ORIG REF: 002

Card 1/1 UDC: 621.375.9

S/103/63/024/004/013/014
D201/D308

AUTHOR: Yefimov, Yu.N. (Taganrog)

TITLE: Analysis of an inductive parametron

PERIODICAL: Avtomatika i telemekhanika, v. 24, no. 4, 1963, 563-572

TEXT: The author analyzes the operation of an inductive parametron composed of two cores; a resistance in series with the two signal windings (and a capacitance and a resistance shunting the d.c. windings). It is assumed that the magnetic properties of both cores are identical and constant for a given frequency range and that the a.c. impedance of the d.c. magnetizing circuit is infinite. The fundamental equation and the steady-state operation of such a parametron are analyzed taking into account the effect of alternating components of the flux on the d.c. component. It is shown that in parametrons with opposing magnetizing currents, there is a phase shift of 90°. The experiments, carried out with a parametron with standard cores ОКСИФЕР -1000 (OKsifer-1000), produced

Card 1/2

results in good agreement with theory. It is eventually shown that a parametron without any magnetizing current represents a system with five steady states (the fifth state is that with no oscillations present) and that there exists a range of signal amplitudes for which a steady state is impossible and the parametron operates as a self-modulator. There are 6 figures.

SUBMITTED: November 9, 1962

ACCESSION NR: AP4012366 S/0142/63/006/006/0683/0687

AUTHOR: Yefimov, Yu. N.

TITLE: Concerning the influence of the supply voltage on the threshold characteristics of an inductive parametron

SOURCE: IVUZ. Radiotekhnika, v. 6, no. 6, 1963, 683-687

TOPIC TAGS: parametron, inductive parametron, parametron threshold characteristic, parametron self excitation, parametron self excitation condition, parametron threshold voltage, parametron magnetic flux, parametron ac magnetic flux, parametron dc magnetic flux

ABSTRACT: This is a continuation of an earlier investigation of the self-excitation conditions of a parametron with variable inductance (Izv. Vuzov SSSR -- Radiotekhnika, 1962, 5, No. 3, 347). The present article deals with the influence of the supply voltage on the dc component of the flux in the parametron cores. It is shown that the plots of the threshold voltage against the frequency and against the circuit capacitance form closed loops, in agreement with the ex-

Card 1/2

ACCESSION NR: AP4012366

perimental data. It is demonstrated that the parametron becomes self-excited in a certain region, and the value of the dc component of the flux for that region is determined. It is also demonstrated that the effect of the supply voltage must be taken into account in the design of parametrons. Orig. art. has: 3 figures and 11 formulas.

ASSOCIATION: Kafedra vy'chislitel'noy tekhniki Taganrogskogo radiotekhnicheskogo instituta (Department of Computation Techniques, Taganrog Radio Institute)

SUBMITTED: 09Nov62 DATE ACQ: 14Feb64 ENCL: 00

SUB CODE: SD, GE NO REF SOV: 002 OTHER: 00

Card 2/2

YEFIMOV, Yu.N.

Capacitive parametron with five stable states. Izv. vys. ucheb. zav.; prib. 8 no.5:72-74 '65. (MIRA 18:10)

1. Taganrogskiy radiotekhnicheskiy institut. Rekomendovana kafedroy vychislitel'noy tekhniki.

YEFIMOV, Yu.N.(Taganrog)

Study of an inductive parametron. Avtom. i telem. 24 no.4:563-572 Ap '63. (MIRA 16:4)
(Electronic computers) (Pulse techniques (Electronics))

ACCESSION NR: AP4018990 S/0146/64/007/001/0003/0010

AUTHOR: Yefimov, Yu. N.

TITLE: Parametrons with five stable states

SOURCE: IVUZ. Priborostroyeniye, v. 7, no. 1, 1964, 3-10

TOPIC TAGS: parametron, inductive parametron, five stable states parametron, parametron theory, parametron characteristics

ABSTRACT: A theoretical and experimental study of an inductive parametron with 5 stable states is reported. The oscillation made with $i_o w_o = 0$ is found to be the most interesting: oscillations of any of four phases differing by 90^o are possible (see Enclosure 1). The zero oscillation represents the fifth stable state. Experimental verification was performed with a parametron designed with standard 4-mm-diameter "Oxifer-1000" cores. The parameters selected were: $w_o = 1$, $w_1 = w_2 = 12$, C = 0.2 microf, R = 100 ohms, f = 200 kc. Fed by a

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ACCESSION NR: AP4018990

control voltage of any possible phase, the parametron set up its own oscillations of the same phase and, moreover, retained the oscillations upon turning off the driving voltage. The physical interpretation of the phenomena observed in the parametron is given. The absence of magnetic bias and an ability to store more information are seen as advantages over conventional parametrons. Orig. art. has: 5 figures and 7 formulas.

ASSOCIATION: Taganrogskiy radiotekhnicheskiy institut (Taganrog Radiotechnical Institute)

SUBMITTED: 06May63 DATE ACQ: 23Mar64 ENCL: 01

SUB CODE: GE NO REF SOV: 002 OTHER: 000

Card 2/3

YEFIMOV, Yu.N.

Parametrons with five steady states. Izv. vys. ucheb. zav.; prib. 7 no.1:3-10 '64. (MIRA 17:9)

1. Taganrogskiy radiotekhnicheskiy institut.

VASIL'YEV, V.G.; IVANOV, A.P.; VOSTRYAKOV, O.I.; SHMITEL'SKIY, V.N.; GAFANOVICH, M.D.; DIDENKO, K.I.; ABUGOV, Yu.O.; SHRAMKO, K.N.; ZAGARIY, G.I.; DUDCHENKO-DUDKO, V.M.; NIKULIN, Yu.Ya.; YEFIMOV, Yu.N.; BYKOV, V.L.

Inventions. Avt. i prib. no.4:73-74 O-D '64 (MIRA 18:2)

ACC NR: AR6027186 SOURCE CODE: UR/0271/66/000/005/B018/B018

AUTHOR: Razin, V. M.; Yefimov, Yu. N.; Strogonov, M. N.

TITLE: Certain problems in automatic checking of digital computer malfunctions 16

SOURCE: Ref. zh. Avtomat telemekh i vychisl tekhn, Abs. 5B142

REF SOURCE: Izv. Tomskogo politekhn. in-ta, no. 138, 1965, 105-107

TOPIC TAGS: special purpose computer, digital computer, computer application

ABSTRACT: The utilization of a special-purpose logic computer in the form of an adaptor unit for testing a least number of basic elements is examined. The adaptor unit must be relatively small since it is intended for testing a small quantity of elements. It must also be sufficiently reliable and have self-diagnostic features. It is assumed that the tested machine has a built-in self-checking system consisting of a portion of the total number of elements whose operation may be checked without making the tested machine overly complex. This implies the power supplies, periodic clock pulse generators, power amplifiers, etc. The diagnostic testing system in this case must encompass only those elements in its test which are not tested by the auto-control system. [Translation of abstract] Bibliography of 5 titles. B. U.

SUB CODE: 09

Card 1/1 UDC: 681.142.32.004.5

YEFIMOV, Yu.P.

Poisoning by sodium nitroprusside. Sud.-med. ekspert. 4 no.3:58-59 Jl-S '61. (MIRA 14:10)

1. Byuro sudebnomeditsinskoy eksperitzy (nachal'nik - dotsent S.N.Bakulev) Ivanovskogo oblzdravotdela.
(SODIUM NITROPROSSIDES)

YEFIMOV, Yu.P.; KRASNOV, A.K.

Expertise on self-strangulation. Sud.-med.ekspert. 6 no.1:52-53 Ja-Mr '63. (MIRA 16:2)

1. Byuro sudebnomeditsinskoy ekspertizy (nachal'nik - dotsent S.N. Bakulev) Ivanovskogo oblastnogo otdela zdravookhraneniya.
(MEDICAL JURISPRUDENCE) (STRANGLING)

3(1)
AUTHOR: Yefimov, Yu.S. SOV/33-36-3-9/29

TITLE: Photometry of the Planetary Nebula NGC 7293 (Helix)

PERIODICAL: Astronomicheskiy zhurnal, 1959, Vol 36, Nr 3, pp 457-460 (USSR)

ABSTRACT: This is a report on a photometric study of the planetary nebula NGC 7293 near H_α. The photograph was taken in Simeiz on October 15, 1957. An isophotic chart was made and estimations of the electron concentration and mass of the nebula were made. It is conjectured that the mass amounts some tenth up to a whole solar mass. The author mentions G.A.Shayn. The author thanks Professor B.A.Vorontsov-Vel'yaminov for giving the theme.
There is 1 figure, and 11 references, 5 of which are Soviet, 2 German, and 4 American.

ASSOCIATION: Gosudarstvennyy astronomicheskiy institut imeni P.K.Shternberga (State Astronomical Institute imeni P.K.Shternberg)

SUBMITTED: May 19, 1958

Card 1/1

L 54009-65 EWT(1)/EWG(v) Pe-5/Pae-2 GW

ACCESSION NR: AP5... UR/0020/65/161/006/1299/130

Nikitov, V. B., ...yeva, ... Yefimov, Yu.

TITLE: Evaluation of the threshold sensitivity of a TV system through stellar observations

SOURCE: AN SSSR. Doklady, v. 161, no. 6, 1965, 1299-1300

TOPIC TAGS: light flux measurement, TV detection system, stellar observation night sky radiation/MTM 500 telescope

ABSTRACT: The threshold sensitivity of a TV observation system with a high quantum output, minimum noise level, and high contrast sensitivity has been experimentally determined from stellar observations carried out at the Crimean Astrophysical Observatory with the MTM-500 (f = 500 mm, F = 65 m) telescope. The highly sensitive TV system was developed for observing distant stars by measuring ... weak light fluxes against a background of the night sky radiation ... TV photographs of the M3 cluster were made under conditions of ... data readout and storage on an image ... target. The results are presented

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L 54009-65
ACCESSION NR: AP5012758

graphically in Fig. 1 of the Enclosure, which shows that the experimentally

2 figures and 1 table.

ASSOCIATION: Krymskaya astrofizicheskaya observatoriya Akademii nauk SSSR (Crimean Astrophysical Observatory, Academy of Sciences SSSR)

NO REF SOV: 004 OTHER: 000 ATD PRESS: 4021

L 54009-65
ACCESSION NR: AP5012758

ENCLOSURE: 01

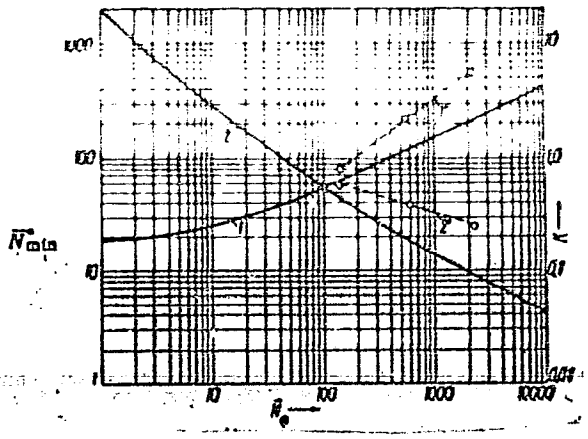

Fig. 1. Dependence of detectable number of quanta $\bar{N}_{min}$ (curves 1 and 1') and contrast K (curves 2 and 2') on the number of quanta $\bar{N}_b$ in the background of night sky radiation. Curves 1 and 2 represent an ideal receiver, and curves 1' 2', the experimental results.

Card 3/3

BOYARCHUK, A.A.; YEFIMOV, Yu.S.; STEPANOV, V.Ye.

Magnetic intensification of absorption lines. Izv.Krym.astrofiz. obser. 24:52-77 '60. (MIRA 13:12)
(Magnetic fields (Cosmic physics)) (Absorption spectra)

S/033/60/037/005/004/024
E032/E514

AUTHORS: Boyarchuk, A.A., Yefimov, Yu. S. and Stepanov, V.Ye.

TITLE: The Increase in Equivalent Widths of Absorption Lines in a Magnetic Field

PERIODICAL: Astronomicheskiy zhurnal, 1960, Vol.37, No.5, pp. 812-823

TEXT: The theory of the inverse Zeeman effect developed in Refs. 1-3 is used to determine the magnetic broadening of equivalent widths as a function of the nature of the splitting, the strength and direction of the magnetic field and the physical state of the atmospheres. The magnetic broadening of an absorption line is defined by

$$q = \ln \frac{W^*}{W_o} \qquad (1)$$

where W^* is the broadened line width and W_o is the line width in the absence of a magnetic field. The calculations are carried out for the following lines: FeI, FeII, NdII, EuII and LaII. It is found that the magnetic broadening in a longitudinal field

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S/033/60/037/005/004/024
E032/E514

The Increase in Equivalent Widths of Absorption Lines in a Magnetic Field

increases linearly with $n\delta$, where n is the number of components and δ is the distance between neighbouring sub-components. It is assumed that LS-coupling is operative. When the magnetic field is at an angle to the line of sight, there is an additional broadening due to blending of sub-component groups with different polarizations. In this case the broadening depends on the intensity distributions in the sub-components of the splitting and increases with this angle. This increase is most rapid between 0 and 50° and then tends to level off. The magnetic broadening is proportional to the intensity of the magnetic field for all fields observed in the atmospheres of magnetic stars. The broadening decreases with increasing turbulent velocity and damping constant. The dependence of the magnetic broadening on the number x_o of absorbing atoms is more complicated. At first, the broadening increases with x_o, it then reaches a maximum at x_o = [illegible] and slowly tends to zero thereafter. General expressions are derived for calculating the magnetic

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S/033/60/037/005/004/024
E032/E514

The Increase in Equivalent Widths of Absorption Lines in a Magnetic Field

broadening as functions of the magnetic field, the angle between the magnetic field and the line of sight, the number of absorbing atoms and the damping constant. It is shown that the formula given by Warwick (Ref.9) is incorrect and cannot be used in the calculation of the equivalent widths of lines in a magnetic field. An estimate is given of the role played by the magnetic field in determining the abundances of elements in the atmospheres of magnetic stars. It is shown that the magnetic field cannot give rise to the observed broadening of rare-earth lines and that their excess abundance in peculiar A stars is real. A study is also made of the effect of the magnetic field on the growth curve for sunspots. The magnetic field tends to produce a rise of the curve as a whole. In the linear part of the curve the broadening is very small and tends to zero for large x_0. In order to determine the effect of the magnetic broadening in sunspots, it is necessary to plot growth curves separately for spots in the neighbourhood of the centre of the solar disc and those near its

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S/033/60/037/005/004/024
E032/E514

The Increase in Equivalent Widths of Absorption Lines in a Magnetic Field

limb. In order to determine the physical conditions in sunspots, the growth curve must be corrected for the effect of the magnetic field. Acknowledgment is made to T. S. Galkina for assistance in the numerical calculations. There are 8 figures, 4 tables and 15 references: 6 Soviet, 2 German and 7 English.

ASSOCIATION: Krymskaya astrofizicheskaya observatoriya
Akademii nauk SSSR
(Crimean Astrophysical Observatory, Academy of Sciences USSR)

SUBMITTED: April 19, 1960

Card 4/4

SAVITSKIY, Ye.M.; BARON, V.V.; TUYSEBALIYEV, B.K.; YEFIMOV, Yu.V.

Phase diagram of the system vanadium - copper. Vest. AN Kazakh. SSR 20 no.7:38-44 Jl '64. (MIRA 17:11)

SEDOV, V.N.; kand.tekhn.nauk; YEFIMOV, Yu. V.; inzh; GRIGOR'YANTS, A.A.

Program control of traffic at railroad stations. Avt., telem. i sviaz' 5 no.1:4-6 Ja '61. (MIRA 14:3)

(Railroad—Signaling—Centralized traffic control)

SAVITSKIY, Ye.M.; BARON, V.V.; YEFIMOV, Yu.V.; KARASIK, V.R.; VYLEGZHANINA, T.V.; GLADYSHEVSKIY, Ye.I.

Sustem V_3Si – V_3Ge. Zhur. neorg. khim. 9 no.8:2045–2046 Ag '64. (MIRA 17:11)

TSYGANOV, V.A.; GOLYAKOV, P.N.; KONEV, Yu.Ye.; YEFIMOVA, V.M.

Actinomyces--producers of pentaene antibiotics. Mikrobiologiia 33 no.1:152-161 Ja-F '64. (MIRA 17:9)

1. Leningradskiy nauchno-issledovatel'skiy institut antibiotikov.

SOV/24-58-4-6/39

AUTHORS: Baron, V.V., Yefimov, Yu.V. and Savitskiy, Ye.M. (Moscow)

TITLE: The Structure and Properties of Alloys in the Vanadium-Molybdenum System (Struktura i svoystva splavov sistemy vanadiy-molibden)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, 1958, Nr 4, pp 36 - 40 (USSR)

ABSTRACT: A vanadium-molybdenum phase diagram has not been published so far. As Mo and V have the same crystal lattices, similar atomic diameters and identical electron structures, it is possible to assume that these two elements form a continuous series of solid solutions. This assumption has been confirmed experimentally when measuring the lattice parameters of powder-metallurgical specimens of V-Mo. However, cast V-Mo alloys are reported to exhibit a second phase at between 10 and 60% Mo.
No data on the physical and mechanical properties of these alloys exist. The authors have carried out an investigation of the structure and properties of V-Mo alloys, established their melting temperatures and constructed a phase diagram for them.
Cardl/4 Alumothermal vanadium, containing 95.5% V, 0.9% Al, 0.15% Fe,

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0.2% C, 0.3% Si and a considerable quantity of oxygen, and molybdenum in the form of sintered rods, containing 99.00% Mo, 0.075% C, 0.04% Fe and traces of Si and W, served as raw materials. The alloys were prepared in an arc furnace, provided with an insoluble tungsten electrode, in a helium atmosphere. The voltage applied was 60 V and the current 1 000 A, the electrode diameter being 8 mm. Each alloy was remelted four times in order to ensure even mixing, and each ingot weighed 60 to 70 g. Spectroscopic analysis of the alloys for impurities showed the presence of 0.01% each of Fe, Mn and Si and traces of Mg and W. The solidus and liquidus temperatures for alloys of various compositions were determined and a phase diagram constructed (Figure 1). This shows that all alloys are solid solutions. The as-cast structures were examined and hardness values determined. The specimens were then homogenised by annealing for 10 hours at 1 600 °C in vacuo. The microstructures of the homogenised specimens were also examined and hardness, microhardness, plasticity under a compressive load and electrical resistance determined. Hardness was

The Structure and Properties of Alloys in the Vanadium-Molybdenum System

measured under a 50 kg load for 30 sec, microhardness under a 50 g load.
The microstructures of the cast alloys are shown in Figure 2. The alloys with up to 30% V are single-phased. The alloys with 30-60% V show dendritic liquation and those with 80-90% V have a finely dispersed precipitate with a coarse-grained background. After the homogenising treatment (Figure 3) alloys with up to 60% V are single phased. Alloys richer in vanadium have coagulated particles (mainly Al_2O_3) in the grain boundaries and within the grains. Homogenisation also results in grain growth.
Addition of vanadium to molybdenum results in an increase in hardness. The alloys have a greater hardness before the homogenising treatment (Figure 4, Curves 1 and 2). The maximum hardness is 380 kg/mm^2 for the as-cast alloys and 315 kg/mm^2 for the homogenised alloys. Microhardness (Figure 4, Curve 3) is higher and the maximum is 675 kg/mm^2 at 60-70% V. The difference between the hardness