LEBEDEV S. V.

62 An exception to the Bogusiavskii-Langmuir law in heating of a tungsten cathode of a vacuum tube by an impulse of high current density. S. V. Lebedev (P. N. Lebedev Phys. Inst., Acad. Sci. U.S.S.R., Moscow). *Zhur. Eksptl. i Teoret. Fiz.* 27, 487–500(1954).—Upon heating the W cathode of a vacuum tube by an impulse current of about 3.4 × 10^6 amp./sq. cm. an anode-impulse current I_a appeared, which was 100 times greater than the anode current I_a^0, which was limited by the space charge. Upon heating of the cathode with an impulse current of 10^6 amp./sq. cm. the current I_a was only about 10 times as great as I_a^0. If the anode voltage and I_a^0 were decreased, the anomalous magnitude of I_a also decreased. A ratio I_a/I_a^0 of about 10^3 was found at anode voltages V_a in the order of 100 v., just as well as at 5–6 v., where the origin of ions in the tube at the expense of the anode field was impossible. This anomalous I_a appeared for about 10^{-4} sec. after the current i had been switched off, which heated the cathode (in the absence of any other current), but I_a did not grow any more during this time. The fact that I_a was so much greater than I_a^0 could not be explained by a neutralization of the space charge by ions, because this anomalously high I_a appeared when the no. of ions in the tube was rather small; if this no. increased, I_a became almost equal to I_a^0. The growth of I_a was ascertained by a change of the state of the cathode caused by the passage of current i. The growth of the anode current above the value I_a^0 preceded the domain at the time of heating of the cathode by the current i, in which the anode current was almost const. and equal to I_a^0 (the region of validity of the Bogusiavskii-Langmuir law). The growth of I_a above I_a^0 (i.e., the exception of the B.-L. law) on further heating of the cathode must be explained by the very heavy increase of the emission from the cathode, which reached a high value. Werner Iacobaeus

USSR/Physics - High-density currents FD-986

Card 1/1 Pub. 146 - 10/20

Author : Lebedev, S. V.

Title : Phenomena in wolfram conductors just preceding their explosion under the action of a strong current.

Periodical : Zhur. eksp. i teor. fiz., 27, No 5 (11), 605-614, Nov 1954

Abstract : For a current density of about j - 5 10^5 ampere/cm^2 one observes anomalies in the state of wolfram, which were discovered earlier for the case of current densities greater than $5 \cdot 10^6$ ampere/cm^2 (S. V. Lebedev and S. E. Khaykin, ibid., 26 (1954), 629 and 723). When a current of about $5 \cdot 10^5$ ampere/cm^2 suddenly enters a circuit it is noted that wolfram does not become fluid although its energy correspond to the energy of the liquid state. Indications of anomalous emission are observed simultaneously with indications of anomalous dependence of resistance upon energy. The author considers assumptions concerning the character of the variations occurring in a metal when heated by a current of large density. Five references (e.g. L. A. Ignat'yeva and S. G. Kalashnikov, ibid., 22, 385, 1952).

Institution : Physics Institute imeni P. N. Lebedev, Acad. Sci. USSR

Submitted : January 1, 1953

FD-1892

Lebedev, S.V.

USSR/Physics - Electron emission

Card 1/1 Pub. 146-12/21

Author : Borodovskaya, L. N., and S. V. Lebedev

Title : Dependence of electrical conductivity and electron emission upon the energy of a metal in process of its being heated by a current of large density

Periodical : Zhur. eksp. i teor. fiz. 28, 96-110, January 1955

Abstract : During the heating of nickel conductors by a current of 60,000 to 5,000,000 amperes per square centimeter the authors observed a phenomenon of the same character as was observed earlier in wolfram by S. V. Lebedev and S. E. Khaykin (ibid., 26, 629, 1954 etc.). In the investigation of the dependence of the resistance R of the conductor upon the energy E introduced into it, they observed in the curve R = R (E) points of discontinuity whose positions in resistance and energy do not change with change in the density of the heating current (Ni, W, Au, constantan). Investigation of the emission showed that the anomalously large emission from nonruptured conductors can decrease although the rate of energy onset into the conductor exceeds the loss of energy at the temperature of fall in the case of stationary heating. The present data characterizing the rate of decrease of emission after disconnection of the heating current. 12 ref.

Institution: Physical Institute im. Lebedev, Acad. Sci, USSR

Submitted : August 1, 1953.

PA - 2073

AUTHOR: LEBEDEV,S.V.

TITLE: Reply to the Critical Remarks of I.F.KVARTSKHAVA concerning some of our papers. (Otvet na kritičeskie zamecanija I.F. KVARTSKHAVY po povodu našich statej, Russian).

PERIODICAL: Zhurnal Eksperimental'noi i Teoret.Fiziki, 1957, Vol 32, Nr 1, pp 144-146 (U.S.S.R.)
Received: 3 / 1957 Reviewed: 4 / 1957

ABSTRACT: In some of his previous papers the author investigated the dependence of the electric resistance R and of the electron emission on the energy E of the metal which is deposited in it at a current density of $j \sim 10^5 - 10^7$ A/cm^2. The main results of these works are again enumerated. According to the criticism of I.F.KVARTSKHAVA, Zhurnal Eksperimental'noi i Teoret.Fiziki, Vol 30, p 621 (1956) it might be assumed that the author in his previous works had assumed an abnormal dependence of the resistance R on E in the case of $E \leq W_H$ and the exclusion of OHM'S law. (The significance of W_H is not given here). The lack of anomalies of R and E in the case of $E \leq W_H$, however, was ascertained by the author in a previous work with an accuracy of 5%. The author did not notice any deviations from OHM'S law but he found that the mistakes ascribed to the invalidity of

Card 1/3

PA - 2073

Reply to the Critical Remarks of I.F.KVARTSKHAVA concerning some of our Papers.

OHM'S law by other experimenters is due to inductive distortions of the oscillograms. Contrary to what KVARTSKHAVA says the author actually introduced the correction for inductivity. KVARTSKHAVA says that the author did not measure E and R correctly, and that the energy surplus of the wire noticed in the case of large j is connected with the macroscopic motion of the metal and not with its interior energy. The conclusions, however, arrived at by the author are confirmed by new data according to which at $j \gtrsim 5.10^6$ A/cm^2 the motion of the metal up to the moment of explosion cannot destroy the constancy of the cross section along the wire. If the current is switched on at such values of E as are a little less than E_c (the significance of E_c is not given here), the explosion of the wire no longer takes place and the wire disperses in droplets.

KVARTSKHAVA tries to explain the anomalies of the anode current I_a by the ignition of the discharge. In the case of the ignition of discharge, however, the increase of discharge

Card 2/3

Reply to the Critical Remarks of I.F.KVARTSKHAVA PA - 2073
concerning some of our Papers.

is limited by the properties of the exterior electric circuit.

Furthermore, KVARTSKHAVA declares, as the author believes without justification, that the magnetic field of the current i which heats the wire is bound to shut off the anode current I_a at the here applied anode voltages $V_a < 1kV$, if no discharge occurs along the wire.
KVARTSKHAVA'S explanation that the anomalies of the anode current are due to a discharge and some other statements he made do not agree with the author's experiments.

ASSOCIATION: Physical Institute "P.N.LEBEDEV" of the Academy of Sciences of the USSR
PRESENTED BY:
SUBMITTED:
AVAILABLE: Library of Congress

PA - 2661

Author: LEBEDEV,S.V.

TITLE: Explosion of a Metal Due to an Electric Current, (Vzryv metalla pod deystviyem elektricheskogo toka, Russian)

PERIODICAL: Zhurnal Eksperim. i Teoret. Fiziki, 1957,Vol 32, Nr 2, pp 199 - 207 (U.S.S.R.)

Received: 5 / 1957 Reviewed: 6 / 1957

ABSTRACT: The present work investigates the destruction of metallic wire at current densities of 5.10^5 - 5.10^6 and examines the assumption that the metal is in an anomalous state at the moment of the explosion.

Method: The destruction of the wire under the influence of the current intensity i was investigated by comparing its photographs with the oscillograms of $V_R(t)$ and $V_r(t)$. Here $V_R(t) = R'(t)i(t)$ and $V_r(t) = ri(t)$ applies, where R' denotes the resistance of the wire and r the calibrating resistance. The individual chapters of this work deal with the following subjects: destruction of the wires at $\sim 5.10^5$ A/cm^2 and at $\sim 5.10^6$ A/cm^2, interpretation of previous tests with tungsten in the case of short impulses, examination of the assumption that at the moment of the explosion the metal is in an anomalous state, comparison of the author's

Card 1/3

ideas with conclusions arrived at by other authors.

Conclusions: At current densities of $j \sim 5.10^5$ A/cm^2 the wires ($d \leqslant 0{,}01$ cm) break after melting, and under the influence of surface voltage small drops are formed. In the case of larger j, however, dE/st is greater, but the surface voltage for a given E remains unchanged. Here the energy E is able to increase to such an extent already before breaking that the metal is destroyed like by an explosion. Within some microseconds the metal evaporates in form of a cloud. If the current is switched off already before the wire breaks and without a modification of j, no explosion occurs. The destruction of the wire then differs from the destruction in the case of small j only in macroscopic motion. The wire bends and explodes into small droplets. The melting wire can therefore be destroyed by two methods:

a) Breaking into macroscopic particles by exterior forces,
b) Explosion and atomization of the metal by a modification of the state of the metal itself.

In conclusion the dependence of the resistance R on the energy E is discussed. (7 illustrations and 1 table)

Card 2/3

SOV/56-37-2-4/56

24(7)
AUTHORS: Lebedev, S. V., Mandel'shtam, S. L., Rodin, G. M.

TITLE: On the Short-wave Radiation of a Vacuum Spark

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 37, Nr 2(8), pp 349-354 (USSR)

ABSTRACT: The spectra of the highly ionized atoms in a spark discharge are in the ultraviolet range and in the range of soft X-ray radiation; it was investigated down to 6 Å (Ref 1). In this case the excitation energy amounts to 2000 ev. In the present paper the authors give results obtained from investigating these spectra within the range $\lambda < 6$ Å, as well as an evaluation of the discharge temperatures by means of a spectroscopic method. (Analogous temperature measurements have already been carried out by Akimov and Malkov (Ref 2).) The measuring method is first briefly described (iron electrode - one plate and one cylinder, distance 4 mm; initial pressure in the discharge chamber 1.10^{-5} mm Hg; current source: condenser 3.3 μF, 40 kv, 1.5 μH, 0.2 Ω, $i_{max} = 4.8 \cdot 10^4$ a; absorption of the longer-wave radiation by

Card 1/3

beryllium filters; recording: photomultiplier FEU-25 and cathode ray oscillograph. Total sensitivity of the FEU: 10 a/lumen; filter dimensions: thickness 0.25 mm, diameter 18 mm; scintillators: tetraphenyl-butadiene in polystyrene and CsI(Tl), 5 mm thick . The results are given in form of characteristic oscillograms. Three series of measurements were carried out under various conditions and by using the two above-mentioned scintillators, and the latter are described in detail. The second part of the paper deals with temperature evaluation. The value obtained for electron temperature in the case of a spark discharge in a vacuum was found to amount to 2.10^5 °K. These evaluations agree with measurements. Figure 5 shows the temperature dependence of the intensity of the lines of multiple charged ions for an electron concentration $n_e = 10^{18}$ electron/cm^3; the curves from Al V to Al X are given. The position of the curves shows to what extent temperature evaluation depends on ionization - the curves shift with increasing ionization towards higher temperatures; to the here mentioned temperature of 2.10^5 °K there corresponds the Al VII peak. There follows a

On the Short-wave Radiation of a Vacuum Spark SOV/56-37-2-4/56

short discussion of the excitation mechanism, which might explain the spectral composition of the observed radiation. There are 5 figures, 1 table, and 8 references, 4 of which are Soviet.

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

SUBMITTED: March 3, 1959

Card 3/3

3982
S/057/62/032/008/009/015
B104/B102

AUTHORS: Il'in, V. Ye., and Lebedev, S. V.

TITLE: Destruction of the electrodes in electric discharges with high current densities

PERIODICAL: Zhurnal tekhnicheskoy fiziki, v. 32, no. 8, 1962, 986 - 992

TEXT: An attempt is made to explain the destruction of the electrodes at current densities $j > 10^6$ a/cm^2 as being due to the action of the Joulean heat. In the first chapter processes in the discharge gap are studied that are related to the area of the electrode spot. The formula $m = \frac{d}{3\sqrt{2\pi}} \left[\frac{D(\tau)}{A+B}\right]^{3/4}$ for the amount of electrode material melted by Joulean heat, assuming a stationary discharge channel, is specialized for a square current pulse and for a capacitor discharge. A and B are determined by the electrode material. $D(\tau) = \int_0^\tau I^2(t)dt$ characterizes the discharge pulse. With the aid of these formulas the experimental results of other

Card 1/2

S/057/62/032/008/009/015
B104/B102

Destruction of the electrodes...

authors can be described approximately. An erosion model based on the Joulean heating of the electrodes which takes account of the metal behavior at high current densities is discussed and it is shown that electrode erosion can be explained qualitatively. There are 4 tables.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Moskva.(Physics Institute imeni P. N. Lebedev, Moscow)

SUBMITTED: February 27, 1961 (initially)
November 10, 1961 (after revision)

Card 2/2

IL'IN, V.Ye.; LEBEDEV, S.V.

Erosion of electrodes by high-density electric current discharges. Zhur.tekh.fiz. 32 no.8:986-992 Ag '62. (MIRA 15:8)

1. Fizicheskiy institut imeni P.N.Lebedeva, Moskva.
(Electric discharges)

L 64492-65

ACCESSION NR: AP5012636

UR/0051/65/018/005/0923/0925 28
535.33

AUTHORS: Mandel'shtam, S. L.; Fedoseyev, S. P.; Kononov, E. Ya.; Lebedev, S. V.

TITLE: Laboratory reproduction of the short wavelength section of the solar spectrum

SOURCE: Optika i spektroskopiya, v. 18, no. 5, 1965, 923-925

TOPIC TAGS: solar corona, solar plasma, solar spectrum, solar UV radiation, high temperature plasma, controlled thermonuclear reaction

ABSTRACT: Interest in this section of the spectrum is prompted by the fact that satellites and rockets make it possible to obtain the short-wavelength spectra of the solar corona, so that these spectra need be more precisely identified. The identification of the corresponding lines is necessary for the obtaining of information from these spectra about the chemical compositions and physical state of

Card 1/3

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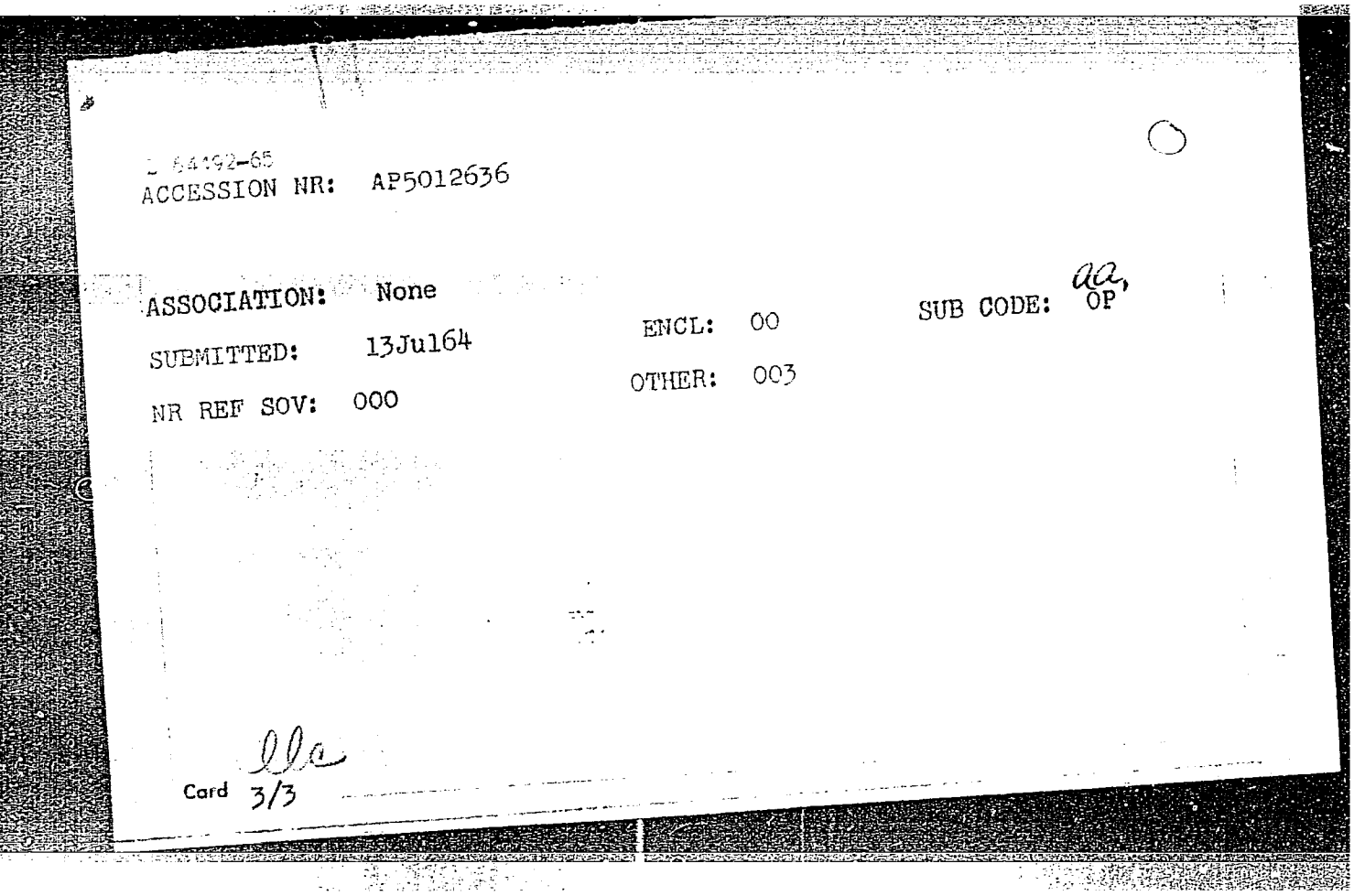
ACCESSION NR: AP5012636

coronal plasma (temperature, density, macroscopic motion of the plasma etc.). Similar problems arise in investigations of hot plasma in connection with work on controlled thermonuclear reactions. Investigations, using hot plasma, carried out in the author's laboratory are described. The authors present the vacuum spark spectra obtained between iron electrodes, which show a significant number of lines that coincide with the lines in the solar spectrum, thus making identification of the other lines easier. The wavelengths of the spectral lines were calculated using certain lines of O V as references. The accuracy of the wavelength measurement is taken to be ± 0.04 Å. The lines present in the spectra were found to be those of ionized iron atoms. It follows that the coincident lines of the solar spectrum, taking into account the possibility of accidental coincidence, also belong to iron ions. The question as to which iron ions these lines belong to is presently under investigation by the authors, although tentatively they are identified as belonging to FeV, FeVI, FeVII, and FeVIII, as well as FeIX. 'The authors are grateful to R. Tousey for supplying the solar spectrum and consenting to its publication.' Orig. art. has: 1 figure

Card 2/3



L 64192-65
ACCESSION NR: AP5012636

ASSOCIATION: None

SUBMITTED: 13Jul64 ENCL: 00 SUB CODE: aa, OP

NR REF SOV: 000 OTHER: 003

Card 3/3

L 33419-66 EWT(1) AT
ACC NR: AP6015320 (A, N) SOURCE CODE: UR/0057/66/036/005/0960/0962

AUTHOR: Lebedev, S. V.; Morozov, A. I.

ORG: none

TITLE: Focusing of an ion beam in the field of a charged current-carrying ring.

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 36, no. 5, 1966, 960-962

TOPIC TAGS: electron optics, electric field, magnetic field, space charge, ionized plasma

ABSTRACT: From a general argument based on previous theoretical work of A.I.Morozov (DAN SSSR, 164, No. 6, 1363, 1965) on electric and magnetic fields in plasmas, the authors conclude that any focusing system containing both electric and magnetic fields will focus a low density beam with uncompensated space charge differently than it will focus a high density beam with compensated space charge (plasma). This conclusion is illustrated by calculation of the focal length of a charged current-carrying ring under the two conditions. The calculations are performed in the thin lens approximation, i.e., it is assumed that the focal length is much larger than the radius of the ring. It is found that in the case of a low density beam with uncompensated space charge the paraxial focal length is always positive, whereas in the case of a high density beam the focal length can have either sign. The difference between the focal

Card 1/2

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ACC NR: AP6015320

lengths in the two cases is due to redistribution of the electric field as a result of the space charge induced in the high density space charge compensated beam. The expression derived for the induced space charge density is independent of the density of the beam. This means that if the density of the space charge compensated beam exceeds a certain value, further increase of the density will not lead to further change in the focal length. Orig. art. has: 11 formulas and 2 figures.

SUB CODE: 20/ SUBM DATE: 05Jun65/ ORIG REF: 002/ OTH REF: 000

Card 2/2 UR

L 22639-66 EWT(m)/EWP(t)/EWP(k) JD/HW
ACC NR: AP6010969 SOURCE CODE: UR/0056/66/050/003/0509/0519

AUTHOR: Lebedev, S. V.

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences SSSR (Fizicheskiy Institut Akademii nauk SSSR)

TITLE: On the initial heating stage of exploding wires

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 50, no. 3, 1966, 509-511

TOPIC TAGS: exploding wire, diode, diode collector current, diode anode current, abnormal collector current, abnormal anode current

ABSTRACT: An experimental investigation was made of the phenomenon of abnormally high collector currents in a vacuum diode with a tungsten exploding wire as emitter. Such currents develop when the emitter is heated close to the melting point by a high-power (10^6 amp/cm^2 or higher) pulse. The collector current values may exceed their stationary incandescence values as derived from the Langmuir formula up to several hundred times. Systematic experiments were conducted to establish the character of the phenomenon and its dependence on the conditions of the experiment. A special series of tests was arranged to exclude the ionization of tungsten vapors by keeping the potentials

Card 1/2

L 22639-66
ACC NR: AP6010969

below the ionization level. The results showed that ionization is not among the causes of the phenomenon. It was established that the abnormal magnitude of the collector current manifests itself at temperatures considerably below the melting point, and that it increases with the duration of the heating pulse, i.e., with the temperature. This is interpreted as the effect of the condition of the emitting metal. It was further observed that the abnormal collector current drops to its normal value, after the heating pulse ends, far too rapidly to be explained by the cooling of the wire, which leads to the conclusion that the condition of the wire metal responsible for the phenomenon is not a function of temperature alone. The condition of the emitter's surface is considered a possible explanation. The exact physical nature of the phenomenon, however, could not be clarified by these experiments. Orig. art. has: 9 figures and 1 formula. [FP]

SUB CODE: 09,20 SUBM DATE: 06Jul65/ ORIG REF: 010/ OTH REF: 003
ATD PRESS: 4228

Card 2/2 Vilg S

L 45166-66 EWT(1)/EWT(m)/EEC(k)-2/T/EWP(t)/ETI IJP(c) RM/WW/JD/JG
ACC NR: AP6028623 SOURCE CODE: UR/0057/66/036/008/1481/1488

AUTHOR: Bekmukhambetov, Ye.S.; Gus'kov, Yu.K.; Kasikov, I.I.; Lebedev, S.Ya.; Stakhanov, I. P.; Rodin, A. V.

ORG: none

TITLE: Operation of a cesium thermoelectric converter in the presence of an inert gas

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 36, no. 8, 1966, 1481-1488

TOPIC TAGS: thermionic energy conversion, cesium, electric arc, cesium plasma, inert gas, neon, argon, krypton, xenon

ABSTRACT: The authors have investigated the effect of the presence of Ne, Ar, Kr, and Xe on the operation of a cesium arc in the 0.5 to 1.0 mm gap between a hot molybdenum foil cathode and a niobium anode. The apparatus was sealed off at 10^{-7} mm Hg after having been cleansed by the usual vacuum techniques. The cesium pressure was controlled by varying the temperature of a branch tube containing metallic cesium, the temperature of the remainder of the apparatus being kept 30 to 50° C higher. The inert gas was admitted in successive doses by breaking tubes containing it. The cesium pressure was varied from 0.0275 to 3.9 mm Hg, and inert gas pressures up to 234 mm Hg were investigated. Very small additions of inert gas increased the cesium plateau of the current-voltage characteristic by some 0.1 V, but further increase of the inert gas pressure led to deterioration of the characteristics of the converter.

Card 1/2

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ACC NR: AP6028623

2

The presence of the inert gas decreased the saturation current. The saturation current under different conditions was calculated with the aid of the diffusion theory of B.Ya.Moyzhes and G.Ye.Pikus (FTT, 2, 756, 1960), and the results are compared with the measured values. The measured saturation currents were usually from 2 to 10 times lower than the calculated currents. This is ascribed to increase of the inert gas concentration in the hot region between the electrodes as a result of thermal diffusion of the inert gas cesium mixture. Zenon reduced the saturation current less than did neon or krypton; this is ascribed to the fact that the atomic mass of xenon is closer than that of neon or krypton to the atomic mass of cesium. A formula is derived for the thermal diffusion ratio, and with the aid of this formula and the assumption that the observed deviations from the moyzhes-Pikus theory are due to thermal diffusion, values of the Kr-Cs and Xe-Cs cross sections were calculated from the experimental data. The Kr-Cs and Xe-Cs cross sections were thus found to be 8×10^{-14} and 1.05×10^{-13} cm^2, respectively. The authors thank S.I.Kutashev and V.I.Klinov for assistance in constructing the apparatus and performing the measurements. Orig. art. has: 11 formulas, 6 figures and 3 tables. [15]

SUB CODE: 20 SUBM DATE: 23Aug65 ORIG. REF: 002 OTH REF: 004/
ATD PRESS: 5081

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B013/B063

26.1420

AUTHORS: Stavisskiy, Yu. Ya., Lebedev, S. Ya.

TITLE: Surface Ionization of Cesium During Its Diffusion Through Porous Tungsten

PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1960, Vol. 30, No. 10, pp. 1222 - 1226

TEXT: The authors studied the dependence of an ion current emitted by an ionizing surface (porous emitter) upon the surface temperature with a constant consumption of cesium vapor. The experimental arrangement is schematically shown in Fig.1. The surface temperature of the porous partition wall was determined by measuring the temperature distribution over its thickness. For this purpose, a platinum - platinum rhodium cell was introduced into the partition wall and the container (Figs. 2 and 4). The temperature of the outer surface was determined by extrapolation (Fig.3). Fig.4 shows the dependence of the ion current on the applied voltage for constant temperature of the vaporizer and for varying temperatures of the emitter. The temperature dependence of the ion current

Card 1/2

Surface Ionization of Cesium During Its Diffusion Through Porous Tungsten

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for four values of cesium-vapor consumption is illustrated in Figs. 5 and 6. The dependence of the saturation temperature on the current density is shown in Fig. 7. All these Figures also contain comparative data from Refs. 4 and 5. The authors' studies have shown that during the diffusion of cesium vapor through porous tungsten, surface ionization is practically perfect at the proper temperature. The temperatures of saturation are higher than in the case of ionization on smooth emitters. At a current density of 10 ma/cm^2, temperature changes by ~80°C, but at a current density of 0.25 ma/cm^2, it changes only by ~50°C. The authors thank I. I. Bondarenko, Doctor of Physical and Mathematical Sciences, Professor N. I. Ionov, and E. Ya. Zandberg, Candidate of Physical and Mathematical Sciences, for discussions. There are 7 figures and 5 references: 1 Soviet.

SUBMITTED: April 27, 1960

Card 2/2

27178
S/057/61/031/009/018/019
B104/B102

26.2312

AUTHORS: Lebedev, S. Ya., Stavisskiy, Yu. Ya., and Shut'ko, Yu. V.

TITLE: Surface ionization of cesium during diffusion of its vapors through porous molybdenum

PERIODICAL: Zhurnal tekhnicheskoy fiziki, v. 31, no. 9, 1961, 1148-1149

TEXT: The authors studied the temperature dependence of the surface ionization of cesium during diffusion of its vapors through porous molybdenum plates (thickness 1 mm, porosity 30%, dimension of pores 1 μ). The temperature of the ionized surface was controlled with a thermocouple. The temperature dependence of the ion current density was studied for current densities of 0.015 - 16 ma/cm^2. Figs. 1 and 2 show the results. Results reveal that practically full ionization takes place during diffusion of cesium vapor through porous molybdenum of porous tungsten. Full ionization is achieved in molybdenum at much lower temperatures than in tungsten. With an ion current density of 15 ma/cm^2, this temperature

Card 1/3

Surface ionization of cesium...

difference is about 20°C. It is explained by a difference in the evaporation heats of cesium from tungsten and cesium surfaces and different mean lifetimes of cesium atoms on the ionized surface. The authors thank A. I. Leypunskiy, Academician of the AS UkrSSR, I. I. Bondarenko, and N. I. Ionov, for discussions. Further, they thank Yu. A. Eyduk who supplied the porous materials. There are 2 figures and 2 references: 1 Soviet and 1 non-Soviet. The reference to the English-language publication reads as follows: W. B. Nottingham, Cesium plasma diode as a heat-to-electrical power transducer. Uppsala, August, 1959.

SUBMITTED: March 20, 1961

Fig.1. Dependence of the ion current on the temperature of the porous molybdenum surface.
Fig.2. Dependence of the saturation temperature on the current density. Legend: (1) Calculated by a formula for smooth tungsten suggested by Nottingham, (2) values measured by the authors for porous molybdenum, (3a) values measured by the authors for porous tungsten, (3b) values measured by Yu. Ya. Stavisskiy and S. Ya. Lebedev (ZhTF, XXX, no. 10, 1960).

Card 2/3

24.2120 (1163, 1532, 1538)
10.2000
26.7310

28773 S/057/61/031/010/006/015
B104/B125

AUTHORS: Lebedev, S. Ya., Stavisskiy, Yu. Ya., Bondarenko, I. I., Mayev, S. A., Stakhanov, I. P., and Stumbur, E. A.

TITLE: Plasma oscillations in ion-beam neutralization

PERIODICAL: Zhurnal tekhnicheskoy fiziki, v. 31, no. 10, 1961, 1202-1208

TEXT: The consequences of the condition that the total ion current in a plasma vanishes have been studied. Electrons and ions are assumed to be emitted orthogonally from a conductor surface at the velocities v_{10} and v_{20}. Equations of motion and continuity for electrons and ions are studied. For the potential φ in the interval $0 \leqslant x \leqslant \infty$, the condition that electrons and ions do not reverse the direction of their motion reads: $d\varphi/dx = 0$. (The conductor surface lies in the $x = 0$ plane.) The inequality $v_{10} \leqslant 2v_{20}$ holds for the velocities. If $d\varphi/dx \neq 0$ on the conductor surface, the admissible velocity range, in which no reversal of the direction of motion will occur, is smaller. If the electron and ion currents in plasma do not compensate each other, a steady, periodically distributed

Card 1/3

Plasma oscillations in...

charge will occur in the plasma. The period of charge distribution, the velocity and the acceleration of electrons in this spatially periodic charge are studied. Theoretical results were experimentally verified by measuring the electromagnetic radiation emitted by the electrons while traveling through the periodic charge. The experimental setup is shown in Fig. 2. Positive cesium ions reach the operating part from the incandescent tungsten plate 5. Grid 3 accelerates the ions and simultaneously emits electrons that neutralize the positive ions. The potential of the ion source relative to the earth ranged between 0 and 10 kv. Grid 3 had a zero potential. The emission of electromagnetic waves was measured with a radiotechnical installation. Very high-frequency oscillations were produced between 80 and 120 Mc/sec, and between 126 and 200 Mc/sec as dependent on the current density and ion energy. Experimental results are in good agreement with theoretical data. Professor A. I. Leypunskiy is thanked for his interest, and S. I. Chubarov for advice. There are 4 figures and 11 references: 6 Soviet and 5 non-Soviet. The three most important references to English-language publications read as follows: J. Feinstein et al., Phys. Rev., 83, 405, 1951; H. K. Sen, Phys. Rev., 99, 849, 1955; P. L. Auer et al., J. Appl. Phys., 30, no. 2, 161, 1959.

Card 2/3

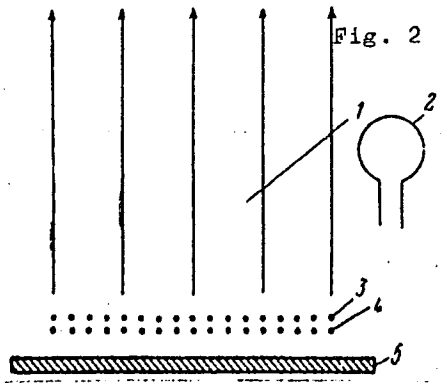
Plasma oscillations in...

SUBMITTED: December 19, 1960

Fig. 2. Diagram of experimental arrangement.

Legend: (1) compensated ion and electron beams; (2) antenna; (3) neutralizing grid; (4) screened grid; (5) ion source.

Fig. 2



Card 3/3

35788

S/120/62/000/001/034/061
E032/E314

26.2312
11.4100

AUTHORS: Lebedev, S.Ya. and Stavisskiy, Yu.Ya.

TITLE: Measurement of the vapour pressure of alkali metals in the range 10^{-5} - 10^{-2} mm Hg

PERIODICAL: Pribory i tekhnika eksperimenta, no. 1, 1962, 142 - 144

TEXT: The usual method of measuring the vapour pressure of alkali metals is based on the well-known relation between the vapour pressure and the temperature. However, this method suffers from the disadvantage that it can only be used under the conditions of thermodynamic equilibrium and, moreover, it has considerable inertia so that it cannot be used for continuous measurements. The authors describe a different method in which the vapour pressure can be measured with the aid of the phenomenon of surface ionization of alkali metals on tungsten. This phenomenon is described by the well-known Saha-Langmuir formula, giving the surface-ionization coefficient in terms of the ionization potential of the atoms and the work function of the

Card 1/2

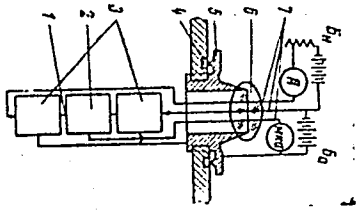
Measurement of ....

tungsten surface. The device now described is illustrated in Fig. 2. It is found that the ion current is a linear function of the vapour pressure and is in agreement with theoretical considerations. There are 3 figures.

SUBMITTED: May 26, 1961

Legend to Fig. 2: 1 - tungsten anode; 2 - measuring part of the cathode; 3 - cathode guard rings; 4 - vacuum seal; 5 - kovar ring; 6 - glass-to-metal seal; 7 - kovar holders; $\mathcal{B}_H$ - battery supplying the tungsten anode; A - ammeter for measuring the filament current; $\mathcal{B}_a$ - battery supplying potential difference between the tungsten wire and the outer cylinders.

Fig. 2:



Card 2/2

LEBEDEV, S.Ya.; STAVISSKIY, Yu.Ya.

Surface ionization of cesium as its vapors diffuse through porous nickel. Zhur. tekh. fiz. 33 no.12:1473-1474 D '63.

Adsorption energy of cesium ions on a metal surface. Ibid.:1474-1477 (MIRA 16:12)

L 12040-65 EWT(l)/EWG(k)/EWT(m)/EPA(sp)-2/EPF(n)-2/EPA(w)-2/T/EWA/EWP(b) Pz-6/
Pab-10/Pq-4 IJP(c)/APMDC/ASD(m)-3/ASD(a)-5/ASD(f)-2/ESD(gs)/ESD(t)
ACCESSION NR: AP4045306 S/0048/64/028/009/1488/1490

AUTHOR: Lebedev, S.Ya.; Stavisskiy, Yu.Ya.; Shut'ko, Yu.V.

TITLE: Cathode sputtering by bombardment with accelerated cesium ions /Report, Tenth Conference on Cathode Electronics held in Kiev, 11-18 Nov 1963/

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v.28, no.9, 1964, 1488-1490

TOPIC TAGS: cathode sputtering, cesium ion beam, nickel, titanium, niobium, platinum, carbon, molybdenum, rhenium, tungsten, tantalum, iron, stainless steel

ABSTRACT: The cathode sputtering coefficients of Ni, Ti, Nb, Pt, C, Mo, Re, W, Ta, Fe and stainless steel bombarded by 2 to 10 keV cesium ions were measured at temperatures from 700 to 1100°C, and the results are presented graphically. The cesium ions were produced by surface ionization of cesium vapor traversing hot porous tungsten in an ion source previously described by two of the authors (Zhur.tekh.fiz.30, 1222,1960). The ion current was not measured, but was calculated by the $V^{2/3}$ law for space charge limited currents between infinite plane electrodes. The applicability of this law to the specific conditions of the experiment was tested by computing ion trajectories and by auxiliary experiments in which the beam was caught in a

1/2

L 12040-65
ACCESSION NR: AP4045306

3

Faraday cup and the current measured. The formula was found to give the correct current within 10%. Strips (1 x 10 x 0.05 mm^3) of the 11 metals were bombarded simultaneously and the sputtering coefficients were obtained by weighing the specimens before and after bombardment. The sputtering coefficients increased with increasing cesium ion energy, but reached saturation values at 7 to 9 keV. The sputtering factors also increased with increasing temperature. The increase with temperature was more marked at the higher cesium ion energies and for the more easily sputtered materials. At fixed temperature and cesium ion energy, the sputtering coefficient generally decreased with increasing heat of sublimation of the material. "In conclusion, the authors thank Academician A.I.Leypunskiy of the USSR Academy of Sciences and Professors M.A.Yeremeyev and N.I.Ionov for valuable discussions." Orig.art. has: 1 formula and 5 figures.

ASSOCIATION: none

SUBMITTED: 00

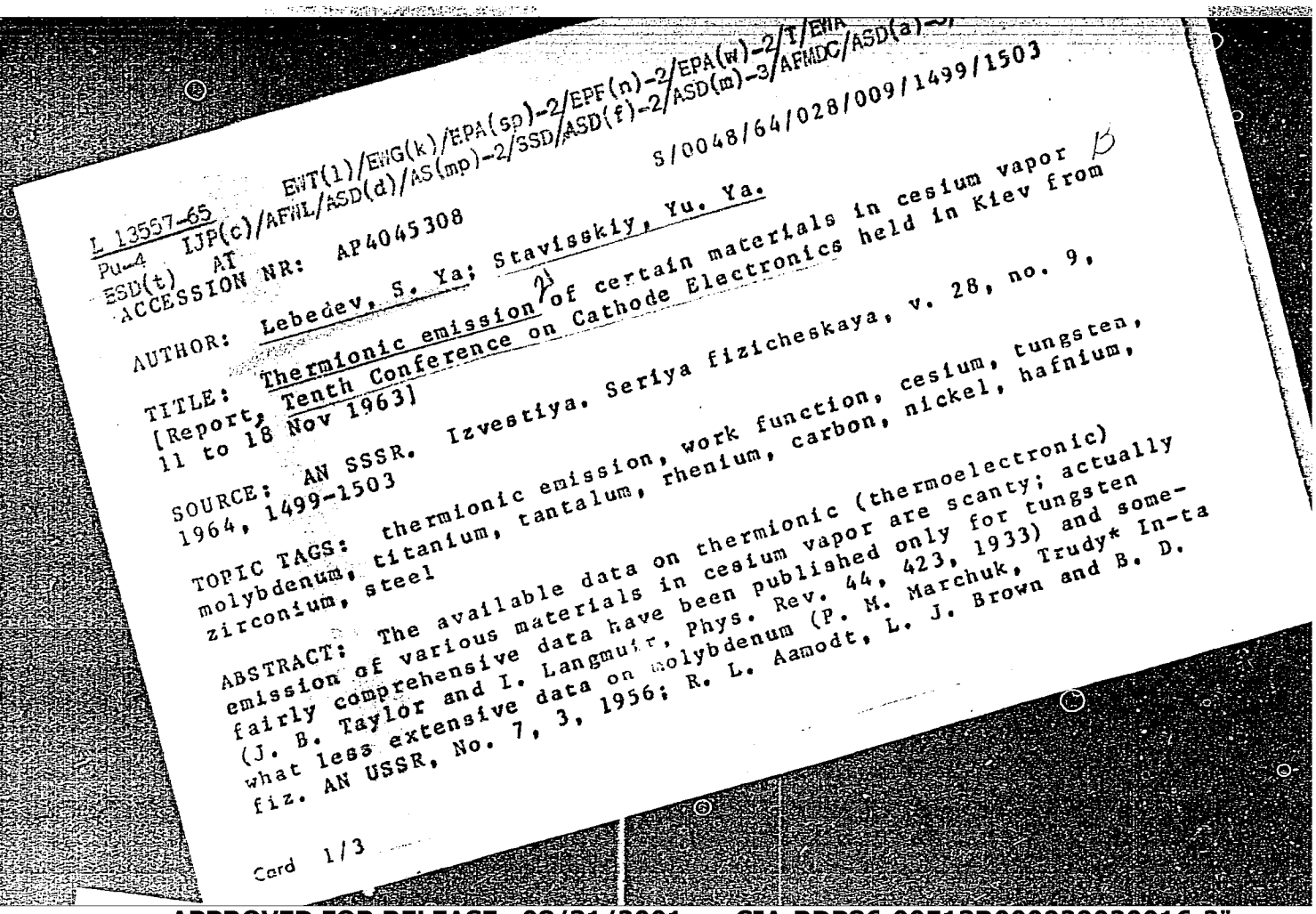
ENCL: 00

SUB CODE: EC,NP

NR REF SOV: 002

OTHER: 001

2/2



L 13557-65 ENT(1)/EWG(k)/EPA(sp)-2/EPF(n)-2/EPA(w)-2/T/EWA
Pu-4 IJP(c)/AFWL/ASD(d)/AS(mp)-2/SSD/ASD(f)-2/ASD(m)-3/AFMDC/ASD(a)-
ESD(t) AT
ACCESSION NR: AP4045308 S/0048/64/028/009/1499/1503

AUTHOR: Lebedev, S. Ya; Stavisskiy, Yu. Ya. 21 B

TITLE: Thermionic emission of certain materials in cesium vapor [Report, Tenth Conference on Cathode Electronics held in Kiev from 11 to 18 Nov 1963]

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 28, no. 9, 1964, 1499-1503

TOPIC TAGS: thermionic emission, work function, cesium, tungsten, molybdenum, titanium, tantalum, rhenium, carbon, nickel, hafnium, zirconium, steel

ABSTRACT: The available data on thermionic (thermoelectronic) emission of various materials in cesium vapor are scanty; actually fairly comprehensive data have been published only for tungsten (J. B. Taylor and I. Langmuir, Phys. Rev. 44, 423, 1933) and somewhat less extensive data on molybdenum (P. M. Marchuk, Trudy* In-ta fiz. AN USSR, No. 7, 3, 1956; R. L. Aamodt, L. J. Brown and B. D.

Card 1/3

L 13557-65

ACCESSION NR: AP4045308

Nichols, J. Appl. Phys. 33, 2080, 1962). Accordingly, the present work deals with the emission of W, Mo, Ta, Ti, C, Re, Ni, Nb, Zr, Hf, and 1Kh18N9T steel in cesium vapor. The measurements were performed by using a special tube with a cylindrical three-section anode; the PtRh-Pt thermocouple employed precluded aging at temperatures above 1700C, which possibly did not ensure adequate surface cleanliness of the high-melting materials. The inside of the measurement tube was heated to 300-350C, the temperature of the evaporator branch with the cesium was varied from 18 to 150C (equivalent Cs pressures of 10^{-6} to 10^{-2} mm Hg). The temperature of the test emitters was varied over the range from 18 to 1000C. Some of the above listed materials have work function values exceeding the ionization potential. The values of the work function and the constant A for the tested materials are tabulated. The experimental results are presented by plotting log i versus 1/T curves for different Cs vapor pressures. Finally, the ranges of the work function, evaluated on the assumption that A = 120, and the values of the heat of evaporation of Cs from the different surfaces, evaluated from the temperature dependences of the thermionic emission are tabulated. The last

Card 2/3

L 13557-65

ACCESSION NR: AP4045308

disagree with the values available in the literature. "In conclusion, the authors express their gratitude to L. N. Dobretsov for valuable suggestions made in discussing the results of the work." Orig. art. has: 7 figures and 3 tables.

ASSOCIATION: none

SUBMITTED: 00 ATD PRESS: 3131

SUB CODE: MM, EM NO REF SOV: 004 ENCL: 00

OTHER: 008

Card 3/3

L 12043-65 EWT(l)/EPA(s)-2/EWT(m)/EPF(c)/EPF(n)-2/EPR/EPA(w)-2/EEC(t)/T/EWP(t)/EWP(b)/EWA(m)-2 Pr-4/Ps-4/Pt-10/Pu-4/Pab-10/Pad IJP(c)/ASD(m)-3/ASD(a)-5/ASD(d)/AS(mp)-2/ASD(f)-2/ESD(gs) JD/WW/HM/JG

ACCESSION NR: AP4045314 S/0048/64/028/009/1527/1529

AUTHOR: Lebedev, S.Ya.; Stavisskiy, Yu.Ya.

TITLE: Surface ionization of cesium incident to diffusion of the vapor through porous diaphragms of molybdenum, tungsten, nickel and rhenium [Report, Tenth Conference on Cathode Electronics held in Kiev, 11-18 Nov 1963]

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v.28, no.9,1964, 1527-1529

TOPIC TAGS: surface ionization, cesium, tungsten, nickel, rhenium, adsorption energy

ABSTRACT: The surface ionization of cesium vapor seeping through porous diaphragms of molybdenum, tungsten, nickel and rhenium was investigated. The authors have described their apparatus elsewhere(Zhur.tekh.fiz.33,12,1963). Cesium vapor from an oven was conducted through a porous diaphragm of the metal under investigation (porosity, 30%; grain and pore size, 1 micron), and the ions issuing from the diaphragm were collected in a Faraday cup. The diaphragm was heated indirectly; thermocouples served to measure its temperature and to assure the absence of any radial temperature gradient. The potential difference between the diaphragm and the Faraday cup was so chosen with the aid of auxiliary experiments as to avoid space charge

1/3

effects. The Faraday cup was provided with a negatively charged grid to suppress secondary electron emission, and it was sufficiently cooled as to condense the neutral cesium atoms that entered it. To perform a measurement, the cesium vapor flux was held constant and the ion current was plotted against the diaphragm temperature. The curve thus obtained showed a rapid rise of ion current with increasing temperature, followed by sudden onset of saturation. The saturation ion current was regarded as the surface ionization current corresponding to the temperature for onset of saturation for a clean surface. This procedure was repeated for different flow rates, and thus the relation between ionization current and temperature was obtained. The logarithm of the ionization current was a linear function of the reciprocal of the temperature. The activation energy defined by this linear relation is regarded as the energy of adsorption on a clean surface. The adsorption energies thus obtained were 2.65 eV for the molybdenum, 2,92 eV for the tungsten, 3.04 eV for the nickel, and 3.22 eV for the rhenium diaphragm. "In conclusion, the authors express their gratitude to N.I. Ionov and E.Ya.Zandberg for valuable discussions." Orig.art. has: 2 formulas, 2 figures and 1 table.

L 12043-65
ACCESSION NR: AP4045314

ASSOCIATION: none

SUBMITTED: 00

SUB CODE: EM, MM

NR REF SOV: 003

ENCL: 00

OTHER: 000

3/3

BR

S/0057/64/034/006/1101/1104

ACCESSION NR: AP4040316

AUTHOR: Lebedev, S.Ya.; Stavisskiy, Yu.Ya.; Shut'ko, Yu.V.

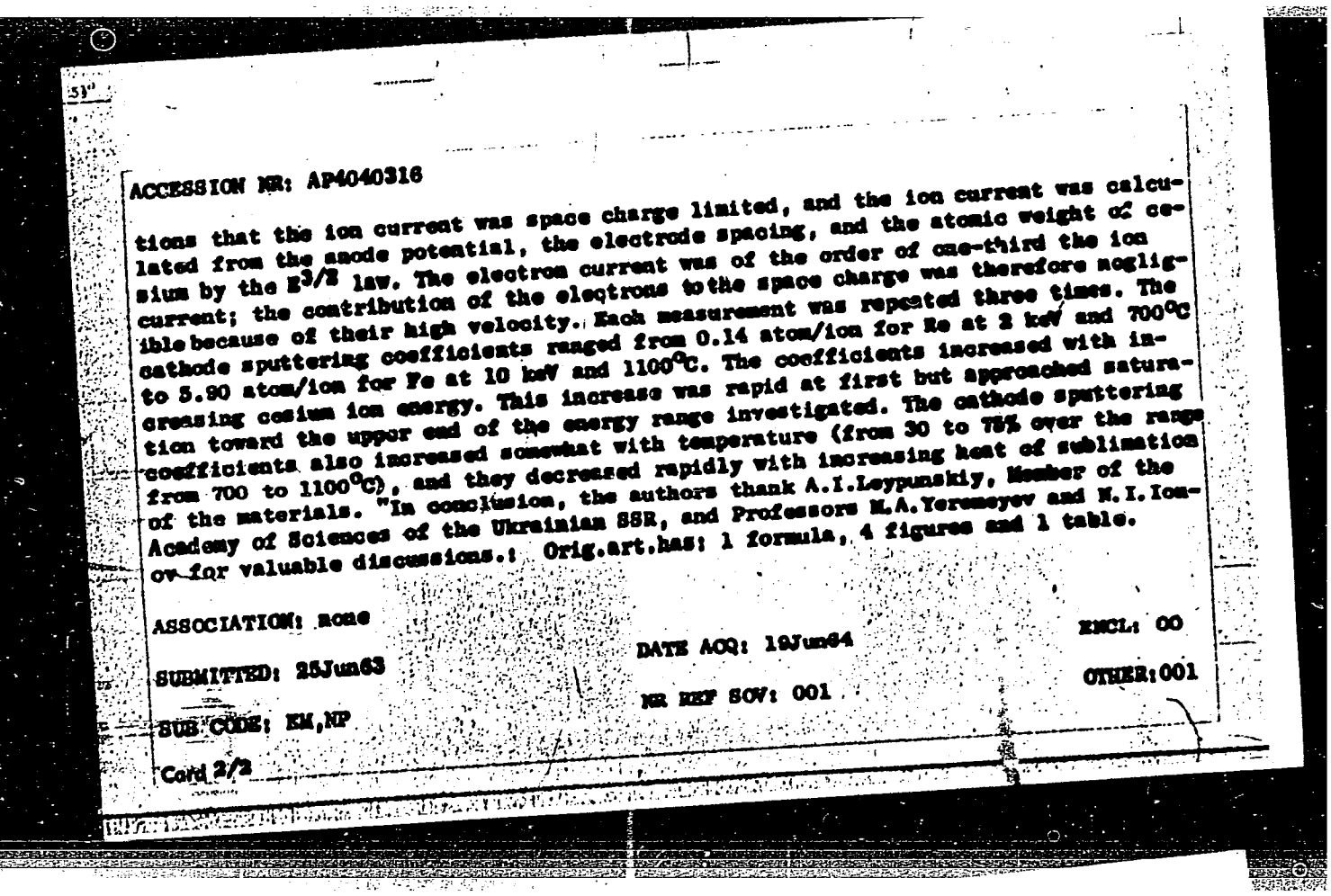
TITLE: Cathode sputtering by cesium ions

SOURCE: Zhurnal tekhnicheskoy fiziki, v.34, no.6, 1964, 1101-1104

TOPIC TAGS: cathode sputtering, ion bombardment, cesium, nickel, titanium, niobium, platinum, carbon, molybdenum, rhenium, tungsten, tantalum, iron

ABSTRACT: The cathode sputtering coefficients under cesium ion bombardment were measured by the weight method for Ni, Ti, Nb, Pt, C, Mo, Re, W, Ta, and Fe and the results are tabulated for cesium ion energies from 2 to 10 keV and target temperatures from 700 to 1100°C. The ions were formed by passing cesium vapor through a 20 mm diameter 1 mm thick heated disc of porous tungsten; this ion source has been described elsewhere (Yu.Ya.Stavisskiy and S.Ya.Lebedev, ZhTF 30, No.10, 1960). The 10 x 1 x 0.05 mm samples (all 10 at once) were fastened to the central portion of the plane cathode target, which was heated by a tungsten filament. The ion current could not be determined by simply measuring the cathode current because of secondary and thermal electron emission. The apparatus was therefore operated under such condi-

Card 1/2



ACCESSION NR: AP4040316

tions that the ion current was space charge limited, and the ion current was calculated from the anode potential, the electrode spacing, and the atomic weight of cesium by the $E^{3/2}$ law. The electron current was of the order of one-third the ion current; the contribution of the electrons to the space charge was therefore negligible because of their high velocity. Each measurement was repeated three times. The cathode sputtering coefficients ranged from 0.14 atom/ion for Re at 2 keV and 700°C to 5.90 atom/ion for Fe at 10 keV and 1100°C. The coefficients increased with increasing cesium ion energy. This increase was rapid at first but approached saturation toward the upper end of the energy range investigated. The cathode sputtering coefficients also increased somewhat with temperature (from 30 to 75% over the range from 700 to 1100°C), and they decreased rapidly with increasing heat of sublimation of the materials. "In conclusion, the authors thank A.I.Leypunskiy, Member of the Academy of Sciences of the Ukrainian SSR, and Professors M.A.Yeremeyev and N.I.Ionov for valuable discussions." Orig.art.has: 1 formula, 4 figures and 1 table.

ASSOCIATION: none

SUBMITTED: 25Jun63 DATE ACQ: 19Jun64 ENCL: 00

SUB CODE: EM,NP NR REF SOV: 001 OTHER: 001

Card 2/2

L 26969-65 EWT(l)/EWT(m)/EPA(s)-2/EPF(n)-2/EWP(t)/EEC(t)/EPA(w)-2/EPA(bb)-2/
EWA(m)-2/EWP(b) Pab-10/Pt-10/Pu-4 IJP(c) JD/WW/JG S/0057/65/035/001/0156/0157

ACCESSION NR: AP5003253

AUTHOR: Gus'kov, Yu.K./ Lebedev, S.Ya./ Rodionova, V.G.

TITLE: Electric breakdown through a slot in glass in a cesium vapor atmosphere

SOURCE: Zhurnal tekhnicheskoy fiziki, v.35, no.1, 1965, 156-157

TOPIC TAGS: cesium, dielectric breakdown, dielectric strength

ABSTRACT: The breakdown potential between a 1.1 cm diameter hot cylindrical cathode and a 1.8 cm diameter coaxial cylindrical anode was measured in cesium vapor at pressures from 0.001 to 3 mm Hg and at cathode temperatures from 430 to 650°C. In the interelectrode space was located a glass cylinder [diameter and wall thickness not given] coaxial with the electrodes and containing a circular slot of adjustable width; the plane of the slot was perpendicular to the axis of the system. The width of this slot was varied from 0.03 to 0.3 mm. The results are tabulated. The breakdown potential decreased somewhat with increasing slot width, and as a function of pressure it was minimum at about 0.1 mm Hg. "In conclusion, the authors thank Yu.Ya.Stavisskiy for valuable discussions and Ye.S.Afon'kin for assistance with the work." Orig.art.has: 3 figures and 1 table.

Card 1/2

L 26969-65

ACCESSION NR: AP5003253

ASSOCIATION: none

SUBMITTED: 30Jun64

NR REF SOV: 000

ENCL: 00

OTHER: 000

SUB CODE: EM

Card 2/2

4981-66 EWT(d)/EWT(l)/EWT(m)/EPF(c)/ETC/EPF(n)-2/EWG(m)/EPA(w)-2/T/EWP(t)/EWP(b)/
ACC NR: AP5024056 ETC(m) IJP(c) SOURCE CODE: UR/0057/65/035/009/1707/1709
JD/WW/JG/AT 44,55 44,55 44,55

AUTHOR: Bekmukhambetov, Ye. S.; Gus'kov, Yu. K.; Lebedev, S. Ya. 76 23

ORG: none

TITLE: The influence of krypton on the operation of a thermionic converter 21,44,55

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 35, no. 9, 1965, 1707-1709

TOPIC TAGS: thermionic energy converter, cesium, krypton

ABSTRACT: The short-circuit currents and volt-ampere characteristics of a thermionic converter were determined in the presence of pure cesium at pressures of 0.31—235 mm Hg and then with various additions of krypton. The molybdenum emitter was kept at temperatures below 600C, and its distance from the niobium collector was about 0.15 mm. The measurements showed a parallel shift of current-temperature curves toward lower currents when krypton pressures were increased. The volt-ampere characteristics indicated that small admixtures of krypton bring about a small increase of the voltage; when krypton pressure is increased, the converter's output drops. A comparison of the experimentally obtained values for current with those calculated by the use of

Card 1/2

L 4981-65

ACC NR: AP5024056

the diffusion theory showed the former to be 2—3 times lower than the latter. This can be attributed to insufficiently accurate values of the electron scattering cross sections of krypton atoms, or to a thermodiffusion process involving the elimination of Cs from the interelectrode gap. Orig. art. has: 1 formula and 4 figures. [ZL]

SUB CODE: EC,NP/ SUBM DATE: 06Mar65/ ORIG REF: 001/ OTH REF: 001

ATD PRESS: 4131

OC

Card 2/2

L 2089-66 EWT(l)/EPA(s)-2/EWT(m)/EPF(c)/EEC(k)-2/ETC/EWG(m)/EPA(w)-2/T/EWP(t)/
EWP(b)/EWA(h) IJP(c) TT/JD/WW/AT UR/0057/65/035/009/1709/1711
ACCESSION NR: AP5024057

AUTHOR: Bekmukhambetov, Ye. S.; Gus'kov, Yu. K.; Lebedev, S. Ya. 73 B

TITLE: The operation of a cesium thermionic converter in the presence of xenon 27

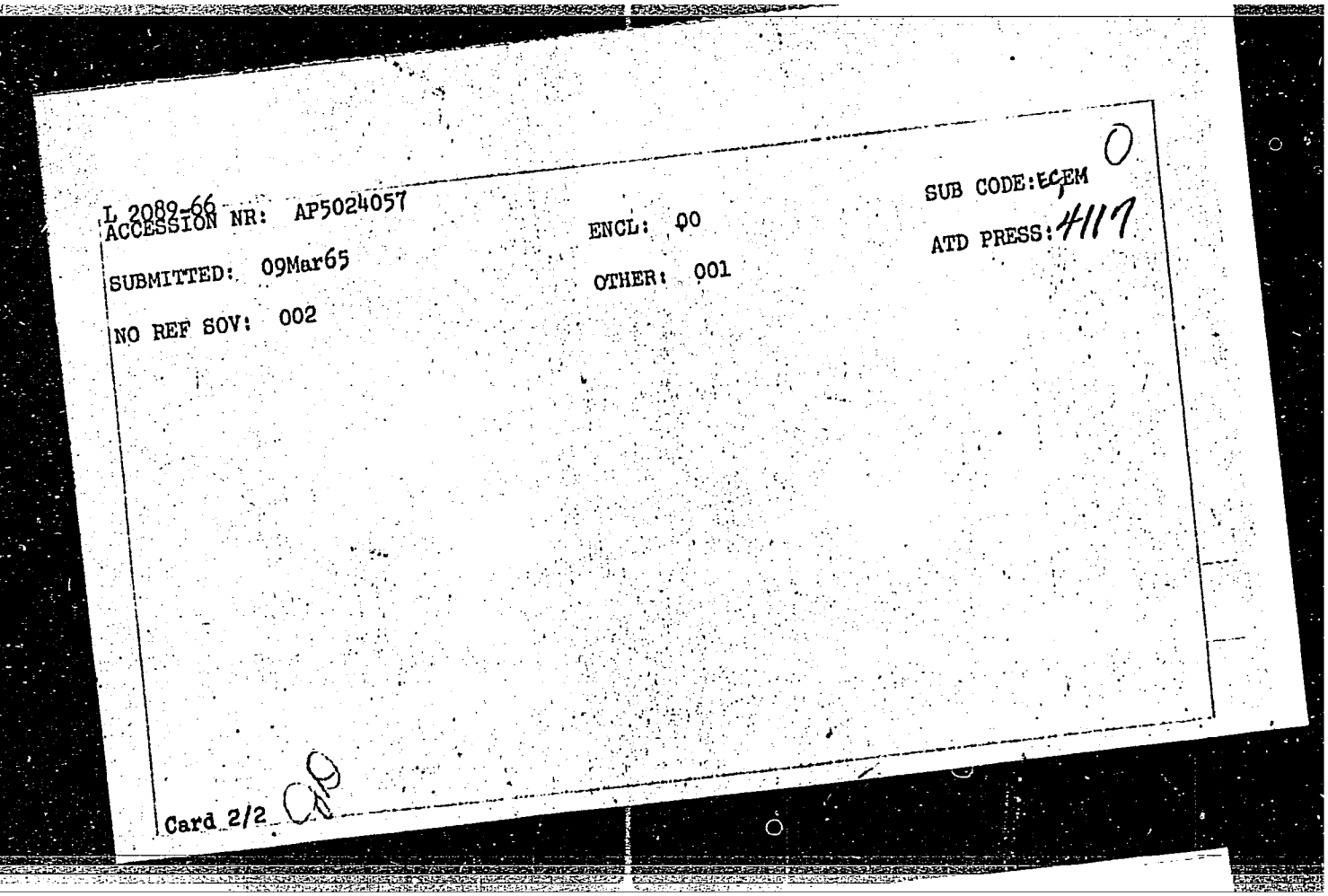
SOURCE: Zhurnal tekhnicheskoy fiziki, v. 35, no. 9, 1965, 1709-1711

TOPIC TAGS: cesium thermionic converter, thermionic converter, cesium, xenon

ABSTRACT: The temperature dependence of short-circuit currents of a thermionic converter was measured, first in pure cesium atmospheres in the range of pressures from 2.75×10^{-2}—2 mm Hg, and then with admixtures of xenon at pressures ranging from 0.27—69 mm Hg. Generally, the experiments showed a parallel shift of the curves toward smaller currents. However, at a xenon pressure of 69 mm Hg a change in the curve's angle was observed. The lack of a plateau in the volt-ampere characteristics is explained by volume recombination. When at cesium pressure of about 2 mm Hg the cathode temperature reaches 1300K, a small admixture of xenon at 0.27 mm Hg brings about an increase of the current and voltage of the converter due to its passing to the arc mode. A further increase of xenon pressure reduces the converter's output. [ZL]
Orig. art. has: 1 formula and 4 figures.

ASSOCIATION: none

Card 1/2



L 2089-66
ACCESSION NR: AP5024057

SUBMITTED: 09Mar65

NO REF SOV: 002

ENCL: 00

OTHER: 001

SUB CODE: EC, EM

ATD PRESS: 4117

Card 2/2

L 23703-66 EWT(l)/EWT(m)/EWP(t) IJP(c) JD/JG

ACC NR: AT6006754 SOURCE CODE: UR/3158/65/000/015/0001/0018

AUTHOR: Bekmukhambetov, Ye. S.; Gus'kov, Yu. K.; Kasikov, I. I.; Lebedev, S. Ya.; Rodin, A. V.; Stakhanov, I. P.

ORG: Physics and Power Institute, State Committee on the Use of Atomic Energy, SSSR (Fiziko-energeticheskiy institut, Gosudarstvennyy komitet po ispol'zovaniyu atomnoy energii SSSR)

TITLE: Operation of a cesium diode with inert-gas impurity

SOURCE: Obninsk. Fiziko-energeticheskiy institut. Doklady, no. 15, 1965. Rabota tseziyevogo dioda s primes'yu inertnogo gaza, 1-18

TOPIC TAGS: cesium electron tube, cesium plasma, thermoelectric convertor, volt ampere characteristic, pressure effect, temperature dependence, inert gas

ABSTRACT: The investigations were motivated by the fact that when a thermoelectric converter is operated in a nuclear reactor, the fission products, a large fraction of which are radioactive krypton and xenon, may enter in the interelectrode gap of the converter, and their effect on the converter in the operation of a cesium diode may be appreciable. The tests were made with experimental tubes with flat electrodes, using a molybdenum cathode and niobium anodes. Doubly distilled metallic cesium and spectrally pure krypton and xenon were used in varying amounts. The cathode was fed with pulsating halfwave current. The cesium vapor pressure ranged from 0.1 to 3.9 mm Hg for the krypton-filled tube and 0.028 to 2 mm Hg for the xenon-filled tube. Plots were prepared of the dependence of the short-circuit current on

Card 1/2

L 23703-66

ACC NR: AT 6006754

the cathode temperature without and with the inert gases, and volt-ampere characteristics at various pressures. The introduction of the inert gases resulted in a parallel shift of the temperature dependence curves towards smaller currents, and to noticeable reduction in the output parameters of the converter. Comparison of the experimental results with calculations based on diffusion theory show in general good agreement, although some unexplained irregularities were observed in that the saturation current following addition of xenon was higher than following addition of krypton, and that the experimental currents usually were lower than the theoretical ones. These deviations are related to thermal diffusion separation of the cesium-krypton and cesium-xenon mixtures in the tube. The experiments show that addition of inert gases reduces the saturation current compared with pure cesium. The experimental saturation currents were as a rule lower than the theoretical ones by a factor 2--4. Addition of krypton reduced the saturation current more than addition of xenon. The thermal diffusion ratios were calculated for Cs-Kr and Cs-Xe mixtures in the case of low cesium densities. The values obtained for the cross sections of the interaction between cesium and xenon and krypton are 1.05×10^{-13} and 8×10^{-14} cm^2, respectively. Direct experiments on the thermal diffusion in the mixtures of cesium and inert gases are necessary for a final interpretation of the results.

Orig. art. has: 12 figures and 12 formulas.

SUB CODE: 20/ ORIG REF: 004/ OTH REF: 002

SUBM DATE: none

Card 2/2

L 35870-66 EWT(1)/EWT(m)/T/EWP(t)/ETI IJP(c) AT/JD

ACC NR: AP6021220 SOURCE CODE: UR/0294/66/004/003/0454/0456

AUTHOR: Bekmukhambetov, Ye. S. (Moscow); Gus'kov, Yu. K. (Moscow); Lebedev, S. Ya. (Moscow)

ORG: none

TITLE: The performance of a thermionic converter in a cesium-neon mixture.

SOURCE: Teplofizika vysokikh temperatur, v. 4, no. 3, 1966, 454-456

TOPIC TAGS: thermionic emission, thermionic energy conversion, volt ampere characteristic, cesium, cesium compound, thermionic converter, neon

ABSTRACT: The authors present the results of an investigation into the influence of a cesium-neon mixture on the performance of a thermionic converter. The measurements were made on an experimental lamp with plane electrodes. The dependence of the short-circuit current (I) on the cathode temperature was established together with the volt-ampere characteristics at different temperatures of the cathode in pure cesium vapors. Analogous series of measurements were made at different additions of neon. Two graphs presented show the curves I as a function of cathode temperature at cesium vapor pressures of $2.8 \cdot 10^{-1}$ and 2 mm Hg, and with neon pressure from 0.27 to 39 mm Hg. The graphs show that the experimental value of I for pure cesium in a diffusion-equilibrium region agrees satisfactorily with the calculations

Card 1/3

UDC: 537.581.621.362.546.36

made on the basis of the diffusion theory (B. Ya. Moyzhes, G. Ye. Pikus. Fizika tverdogo tela, 2, 756, 1960). The introduction of neon leads to a parallel shift of the [illegible] toward smaller voltages. In an arc mode the short-circuit currents also decrease. Two other graphs show the volt-ampere characteristics at cathode temperatures from about 1470 to 1900K for cesium pressures of $2.8 \cdot 10^{-1}$ and 2 mm Hg, respectively, for pure cesium, and at neon pressures of 0.27, 0.71, 3.37, and 39 mm Hg for a cesium-neon mixture. Table 1 shows the

p_{Ne}, mm Hg	I, a/cm^2	V, v	p_{Ne}, mm Hg	I, a/cm^2	V, v	p_{Ne}, mm Hg	I, a/cm^2	V, v
0	$1.54 \cdot 10$	0.097		$2.98 \cdot 10$	0.075		$3.76 \cdot 10$	0.095
	$4.64 \cdot 10^{-1}$	0.117		$2.74 \cdot 10$	0.173		$3.02 \cdot 10$	0.19
	$4.55 \cdot 10^{-1}$	0.286		$2.28 \cdot 10$	0.296		$2.19 \cdot 10$	0.275
			0.71			3.37		
	$9.62 \cdot 10^{-1}$	0.121		$1.81 \cdot 10$	0.341		$1.925 \cdot 10$	0.363
	$9.62 \cdot 10^{-1}$	0.242		$1.67 \cdot 10$	0.462		$1.15 \cdot 10$	0.505
	$9.34 \cdot 10^{-1}$	0.352		$1.18 \cdot 10^{-1}$	0.517		$4.09 \cdot 10^{-1}$	0.616
0.27	$8.05 \cdot 10^{-1}$	0.503		$8.87 \cdot 10^{-1}$	0.56			
	$5.83 \cdot 10^{-1}$	0.55		$6.75 \cdot 10^{-1}$	0.594		$5.07 \cdot 10^{-1}$	0.128
	$4.725 \cdot 10^{-1}$	0.594		$5.3 \cdot 10^{-1}$	0.665	39	$7.55 \cdot 10^{-1}$	0.19
							$6.25 \cdot 10^{-1}$	0.236

output parameters of the converter at p(Cs) = 2 mm Hg and cathode temperature of 1900K without neon and in a cesium-neon mixture when the value of the current through the converter exceeded $4 \cdot 10^{-1}$ a/cm^2. At low cesium vapor pressures (about $2.8 \cdot 10^{-1}$ mm Hg) additions of neon lead only to a decrease in the saturation current. In the region of high cesium vapor pressures (about 2 mm Hg), small additions of neon shift the volt-ampere characteristics toward large output voltages. When the neon pressures are close to and higher than the cesium pressures, the volt-ampere characteristics shift into the region of small output voltages; the output power drops as a result of the decrease in the current and the voltage. Similar results have been obtained for other inert gases elsewhere (Ye. S. Bekmukhambetov, Yu. K. Gus'kov. S. Ya. Lebedev. Zh. tekhn. fiziki, 35, No. 9, 1707, 1965). Orig. art. has: 5 figures, 1 formula, and 1 table. [26]

SUB CODE: 10/ SUBM DATE: 06Aug65/ ORIG REF: 002/ ATD PRESS: 5036

Card 3/3 116

Lebedev, Sergey Yevgen'yevich - Deceased

326

PHASE I BOOK EXPLOITATION

Orlin, Andrey Sergeyevich; Vyrubov, Dmitriy Nikolayevich, Kalish, German Georgiyevich; Kruglov, Mikhail Georgiyevich; Leonov, Oleg Borisovich, Lebedev, Sergey Yevgen'yevich; Librovich, Bronislav Genrikhovich; Chursin, Mikhail Mikhailovich

Dvigateli vnutrennego sgoraniya. t.1: Rabochiye protsessy v dvigatelyakh i ikh agregatakh (Internal Combustion Engines. v. 1: Working Processes in Engines and Their Units) 2d ed., rev. and enl. Moscow, Mashgiz, 1957. 396 p.

Ed.: (title page): Orlin, A.S , Professor; Reviewer: Mel'kumov, T.M.; Ed. (inside book): Yegorkina, L.I., Engineer; Tech. Ed.: Tikhanov, A.Ya.; Managing Ed. for Literature on Automobile, Tractor and Agricultural Machine-building (Mashgiz): Bauman, I.M.

PURPOSE: This book is written as a textbook for students of institutions of higher learning specializing in internal combustion engines, automobiles, tractors, marine engines and locomotives.

~~Card 1/11~~

326

Internal Combustion Engines. v.1: Working Processes (cont.)

COVERAGE: The authors give a brief historical survey of internal combustion engine development in the USSR and mentions the names of the principal designers and engine types built from 1901 to the present. Theoretical bases of contemporary engine cycles, combustion, intake, supercharging processes, fuel supply and engine control are discussed. The influences of the operational and design factors on the work of the engine are analyzed. Problems of power, efficiency, carburetion, transportation engine characteristics, and the bases of mixture formation in compression ignition engines and gas engines are discussed.

This book is a revised and enlarged edition of Dvigateli vnutrennego sgoraniya (Internal Combustion engines) Vol. I (Mashgiz, 1951). Particularly extensive revisions were made on Chapters III, V and IX. Chapters IV and VII have been rewritten. Chapters I and VII were written by Orlin, A.S.; Chapters II and IV by Vyrubov, D.N.; Chapter III by Vyrubov, D.N. and Leonov, O.B.; Chapter V by Vyrubov, D.N. (Sections 1-7),

Card 2/11

GUL'YEV, G.F., inzh.; KRIVCHENKO, Yu.S., inzh.; BOL'SHAKOV, V.A., inzh.; KUDRINA, A.P., inzh.; LEBEDEV, S.Ye., inzh.; CHIGRAY, I.D., inzh.; SERVETNIK, V.M., inzh.

Converter smelting with partial use of tap cinder. Stal' 24 no.10:881-884 O '64. (MIRA 17:12)

KRIVCHENKO, Yu.S., inzh.; SMOKTIY, V.V., inzh., BOL'SHAKOV, V.A., inzh.; LEBEDEV, S.Ye., inzh.

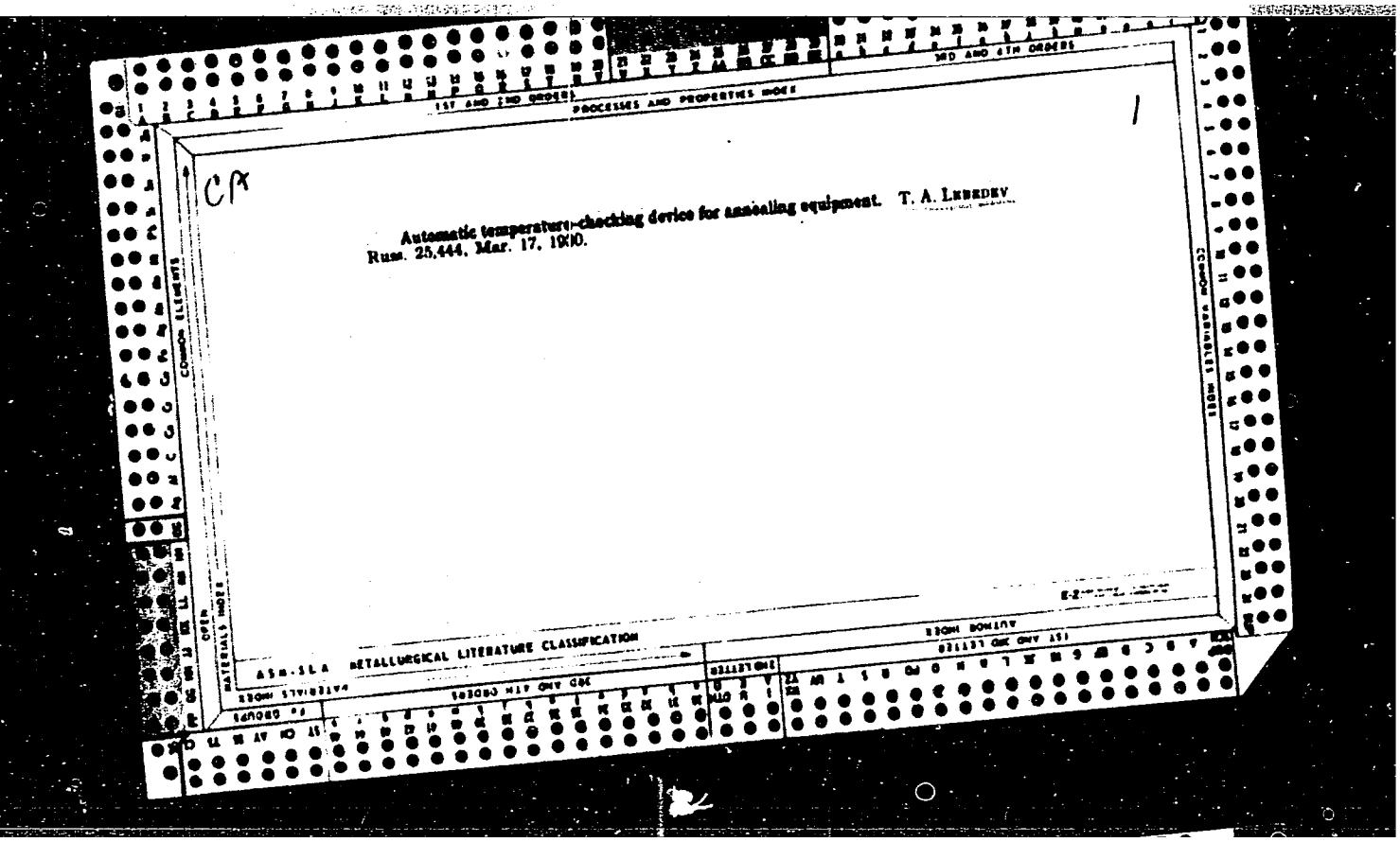
Using steel scrap in the oxygen-blown converter process. Stal' 24 no.2:134-136 F '64. (MIRA 17:9)

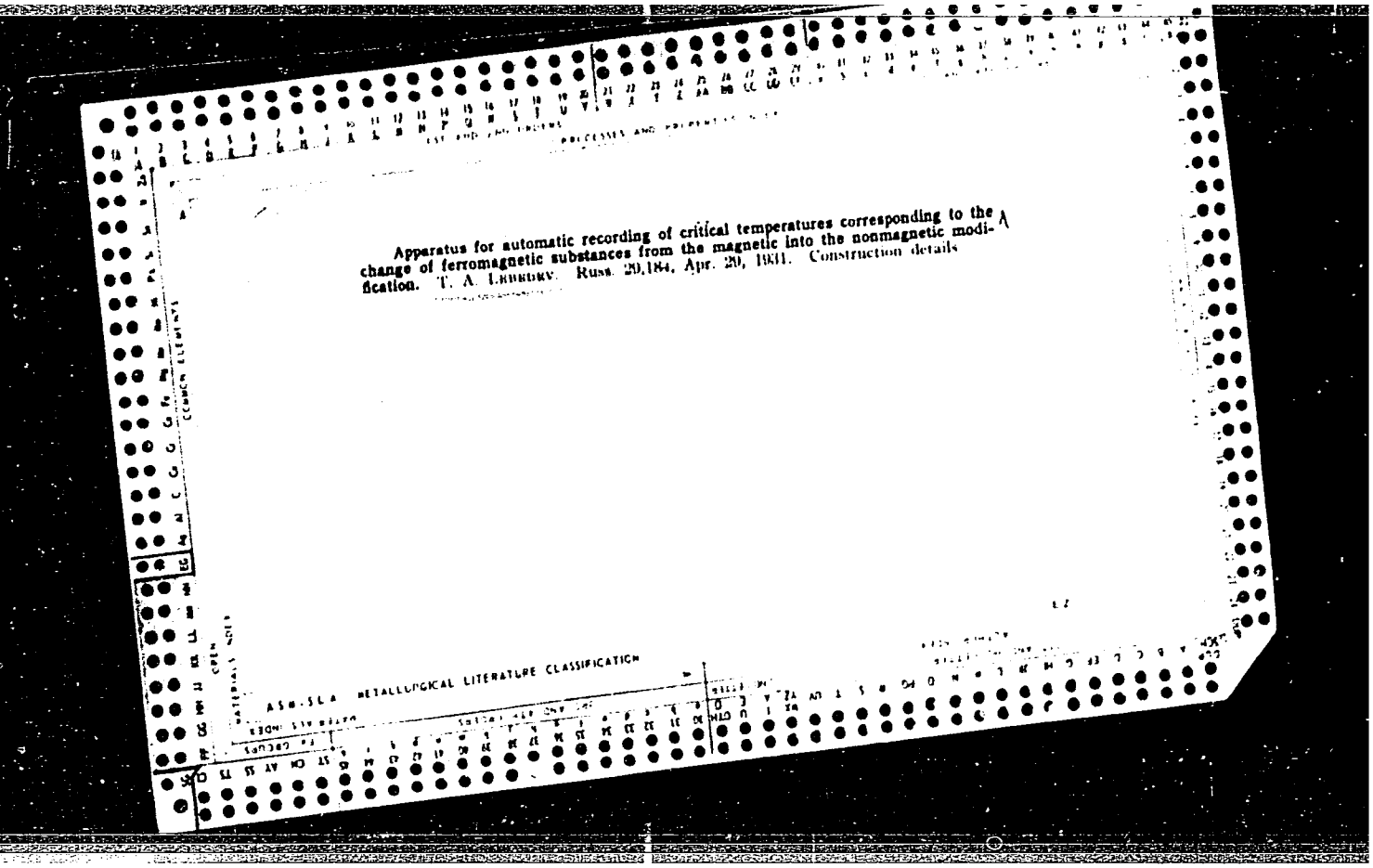
1. Krivorozhskiy metallurgicheskiy zavod i Tsentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii imeni I.P.Bardina.

ARVAN, Kh.L.; KORSUNOVSKIY, G.A.; LEBEDEV, S.Yu.

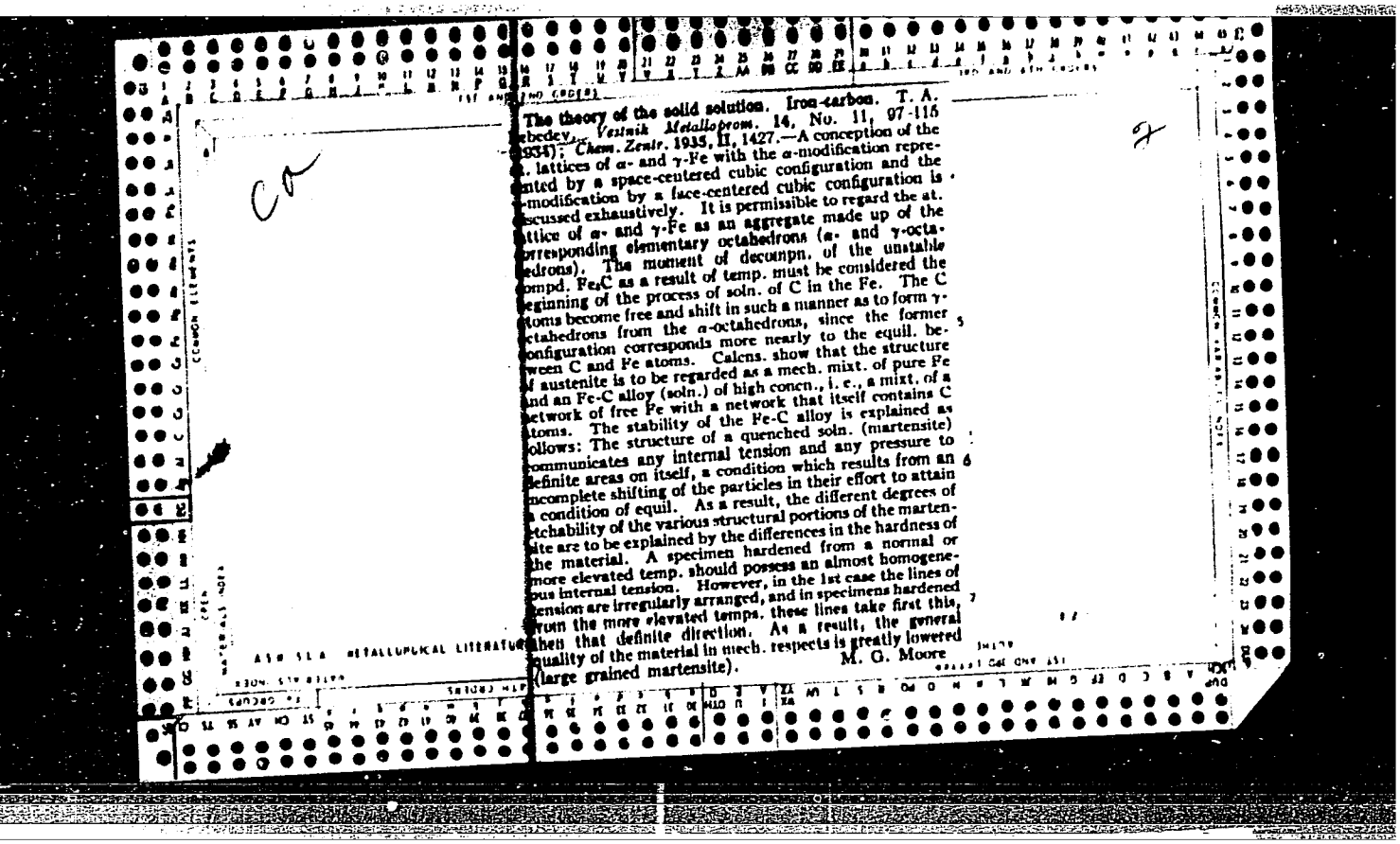
Photoreduction and demethylation of thiazine dyes on silica ash. (MIRA 14:7)
Dokl. AN SSSR 139 no.2:402-405 Jl '61.

1. Predstavleno akademikom A.N. Tereninym.
(Dyes and dyeing) (Thiazine) (Photochemistry)



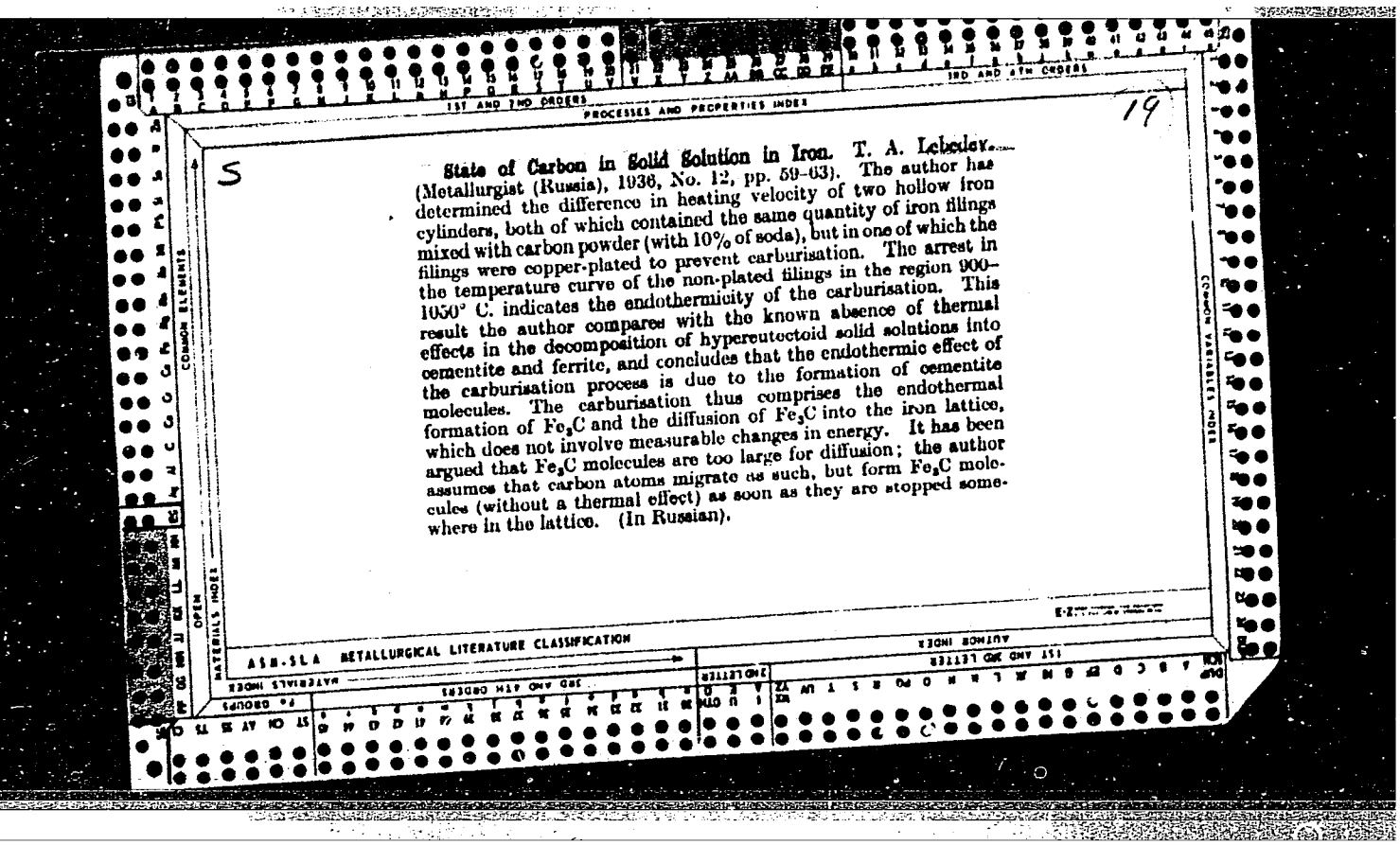


Apparatus for automatic recording of critical temperatures corresponding to the change of ferromagnetic substances from the magnetic into the nonmagnetic modification. T. A. Lebedev. Russ. 20,184, Apr. 20, 1911. Construction details



The theory of the solid solution. Iron-carbon. T. A. ebedev. *Vestnik Metallopromyshl.* 14, No. 11, 97-116 1934); *Chem. Zentr.* 1935, II, 1427.—A conception of the . lattices of α- and γ-Fe with the α-modification repre- nted by a space-centered cubic configuration and the -modification by a face-centered cubic configuration is scussed exhaustively. It is permissible to regard the at. ttice of α- and γ-Fe as an aggregate made up of the rresponding elementary octahedrons (α- and γ-octa- edrons). The moment of decompn. of the unstable mpd. Fe_3C as a result of temp. must be considered the eginning of the process of soln. of C in the Fe. The C toms become free and shift in such a manner as to form γ- ctahedrons from the α-octahedrons, since the former onfiguration corresponds more nearly to the equil. be- ween C and Fe atoms. Calcns. show that the structure austenite is to be regarded as a mech. mixt. of pure Fe nd an Fe-C alloy (soln.) of high concn., i. e., a mixt. of a etwork of free Fe with a network that itself contains C toms. The stability of the Fe-C alloy is explained as ollows: The structure of a quenched soln. (martensite) ommunicates any internal tension and any pressure to efinite areas on itself, a condition which results from an ncomplete shifting of the particles in their effort to attain condition of equil. As a result, the different degrees of tchability of the various structural portions of the marten- ite are to be explained by the differences in the hardness of he material. A specimen hardened from a normal or more elevated temp. should possess an almost homogene- ous internal tension. However, in the 1st case the lines of tension are irregularly arranged, and in specimens hardened rom the more elevated temps. these lines take first this hen that definite direction. As a result, the general uality of the material in mech. respects is greatly lowered (large grained martensite).

M. G. Moore



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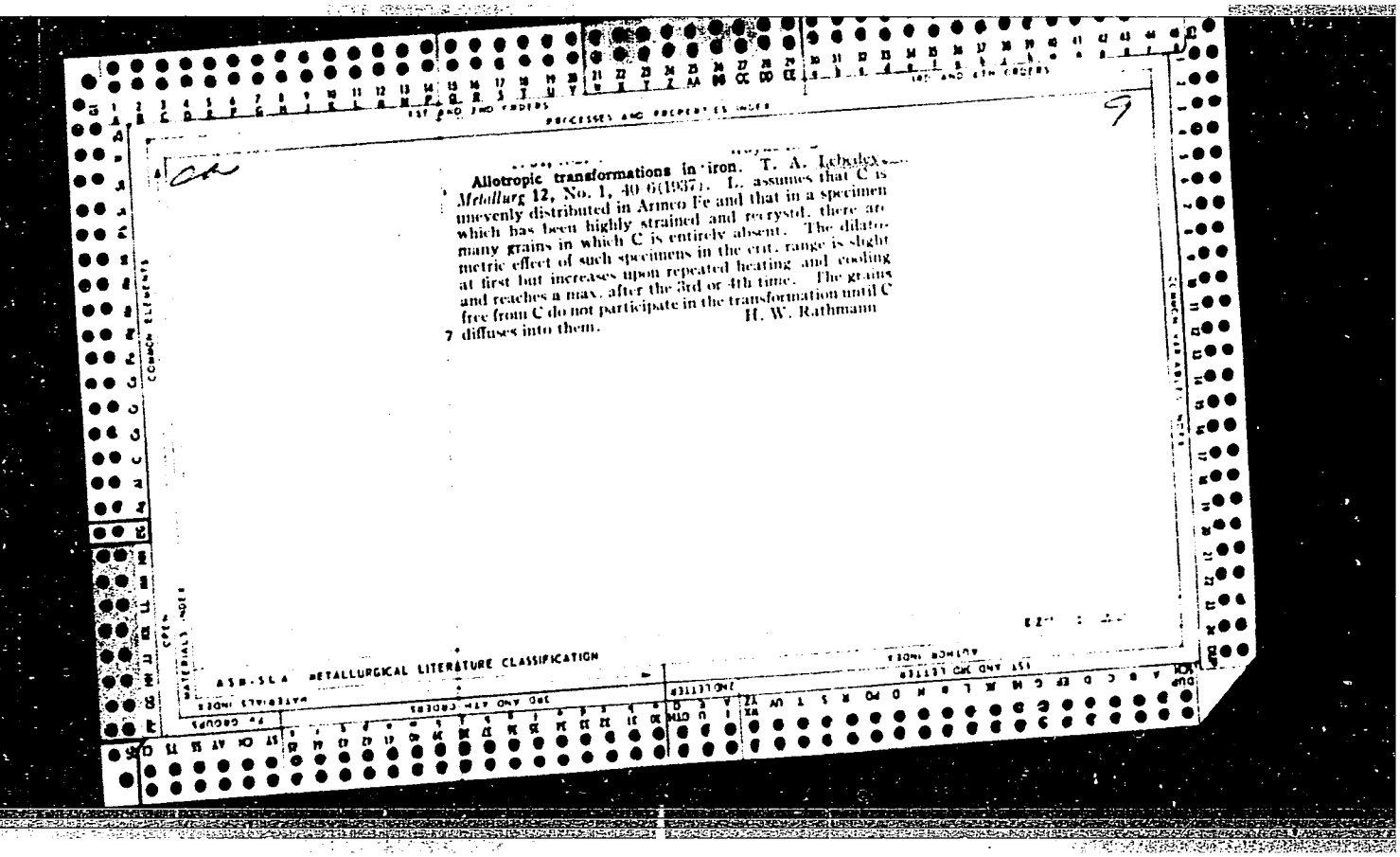
19

State of Carbon in Solid Solution in Iron. T. A. Lebedev. (Metallurgist (Russia), 1936, No. 12, pp. 59–63). The author has determined the difference in heating velocity of two hollow iron cylinders, both of which contained the same quantity of iron filings mixed with carbon powder (with 10% of soda), but in one of which the filings were copper-plated to prevent carburisation. The arrest in the temperature curve of the non-plated filings in the region 900–1050° C. indicates the endothermicity of the carburisation. This result the author compares with the known absence of thermal effects in the decomposition of hypereutectoid solid solutions into cementite and ferrite, and concludes that the endothermic effect of the carburisation process is due to the formation of cementite molecules. The carburisation thus comprises the endothermal formation of Fe_3C and the diffusion of Fe_3C into the iron lattice, which does not involve measurable changes in energy. It has been argued that Fe_3C molecules are too large for diffusion; the author assumes that carbon atoms migrate as such, but form Fe_3C molecules (without a thermal effect) as soon as they are stopped somewhere in the lattice. (In Russian).



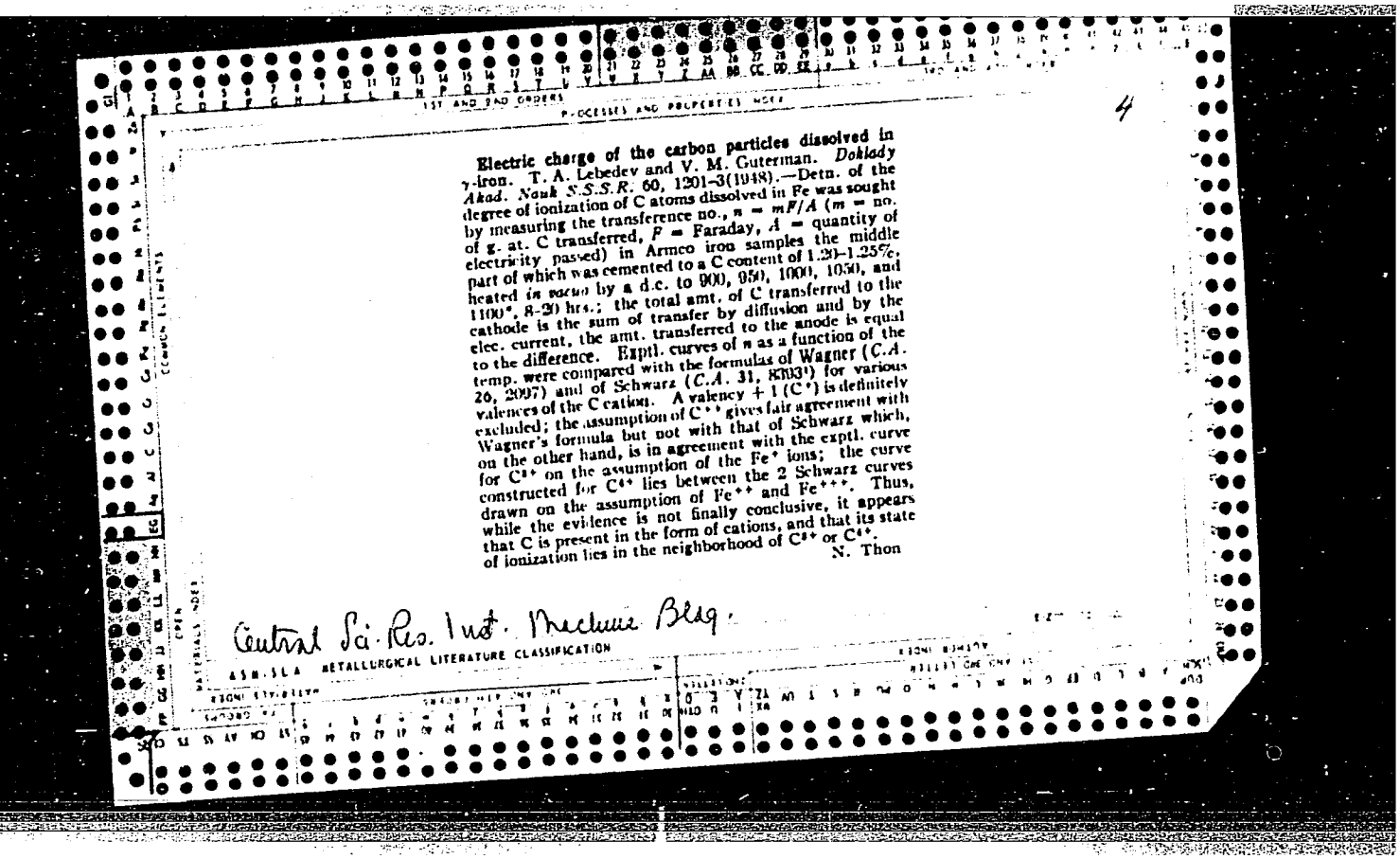
Allotropic transformations in iron. T. A. Ishaley. *Metallurg* **12**, No. 1, 40-6(1937). L. assumes that C is unevenly distributed in Armco Fe and that in a specimen which has been highly strained and recryst. there are many grains in which C is entirely absent. The dilatometric effect of such specimens in the crit. range is slight at first but increases upon repeated heating and cooling and reaches a max. after the 3rd or 4th time. The grains free from C do not participate in the transformation until C diffuses into them.

H. W. Rathmann

LEBEDEV, T. A.

25575. LEBEDEV, T. A.
"Elektroliz" Austenita. V sb: Korroziya, zashchita ot korrozii i elektroliz. M., 1948, s. 156-72. -- Bibliogr: 5 Nazv.

SO: Letopis' Zhurnal Statey, No. 30, Moscow, 1948



Electric charge of the carbon particles dissolved in γ-iron. T. A. Lebedev and V. M. Guterman. *Doklady Akad. Nauk S.S.S.R.* 60, 1201–3(1948).—Detn. of the degree of ionization of C atoms dissolved in Fe was sought by measuring the transference no., $n = mF/A$ (m = no. of g.-at. C transferred, F = Faraday, A = quantity of electricity passed) in Armco iron samples the middle part of which was cemented to a C content of 1.20–1.25%, heated *in vacuo* by a d.c. to 900, 950, 1000, 1050, and 1100°, 8–20 hrs.; the total amt. of C transferred to the cathode is the sum of transfer by diffusion and by the elec. current, the amt. transferred to the anode is equal to the difference. Exptl. curves of n as a function of the temp. were compared with the formulas of Wagner (*C.A.* 26, 2097) and of Schwarz (*C.A.* 31, 8803[1]) for various valences of the C cation. A valency +1 (C^+) is definitely excluded; the assumption of C^{++} gives fair agreement with Wagner's formula but not with that of Schwarz which, on the other hand, is in agreement with the exptl. curve for C^{3+} on the assumption of the Fe^+ ions; the curve constructed for C^{4+} lies between the 2 Schwarz curves drawn on the assumption of Fe^{++} and Fe^{+++}. Thus, while the evidence is not finally conclusive, it appears that C is present in the form of cations, and that its state of ionization lies in the neighborhood of C^{3+} or C^{4+}.

N. Thon

LE EDEV, TIMOFEI ALEKSEEVICH and I.A. REVIS.

Struktura i svoistva litogo instruments iz bystrorezhushchei stali. Moskva, Mashgiz, 1949. 109 p. illus.

Bibliography: p. 106-(108).

Structure and properties of cast high-speed steel instruments.

DLC: TA473.L4

SO: Manufacturing and Mechanical Engineering in the Soviet Union, Library of Congress, 1953.

LEBEDEV, T. A.

Mechanism of Diffusion in Substitutional Solid Solutions. T. A. Lebedev (*Doklady Akad. Nauk S.S.S.R.*, 1949, 65, (2), 163-165; *C. Abs.*, 1950, 44, 9760).—[In Russian]. A mechanism wherein the displacement of an element in a substitutional alloy is brought about in the act of rotation of a complex of atoms is used to account for the diffusion, in particular in the difficult instance of alloys of stoichiometric compn., e.g. $CuAl_2$, FeSi, &c. Calculations on a model show that the perturbation of the lattice produced by such a rotation is one-tenth or one-twelfth that caused by simple displacement of single atoms. The activation energy of rotation is lowered considerably if the complex involved is not one atomic layer thin, but represents a "packet" of several layers. That rotational can give rise to a unidirectional flow of a given atomic species is determined by the fact that a concentration gradient favours preferential rotation in a given sense. Rotations also account for back diffusion, which is brought about in the same way as the direct diffusion.

LEBEDEV, T.A.

PHASE I TRANSLATION BIBLIOGRAPHICAL REPORT AID 348 - I

BOOK Call No.: TN672.V8

Author: LEBEDEV, T.A. and SHEYN, A.S.

Full Title: STRUCTURE AND IMPACT TOUGHNESS OF STEEL TEMPERED AT THE CRITICAL TEMPERATURE INTERVAL

Transliterated Title: S truktura i udarnaya vyazkost' stali, zakalennoy iz kriticheskogo intervala

Publishing Data

Originating Agency: All-Union Scientific Engineering and Technical Society of Machine Builders. Urals Branch

Publishing House: State Scientific and Technical Publishing House of Machine Building Literature ("Mashgiz")

Date: 1950 No. of pp.: 12 No. of copies: 3,000

Text Data

This is an article from the book: VOPROSY TEORII I PRAKTIKI INZHENERNO-TEKHNICHESKOYA OBSHCHESTVO MASHINOSTROITELEY. URAL'SKOYE OBLASTNOYE, THERMAL TREATMENT OF METALS - Symposium of Conference (Termicheskaya obrabotka metallov, Materialy konferentsii) (pp. 167-177), see AID 223-II

Coverage: The author describes the formation of austenite with critical interval of temperatures for pre-and post-eutectoid steels of specific composition (types 30, 45, 15Kh and 20Kh15). The effect of the initial state on the process of austenite for-

Struktura i udarnaya vyazkost' stali, zakalennoy iz kriticheskogo intervala

AID 348 - I

[illegible]ation was studied with the pre-eutectoid steels possesing three different final structures: (1) ferrite and plastic pearlite, (2) ferrite and grained cementite and (3) needled martensite.

The structure of surface layer and central portion often differ materially because of the character of previous thermal treatments and the degree of their penetration. In rational thermal treatment of steel these facts must be considered.

The author analyses the effect of the previous structure on the character of transformation as applied to a few practical problems. 12 charts, 1 table, 4 microphotographs.

Purpose: For scientific workers
Facilities: None
No. of Russian and Slavic References: 4 (1936-46)
Available: Library of Congress.

LEBEDEV, T.A.

2139. Belyayev, V. I., and Lebedev, T. A. On the development of strain-hardening and [illegible] metal in cyclic tests on samples [illegible]

An investigation [illegible] test material was an engineering [illegible] samples were [illegible]

[illegible] exceed the fatigue [illegible] the microhardness increases during progress of the test in the neighborhood of the points most highly stressed [illegible] With increasing number of cycles the hardness begins [illegible] at the same time [illegible] hardness [illegible] increase of hardness is considered by the authors [illegible] of the material. The [illegible] station. The investigation [illegible] at a particular number [illegible] qualitative change takes place in the crystal lattice [illegible] "non elastic distortion" which is the cause of the appearance [illegible] the polished surface [illegible] the metal samples [illegible]

[illegible]

Translation [illegible] England

SOV/124-58-2-2408

Translation from: Referativnyy zhurnal, Mekhanika, 1958, Nr 2, p 119 (USSR)

AUTHOR: Lebedev, T.A.

TITLE: On the Cause of Fatigue and Creep of Metals (O prichine ustalosti i polzuchesti metallov)

PERIODICAL: Tr. Leningr. politekhn. in-ta, 1953, Nr 4, pp 138-153

ABSTRACT: The failure of a polycrystalline substance is considered as a process of severance of interatomic ties by stresses caused by external forces, as well as by temperature oscillations of the atoms and mechanical vibration of microvolumes of the substance. The basic nature of fatigue failures is explained in terms of the interference of local vibrations (the peaks of the vibrational stresses are added to the basic stresses). Creep failures are related to local temperature fluctuation. The author attempts to establish a qualitative connection between creep and fatigue phenomena by referring to the influence of the temperature oscillations of the atoms on the strength. The hypothesis on fatigue failure proposed here lacks substantiation. The dynamic laws governing the system of elementary volumes conceived here as comprising a body (specimen, actual articles) are not examined and

Card 1/2

hence, the concepts relative to the vibrational stress distribution remain indeterminate.

R. D. Vagapov

IEBEDEV, T. A.

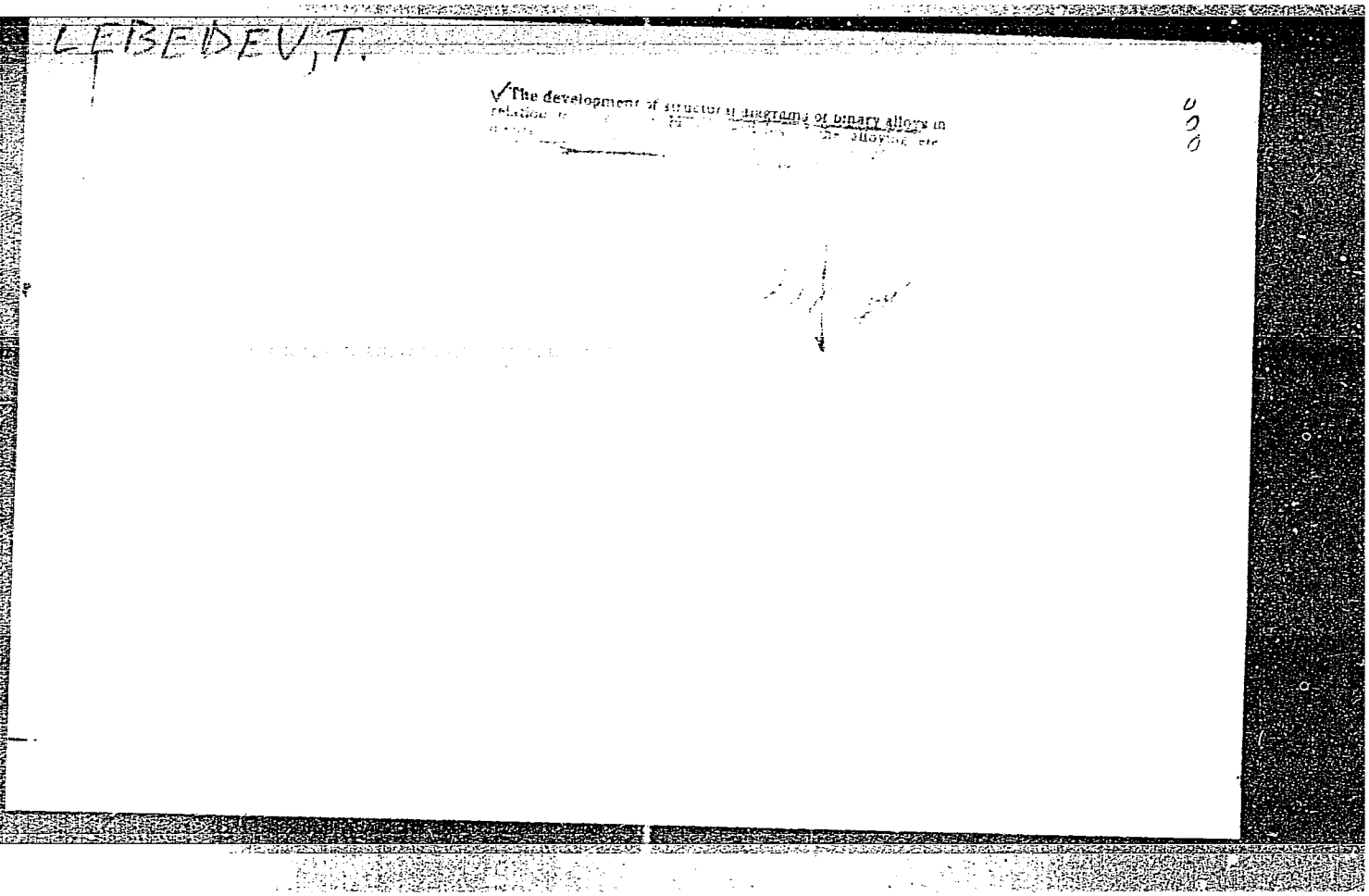
[illegible] Iebedev, T. A. O nekotorykh [illegible] v pravakh sovremennoy Italii. (Rasch. im. Tezisy dokladov). (L., 1954. 20 sm (Leningr. politekhn. in-t im. M. I. Kalinina). Bibl. --- Na pravakh rukopisi. l. 40 s. 200 ekz. --- (54-57767) 53

LEBEDEV, T. A. and MARINETS, T. K.

"Investigation of the Fatigue Process of Carbon Steel by Means of Controlling the Sagging of a Sample".
Tr. Leningr. politekhn. in-ta, No. 3, pp 135-149, 1954

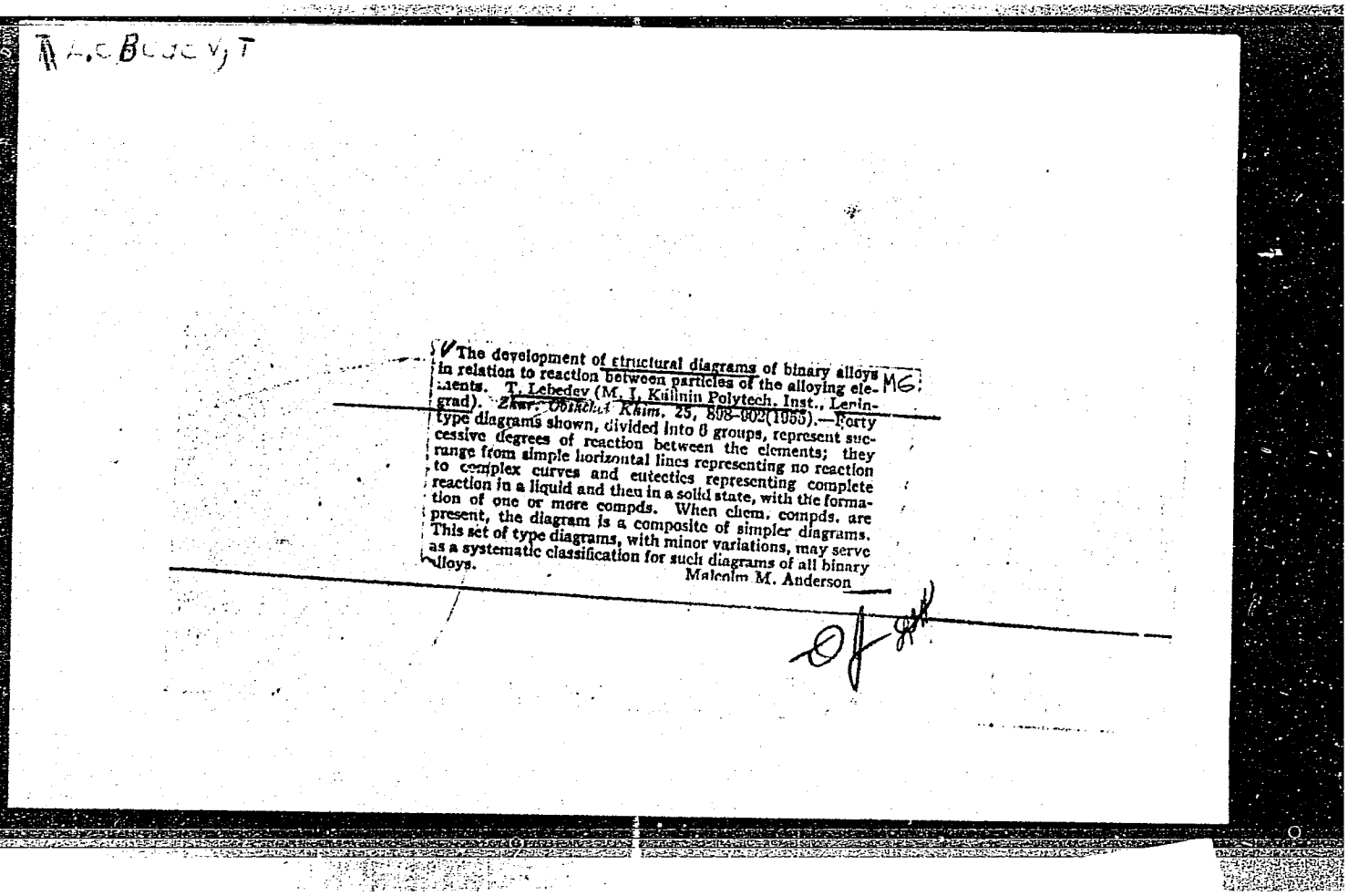
Indirect presentation on the nature and course of process of fatigue breakdown of steels was obtained by investigating the change of the amount of sag of cantilever samples (bending with rotation). Three basic stages in the course of the fatigue process are given. Bibliography, nine references. (RZhMekh, No, 8, 1955)

SO: Sum No 812, 6 Feb 1956



LEBEDEV, T.

✓The development of structural diagrams of binary alloys in



The development of structural diagrams of binary alloys in relation to reaction between particles of the alloying elements. T. Lebedev (M. I. Kalinin Polytech. Inst., Leningrad). *Zhur. Obshchei Khim.* 25, 898–902(1955).—Forty type diagrams shown, divided into 8 groups, represent successive degrees of reaction between the elements; they range from simple horizontal lines representing no reaction to complex curves and eutectics representing complete reaction in a liquid and then in a solid state, with the formation of one or more compds. When chem. compds. are present, the diagram is a composite of simpler diagrams. This set of type diagrams, with minor variations, may serve as a systematic classification for such diagrams of all binary alloys.

Malcolm M. Anderson

81472

S/123/60/000/05/02/009

18.5000

Translation from: Referativnyy zhurnal, Mashinostroyeniye, 1960, No 5, p 96, # 21484

AUTHORS: Lebedev, T.A., Revis, I.A.

TITLE: The Practice of Mechanical Machining of High-Manganese Steel With the Aid of HF-Currents

PERIODICAL: Nauchno-tekhn. inform. byul. Leningr. politekhn. in-t, 1958, No 11, pp 103 - 105

TEXT: It is reported that the valuable properties of the Γ13 (G13) high-manganese austenite steel make it suitable for the manufacture of machine parts operating under conditions of impact and dynamic loads. It is pointed out that a widespread use of this steel grade is prevented by its labor-consuming tooling during the cutting process. The authors cite test results of the mechanical machining of high-manganese steel with the aid of HF-currents, which were carried out with the aim to improve the machinability of this steel. The experiment was effected in such a way that an inductor was fitted in front of the cutting tool in the direction of chip removal, this inductor being connected

Card 1/2

81472

S/123/60/000/05/02/009

The Practice of Mechanical Machining of High-Manganese Steel With the Aid of HF-Currents

to a HF vacuum tube generator of 30kW power, with the aid of which the surface of the item to be machined was heated. The heating temperature of the surface of the corresponding zone of the article ranged from 750 to 800°C. Machining took place with BK8 (VK8) hard-alloy tools at a cutting speed of 25, 40 and 50 m/min, with a cutting depth of 4 mm and a feed of 0.6 mm/rev. The suggested tooling method of high-manganese steel facilitates the machinability of this steel; an uninterrupted chip was obtained during the machining, the tool durability proved to be satisfactory. No increased tool wear in connection with the heating of the machined steel was observed.

1 figure.

B.I.L.

Card 2/2

LEBEDEV, T. A.

PHASE I BOOK EXPLOITATION SOV/4375

Akademiya nauk SSSR. Institut metallurgii imeni A.A. Baykova

Ustalost' metallov; materialy soveshchaniya po ustalosti metallov 22-24 sentyabrya 1958 g. (Fatigue of Metals; Materials of the Conference on Fatigue of Metals, September 22-24, 1958) Moscow, 1960. 157 p. 3,500 copies printed.

Resp. Ed.: I.A. Oding, Corresponding Member, Academy of Sciences USSR; Ed. of Publishing House: A.N. Chernov; Tech. Ed.: I.N. Dorokhina.

PURPOSE: This collection of articles is intended for mechanical engineers, metallurgists, and scientific research workers.

COVERAGE: The collection contains discussions relating to fatigue failure of metals, fatigue in finished parts, and methods for testing endurance. Included are a critical review of existing theories on metal fatigue, some data on physical regularity patterns, and features of steel failure caused by fatigue. Possibilities for applying a new criterion to the notch sensitivity of metals and high-strength steels are investigated. The mechanism of failure due to corrosion fatigue of metals is discussed along with pertinent experimental data. Also presented are the results of testing the fatigue strength of such metal parts as large-size plates and various parts of machines used in the petroleum industry. Problems involved in testing metals for fatigue are examined. No personalities are mentioned. Each article is accompanied by bibliographic references, most of which are Soviet.

AVAILABLE: Library of Congress (TA460.A377).

Card 4/4

VK/vrc/mas
11-9-60

LEBEDEV, I.A.

PHASE I BOOK EXPLOITATION SOV/3559

Akademiya nauk SSSR. Institut metallurgii. Nauchnyy sovet po probleme zharoprochnykh splavov

Issledovaniya po zharoprochnym splavam, t. 5 (Investigations of Heat-Resistant Alloys, Vol 5) Moscow, Izd-vo AN SSSR, 1959. 425 p. Errata slip inserted. 2,000 copies printed.

Ed. of Publishing House: V.A. Klimov; Tech. Ed.: I.F. Kuz'min; Editorial Board: I.P. Bardin, Academician, G.V. Kurdyumov, Academician, N.V. Ageyev, Corresponding Member, USSR Academy of Sciences (Resp. Ed.), I.A. Oding, I.M. Pavlov, and I.F. Zudin, Candidate of Technical Sciences.

PURPOSE: This book is intended for metallurgical engineers, research workers in metallurgy, and may also be of interest to students of advanced courses in metallurgy.

COVERAGE: This book, consisting of a number of papers, deals with the properties of heat-resisting metals and alloys. Each of the papers is devoted to the study of the factors which affect the properties and behavior of metals. The effects of various elements such as Cr, Mo, and W on the heat-resisting properties of various alloys are studied. Deformability and workability of certain metals as related to the thermal conditions are the object of another study described. The problems of hydrogen embrittlement, diffusion and the deposition of ceramic coatings on metal surfaces by means of electrophoresis are examined. One paper describes the apparatus and methods used for growing monocrystals of metals. Boron-base metals are critically examined and evaluated. Results are given of studies of interatomic bonds and the behavior of atoms in metal. Tests of turbine and compressor blades are described. No personalities are mentioned. References accompany most of the articles.

4/5

10:7400

25904

S/123/61/000/013/001/025
A052/A101

AUTHORS: Lebedev, T. A.; Kolosov, I. Ye.

TITLE: Fatigue test of steel annealed samples in a state near to maximum hardening

PERIODICAL: Referativnyy zhurnal, Mashinostroyeniye, no. 13, 1961, 15, abstract 13A119 ("Nauchno-tekhn. inform. byul. Leningr. politekhn. in-ta, no. 5, 1960", 56-61)

TEXT: The effect of training on the fatigue strength of ХВГ (KhVG), У10А (U10A) and 65Г (65G) steel under conditions of a nearly maximum hardening has been investigated. The samples, which withstood 5-10 million cycles at the fatigue limit stress, have been subjected to a gradual increase of the load after a certain number of cycles. After the load causing destruction under such conditions has been determined for each grade of steel, a continuous training has been carried out at this load. It has been established, that at a stepwise increase of the load the training raises the cyclic strength by 40-50% over the fatigue limit. The magnitude of hardening depends on the training stress level.

V. Kolesnik

[Abstracter's note: Complete translation]

Card 1/1

LEBEDEV, T.A.

PHASE I BOOK EXPLOITATION SOV/6025

Soveshchaniye po ustalosti metallov. 2nd., Moscow, 1960.

Tsiklicheskaya prochnost' metallov; [illegible] vtorogo soveshchaniya po ustalosti metallov, 24 - 27 [illegible]. (Cyclic Fatigue Strength; Materials of the Second Conference on the Fatigue of Metals, held May 24 - 27, 1960) Moscow, Izd-vo AN SSSR, 1962. 338 p. Errata slip inserted. 2300 copies printed.

Resp. Ed.: I. A. Oding, Corresponding Member of the Academy of Sciences of the USSR; Ed. of Publishing House: A. M. Chernov; Tech. Ed.: A. P. Gusova.

PURPOSE: This collection of articles is intended for scientific research workers and metallurgists.

COVERAGE: The collection contains papers presented and discussed at the second conference on fatigue of metals, which was held at the Institute of Metallurgy in May 1960. [illegible] with the nature of fatigue fracture, the mechanism of formation

Card 1/0

Cyclic Metal Strength (Cont.) SOV/6025

and growth of fatigue cracks, the role of plastic deformation in fatigue fracture, an accelerated method of determining fatigue strength, the plotting of fatigue diagrams, and various fatigue test methods. New data are presented on the sensitivity of high-strength steel to stress concentration, the effect of stress concentration on the criterion of fatigue failure, the effect of the size factor on the strength of metal under cyclic loads, and results of endurance tests of various machine parts. Problems connected with cyclic metal toughness, internal friction, and the effect of corrosion media and temperature on the fatigue strength of metals are also discussed. No personalities are mentioned. Each article is accompanied by references, mostly Soviet.

TABLE OF CONTENTS:

NATURE OF FATIGUE FRACTURE

Card 2/ 2

S/563/62/000/219/001/002
E111/E483

AUTHORS: Ivanova, N.V., Lebedev, T.A.

TITLE: On the problem of the nature of phase transformations in metals and alloys

SOURCE: Leningrad. Politekhnicheskiy institut. Trudy. no.219. Moscow, 1962. Mashinostroyeniye, 108-114

TEXT: Although the ability to undergo allotropic transformations is generally regarded as an inherent property of certain metals, it has been implied by some workers that transformations of this type cannot occur in absolutely pure metals. Based on theoretical considerations and critical examination of established facts the following postulates are formulated:
1) Any phase transformation associated with a change in the crystal lattice of a metal takes place in a step-like fashion, one microvolume embracing a definite region of the crystal lattice being transformed at a time. 2) An isothermal transformation takes place under the action of foreign atoms diffusing into the original lattice, the formation of a saturated solid solution being a necessary condition for the onset of the transformation.
Card 1/2

3) A phase transformation which takes place within a temperature interval is, as a rule, associated with a change in the concentration of one of the phases present in the alloy; as a result, in this case, the transformation also takes place under the influence of foreign atoms diffusing from one phase to another.
4) Allotropic transformations must be regarded as ordinary phase transformations caused by small quantities of very active impurities present in the phase which is stable at low temperatures. There are 7 figures and 1 table.

S/137/62/000/011/028/045
A006/A101

AUTHORS: Lebedev, T. A., Kolosov, I. Ye.

TITLE: Fatigue tests of quenched steels

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 11, 1962, 67, abstract 11I433 (In collection: "Tsiklich. prochnost' metallov", Moscow AN SSSR, 1962, 42 - 47)

TEXT: The authors studied the behavior in fatigue tests of instruments steel grades У 10 А (U10A), ХВГ (KhVG) and 9ХС (9KhS). The specimens were subjected to conventional or isothermal quenching from 780°C (steel U10A) 830°C (steel KhVG) and 870°C (steel 9KhS), and tempering at 180°C for 1.5 to 2 hours. R$_c$ of the specimens was 60 - 62. The tests were performed on bracket machines ВУ-8 (VU-8) at a speed as high as 2,300 rpm. σ_w could not be established at the stresses used (from 120 - 130 to 65 - 75 kg/mm^2). The specimens broke down after many millions of cycles. The results of the tests show that a continuous relationship exists, within a range of 500 - 1,000 million cycles, which is expressed by a straight line in logarithmic coordinates. Tests with recording of

Card 1/2

Fatigue tests of quenched steels

S/137/62/000/011/028/045
A006/A101

the curve of deflection changes during the process of the cyclic effect, show that there are some differences between quenched steels and ductile materials in the process of fatigue failure.

I. Strebkov

[Abstracter's note: Complete translation]

Card 2/2

S/137/62/000/012/054/085
A006/A101

AUTHORS: Lebedev, T. A., Marinets, T. K., Yefremov, A. I.

TITLE: Investigating cyclic strength of metals by the method of recording fatigue diagrams

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 12, 1962, 104, abstract 12I638 (In collection: "Tsiklich. prochnost' metallov", Moscow, AN SSSR, 1962, 141 - 146)

TEXT: The authors investigated the cyclic strength of metals by recording fatigue diagrams. The investigations were made with specimens of annealed red copper (M2) (σ_{-1} 8.9 kg/mm^2), technically pure Fe (σ_{-1} 21 kg/mm^2) and Ti alloy, containing 2.5% Al (σ_{-1} 34 kg/mm^2). In the fatigue tests a device was used for recording the deflection of a bracket specimen; it was thus possible to record automatically the curves of varying deflections of the specimen in the fatigue process, directly during the test. These tests revealed some peculiarities in the behavior of the materials investigated during the process of their cyclic loading. Fatigue diagrams illustrate the development of cracks during

Card 1/2

S/137/62/000/012/054/085
A006/A101

Investigating cyclic strength of...

the second stage of cyclic loading. They show that the fatigue crack develops initially very slowly and only at the end of the second stage its development is considerably accelerated. The speed of the crack propagation depends mainly upon the magnitude of alternating loading. The data obtained are in a satisfactory agreement with the curves showing the growth of the fatigue crack, obtained by A. Forest on annealed steel specimens. The authors recommend the use of the proposed method for investigating the fatigue strength of metals for a large-scale material range. There are 8 references.

Z. Fridman

[Abstracter's note: Complete translation]

Card 2/2

S/124/63/000/001/070/080
D234/D308

AUTHORS: Lebedev, T.A., Marinets, T.K. and Yefremov, A.I.

TITLE: Investigation of cyclic strength of metals by recording the fatigue graphs

PERIODICAL: Referativnyy zhurnal, Mekhanika, no. 1, 1963, 75, abstract 1V582 (In collection: Tsiklich. prochnost' metallov. M., AN SSSR, 1962, 141-146)

TEXT: Using a special instrument (see in collection Issled. po zharoprochn. splavam. v. 5, M., AN SSSR, 1959, 143-149 - RZhMekh., 1961, 1V503) the variation of static deflection of a cantilever specimen was continuously recorded in durability tests. New data are obtained on development of fatigue damage in the process of testing. Accumulation of damage, starting with the first cycles of the test, was detected. The authors show the irreversible character of damage accumulation after a certain number of cycles, which oscillates within a wide range for different metals. For instance, the number of

Card 1/2

Investigation of cyclic strength ...

cycles for initial formation of a fatigue crack is 2% for 30 steel, 30% for titanium and 97% for austenite steel (% of the total number of cycles before breakdown). 8 references.
[Abstracter's note: Complete translation]

Card 2/2

KOLOSOV, I.Ye., kand.tekhn.nauk; LEBEDEV, T.A., doktor tekhn.nauk

Cyclic strength of hardened tool steels. Metalloved. i term. obr. met. no.10:15-19 O '62. (MIRA 15:10)

1. Leningradskiy politekhnicheskiy institut.
(Tool steel—Fatigue)

IVANOVA, N.V.; LEBEDEV, T.A.

Nature of phase transformations in metals and alloys. (MIRA 15:12)
Trudy LPI no.219:108-114 '62.
(Metallography)

ACCESSION NR: AP4010069 S/0129/64/000/001/0019/0023

AUTHOR: Lebedev, T. A.; Parshin, A. M.; Kolosov, I. Ye.; Pechnikov, I. I.

TITLE: Heat resistance of titanium-stabilized austenitic chrome-nickel steel

SOURCE: Metallovedeniye i termicheskaya obrabotka metallov, no. 1, 1964, 19-23

TOPIC TAGS: steel plasticity, fine-grained steel, coarse-grained steel, X18H9T steel, austenitic steel, titanium-carbon ratio, arsenic, antimony, sulfur, phosphorus

ABSTRACT: An investigation of the durability and plasticity of X18H9T steel revealed that its coarse grain prolongs the durability in some cases, shortens it in others and leaves it unchanged in still others. It was also found that the durable stability and plasticity of the steel are to some extent determined by the titanium-carbon ratio $(\frac{Ti}{C})$ in the steel. A ratio of $\frac{Ti}{C} > 4 - 5$ tends to reduce the

Card 1/2

ACCESSION NR: AP4010069

durability and plasticity of coarse-grained steel. The durable plasticity of coarse-grained steel is considerably shorter than that of fine-grained steel. An increase in the titanium content of coarse-grained steel reduces its deformation capacity, but fine-grained steel, whether produced commercially or in laboratory, is not affected by excessive titanium. Such low-melting impurities as lead, tin, antimony and arsenic, even in small quantities, have an adverse effect on the heat-resisting properties of austenitic steel. Laboratory-produced steel is found to be more durable than commercial steel because it contains fewer impurities. The use of very fine-grained steel for durable products to be used at high temperatures is undesirable. Fine-grained steel becomes brittle at room temperature after prolonged aging at high temperatures. Orig. art. has: 2 figures and 1 table.

ASSOCIATION: none

SUBMITTED: 00 DATE ACQ: 07Feb64 ENCL: 00

SUB CODE: ML, AP NO REF SOV: 011 OTHER: 001

Card 2/2

L 27818-65 EWT(d)/EWT(m)/EWP(w)/EWA(d)/T/EWP(t)/EWP(b) MJW/JD/EM

ACCESSION NR: AT5003066 S/2563/64/000/236/0047/0053

27
17
6+1

AUTHOR: Lebedev, T.A.; Marinets, T.K.; Mal'kevich, A.V.

TITLE: Evaluating the strength of metals working under unstable thermal regimes

SOURCE: Leningrad. Politekhnicheskiy institut. Trudy, no. 236, 1964. Konstruktsii i raschety mashin (Designing of machinery), 47-53

TOPIC TAGS: work capacity, metal strength, metal failure, triangular heat cycle, cyclic strength test

16

ABSTRACT: Evaluation of individual contributions to the loss in work capacity of materials is based on the assumptions that: 1. these losses at individual temperature levels are independent; 2. the time to failure is independent of the number of cycles; 3. damage to the material accumulates gradually; 4. within a definite temperature range there is a linear dependence between: a. stress and time to failure for a constant temperature, and b. temperature and time to failure for a constant stress. EI661 alloy was subjected to cyclic strength testing at constant temperatures of 800 and 900C and under a continuous temperature change over a 16-minute triangular cycle in the 800-900C range. There was a 15% variance between experimental and calculated data.

Card 1/2

L 27818-65

ACCESSION NR: AT5003066

Other comparisons made with EI661, EI415 and EI572 alloys did not vary by more than 20%. A mathematical development is given for determining loss in strength taking into account differences between typical and actual temperature regimes. It is recommended that preliminary strength calculations be made by evaluating individual units of loss in work capacity during the period of a single deviation of temperature from normal. Refinement of strength calculations must be made by calculating stresses cited using experimental values for the coefficient of relative work capacity. Orig. art. has: 13 formulas, 1 table and 2 figures.

ASSOCIATION: Leningradskiy politekhnicheskiy institut imeni M.I. Kalinina (Leningrad polytechnic institute)

SUBMITTED: 00 ENCL: 00 SUB CODE: MM

NO REF SOV: 001 OTHER: 001

Card 2/2

IVANOV, G.P.; LEBEDEV, T.A.

Physical meaning of Pisson's coefficient. Trudy LPI no.236: 38-46 '64. (MIRA 18:3)

LEBEDEV, T.A.; MARINETS, T.K.; MAL'KEVICH, A.V.

Evaluating the strength of metals working under unsteady thermal conditions. Trudy LPI no.236:47-53 '64. (MIRA 18:3)

L 23038-66 EWT(m)/EWP(w)/EWA(d)/T/EWP(t) IJP(c) JD/HW/GS

ACC NR: AT6008673 (N) SOURCE CODE: UR/0000/65/000/000/0277/0285

AUTHORS: Lebedev, T. A. (Leningrad); Marinets, T. K. (Kiev); Mal'kevich, A. V. (Kiev)

ORG: none

TITLE: Cyclic strength of some heat-resistant materials under variable temperature regimes

SOURCE: Vsesoyuznoye soveshchaniye po voprosam staticheskoy i dinamicheskoy prochnosti materialov i konstruktsionnykh elementov pri vysokikh i nizkikh temperaturakh, 3d. Termoprochnost' materialov i konstruktsionnykh elementov (Thermal strength of materials and construction elements); materialy soveshchaniya. Kiev, Naukova dumka, 1965, 277-285

TOPIC TAGS: stress analysis, cyclic test, high temperature material, steel, thermal stress, fatigue test/ EI415 steel, EI572 steel, EI661 alloy, UKT-3000 testing machine, LPI-regulator

ABSTRACT: The cyclic strengths of three alloys were determined under variable temperature conditions. The alloys were: a pearlite EI415, an austenite EI572, and a nickel-base alloy EI661. The fatigue tests were made on a UKT-3000 type force-field rotating machine. A total of 7 different types of variable heat inputs were used. These consisted of sinusoidal, triangular, trapezoidal, and other temperature pulses. The fatigue life of all three specimens was measured quantitatively according to the

Card 1/2