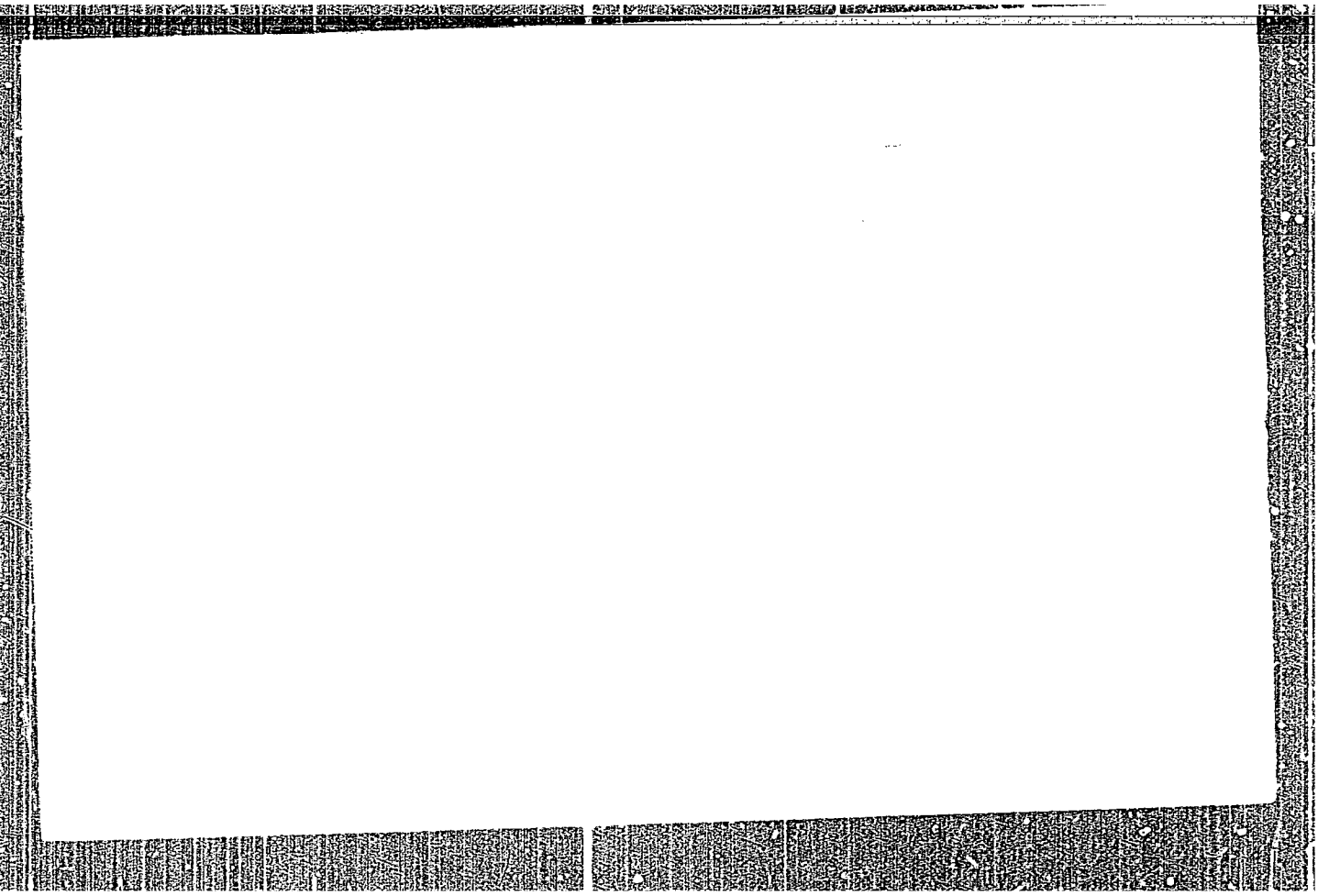
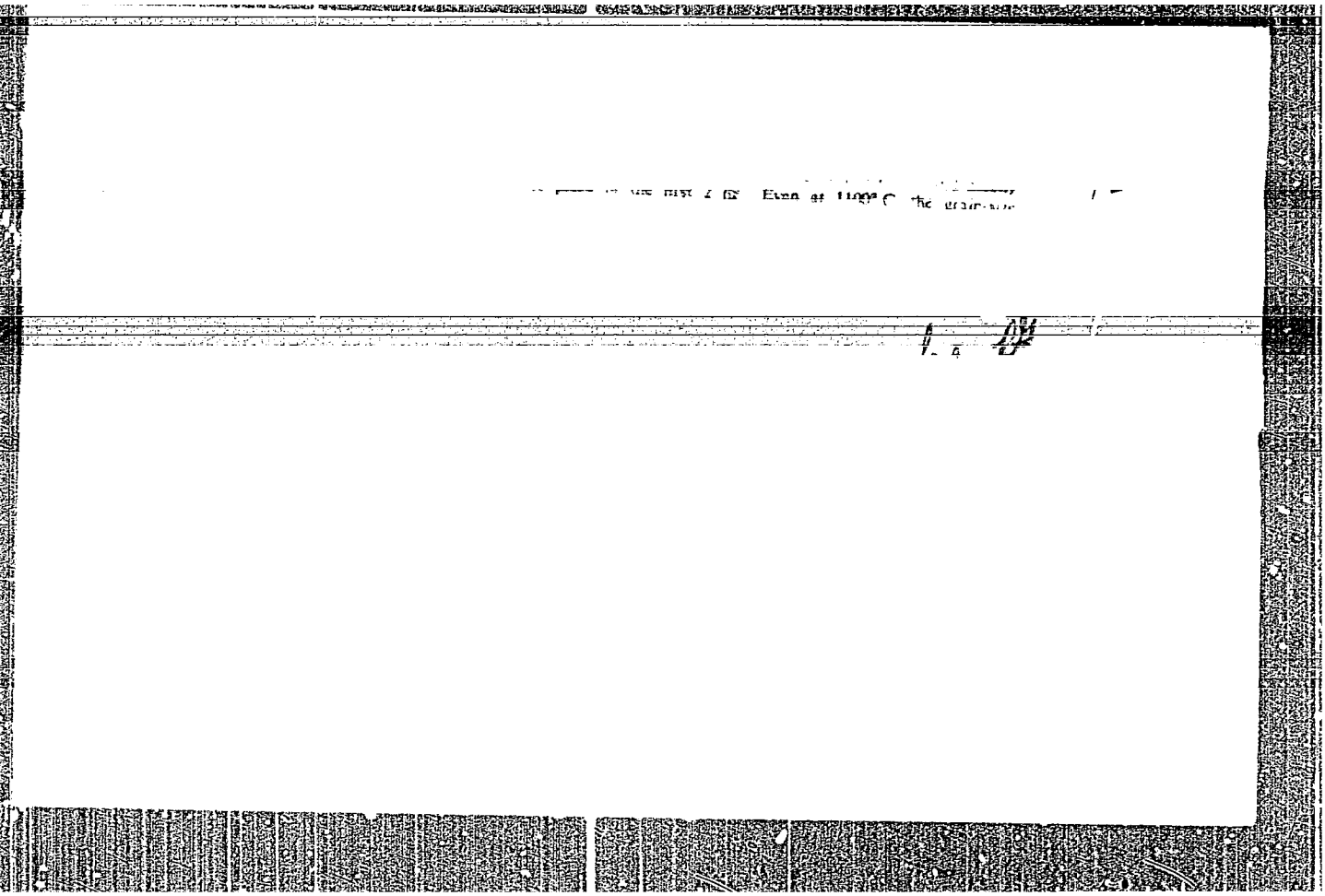
ACC NR: AP6036839

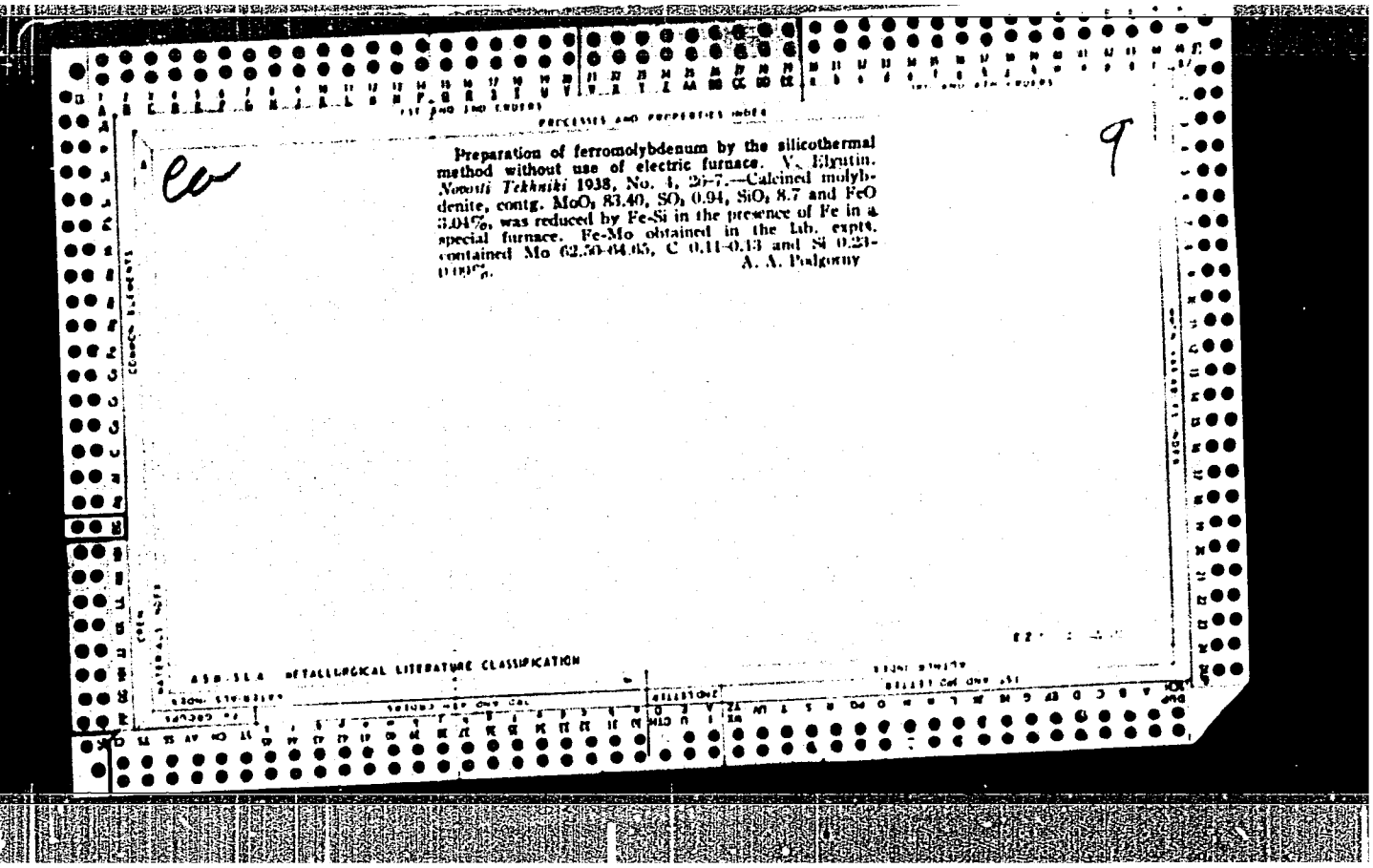
structure. The results indicate that the observed high resistivity of the alloys is connected with the structure of the metastable γ' phase and depends on the nature of the alloying elements. The necessary condition for obtaining the γ' phase is quenching from the unstable β phase which exists in such alloys. The resistivity decreased as a rule with increasing atomic number of the additive, and increased very strongly with increasing atomic percentage of the additive. This report was presented by Academician G. V. Kurdyumov 4 February 1966. Orig. art. has: 3 figures and 2 tables.

SUB CODE: 20, 11/ SUBM DATE: 03Feb66/ ORIG REF: 007/ OTH REF: 005

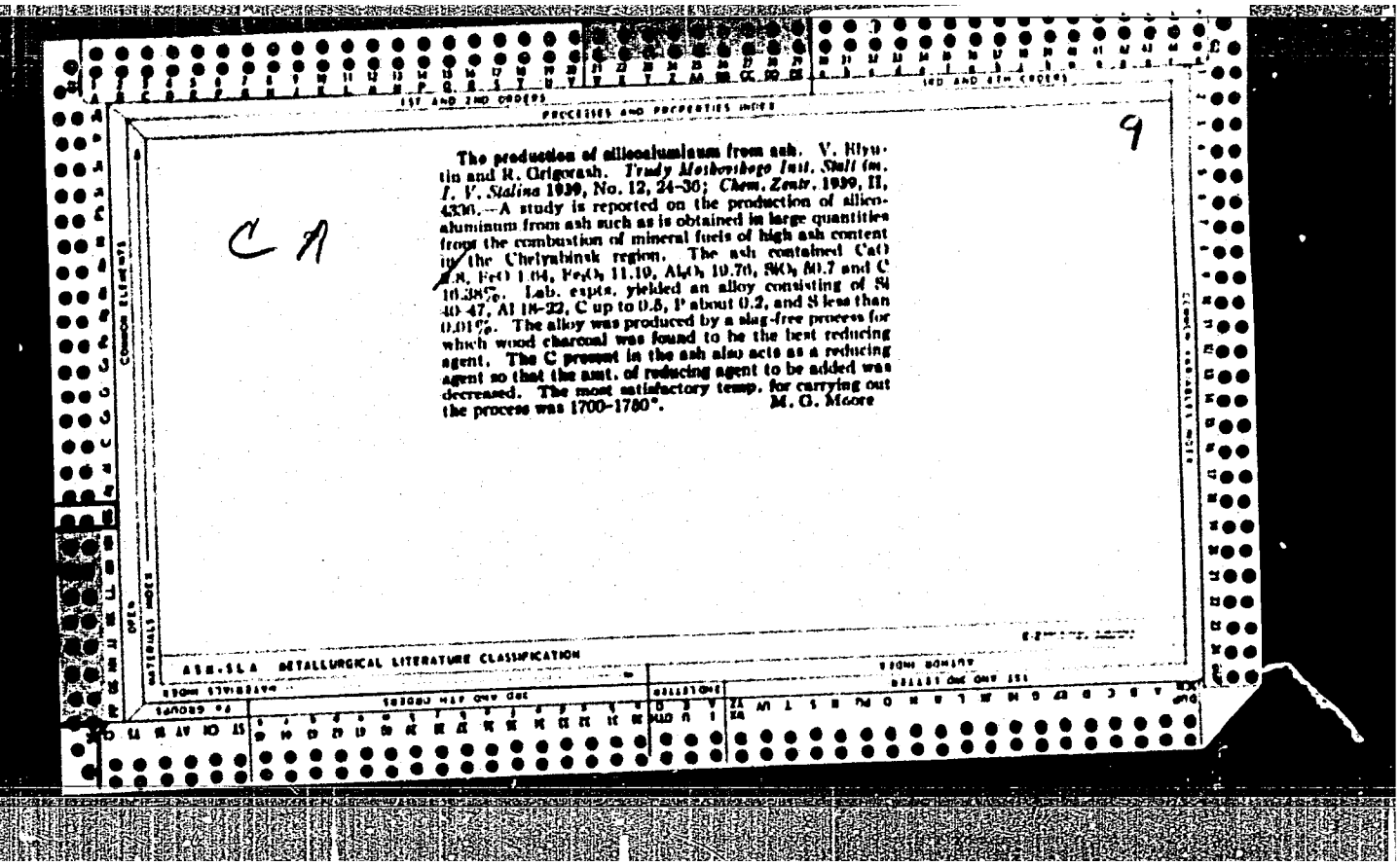
Card 2/2







Preparation of ferromolybdenum by the silicothermal method without use of electric furnace. V. Elyutin. *Novosti Tekhniki* 1938, No. 1, 25-7.—Calcined molybdenite, contg. MoO_3 83.40, SO, 0.94, SiO_2 8.7 and FeO 3.04%, was reduced by Fe-Si in the presence of Fe in a special furnace. Fe-Mo obtained in the lab. exptl. contained Mo 62.50-64.65, C 0.11-0.13 and Si 0.23-0.18%.
A. A. Polgonny



CA

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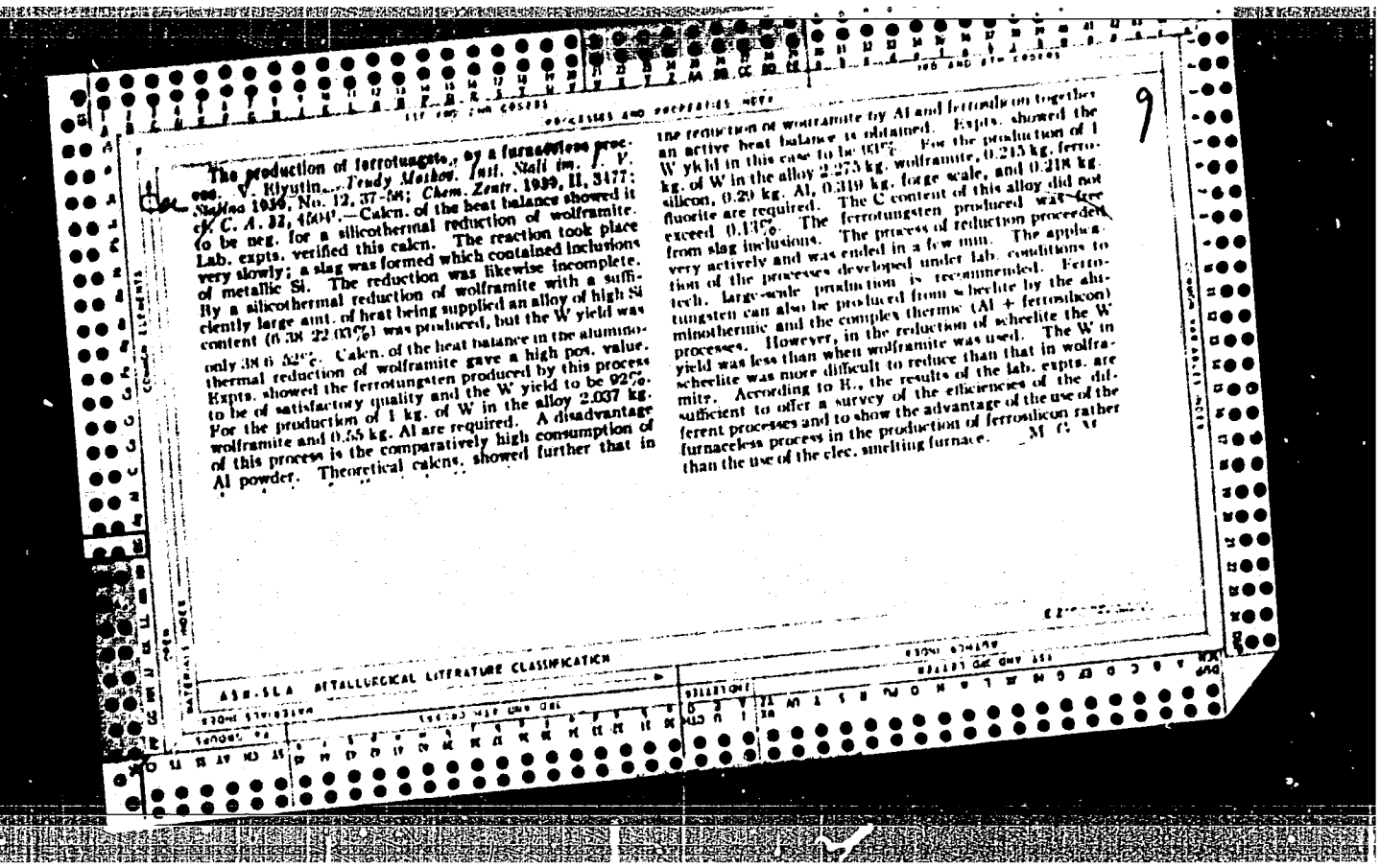
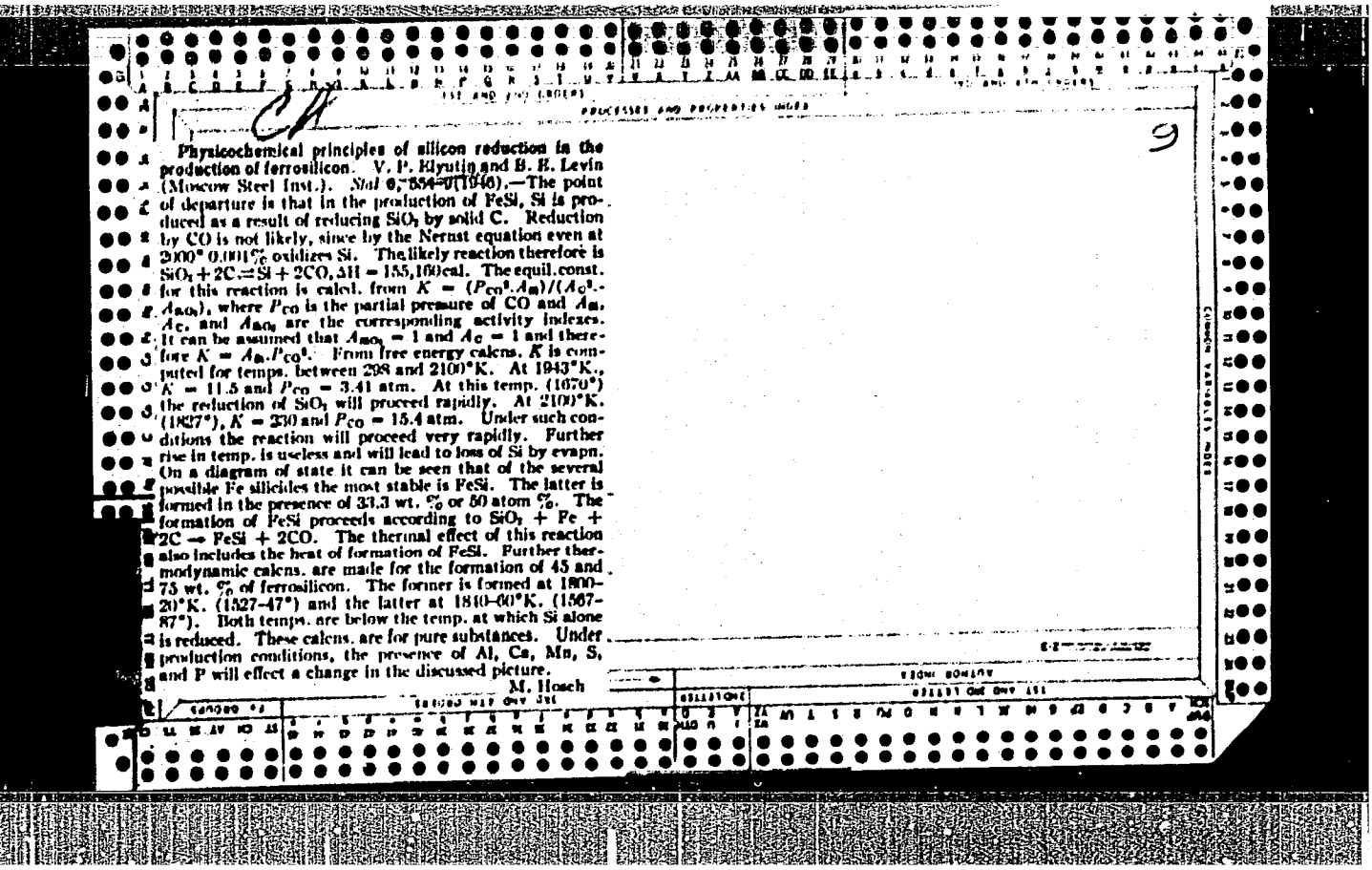
The production of silicoaluminum from ash. V. Ryutin and R. Grigorash. *Trudy Mosheshego Inst. Stali im. I. V. Stalina* 1939, No. 12, 24–30; *Chem. Zentr.* 1939, II, 4330.—A study is reported on the production of silicoaluminum from ash such as is obtained in large quantities from the combustion of mineral fuels of high ash content in the Chelyabinsk region. The ash contained CaO 7.8, FeO 1.04, Fe_2O_3 11.19, Al_2O_3 19.70, SiO_2 50.7 and C 10.38%. Lab. expts. yielded an alloy consisting of Si 40–47, Al 18–22, C up to 0.8, P about 0.2, and S less than 0.01%. The alloy was produced by a slag-free process for which wood charcoal was found to be the best reducing agent. The C present in the ash also acts as a reducing agent so that the amt. of reducing agent to be added was decreased. The most satisfactory temp. for carrying out the process was 1700–1780°.

M. G. Moore

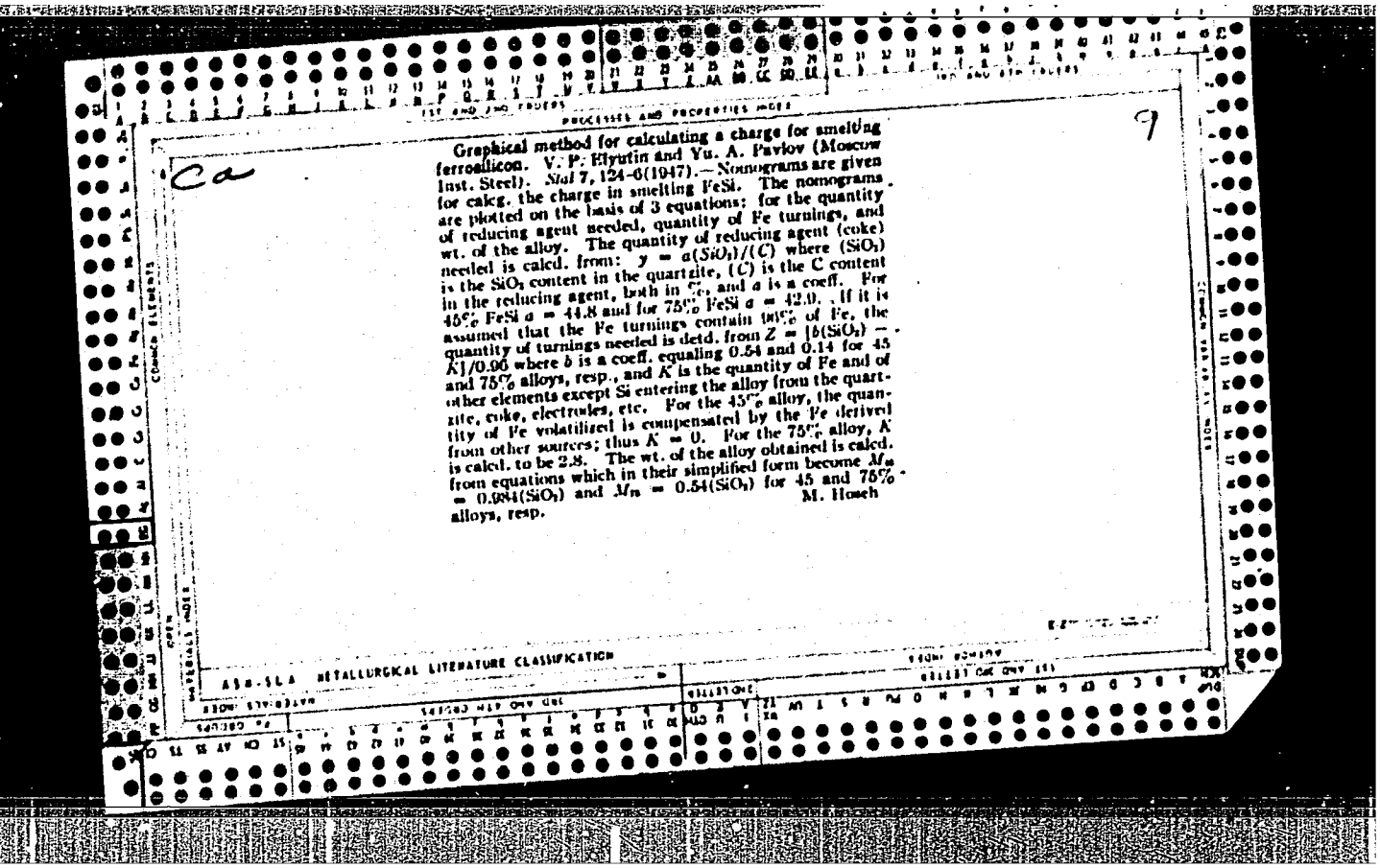


The production of ferrotungsten by a furnaceless proc-
ess. V. Klyutin. *Trudy Moskov. Inst. Stali im. I. V.*
Stalina 1939, No. 12, 37–58; *Chem. Zentr.* 1939, II, 3477;
cf. *C. A.* 32, 4604⁹.—Calcn. of the heat balance showed it
to be neg. for a silicothermal reduction of wolframite.
Lab. expts. verified this calcn. The reaction took place
very slowly; a slag was formed which contained inclusions
of metallic Si. The reduction was likewise incomplete.
By a silicothermal reduction of wolframite with a suffi-
ciently large amt. of heat being supplied an alloy of high Si
content (0.38 22.03%) was produced, but the W yield was
only 38.6 42%. Calcn. of the heat balance in the alumino-
thermal reduction of wolframite gave a high pos. value.
Expts. showed the ferrotungsten produced by this process
to be of satisfactory quality and the W yield to be 92%.
For the production of 1 kg. of W in the alloy 2.037 kg.
wolframite and 0.55 kg. Al are required. A disadvantage
of this process is the comparatively high consumption of
Al powder. Theoretical calcns. showed further that in
the reduction of wolframite by Al and ferrosilicon together
an active heat balance is obtained. Expts. showed the
W yield in this case to be 95%. For the production of 1
kg. of W in the alloy 2.273 kg. wolframite, 0.215 kg. ferro-
silicon, 0.29 kg. Al, 0.319 kg. forge scale, and 0.218 kg.
fluorite are required. The C content of this alloy did not
exceed 0.13%. The ferrotungsten produced was free
from slag inclusions. The process of reduction proceeded
very actively and was ended in a few min. The applica-
tion of the processes developed under lab. conditions to
tech. large-scale production is recommended. Ferro-
tungsten can also be produced from scheelite by the alu-
minothermic and the complex thermic (Al + ferrosilicon)
processes. However, in the reduction of scheelite the W
yield was less than when wolframite was used. The W in
scheelite was more difficult to reduce than that in wolfra-
mite. According to B., the results of the lab. expts. are
sufficient to offer a survey of the efficiencies of the dif-
ferent processes and to show the advantage of the use of the
furnaceless process in the production of ferrosilicon rather
than the use of the elec. smelting furnace. M. G. M.



Physicochemical principles of silicon reduction in the production of ferrosilicon. V. P. Klyutin and B. E. Levin (Moscow Steel Inst.). *Stal* 6, 354–9(1946).—The point of departure is that in the production of FeSi, Si is produced as a result of reducing SiO_2 by solid C. Reduction by CO is not likely, since by the Nernst equation even at 2000° 0.001% oxidizes Si. The likely reaction therefore is $SiO_2 + 2C \rightleftharpoons Si + 2CO$, $\Delta H = 155{,}160$ cal. The equil. const. for this reaction is calcd. from $K = (P_{CO}^2 \cdot A_M)/(A_C^2 \cdot A_{SiO_2})$, where P_{CO} is the partial pressure of CO and A_M, A_C, and A_{SiO_2} are the corresponding activity indexes. It can be assumed that $A_{SiO_2} = 1$ and $A_C = 1$ and therefore $K = A_M \cdot P_{CO}^2$. From free energy calcns. K is computed for temps. between 298 and 2100°K. At 1943°K., $K = 11.5$ and $P_{CO} = 3.41$ atm. At this temp. (1670°) the reduction of SiO_2 will proceed rapidly. At 2100°K. (1827°), $K = 230$ and $P_{CO} = 15.4$ atm. Under such conditions the reaction will proceed very rapidly. Further rise in temp. is useless and will lead to loss of Si by evapn. On a diagram of state it can be seen that of the several possible Fe silicides the most stable is FeSi. The latter is formed in the presence of 33.3 wt. % or 50 atom %. The formation of FeSi proceeds according to $SiO_2 + Fe + 2C \rightarrow FeSi + 2CO$. The thermal effect of this reaction also includes the heat of formation of FeSi. Further thermodynamic calcns. are made for the formation of 45 and 75 wt. % of ferrosilicon. The former is formed at 1800–20°K. (1527–47°) and the latter at 1810–60°K. (1567–87°). Both temps. are below the temp. at which Si alone is reduced. These calcns. are for pure substances. Under production conditions, the presence of Al, Ca, Mn, S, and P will effect a change in the discussed picture.

M. Hosch



Ca

Graphical method for calculating a charge for smelting ferroalloys. V. P. Elyutin and Yu. A. Pavlov (Moscow Inst. Steel). *Stal* 7, 124-6(1947).—Nomograms are given for calcg. the charge in smelting FeSi. The nomograms are plotted on the basis of 3 equations: for the quantity of reducing agent needed, quantity of Fe turnings, and wt. of the alloy. The quantity of reducing agent (coke) needed is calcd. from: $y = a(SiO_2)/(C)$ where (SiO_2) is the SiO_2 content in the quartzite, (C) is the C content in the reducing agent, both in %, and a is a coeff. For 45% FeSi a = 44.8 and for 75% FeSi a = 42.0. If it is assumed that the Fe turnings contain 100% of Fe, the quantity of turnings needed is detd. from $Z = [b(SiO_2) - K]/0.96$ where b is a coeff. equaling 0.54 and 0.14 for 45 and 75% alloys, resp., and K is the quantity of Fe and of other elements except Si entering the alloy from the quartzite, coke, electrodes, etc. For the 45% alloy, the quantity of Fe volatilized is compensated by the Fe derived from other sources; thus $K = 0$. For the 75% alloy, K is calcd. to be 2.8. The wt. of the alloy obtained is calcd. from equations which in their simplified form become $M_a = 0.984(SiO_2)$ and $M_a = 0.54(SiO_2)$ for 45 and 75% alloys, resp.

M. Hoseh

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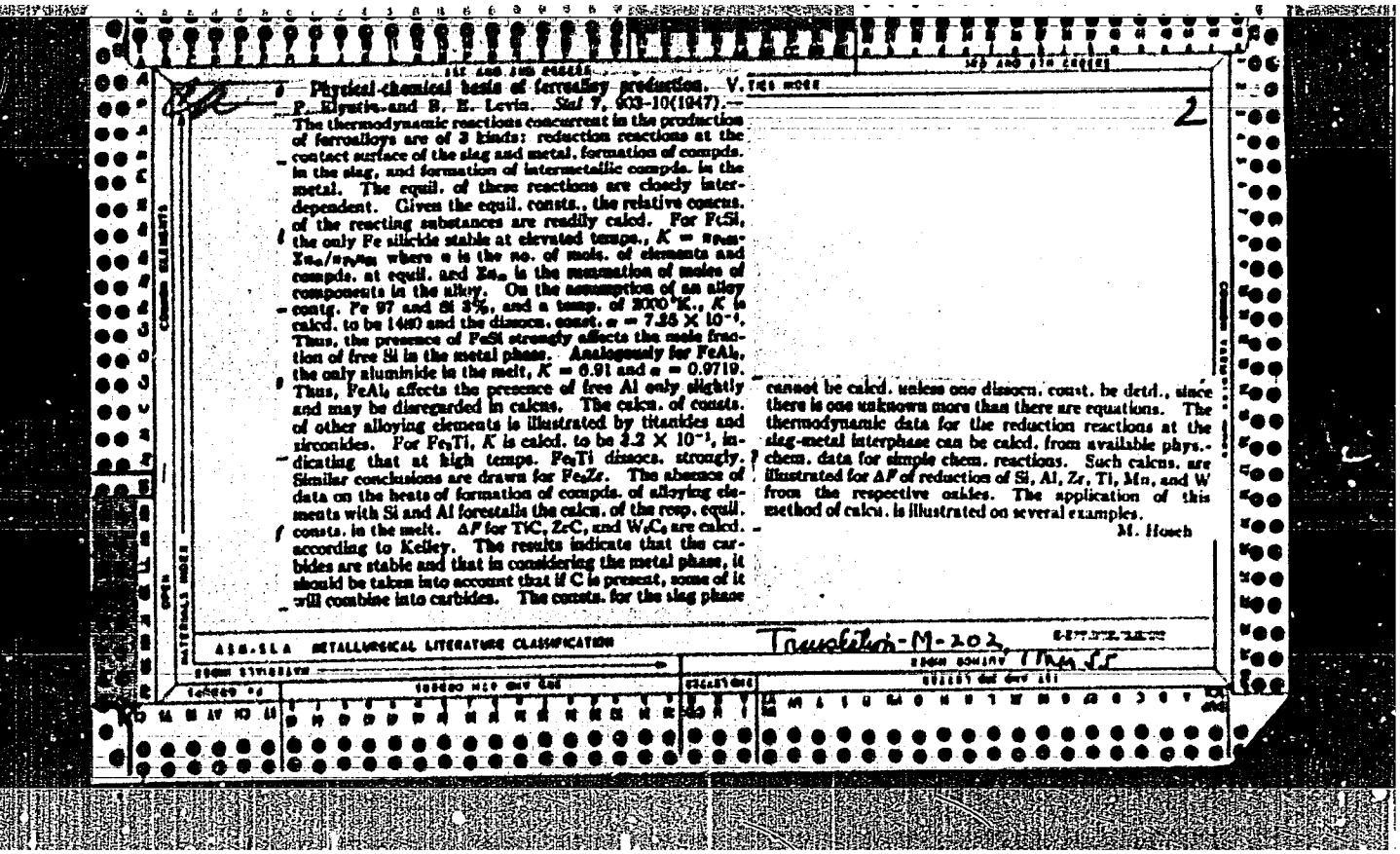


Physical-chemical basis of ferroalloy production. V. [illegible]

P. Klyuzhe and B. E. Levin. *Stal'* 7, 903-10(1947).—

The thermodynamic reactions concurrent in the production of ferroalloys are of 3 kinds: reduction reactions at the contact surface of the slag and metal, formation of compds. in the slag, and formation of intermetallic compds. in the metal. The equil. of these reactions are closely interdependent. Given the equil. consts., the relative concns. of the reacting substances are readily calcd. For $FeSi$, the only Fe silicide stable at elevated temps., $K = \pi a_m \cdot \Sigma a_n / \pi a_m$ where a is the no. of mols. of elements and compds. at equil. and Σa_n is the summation of mols of components in the alloy. On the assumption of an alloy contg. Fe 97 and Si 3%, and a temp. of 2000°K., K is calcd. to be 1480 and the dissocn. const. $\alpha = 7.25 \times 10^{-4}$. Thus, the presence of $FeSi$ strongly affects the mole fraction of free Si in the metal phase. Analogously for $FeAl_3$, the only aluminide in the melt, $K = 6.91$ and $\alpha = 0.9719$. Thus, $FeAl_3$ affects the presence of free Al only slightly and may be disregarded in calcns. The calcn. of consts. of other alloying elements is illustrated by titanides and zirconides. For Fe_2Ti, K is calcd. to be 2.2×10^{-1}, indicating that at high temps. Fe_2Ti dissocs. strongly. Similar conclusions are drawn for Fe_2Zr. The absence of data on the heats of formation of compds. of alloying elements with Si and Al forestalls the calcn. of the resp. equil. consts. in the melt. ΔF for TiC, ZrC, and W_2C are calcd. according to Kelley. The results indicate that the carbides are stable and that in considering the metal phase, it should be taken into account that if C is present, some of it will combine into carbides. The consts. for the slag phase cannot be calcd. unless one dissocn. const. be detd., since there is one unknown more than there are equations. The thermodynamic data for the reduction reactions at the slag-metal interphase can be calcd. from available phys.-chem. data for simple chem. reactions. Such calcns. are illustrated for ΔF of reduction of Si, Al, Zr, Ti, Mn, and W from the respective oxides. The application of this method of calcn. is illustrated on several examples.

M. Hoseh

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

Translation-M-202

YELYUTIN, V.P.

"Investigating the Effect of Some Factors on the Service of Electric Resistance Alloys." Thesis for degree of Cand. Technical Sci., Sub 10 Feb 49, Moscow Order of the Labor Red Banner Steel Instimeni I. V. Stalin.

Summary 82, 18 Dec 52, Dissertations Presented For Degrees in Science and Engineering in Moscow in 1949. From Vechernyaya Moskva, Jan-Dec 1949

ELYUTIN, V.P.

USSR

8099 The Production of Ferromanganese. V. P. Elyutin, Yu. A. Pavlov, and B. E. Levin. Henry Brutcher Translation No. 3446, 27 p. (Part from Book "The Production of Ferro-Alloys", Chap. V 1951. Metallurgizdat, Moscow.) Henry Brutcher, Altadena, Calif.

Survey of production methods for various grades, other products. Tables, graphs. 3 ref.

[redacted].; PAVLOV, Yu.A.; LEVIN, B.Ye.; ALEKSEYEV, Ye.M., redaktor; ATTOPOVICH, M.K., tekhnicheskiy redaktor.

[Iron alloy production; electrometallurgy] Proizvodstvo ferrosplavov; elektrometallurgiia. Moskva, Gos. nauchno-tekhn. izd-vo lit-ry po chernoi i tsvetnoi metallurgii. Pt. 2. 1951. 496 p. [Microfilm] (MIRA 8:4)

(Iron alloys--Metallurgy) (Electrometallurgy)

YELYUTIN, V. P.

New achievements in Soviet science and technics; on the works of Stalin Prize winners of 1951 Moskva, Znanie, 1952. 30 p. (Vsesoiuznoe obshchestvo po rasprostraneniiu politicheskikh i nauchnykh znanii, Moscow. Broshiury-stenogrammy lektsii Seriia 3. no. 11)

DA

FD-1384

USSR/Engineering - Metallurgy YELYUTIN, V.P.

Card 1/1 : Pub. 41-11/18

Author : Sokolov, L. N., Yelyutin, V. P., and Zalesskiy, V. I.

Title : Investigation of the plastic properties of commercial titanium

Periodical : Izv. AN SSSR. Otd. tekh. nauk 3, 110-115, 1954

Abstract : Studies behavior of titanium specimens in upsetting test and in testing for tension, torsion, and impact at various temperatures, from 20 to 1,000°C. Diagrams, tables, micrographs.

Institution :

Submitted : by Academician M. A. Pavlov, April 3, 1954

Summary available in Library as S-119, 5 Nov 54

YELYUTIN, V. P. (Prof.)(Ph. D.): PAVLOV, Y. A.; MERKULOV, R. F. (Eng.)

"Temperature Determinations at the Start of the Reaction in a Reduction of Oxides by Carbon." In book: Application of Radioisotopes in Metallurgy, Symposium XXXIV; Moscow; State Publishing House for Literature on Ferrous and Nonferrous Metallurgy, 1955.

p. 48-52

Prof. B. P. YELYUTIN, Ph. D.; Y. A. PAVLOV, Assistant; R. F. MERKULOV, Engr/Chair of Rare Metal Metallurgy, Moscow Inst. of Steel im I. V. Stalin.

YELYUTIN, V. P. (Prof.) (Dr. Tech. Sci.); MAURAKH, M. A.; PAVLOV, Y. A. ;

"The Interaction of Smelted Titanium with Graphite," in book The Application of Radioisotopes in Metallurgy, Symposium XXXIV; Moscow; State Publishing House for Literature on Ferrous and Nonferrous Metallurgy, 1955. p. 115-121

Prof. V. P. YELYUTIN, Dr. Tech. Sci.; M. A. MAURAKH, Assistant; Y. A. PAVLOV, Assistant/ Chair of Rare Metal Metallurgy, Moscow Inst.of Steel im I. V. Stalin.

YELYUTIN, V. P., Dr. Technical Sci.; NATHANSON, A. K.;

"The Degree of Homogeneity of Mechanical Mixtures of Metallic Powders," in book The Application of Radioisotopes in Metallurgy, Symposium XXXIV; Moscow; State Publishing House for Literature on Ferrous and Nonferrous Metallurgy, 1955. p. 274-282

V. P. YELYUTIN, Dr. Tech. Sci.; A. K. Nathanson, Assistant/Chair of Rare Metals Metallurgy, Moscow Inst. of Steel im I. V. Stalin.

FD-2750

USSR/Engineering - Metallurgy

Card 1/1 Pub 41 - 11/16

Author : Yelyutin, V. P., Maurakh, M. A., Pavlov, Yu. A., Moscow

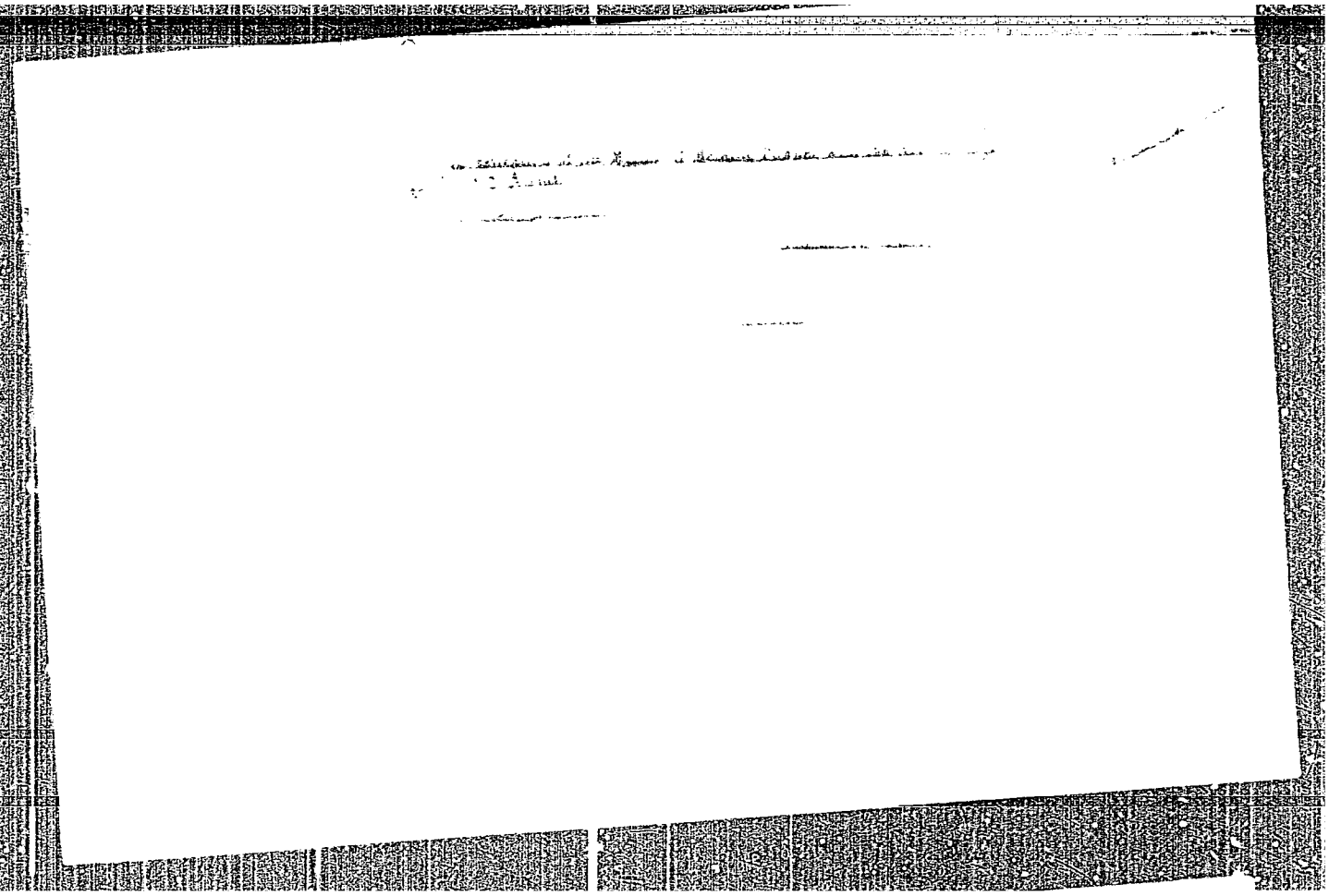
Title : Penetration of liquid titanium into graphite.

Periodical : Izv. AN SSSR, Otd. Tekh. Nauk 5, 129-132, May 1955

Abstract : This investigation was made necessary because with the present method of melting titanium in a graphite crucible there was too much loss of the metal by its penetration into the graphite and also its seepage completely through the crucible and onto the heating elements. This caused the breakdown of the heating furnaces. In conclusion the author states that ordinary graphite crucibles are too porous and cannot be used. It is recommended that graphite crucibles with higher walls and smaller bases, made of the lowest porosity graphite, be used in melting titanium and that the metal be kept in the crucible, in its molten state, for minimum periods of time and at the lowest temperatures possible, above melting point. Graphs, tables. One reference, USSR.

Institution :

Submitted : April 1, 1955



YELYUTIN, V. P

1408 62

ULTRAVIOLET MICROSCOPIC INVESTIGATION OF TITANIUM, NIOBIUM, AND CARBON ALLOY STRUCTURES. V. P. Elyutin, M. L. Bernshteĭn and Yu. A. Pavlov. (Moscow Inst. of Steel). Doklady Akad. Nauk S.S.S.R. 104, 546-8 (1955) Oct. 1. (In Russian)

The structures and properties of titanium–niobium alloy samples, melted in vacuum furnaces of graphite were studied. The content of niobium varied from 1.5 to 68.4%; content of carbon was within 0.7 to 0.9%. The samples were tempered in a vacuum at 1000°C. Ultraviolet microscopic studies determined the phase character of some multi-component systems occurri[illegible] in some samples. (R.V J.)

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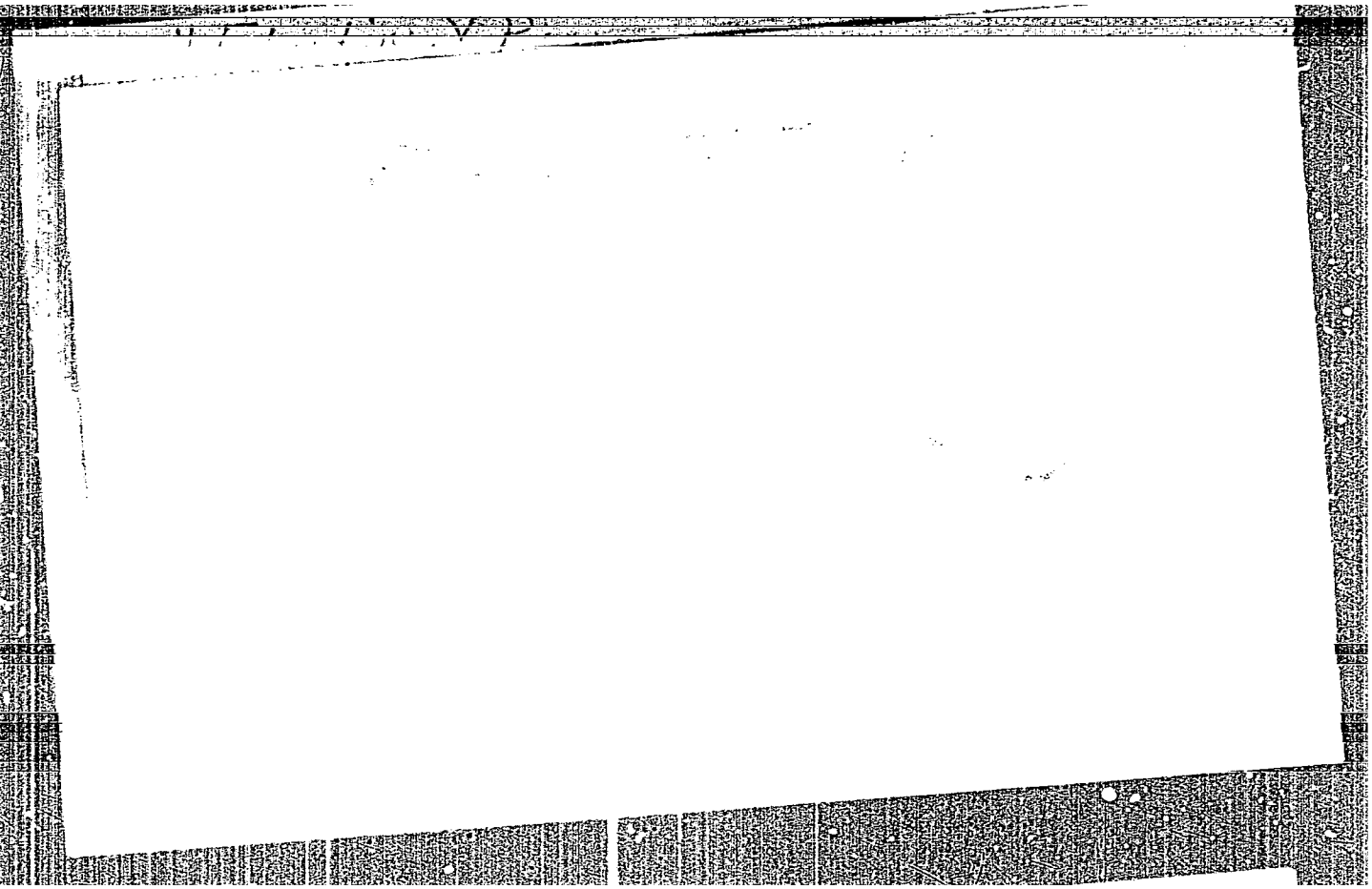

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[redacted] / YELYUTIN, V. P.

D-8

USSR / Liquids.

Abs Jour : Ref Zhur - Fizika, No 4, 1957, No 9092

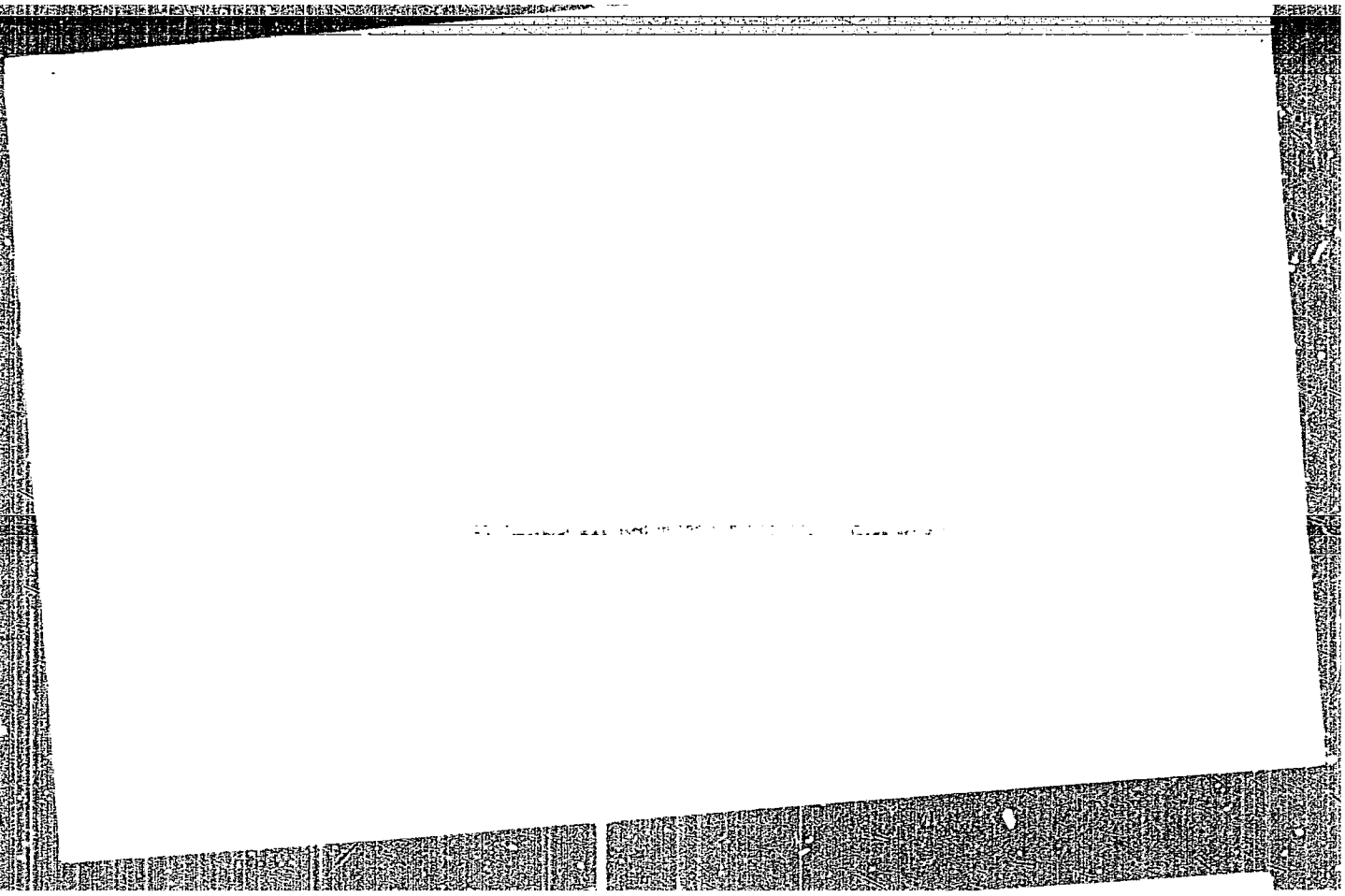
Author : Yelyutin, V.P., Maurakh, M. A.

Title : Density and Surface Tension of Liquid Commercial Titanium

Orig Pub : Izv. AN SSSR, Otd. tekhn. n., 1956, No 4, 129-131

Abstract : Description of a method and results of the measurements of the surface tension σ of commercial titanium (0.1% Fe, less than 0.2% Si, less than 0.1% Ca, and less than 0.5% Mg) in the liquid state. At the crystallization temperature σ = 1510 ± 18 dyne/cm.

Card : 1/1



YELYUTIN, V.P.

Hygiene of student's work and rest. Zdorov'e 3 no.3:5-6 Mr '57 (MIRA 10:4)

1. Ministr vysshego obrazovaniya SSSR
(STUDENTS)

Yelyutin, Vyacheslav Petr...

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PHASE I BOOK EXPLOITATION

Yelyutin, Vyacheslav Petrovich; Pavlov, Yuriy Aleksandrovich; Levin, Boris Yeylevich; Alekseyev, Yevgeniy Mikhaylovich.

Proizvodstvo ferrosplavov; elektrometallurgiya (Production of ferro-alloys; Electrometallurgy) 2d ed., rev. and enl. Moscow, Mashgiz, 1957. 436 p. 7,500 copies printed.

Ed.: Alekseyev, Ye. M.; Ed. of Publishing House: Rozentsveyg, Ya. D.; Tech. Ed.: Vaynshteyn, Ye. B.

PURPOSE: The book is intended as a textbook for students at institutions of higher learning specializing in metallurgy and may also serve as a manual for engineers and scientific workers.

COVERAGE: Theoretical and practical data on production of ferro-alloys are systematized and generalized in this book. The theoretical foundations and technology of producing various ferro-alloys are discussed. Some information on physical chemistry is given in order to facilitate understanding of thermodynamic calculations.

Card 1/7

Production of Ferro-alloys; Electrometallurgy (Cont.)

Problems of economics and of safety engineering in the production of ferrous alloys are elucidated. The present edition of this book gives a more detailed description of technology and progress in Soviet and non-Soviet ferro-alloy industries than that given in the first edition. The bibliography contains 93 references, 69 of which are Soviet, 15 in English, 6 in German and 3 miscellaneous.

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YELYUTIN, V.P.

24-8-13/34

AUTHORS: Grigor'yev, G.A., Yelyutin, V.P. and Maurakh, M.A.(Moscow).

TITLE: Viscosity of molten titanium. (Vyazkost' rasplavlennogo titana).

PERIODICAL: "Izvestiya Akademii Nauk, Otdeleniye Tekhnicheskikh Nauk" (Bulletin of the Ac.Sc., Technical Sciences Section), 1957, No.8, pp. 95-101 (U.S.S.R.)

ABSTRACT: The titanium was molten in graphite crucibles which were sufficiently dense to hold the molten titanium for twenty-five minutes without appreciable penetration of the metal into the crucible walls. The authors used the method of Meyer which was further developed by Shvidkovskiy, Ye.G.(2) and was intended for measuring torsional oscillations of a cylinder with a liquid suspended on an elastic thread and then determining the viscosity from the logarithmic damping decrement and the period of oscillation of the cylindrical crucible suspended on the thread and filled with the molten metal to be investigated. The authors used a high temperature viscosity meter embodying a vacuum resistance furnace with a carbon-graphite heater, the design of which was described by Yelyutin et alii (3), a sketch of which is shown in Fig.1, p.96. The estimated measuring error was 5 to 6% and the Ti used in the experiments was produced by

Card 1/2

Viscosity of molten titanium. (Cont.)

the magnesium-thermal method and remolten in an arc furnace; it contained less than 1% admixtures, i.e. max 0.2% Fe, max 0.2% Si, max 0.4% O, max 0.1% N. The results obtained in five series of measurements at temperatures between 1730 and 1920 C are entered in Table 2, p.100 and it can be seen from the obtained data that the viscosity decreases from 0.89 to 0.37 centistokes if the temperature increases from 1730 to 1920 C. Calculated results show that the free energy of the viscous flow is a linear function decreasing with temperature. The heat of evaporation/energy of activation of the viscous flow ratio equals 2.7. There are 2 tables, 4 figures and 10 references, 5 of which are Slavic.

SUBMITTED: April 26, 1957.

AVAILABLE: Library of Congress

Card 2/2

YELYUTIN, V.P.

AUTHOR: Yelyutin, V.P., Minister of Higher Education, USSR. 3-11-1/17

TITLE: 40 Years of Higher Schools in USSR (Vysshaya shkola SSSR za sorok let)

PERIODICAL: Vestnik Vysshey shkoly, 1957, # 11, pp 3 - 10 (USSR)

ABSTRACT: The author gives a description of the educational conditions in Russia before and after the Revolution. He states that the development of higher education made enormous progress during the post-revolution period. He indicates some figures relating to this evolution. The number of students in 1940 amounted to 811,000; in 1950 to 1,247,000; in 1957 to 2,001,000. Compared with 1919 the number of students increased by 16 times, especially in the fields of engineering, transport communication, agriculture, forestry, and economy. The creation of vuzes in remote areas was considerably activated. The organization of new vuzes and the expansion of those already existing was carried out in the Ural, western and eastern Siberia, in the Far East and in Central Asian republics. The number of students increased in 1956 by 1.6 times compared with the figure of 1950 and by 3.2 times compared with 1940. In the eastern areas there are 25 technical, 7 agricultural, 6 medical and a few

Card 1/2

40 Years of Higher Schools in USSR

other higher educational institutions. In the Soviet Union there is no republic without a national university and other higher educational institutions. In 1956 the Soviet higher and secondary special educational institutions released 770,000 specialists, and during the last 5 years - more than 2,700,000. The Soviet Union has now 38 universities, and the number of students amounts to 200,000. A characteristic feature of the higher schools is the uninterrupted endeavor to improve their education methods.

ASSOCIATION: Ministerstvo vysshego obrazovaniya SSSR (USSR Ministry of Higher Education)

AVAILABLE: Library of Congress

Card 2/2

SOV/163-58-1-17/53

AUTHORS: Yelyutin, V. P., Pavlov, Yu. A., Glukhovtsev, B. V.

TITLE: The Interaction Between Nickel-Vanadium Alloys and Refractories (Vzaimodeystviye nikelevanadiyevykh splavov s ogneuporami)

PERIODICAL: Nauchnyye doklady vysshey shkoly. Metallurgiya. 1958. Nr 1, pp 87-92 (USSR)

ABSTRACT: The present investigation was carried out to improve the technology of high-temperature alloys, especially in regard to the removal of inclusions of non-metals or gases in alloys. Nickel-vanadium alloys were used as initial materials the melt of which was produced at 1 800 - 1 900°. The melt of the nickel-vanadium alloys was carried out in crucibles of Al_2O_3, BeO, ZrO_2 with different duration of storing. The analysis showed that the alloys were rich in gases such as 0,072 - 0,022% O_2 and 0,01 - 0,095% N_2. It was found that the high gas content of the alloys is caused by inclusion of the initial materials, especially the aluminum thermic vanadium.

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The Interaction Between Nickel-Vanadium Alloys and Refractories

To determine the suitable refractory for the nickel-vanadium alloys the interaction between the alloys and the refractory was investigated. Vanadium is a comparatively active metal in the melt and reacts energetically with the refractories of the crucible, bringing impurities into the metal melts. In the reactions mainly VO reacts. In the interaction between VO and the oxides of refractories also V_2O_3 is formed. The lower stability of ZrO_2 as compared to vanadium melts is probably a consequence of the reaction $2ZrO_2 + V \rightleftarrows Zr_2O_3 + VO$.

By means of radioactive indicators the character of the interaction between the refractory and the liquid metal alloy with a vanadium content of 30% was determined. ZrO_2 was used as refractory to which the radioactive isotope Zr^{95} was added. The investigations showed that non-metallic impurities can be avoided only if the melt is not overheated and is left in the state of melting for as short a period as possible. The reaction products were investigated also by means of x-ray structural analysis to explain the character of the interac-

The Interaction Between Nickel-Vanadium Alloys and Refractories

tion between the refractory and the liquid nickel-vanadium alloys. This analysis showed that in the interaction between the alloys and the refractory ZrO_2 is reduced to Zr.

The character of the interaction between the alloys and the refractories of beryllium oxide was not explained by the x-ray structural analysis. Probably only little vanadium oxide is formed in the interaction; this vanadium oxide dissolves in the melt. Beryllium vapor is formed which also dissolves in the metal melt.

Experiments on the interaction of nickel-vanadium alloys and Al_2O_3 were also carried out.

The macro- and microscopic investigation of the surface of zirconium bricks showed that in the melting in zirconium crucibles in the case of a longer period of storage the metal melt penetrates the ZrO_2. In melting beryllium and aluminum oxide in crucibles the interaction between the liquic metal and the refractory is much smaller.

There are 1 figure and 1 reference,

SOV/163-58-1-17/53

The Interaction Between Nickel-Vanadium Alloys and Refractories

ASSOCIATION: Moskovskiy institut stali (Moscow Steel Institute)

SUBMITTED: October 1, 1957

Card 4/4

AUTHORS: Yelyutin, V. P., Merkulova, R. F., Pavlov, Yu. A. SOV/163-58-3-2/49

TITLE: Investigating the Reduction Reactions of Metal Oxides With Carbon (Issledovaniye reaktsiy vosstanovleniya okislov metallov uglerodom)

PERIODICAL: Nauchnyye doklady vysshey shkoly. Metallurgiya, 1958, Nr 3, pp 10 - 14 (USSR)

ABSTRACT: The influence of the temperatures on the reaction velocity of the reduction of metal oxides with carbon was investigated. Activated and non-activated charcoal were used as reducing agent; it had been obtained by the interaction of the gas mixture $CO_2 + C^{14}O_2$ with metallic magnesium. The initial temperature of the interaction between carbon and metal oxides, as for instance MoO_3, Fe_2O_3, V_2O_5, Nb_2O_5 and TiO_2 was determined. The reduction of V_2O_5 was investigated at 600, 700, 800, 900 and 1000° C, the reduction of MoO_3 at 500, 590, 600, 650 and 700° C,

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the reduction of Fe_2O_3 at 500, 600, 700, and 800° C, and the reduction of WO_3 at 900, 1000, 1100 and 1200° C.

The reduction processes take place at the same time with the increase of the reaction velocity they reach their maximum at the corresponding temperature and then slowly decrease again. The increase in temperature effects an increase of the rate of the reduction process. The kinetic curves obtained show that the reduction processes of the oxides have an autocatalytic mechanism. Based on the results obtained the apparent activation energy of the reduction processes of the oxides with metals was calculated. The following values were found for the activation energy: kcal/Mol: V_2O_5 - 2,3, MoO_3 - 14,3, Fe_2O_3 - 11,7 and WO_3 - 18,0. The linear dependence between the initial temperatures of the reduction and the activation energy of the corresponding processes was found. There are 4 figures, 1 table, and 9 references, 3 of which are Soviet.

Card 2/2

Moscow Steel Institute

SOV/163-58-4-2/47

18(6)
AUTHORS: Yelyutin, V.P., Pavlov, Yu.A., Glukhovtsev, B.V.

TITLE: Fluidity and Density of Nickel-Vanadium Alloys (Zhidkotekuchest' i plotnost' splavov nikelya s vanadiyem)

PERIODICAL: Nauchnyye doklady vysshey shkoly. Metallurgiya, 1958, Nr 4, pp 12 - 16 (USSR)

ABSTRACT: In order to determine the fluidity of nickel-vanadium alloys of a content of 25, 30, and 35 % of vanadium, the method of pouring the alloys into molds of the Ruff-type was chosen. By this method, the tests can be carried out in vacuum or in a neutral atmosphere. The metal was melted in crucibles of beryllium-oxide with argon in a high-temperature resistance furnace with a graphitic carbon heater. A special furnace structure as shown here allowed the metal to be poured into crucibles without disturbing the tightness of the furnace. The experimental method of Yelyutin and Maurakh (Ref 6) was employed to determine the specific gravity of the smelt. This formerly used method is rather simple but reliable.- By investigating the fluidity of the nickel alloys of a vanadium content of 25, 30, and 35 % it was found that these alloys showed a rather good fluidity;

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Fluidity and Density of Nickel-Vanadium Alloys

SOV/163-58-4-2/47

e.g., their fluidity surpasses that of stainless steel. The fluidity of nickel-vanadium alloys of the investigated composition increases with increasing concentration of vanadium. Measurings of the density of molten nickel-vanadium alloys showed that it was lower by 0.3 - 0.4 g/cm^3 than the specific density of the solid samples. There a.e 5 figures, 2 tables, and 6 references, 4 of which are Soviet.

ASSOCIATION: Moskovskiy institut stali (Moscow Steel Institute)

SUBMITTED: March 29, 1958

Card 2/2

YELYUTIN, V.P.

3-58-6-1/34

AUTHOR: Yelyutin, V.P., Minister of USSR Higher Education

TITLE: The Higher School Is Confronted with Great, Responsible Problems (Pered vysshey shkoloy stoyat bol'shiye, otvetstvennyye zadachi)

PERIODICAL: Vestnik Vysshey Shkoly, 1958, Nr 6, p 3-10 (USSR)

ABSTRACT: In recent years the training of specialists has been substantially improved, both theoretically and practically. The system of obtaining an education without ceasing to work in one's profession has been considerably expanded. Out of 2,100,000 higher school students, 880,000 are being trained by the evening and correspondence system. In recent years higher education has developed vigorously in the eastern provinces of the Soviet Union. At present over 500,000 students, almost 25 % of the entire number, are being trained there. In 1958, there will be established in the East the Khabarovskiy avtomobil'no-dorozhnyy(Khabarovsk Automobile-Roads Institute) and the Akmolinskiy sel'skokhozyaystvennyy institut (Akmolinsk Agricultural Institute). The Karagandinskiy gornyy institut (Karaganda Mining Institute) is being reorganized into a

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The Higher School Is Confronted with Great, Responsible Problems 3-58-6-1/34

polytechnical institute with a branch for evening study in Temir-Tau. In the light of N.S. Khrushchev's speech at the 13th VLKSM Congress, the question of shop practice must play not only an instructional, but also a great educational role. It is considered expedient and necessary, beginning with the 1958/59 school year, to considerably increase the admission to vuzes of persons with not less than 2 years experience in industry, agriculture, and other branches of the national economy and culture, who are recommended by the social organizations of the enterprises where they are working. The new rules of enrollment into USSR higher schools this year provide for admission, with work being discontinued, of persons awarded a gold or silver medal on graduating from secondary schools or of excellent pupils of secondary special schools, who are in the top 5 % of the graduating class. The encouragement of youth with shop or personal experience does not prevent capable young people with secondary education from entering the vuzes, even though they have no shop practice. The new rules of admission provide that 20 % of admissions be allotted for general competition in case applications of persons having priority exceed 80 % of the vacancies. At present a 7 year plan of higher school development is being

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The Higher School Is Confronted with Great, Responsible Problems

planned. The most important task of the higher school is to supplement the cadres of Soviet intellectuals with young specialists who have not only acquired the highest professional qualification, but also have been educated in a spirit of unconditional loyalty to their country and to the cause of the Party and Communism.

ASSOCIATION: Ministerstvo vysshego obrazovaniya SSSR (USSR Ministry of Higher Education)

Card 3/3

78-3-4-6/38

AUTHOR: Funke, V. F., Yelyutin, V. P.

TITLE: Some Data on Equilibrium Diagrams of Chromium-Niobium Systems(Nekotoryye dannyye k diagramme ravnovesiya sistemy khrom-niobiy)
Questions and Answers (Voprosy i otvety)

PERIODICAL: Zhurnal Neorganicheskoy Khimii, 1958, Vol. 3, Nr 4, pp. 866-867 (USSR)

ABSTRACT: Question :In publications data exist on the fact that at 1300° the cubic face-centered $NcCr_2$ ($HgCu_2$ type) phase changes to the hexagonal phase, which remains constant up to 1590°. What is your opinion on this fact ?
Answer: That refers to the diagram: tantalum-niobium, where the transition of one modification into the other is found. In the niobium- chromium system this cannot be observed any longer.
Question: What is the opinion on the accuracy of determining the liquidus- and solidus points and on the analysis of alloys?
Answer: That can easily be observed in the iron-aluminium system where the great crystallization intervals permit

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Some Data on Equilibrium Diagrams of Chromium-Niobium Systems

exactly to determine the temperature, to which the determination of the liquidus point in the fusion mothod corresponds. Here it can be determined that in the interval of 300° the lag of the temperature in liquidus can amount to 40 - 45°. That yields 10 - 15% of the temperature interval of crystallization of the alloy. For measuring temperature the thermocouple element is used in this case, which is connected with the molten part of the sample. Besides, here the cooling-down curve (Thermal analysis) is recorded. In determining the fusion temperature according to both methods a difference of 10 - 20° is found. After this the accuracy in determining the temperature of solidus in alloys, which must amount to ± 15%, is classified.

Question: How is it that you put in the chromium-niobium diagram such a low melting temperature for niobium = 2100° ?

Answer: The melting temperature of niobium lies higher, however this problem was out of question, since in the ex-

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Some Data on Equilibrium Diagrams of Chromium- Niobium Systems

periment no pure niobium, but 99,5% niobium with 5% tantalum content was used, because pure niobium was not present. (See article publ. in Izv. AN SSSR, OKhN, No. 3, 68 (1956))

YELYUTIN, V.P., prof., doktor tekhn. nauk; MEHKULOVA, R.F., inzh.; PAVLOV, Yu.A., dots., kand. tekhn. nauk.

Temperatures at the start of metal oxide reduction by solid carbon. Sbor. Inst. stali no.38:79-87 '58. (MIRA 11:8)

1. Kafedra metallurgii redkhikh metallov Moskovskogo instituta stali im. Stalina.
(Oxidation-reduction reaction) (Thermometry)
(Radioisotopes--Industrial applications)

SOV/137-59-1-575

Translation from: Referativnyy zhurnal. Metallurgiya, 1959, Nr 1, p 75 (USSR)

AUTHORS: Yelyutin, V. P., Mozzhukhin, Ye. I., Shulepov, V. I.

TITLE: Effect of Combined Chemical and Heat Treatment on Heat Resistance of Alloys (Vliyaniye khimiko-termicheskoy obrabotki na zharoupornost' splavov)

PERIODICAL: Sb. Mosk. in-t stali, 1958, Nr 38, pp 427-432

ABSTRACT: The authors investigated the effect of combined chemical and heat treatment (CHT) of the surface of specimens of a TiC base (71.5% TiC) alloy cemented with a NiAl compound containing 54 atom-% Ni and 60 atom-% of metallic Nb, Zr, Cr, or Be on the resistance to scale formation at 1150 - 1250°C. The CHT consisted of annealing of the specimens covered with a 50:50 mixture of ZrO_2 and alloying metal and 1% NH_4Cl in an H_2 atmosphere at 1500°. Saturation of the surface with niobium and zirconium does not improve the resistance to scale formation of TiC - NiAl alloys. CHT with beryllium and chromium increases the heat resistance by 1900% and 200%, respectively. The authors note that a change in the procedure of saturation of the alloy surface with chromium (for example at 1150° temperature

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Effect of Combined Chemical and Heat Treatment on Heat Resistance of Alloys

in an atmosphere of air) has no effect on its resistance to scale formation. However, CHT conditions should remain constant (1500° temperature for 0.5 hour) for Be, because any difference in the interaction between Be and TiC and NiAl results in a different concentration of Be in these phases. The authors submit that during longer CHT Be reacts predominantly with the NiAl and that the TiC grains become exposed, which lowers the resistance to scale formation of these alloys.

R. A.

YELYUTIN, V.

JELUTIN, W.

The technical cadres in the USSR, and the US. Przegl techn 79 no.2: 62-64 '58.

(Russia—Technology)
(United States—Technology)

YELYUTIN, Vyacheslav Petrovich

Vysshaya Shkola Stramy Sotsializma. Moskva, Sotsekgiz, 1959.
98p. Tables.
Bibliographical Footnotes.

YELYUTIN, V. P.

AYZENKOL'B, F. [Eisenkolb, Friedrich], prof., Dr.Ing.habil.; MAURAKH, M.A., kand.tekhn.nauk, prepodavatel' [translator]; MOZZHUKHIN, Ye.I., kand.tekhn.nauk, prepodavatel' [translator]; NATANSON, A.K., kand.tekhn.nauk, prepodavatel' [translator]; LEVIN, B.Ye., kand.tekhn.nauk [translator]; YELYUTIN, V.P., prof., doktor, nauchnyy red.; RZHEZNIKOV, V.S., red.; EL'KIND, L.M., red.izd-va; ATTOPOVICH, M.K., tekhn.red.

[Powder metallurgy] Poroshkovaia metallurgiia. Pod nauchnoi red.V.P.Eliutina i A.K.Natansona. Moskva, Gos.nauchno-tekhn. izd-vo lit-ry po chernoi i tsvetnoi metallurgii, 1959. 518 p. (MIRA 13:1)
Translated from the German.

1. Kafedra metallurgii redkikh metallov i poroshkovoy metallurgii Moskovskogo instituta stali (for Maurakh, Mozzhukhin, Natanson).

(Powder metallurgy)

77678
SOV/148-60-1-1/34

18.3100

AUTHORS: Yelyutin, V. P., Pavlov, Yu. A., Lysov, B. S.

TITLE: Free Energy of Formation of Vanadium-Oxygen Solutions

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Chernaya metallurgiya, 1960, Nr 1, pp 5-11 (USSR)

ABSTRACT: The authors investigated the solubility of oxygen in metal while treating vanadium with liquid calcium within the temperature range of 1,000-1,900° C. The equilibrium of the system $V_s - O$ was investigated by heating (to a certain temperature) vanadium, contaminated by oxygen, in the presence of molten calcium or magnesium, with subsequent determination of residual concentration of oxygen in metal. The experimental part was conducted in the laboratory of rare metals of the Moscow Steel Institute (Moskovskiy institut stali). The initial material consisted of: distilled calcium, containing 0.3-0.4% N_2;

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Free Energy of Formation of Vanadium-Oxygen Solutions

magnesium of MG-0 type; and calcium-treated vanadium containing about 0.5% O_2, 0.2% N_2, and 0.2% C.

Vanadium was crushed to the particle size under 1.0 mm. The experiments at 1,000 and 1,200° C were conducted in steel crucibles, and at 1,500° C in molybdenum crucibles. The crucibles contained 1-3 g of vanadium and 5-10 g of reducing metal. The diagram of changes of free energy in the system vanadium-oxygen for 1,000° C was plotted by O. Kubashevskiy and coworkers (N. P. Allen, O. Kubaschewski, O. Goldbeck, J. of the Electrochem. Soc., 98, 417, 195) (see Fig. 1) who determined the value of free energy by the equilibrium content of oxygen in metal after its treatment by liquid calcium, magnesium, and barium.

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Free Energy of Formation of Vanadium-Oxygen Solutions

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SOV/148-60-1-1/34

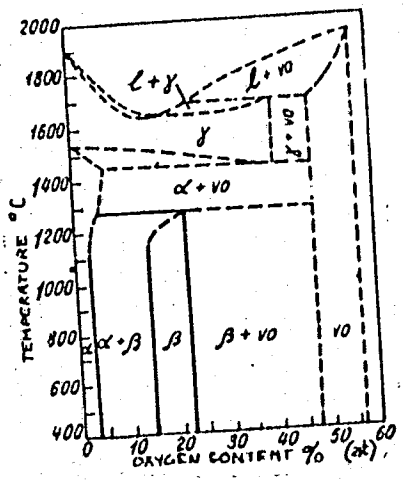

Fig. 1. Equilibrium diagram of a vanadium-oxygen system.

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Free Energy of Formation of Vanadium-Oxygen Solutions

Table 1 gives the equilibrium content of oxygen in vanadium and the corresponding values of partial free energy of solid solutions [O]V.

Table 1. Equilibrium oxygen content in metal and partial free energy.

REDUCER	OXYGEN CONTENT IN METAL AFTER TREATMENT, %	PARTIAL FREE ENERGY, CAL/MOLE
BARIUM	0,26; 0,34; 0,21	189 900
MAGNESIUM.	0,181; 0,163; 0,19	224 000
CALCIUM.	0,134; 0,18; 0,41	241 000

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Free Energy of Formation of Vanadium-Oxygen Solutions

The authors determined the equilibrium concentration of oxygen in vanadium at its melting temperature, by analyzing the metal obtained by the reduction of its pentoxide by calcium in the presence of iodine. The equilibrium oxygen content was considered to be the minimum oxygen content established by several tests. The value proved to be 0.02%. These results correspond to the results obtained by R. K. McKechnie, A. U. Seabolt (J. of the Electrochem. Soc., 97, 311, 1950), who obtained the following content in various samples of vanadium: 0.025, 0.031, 0.017, and 0.029%. The results of determination of equilibrium concentrations of oxygen in vanadium, treated by liquid calcium at 1,000, 1,200, 1,500, and 1,900° C are given in Table 2 and in Fig. 2(a).

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Free Energy of Formation of Vanadium-Oxygen Solutions

Table 2. Equilibrium concentrations of oxygen in the vanadium-oxygen system at various temperatures and reducers and corresponding free energy values.

REDUCER	TEMPERATURE °C	TEMPERATURE °K	OXYGEN CONTENT IN METAL %	PARTIAL FREE ENERGY CAL/MOLE	INTEGRAL FREE ENERGY CAL/MOLE
CALCIUM	1000	1273	0,13	241 000	214 100
	1200	1473	0,05	231 500	193 700
	1500	1773	0,03	216 300	167 300
	1900	2173	0,02	197 900	133 300
MAGNESIUM	1000	1273	0,16	224 000	197 200
	1200	1473	0,08	213 940	178 900

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Free Energy of Formation of Vanadium-Oxygen Solutions

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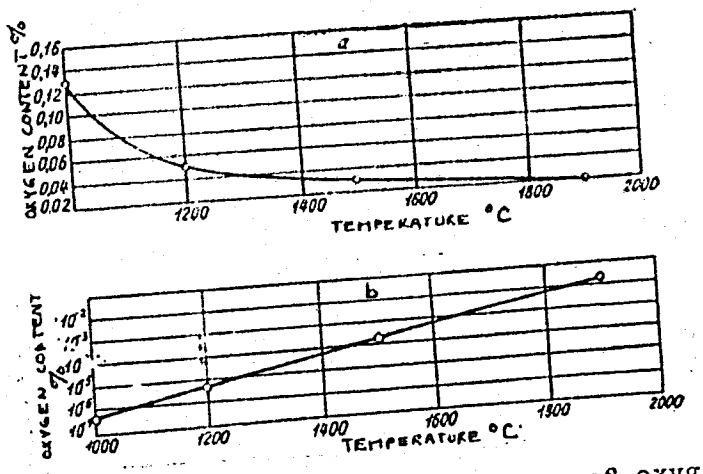

Fig. 2. Equilibrium concentrations of oxygen in vanadium after treatment with calcium: (a) test data; (b) calculated according to thermodynamic data for oxides.

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Free Energy of Formation of Vanadium-Oxygen Solutions

The authors' calculations were based on conditions of reduction of vanadium (containing dissolved oxygen) by calcium:

$$[O]_V + Ca_l = CaO_s; \quad \Delta Z_1^\circ. \tag{1}$$

This reaction is characterized by the following change of free energy:

$$\Delta Z_1^\circ = \Delta Z_{CaO}^\circ - \Delta Z_{[O]V}^\circ. \tag{2}$$

At the same time:

$$\Delta Z_1^\circ = -RT \ln K. \tag{3}$$

When activity of CaO and Ca is equal to 1, the equilibrium constant can be expressed by:

$$K = \frac{1}{N_{[O]V}}. \tag{4}$$

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Free Energy of Formation of Vanadium-Oxygen Solutions

The values of free energy, characterizing the region of solid solutions vanadium-oxygen (in presence of liquid calcium) can be calculated by substituting into the above equation the equilibrium values of oxygen concentrations (see Table 2 and Fig. 3).

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Free Energy of Formation of Vanadium-Oxygen Solutions

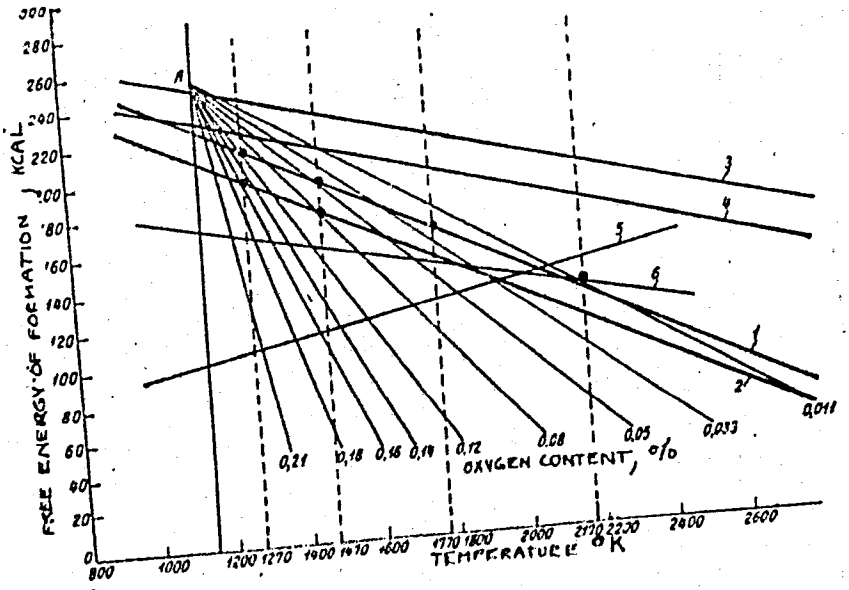

Fig. 3.

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Free Energy of Formation of Vanadium-Oxygen Solutions

Caption to Fig. 3.
Fig. 3. A nomogram of free energy of formation of vanadium-oxygen solutions. (1) $2V + O_2 = 2[O]_V$ (treatment by calcium); (2) $2V + O_2 = 2[O]_V$ (treatment by magnesium); (3) $2Ca + O_2 = 2CaO$; (4) $2Mg + O_2 = 2MgO$; (5) $2C + O_2 = 2CO$; (6) $2V + O_2 = 2VO$.

The established relationship of change of free energy of formation of vanadium-oxygen solutions gives means to perform the thermodynamic calculations involving other reducers. The described methods can be used for a more general problem: the thermodynamic analysis of solutions of metals with oxygen in the presence of third component. There are 3 figures; 3 tables; and 5 references, 2 Soviet, 3 U.S. The U.S. references are: N. P. Allen, O. Kubaschewski, O. Goldbeck, J. of the Electrochem.

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Free Energy of Formation of Vanadium-Oxygen Solutions

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SOV/148-60-1-1/34

Soc., 98, 417, 1951; W. C. Lilliendahl, E. D. Gregory, J. of the Electrochem. Soc., 99, Nr 5, 1952; R. K. McKechnie, A. U. Seubolt, J. of the Electrochem. Soc., 97, 311, 1950.

ASSOCIATION: Moscow Steel Institute (Moskovskiy institut stali)

SUBMITTED: January 26, 1959

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S/148/60/000/002/007/008

18.6200

AUTHORS: Mozzhukhin, Ye.I., Yelyutin, V.P., Umanskiy, Ya.S.

TITLE: The Effect of Sintering Conditions on the Strength of Carbide Base Alloys Carburized by a NiAl Compound

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Chernaya metallurgiya, 1960, Nr 2, pp 142 - 147

TEXT: To determine optimum sintering conditions ensuring the preparation of high-strength alloys, the authors studied the effect of various sintering conditions on the properties of Ti-carbide and Ti-W-carbide base alloys carburized by a Ni-Al compound. The effect of sintering conditions on the strength of alloys during bending tests at room and elevated temperatures was mainly studied. Students of the Moskovskiy institut stale (Moscow Steel Institute), Ye.A. Bychkova, L.V. Maksimova and Ye.I. Oginskaya took an active part in the studies. The carburizing alloys contained 54 - 60% (at) Ni. The given theoretical compositions of the investigated alloys are contained in Table 1. The specific weight of Ti-W-carbides was calculated from the weight and volume of the carbide component in hard alloys. It was 11.4 g/cm^3

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The Effect of Sintering Conditions on the Strength of Carbide Base Alloys Carburized by a NiAl Compound

for T15 carbide, 6.16 g/cm^3 for T60 carbide. The alloys were prepared of Ti-carbide powder and complex Ti-W-carbides. Powders of the initial material were mixed in alcohol for 48 hours, dried in air, pressed into briquets and dried in a vacuum cabinet. Sintering was carried out in argon and hydrogen atmosphere, in a laboratory vacuum furnace with a graphite shaft and in a TVV-2 furnace. Optimum sintering conditions were determined from the results of measuring the strength, hardness, specific weight, and changes in the composition of the alloys. Greatest changes in the composition were observed in sintering Ti-carbide-base alloys in a vacuum. Loss of individual components through sintering was calculated after sintering in a vacuum, hydrogen and argon for 1 hour at 1,700°C. The loss amounted to 15% Ti, 67% Al and 13% C of the total amount of the component in the alloy prior to sintering. Minimum loss was observed in sintering in pure argon. Table 2 contains the composition of the T100B (15) alloy prior to and after sintering under different conditions. The strength of alloys during bending was investigated with the aid of a special device on a two-ton testing machine at high temperatures

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S/148/60/000/002/007/008

The Effect of Sintering Conditions on the Strength of Carbide Base Alloys Carburized by a NiAl Compound

without shielding atmosphere. Figures 1 - 5 show the effect of the sintering temperature on the alloy strength during bending. Highest strength of Ti-carbide base alloys was obtained by sintering for 1 hour at 1,900°C. A raise of the sintering temperature up to 2,100°C did not affect the strength (Figure 1), although shrinkage and density of the alloys increased. Extended holding up to four hours entailed decrease in strength; holding time reduced down to 0.5 hrs entailed a decrease in density. The authors contradict the statement made in [Ref 4] that the optimum temperature of sintering for a TiC-NiAl alloy was 1,650°C. They proved experimentally that alloys of highest strength and density were obtained at 1,900°C and above. It was established that optimum mechanical properties of the alloys depended on the optimum amount of the liquid phase during sintering. To obtain this, alloys with a lesser content of binder should be sintered at higher temperatures which raise the amount of the liquid phase due to the dissolving of the carbide component.

4

S/148/60/000/002/007/008

The Effect of Sintering Conditions on the Strength of Carbide Base Alloys Carburized by a NiAl Compound

There are: 2 tables, 5 graphs and 7 references, 6 of which are English and 1 Soviet.

ASSOCIATION: Moskovskiy institut stali (Moscow Steel Institute)

SUBMITTED: May 25, 1959

4

Card 4/4

85811
S/148/60/000/003/015/018
A161/A029

18.6100 1497

AUTHORS: Mozzhukhin, Ye.I.; Yelyutin, V.P.; Umanskiy, Ya.S.

TITLE: Strength of Carbide Alloys Cemented by NiAl and CoAl Compounds

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. - Chernaya metallurgiya, 1960, No. 3, pp. 131 - 135

TEXT: An investigation was carried out with titanium and titanium-tungsten carbide powder bound with NiAl and CoAl compounds. The effect of the composition and of different quantities of the binders was determined. The results are illustrated by curves. In case of titanium carbide with 15 volume % NiAl the binder composition had no effect on the alloy strength at room temperature, but a pronounced effect was observed at 1,000°C. Alloys bound with binders of stoichiometric composition proved strongest, and alloys bound with NiAl with 60 atomic % Ni weakest. Alloys with over 25 volume % NiAl have the maximum strength. The strength of TiC-NiAl at 1,000°C was in all cases higher than at room temperature, which not fully corresponds to statements made in a previous investigation (Ref.3). The alloy with high NiAl content had a considerably higher heat resistance than with low NiAl content. Titanium-tungsten carbide T-15 (T-15) and T-60 (T-60) were bound with CoAl with 60 atomic % Co, with 10 and 15 volume % CoAl, respectively.

Card 1/2

85811
S/148/60/000/003/015/018
A161/A029

Strength of Carbide Alloys Cemented by NiAl and CoAl Compounds

A higher strength was observed in alloys with 15 and 20 volume % of NiAl at 900°C than in cold which is explained by higher plasticity of NiAl at 900°C. At higher temperature the alloy strength dropped. The high strength of TiC-NiAl alloys in hot state is apparantly also due to the plasticity of NiAl and stress redistribution. This phenomenon had been observed by G.S. Kreymer, O.S. Safonova and A.I. Baranov (Ref. 4) in WC-Co alloys (maximum strength at 200°C due to softened cobalt.) The following conclusions were drawn: 1) Titanium carbide alloys bound with NiAl have higher bending strength at 1,000°C than at room temperature. 2) Titanium--tungsten carbide alloys with 16% titanium carbide bound by NiAl retain their strength up to 900-1,000°C. 3) Titanium-tungsten carbide bound with CoAl has a higher strength than analogous alloys bound with NiAl. 4) At room temperature the strength of titanium carbide alloys does not depend on the composition of NiAl, but at 1,000°C it does. At 1,000°C alloys bound with NiAl of stoichiometric composition have maximum strength. 5) The carbide base composition is important for alloys bound with NiAl and CoAl. Alloys with pure titanium carbide and titanium-tungsten alloys with high titanium content (64% TiC) have low strength at room temperature, but they retain their strength or even increase it at 1,000 - 1,100°C. There are 4 figures and 5 references: 3 Soviet, 2 English.

Card 2/2

S/002/60/000/008/002/002
C111/0222

AUTHOR: Yelyutin, V.P., Minister of the Advanced and Intermediary Special Education of the USSR

TITLE: On the Condition and Problems of the Preparation of Specialists in the Domain of Mechanization and Automatization of the Engineering-Technical and Administrative-Managing Work in the USSR

PERIODICAL: Vestnik statistiki, 1960, No.8, pp. 29-32.

TEXT: The specialists in the domain of the mechanization and automatization of the engineering-technical and administrative work need a good finishing education in mathematics, electrotechnique, electronics and computers. Therefore there exists the special branch "mechanization of accounting and calculating problems" at several high schools. In 1959/1960, 1489 students learned in this special branch. From 1950 to 1959, 1322 students finished this special education, among them 700 completed their studies at the Moskovskiy ekonomiko-statisticheskiy institut (Moscow Economical-Statistical Institute) and 300 at the Moskovskiy aviatsionnyy institut (Moscow Aviation Institute). Furthermore the specialists in question were prepared in the mathematical faculties in the Moscow and Leningrad universities. In spite of this the specialists

Card 1/3

S/002/60/000/008/002/002
C111/C222

On the Condition and Problems of the Preparation of Specialists in the Domain of Mechanization and Automatization of the Engineering-Technical and Administrative-Managing Work in the USSR

in question are not sufficient. Therefore it is considered to educate the specialists also in the Khar'kov Engineering-Economic Institute, in the Moscow Mechanical Engineering Evening Institute, in the Moscow Polygraphical Institute, in the Moscow Historical Archives Institute and in the Moscow Engineering-Economic Institute. Since 1960/1961 the education in the special directions "mechanization of the accounting and the calculating problems" and "programming on quickly working mathematical machines" is given in secondary schools. At the same time an advance of the quality of the preparation shall be reached, theoretical and practical educations shall go hand in hand. The establishment of books is essential. A strengthened mathematical preparation of the students is aspired. A research on the domain of mechanization on a broad base is essential. This research is performed already successfully at the Moskovskiy gosudarstvennyy universitet (Moscow State University) at the Leningradskiy institut tochnoy mekhaniki i optiki (Leningrad Institute of Fine Mechanics and Optics), Moskovskiy energeticheskiy institut

Card 2/3

S/002/60/000/008/002/002
C111/C222

On the Condition and Problems of the Preparation of Specialists in the Domain of Mechanization and Automatization of the Engineering-Technical and Administrative-Managing Work in the USSR

(Moscow Power Engineering Institute), Moskovskiy inzhenerno-ekonomicheskiy institut (Moscow Engineering Economical Institute) and the Moskovskiy ekonomiko-statisticheskiy institut (Moscow Economical-Statistical Institute). There are still too little dissertations on themes of this special branch. A better notice of foreign experiences is necessary.

Card 3/3

YELYUTIN, V.P.; KITAYGORODSKIY, I.I.; MOZZHUKHIN, Ye.I.; RAKKIN, V.B.

Composition of microlite and of the metallic compound NiAl.
Zhur.prikl.khim. 33 no.3:559-563 Mr '60. (MIRA 13:6)

1. Moskovskiy institut stali i Moskovskiy khimiko-tekhnologicheskiy institut.
(Nickel compounds) (Aluminum compounds)

S/032/60/036/03/036/064
B010/B117

AUTHORS: Yelyutin, V. P., Natanson, A. K., Shulepov, V. I., Yudkovskiy, S. I.

TITLE: A Device Used to Measure the Electric Resistance of Alloys at High Temperatures

PERIODICAL: Zavodskaya laboratoriya, 1960, Vol 36, Nr 3, pp 344-346 (USSR)

TEXT: A special device has been designed (Fig 1) for measuring the electric resistance of samples 1 × 6 × 20 up to 10 × 15 × 40 mm in size and used in powder metallurgy, at 2000 to 2500°, with a standard furnace of the type TVV-4 used to heat the samples. The sample is attached to molybdenum- or tantalum electrodes by spot welding. The electric resistance is measured by the compensation method (Fig 2, circuit diagram), and calibrated resistors are used which were calculated by the following equation: $R_x = R_E \cdot \frac{V_x}{V_E}$ (R_x and R_E = electric resistances of the sample and the calibration sample, V_x = voltage drop in the sample, V_E = voltage drop in the calibration sample). Phase transformations occurring in Ni-Al-Be alloys were investigated, and it was found that the electric resistance ranging between 0.1 and 0.5 ohm has to be measured at

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A Device Used to Measure the Electric Resistance of Alloys at High Temperatures

S/032/60/036/03/036/064
B010/B117

0.01 to 0.05 a at most since otherwise the sample heats up excessively. The sharp change of the electric resistance and the temperature coefficient of the electric resistance as a function of temperature which has been observed in the alloy consisting of 55.5 atom % Ni, 37 atom % Al, and 7.5 atom % Be at 1400° is attributed to a transition of the alloy from the two-phase to the one-phase state. There are 3 figures.

ASSOCIATION: Moskovskiy institut stali im. I. V. Stalina (Moscow Institute of Steel imeni I. V. Stalin)

Card 2/2

28065
S/148/61/000/007/001/012
E073/E335

15.2640

AUTHORS: Yelyutin, V.P., Pavlov, Yu.A., Surovoy, Yu.N. and Shulenov, V.I.

TITLE: Electric Conductivity and Thermal Expansion of Vanadium, Molybdenum and Tungsten Oxides

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Chernaya metallurgiya, 1961, No. 7, pp. 12 - 17

TEXT: The oxides V_2O_5, MoO_3 and WO_3 are n-type semiconductors. The electric conductivity of V_2O_5 was investigated by several authors within a very wide range of temperatures (-200 to + 1 200 °C). One of these authors did not study the temperature range of interest to the authors of this paper, whilst the results of the others might have been influenced by the interaction of the V_2O_5 with crucible material. As far as the authors are aware, data on the electric conductivity of MoO_3 and WO_3 are available only for temperatures below 200 °C. In

Card 1/9

Electric Conductivity ....

this paper, specimens for tests were produced from oxides of high purity by pressing and sintering in an oxygen stream. The applied pressure was 1.5 t/cm^2. The specimens were sintered at 600 °C (V_2O_5), at 700 °C (MoO_3) and at 1 000 °C (WO_3). The tests have shown that to obtain a stable density and electric conductivity the specimens have to be held at these temperatures for about 6 hours. The electric resistance of these specimens was measured on a potentiometric instrument consisting of a potentiometer, a mirror galvanometer and a DC source. The measurements were made at elevated temperatures by means of apparatus, a sketch of which is shown in Fig. 1 (1 - test specimen; 2 - thermocouple; 3 - heater; 4 - stainless-steel container; 5 - lid; 6 - stress-bearing current leads; 7 - clamping arrangement; 8 - pressure-current leads). The results have shown that the plots - reciprocal of the temperature versus logarithm of the specific conductivity - have a pronounced bend located somewhat lower than the observed temperatures of the beginning of reduction of these oxides with carbon.

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Electric Conductivity ....

Figs. 2, 3a and 3b show the dependence of the electric conductivity on the temperature and the reciprocal of the temperature, $10^4/T$, for V_2O_5, MoO_3 and WO_3, respectively. In Fig. 3 Curves 1 apply to the heating and Curves 2 to the cooling process. The bends were observed at about 380 °C for V_2O_5, at about 460 °C for MoO_3 and at about 700 - 725 °C for WO_3. The temperatures of the beginning of interaction of these oxides with carbon are, respectively, 438, 475 and 782 °C. Thus, at temperatures at which the reduction with carbon begins, a physical transformation occurs, which is accompanied by a slowing-down in the increase of the electric conductivity with temperature. From the point of view of the semiconductor properties, this corresponds probably to a transition from impurity- to intrinsic-conductivity of the oxides.

Card 3/9

Electric Conductivity ....

In a special series of experiments with specimens consisting of V_2O_5 and finely-ground graphite, pressed and sintered for 6 hours at 250 °C, it was found that the electric resistance increased monotonously at all temperatures with increasing holding time. On the other hand, the electric resistance of pressed graphite powder was found to drop on heating to 300 °C and remained constant on further heating. This behaviour of oxide-plus-graphite specimens is attributed to interaction between them, accompanied by the formation of CO + CO_2;

the carbon consumption of the reduction reaction leads to a decrease in the electric conductivity of the specimen since the conductivity is basically determined by the electric conductivity of the graphite. It follows therefrom that the speed of change of the electric resistance at various temperatures can serve as a characteristic of the speed of the process of reduction of the oxide by the carbon. Fig. 5 shows the dependence of the speed of change with time of the electric resistance ($\Delta R/\Delta\tau$, Ω/min) as a function of the temperature (°C) of the V_2O_5 plus C specimens; a sharp increase was

Electric Conductivity ....

observed at about 380 °C. The conclusion drawn is that the beginning of appreciable reduction of the oxides coincides with the transition from impurity- to intrinsic-type conductivity. The results of dilatometric measurements on V_2O_5, MoO_3 and WO_3 specimens, for heating and cooling rates of 150, 200 and 250 °C/h, respectively, are plotted in Fig.6 [V_2O_5, MoO_3 (Fig.6a), WO_3 (Fig. 6b)],(change in length, μ versus temperature, °C). The temperature was measured with an accuracy of ± 10 °C and the length with an accuracy of 0.5 μ. Thermal expansion occurs up to 350, 440 and 680 °C, respectively. From these temperatures upwards, which correspond approximately to the bends in the temperature-electric conductivity curves, contraction of the specimens was observed. This contraction is attributed to polymorphous transformation or to plastic deformation caused by the measuring equipment as a result of the sharp drop in strength of the oxide at this temperature. It is concluded that at the temperature of the beginning of the reduction process, a change is observed in the physical properties, which is accompanied

Electric Conductivity ....

by a sharp decrease in the strength of the sintered specimens and by a slowing-down of the drop in the electrical resistance during heating. The beginning of the intensive chemical interaction corresponds with the transition from impurity- to intrinsic-type conductivity.
There are 6 figures and 9 references: 8 Soviet and 1 non-Soviet.

ASSOCIATION: Moskovskiy institut stali (Moscow Steel Institute)

SUBMITTED: January 25, 1961

Card 6/9

35217
S/148/62/000/001/001/015
E039/E435

AUTHORS: Yelyutin, V.P., Pavlov, Yu.A., Ts'ao Fu-k'ang

TITLE: The connection between the beginning of reduction and the semiconductor properties of metallic oxides

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Chernaya metallurgiya, no.1, 1962, 14-19

TEXT: The mechanism of reduction of metallic oxides is insufficiently understood, particularly for temperatures below 700°C at which the speed of regeneration of the oxides of carbon is insignificant, hence new methods of investigation are needed. In this work the change in electrical resistance of the higher oxides of vanadium, molybdenum and tungsten was investigated at the temperature of their initial interaction with carbon. Samples of cermets (2 x 6 x 40 mm) were prepared by pressing the powdered oxides at 1.5 tons/cm^2 and sintering in an atmosphere of oxygen for 6 hours at 600°C (V_2O_5); 700°C (MoO_3) and 900°C (WO_3). The electrical resistance of the samples was measured by a compensating method using a high temperature four-point probe in an atmosphere of argon at temperatures of 200 to 580°C (V_2O_5);

Card 1/2

The connection between ...

320 to 600°C (MoO_3) and 500 to 850°C (WO_3). The results show that the resistance of the samples has a typical semiconductor character. A discontinuity occurs in the curves relating electrical conductivity and temperature and it is shown that the temperature at which this discontinuity occurs is approximately the same as the temperature at which reduction of the oxides begins. The effect of adding SiO_2 to V_2O_5 was also investigated. The transition temperatures are: V_2O_5, 373 to 430°C; V_2O_5 + 0.08% SiO_2, 381°C; V_2O_5 + 0.17% SiO_2, 416°C; V_2O_5 + 0.35% SiO_2, 433°C; MoO_3, 415 to 480°C; WO_3, 675 to 695°C. It is also shown that the temperature for the initial reduction of the oxides depends on the width of the forbidden zone / E_o. The larger ΔE_o the higher the transition temperature. The addition of SiO_2 raises the transition temperature of V_2O_5 and simultaneously lowers its chemical activity. There are 3 figures and 2 tables.

ASSOCIATION: Moskovskiy institut stali (Moscow Steel Institute)

SUBMITTED: June 17, 1961

Card 2/2

X

35224
S/148/62/000/001/009/015
E073/E535

18.1785

AUTHORS: Volcynik, V.V., Yelyutin, V.P., Lysov, B.S. and Maurakh, M.A.

TITLE: Electric conductivity of solid and liquid titanium

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Chernaya metallurgiya, no.1, 1962, 137-140

TEXT: Although data on the electric conductivity of titanium up to temperatures of 1300°C have been published, similar data relating to near-fusion temperature and to the liquid state have not been published. An electrodeless method was applied for measuring the resistivity of titanium. This is based on measuring the stationary torsion angle of a specimen suspended on an elastic thread in a rotating magnetic field. The stator coil winding of the measuring instrument was provided with a high temperature insulation and the coils were placed inside a water-cooled steel housing. Graphite heater elements were used which permitted obtaining temperatures up to 2500°C. The method of measurement of the resistivity is similar to that applied by other authors for measuring the resistivity of molten metals. The temperature

dependence of the resistivity of titanium ρ, mohm·cm is plotted in a graph. Curve 1 represents the values obtained by the author of this paper, curves 2 and 3 are published values. For the liquid metal two values were obtained: A - for melts produced in ThO_2 or BeO crucibles, B - for melts produced in graphite crucibles. The author points out that the data for liquid titanium at 1800°C (points A and B) are not entirely reliable and should be verified with a crucible material less active towards liquid titanium than the graphite, thorium dioxide, and beryllium oxide used in these experiments. From the test results the temperature coefficients of α- and β-titanium were determined. The specific resistance of α-titanium in the temperature range 20 to 450°C can be expressed by

$$\rho_\alpha = 61.5 \left[1 + 2.48 \cdot 10^{-3} (t - 20)\right]$$

and for β-titanium, in the temperature range 880 to 1700°C, can be expressed by

$$\rho_\beta = 143 \left[1 + 2.13 \cdot 10^{-4} (t - 880)\right]$$

There are 1 figure and 11 references: 5 Soviet-bloc and 6 non-Soviet-bloc. The four latest English-language references read as follows: Ref.2: McQuillan A.D. J. Inst. Met., 78,249, 1950-51;

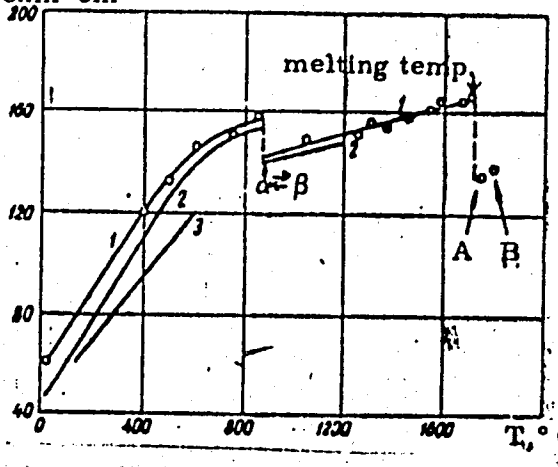
Electric conductivity of solid ... S/148/62/000/001/009/015
E073/E535

Ref.3: I.L.Wyrtt.Trans.Amer.Inst.min.(metal) Engrs.197,903,1953;
Ref.4: W.C.Michels, S.Wilford. Phys.Rev. 76,174,1949; Ref.10:
B.Weber, M.Thompson. J.Amer.Ceram.Soc. 40(11), 363, 1957.

ASSOCIATION: Moskovskiy institut stali (Moscow Steel Institute)

SUBMITTED: April 6, 1961

Figure



Card 3/3

GORELIK, S.S.; YELYUTIN, V.P.; MOZZHUKHIN, Ye.I.; URAZALIYEV, U.S.; FUNKE, V.F.

X-ray investigation of recrystallization processes of titanium, zirconium, and molybdenum borides, and titanium and tungsten carbides. Izv. vys. ucheb. zav.; tsvet. met. 5 no.4:143-148 '62. (MIRA 16:5)

1. Moskovskiy institut stali, kafedry redkikh metallov, fiziki metallov i rentgenografii.
(Borides) (Carbides) (Crystallization)

S/126/62/014/003/014/022
E193/E383

AUTHORS: Yelyutin, V.P., Mozzhukhin, Ye.I., Panov, A.V. and Khalil, R.B.

TITLE: Study of internal friction of copper on specimens prepared by powder-metallurgy techniques

PERIODICAL: Fizika metallov i metallovedeniye, v. 14, no. 3, 1962, 443 - 451

TEXT: The object of the present investigation was to study the effect of various factors (compacting pressure, sintering conditions) on the internal friction of green and sintered copper-powder specimens. The test pieces (70 x 5 x 0.5 - 1.5 mm) were prepared from electrolytic copper powder (20 - 30 μ particle size), 99.915% purity, which had been given a preliminary reducing anneal (2 hours at 400 °C) in hydrogen. The internal friction was determined by measuring the amplitude of forced oscillations of the specimen near its resonance frequency on an apparatus designed by one of the present authors (a description is given of both the equipment and experimental procedure). Typical results are reproduced

in Figs. 3 and 5. In Fig. 3, the internal friction ($\tan \delta \times 10^4$) of green compacts, prepared under a pressure of 4 t/cm^2, is plotted against temperature ($^\circ$C), curve 1 representing the results obtained on heating a freshly prepared compact, curve 2 showing the results obtained on subsequent cooling. Fig. 5 shows the temperature dependence of $\tan \delta \times 10^4$ of compacts sintered at 900 $^\circ$C in a vacuum (curve 1) and hydrogen (curve 2). Several conclusions were reached: 1) Temperature-dependence of internal friction of green copper-powder compacts have two peaks: a low-temperature peak associated with the grain-boundary effect and a high-temperature peak associated with the presence of oxygen; the internal friction of green compacts decreases with increasing compacting pressure. 2) The internal friction of green compacts, measured during the first heating cycle, is lower than that observed during subsequent cooling; this can be attributed to sintering taking place during the first heating cycle and during the first internal-friction measurements. 3) The high-temperature peak disappears if sintering is carried out in hydrogen at 900 - 1 000 $^\circ$C.

Study of internal friction ....

4) On increasing the sintering temperature from 600 - 900 °C the height of the low-temperature peak increases and the peak is shifted towards higher temperatures; further increase in the sintering temperature brings about a decrease in the height of this peak. These effects indicate that on raising the sintering temperature from 600 to 900 °C the contact area increases at a rate faster than the rate of the grain growth; on raising the sintering temperature from 900 to 1 000 °C the rate of grain growth becomes faster. There are 7 figures.

ASSOCIATION: Moskovskiy institut stali (Moscow Institute of Steel)

SUBMITTED: February 5, 1962

Card 3/3

S/032/62/028/009/007/009
B104/B102

AUTHORS: Yelyutin, V. P., Panov, A. V., Natanson, A. K., Shulepov, V. I., and Vasil'yev, O. A.

TITLE: A device for measuring the internal friction and shear modulus at high temperatures

PERIODICAL: Zavodskaya laboratoriya, v. 28, no. 9, 1962, 1123 - 1126

TEXT: This device can be used to determine the internal friction and shear modulus from the damping of torsional vibrations in wire samples (0.2 - 1 mm diameter) at temperatures up to 2500°C. The sample is suspended vertically inside a tubular tungsten heater and has a zone 100 mm long wherein the heat increases uniformly. Its temperature is measured by a thermocouple whose hot junction is situated half way along it. The sample is fixed at its upper end whilst the lower end is twisted by a vibrating mass. The latter has two long arms which carry permalloy magnetic cores to excite torsional vibrations in the sample, which are visible and are recorded magnetoelectrically. At temperatures below 1000°C the number of vibrations is counted up to a certain value after

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which their amplitude decreases. Above 1000°C the amplitude of each individual vibration is measured. The measuring error is only 3% and increases only slightly at very high temperatures. There are 4 figures.

ASSOCIATION: Moskovskiy institut stali i splavov (Moscow Institute of Steel and Alloys)

Card 2/2

S/076/62/036/007/007/010
B101/B138

AUTHORS: Yelyutin, V. P., Pavlov, Yu. A., Shulepov, V. I., and Myakisheva, T. G.

TITLE: Electrical resistivity of V_2O_5, MoO_3, and WO_3 when heated in hydrogen atmosphere

PERIODICAL: Zhurnal fizicheskoy khimii, v. 36, no. 7, 1962, 1524 - 1527

TEXT: The initial stage of the reaction of V_2O_5, MoO_3, and WO_3 with H_2 was studied by measuring the electrical resistivity (apparatus see Izv. vyssh. uchebn. zavedeniy, Chernaya metallurgiya, no. 7, 1961). Oxides sintered in an O_2 flow for 6 hr were used. At all temperatures applied (200 - 700°C), resistivity was found to diminish in the course of heating. $\Delta R/R\Delta\tau$ for V_2O_5 was 0.002 at 250°C, 0.004 at 300°C, 0.007 at 350°C, 0.016 at 375°C, and 0.027 at 380°C (start of reaction with H_2). For MoO_3 and WO_3, $\Delta R/R\Delta\tau$ rose slowly at low temperatures, and rapidly near the beginn-

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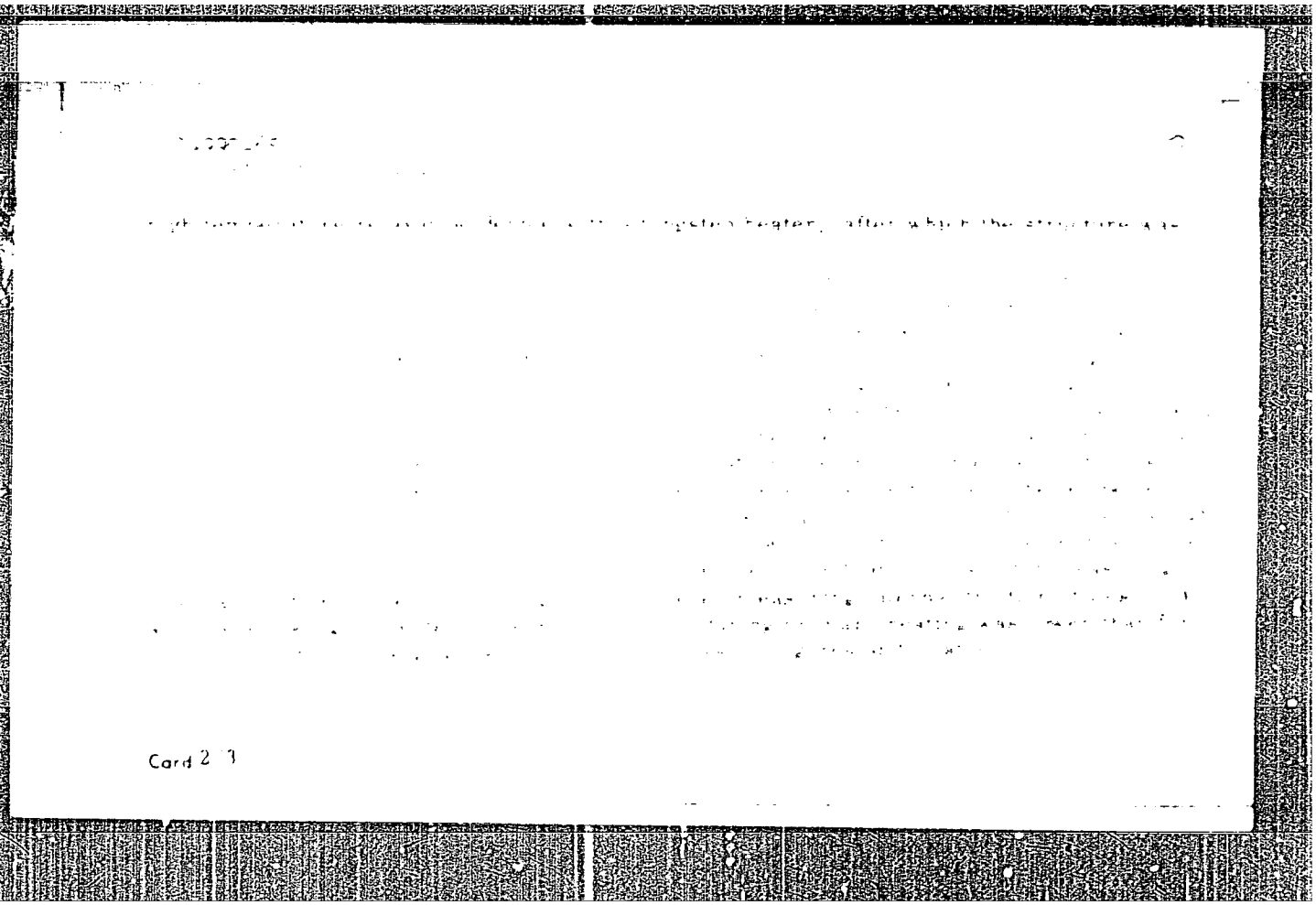
ing of reaction with H_2 (430°C for MoO_3, 630°C for WO_3). The slow rise corresponds to the extrinsic conductivity of the oxides with chemisorbed H_2 reacting as donor with the oxide, while the steep rise of the curve is due to the changeover to intrinsic conductivity. Here, an intense reaction with H_2 starts in the gaseous phase owing to sublimation (dissociation) of the oxide. There are 4 figures and 1 table.

ASSOCIATION: Moskovskiy institut stali (Moscow Steel Institute)

SUBMITTED: March 1, 1960

L 14990-65 EWT(m)/EWP(w)/EWA(d)/EWP(t)/EWP(b) ASD(f)-2/ASD(m)-3/ESD(c) MJW/
ACCESSION NR: AT4048120 JD/JG/MLK 8/0000/63/000/000/0055/0064

differed in the residual elongation after creep tests from zero in the first lot to 1 mm in the



Card 2 3

APPROVED FOR RELEASE: 03/15/2001 CIA-RDP86-00513R001962620007-8"