KOVIKOV, I.I.

Thermodynamic similitude; application of the theory of similitude to the study of physical properties of substances. Nek. vop. inzh. fiz. no.1:43-48 '57. (MIRA 12:5)
(Dimensional analysis) (Thermodynamics)

NOVIKOV, I.I.

Conditions governing the thermodynamic similitude of real substances. Nek. vop. inzh. fiz. no.1:49-57 '57. (MIRA 12:5)
(Dimensional analysis) (Thermodynamics)

89-5-9/22

AUTHOR NOVIKOV I.I.

TITLE Some Dependences Upon the Viscosity And the Thermal Conduction of Liquid- And Gaseous Bodies
(Nekotoryye zavisimosti dlya vyazkosti i teploprovodnosti zhidkikh i gazoobraznykh tel -Russian)

PERIODICAL Atomnaia Energiia, 1957, Vol 2, Nr 5, pp 469 - 469, (U.S.S.R.)
Received 6/1957 Reviewed 7/1957

ABSTRACT When studying the viscosity and the thermal conduction of the liquid and gaseous heat carriers (especially those which may be used in atomic reactors), the author investigated an interesting rule, which connects the coefficients of the viscosity and the thermal conduction of the liquid and the gaseous phase. This hitherto apparently unknown rule might also be of interest in a practical respect.
Within the domain of the liquid state the coefficient of viscosity diminishes at increasing temperature. However, within the domain of the gaseous state (including the saturation curve), the coefficient increases with increasing temperature, i.e. the temperature dependences of the viscosity of the liquid and gaseous phase are directly opposed to one each other. With a modification of the temperature also the density of the liquid and the gaseous phase change in a similar manner.
As the curve of the phase equilibrium within the domain of the critical point is symmetric, it is to be expected that the viscosity coefficient of the liquid phase (which is in equilibrium with the saturated vapor), and the

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Some Dependences Upon the Viscosity And the Thermal Conduction 89 5 9/22
of Liquid And Gaseous Bodies.

Viscosity coefficient μ' of the saturated vapor or the vaporous-like phase near the critical point (i.e. at temperatures near the critical temperature t_{kr}), approximatively satisfy the following simple relation: $(1/\mu'') + (1/\mu') = (2/\mu) + a(t_{kr} - t)$. Here μ denotes a constant, which is numerically equal to the value of the viscosity coefficient in the critical point. This relation is an analogy between the known equation for the densities of a saturated vapor and the liquid which is in equilibrium with it within the domain of the critical point. As may be seen from the table attached, $(1/\rho'') + (1/\rho') = 0.33 + 13\,(t_{kr} - t)$ holds with great accuracy for CO_2. The coefficient of the thermal conduction of the liquid and gaseous phase has an analogous temperature dependence.
The relation $(1/\lambda') + (1/\lambda'') = (2/\lambda_{\kappa}) + b(t_{kr} - t)$ therefore applies for the coefficients of the thermal conduction of the saturated vapor and the liquid which is in equilibrium with it
(1 table)

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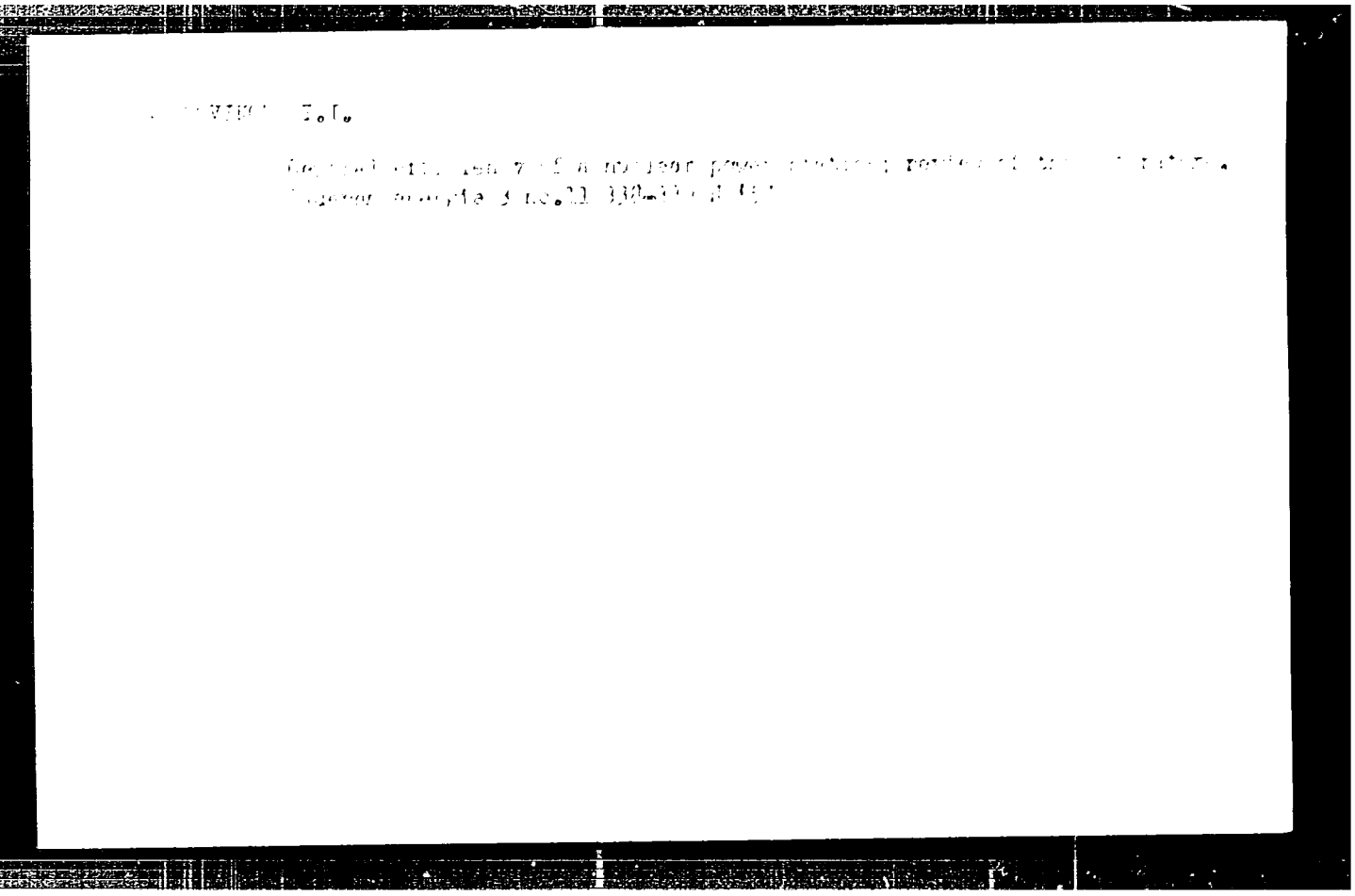

N . . . . I I.

AUTHOR: Novikov, I. I. 89-11-5/9

TITLE: The Effective Output of Atomic Energy Stations (Effektivnyy koeffitsiyent poleznogo deystviya atomnoy energeticheskoy ustanovki)

PERIODICAL: Atomnaya Energiya, 1957, Vol. 3, Nr 11, pp. 409-412,(USSR)

ABSTRACT: From the formulae derived for the effective efficiency follows that the average temperature of the working medium T' and the effective efficiency (η_e) of the station increase with a temperature increase in the reactor (that means when the temperature load permitted for the fuel elements is increased). On that occasion T' increases only slowly, but the effective efficiency rather rapidly. When the reactor temperature is increased to twice its former value T' increases by 40%, whereas η_e also increases to almost twice of its former value. The effective efficiency of an atom-electric station can be increased by regeneration of the heat just as for example in heat-engine generating stations. For an atom-electric station,however, this heat regeneration is considerably more difficult. There are 2 Slavic references.

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PHASE I BOOK EXPLOITATION 775

Kutateladze, S.S., Borishanskiy, V.M., Novikov, Ivan Ivanovich, and Fedynskiy, O.S.

Zhidkometallicheskiye teplonositeli (Liquid Metal Heat-Transfer Agents) Moscow, Atomizdat, 1958. 204 p. (Series: Atomnaya energiya. Prilozheniye, 1958, no 2) 8,750 copies printed.

Resp. Ed.: Koryakin, Yu. I.; Tech. Ed.: Usachev, G.L.

PURPOSE: This book is intended for scientists and engineers working in the field of reactor construction and nuclear engineering. It can also be useful in other fields where liquid metal heat-transfer agents are applicable.

COVERAGE: This booklet, a 1958 supplement to the periodical "Atomic Energy," is devoted to a study of liquid metal heat-transfer agents used in nuclear power engineering. The authors present data from Soviet and foreign research in this field conducted within the last 10 years. The greater part of the

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Liquid Metal Heat-Transfer Agents 775

text was written by S.S. Kutateladze, V.M. Borishanskiy, and I.I. Novikov. Chapters I, III, V, and VIII were written in collaboration with O.S. Fedynskiy. G.M. Lyamkin, N.A. Prikhodchenko and Yu. I. Koryakin took part in preparing the manuscript. There are 81 references of which 40 are Soviet, 33 English, 3 German, and 4 French .

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YEMEL'YANOV, V.S., otv.red.; BARDIN, I.P., red.; VINOGRADOV, A.P., red.; GOL'DANSKIY, V.I., red.; GULYAKIN, I.V., red.; DOLIN, P.I., red.; YEFREMOV, D.V., red.; KRASIN, A.K., red.; LEBEDINSKIY, A.V., red.; MINTS, A.L., red.; MURIN, A.N., red.; NIZE, V.E., red.; NOVIKOV, I.I., red.; SEMENOV, V.F., red.; SOBOLEV, I.N., red.; BAKHAROVSKIY, G.Ya.; nauchnyy red.; BERKOVICH, D.M., nauchnyy red.; DANOVSKIY, N.F., nauchnyy red.; DELONE, N.N., nauchnyy red.; KON, M.A., nauchnyy red.; KOPYLOV, V.N., nauchnyy red.; MANDEL'TSVAYG, Yu.B.; MILOVIDOV, B.M., nauchnyy red.; MOSTOVENKO, N.P., nauchnyy red.; MURINOV, P.A., nauchnyy red.; POLYAKOV, I.A., nauchnyy red.; PREOBRAZHENSKAYA, Z.P., nauchnyy red.; RABINOVICH, A.M., nauchnyy red.; SIMKIN, S.M., nauchnyy red.; SKVORTSOV, I.M., nauchnyy red.; SYSOYEV, P.V., nauchnyy red.; SHORIN, N.A., nauchnyy red.; SHREYBERG, G.L., nauchnyy red.; SHTEYNMAN, R.Ya., nauchnyy red.; KOSTI, S.D., tekhn.red.

[Concise atomic energy encyclopedia] Kratkaia entsiklopediia "Atomnaia energiia." [___Tables of isotopes (according to published data available at the beginning of 1958)] ___Tablitsa izotopov (po dannym, opublikovannym k nachalu 1958. 12 p. Gos. nauch. izd-vo "Bol'shaia sovetskaia entsiklopediia," 1958. 610 p. (MIRA 12:1)

1. Sotrudniki Bol'shoy Sovetskoy Entsiklopedii (for Bakharovskiy, Berkovich, Danovskiy, Delone, Kon, Kopylov, Mandel'tsvayg, Milovidov, Mostovenko, Murinov, Polyakov, Preobrazhenskaya, Rabinovich, Simkin, Skvortsov, Sysoyev, Shorin, Shreyberg, Shteynman).
(Atomic energy)

AUTHORS. Kutateladze, S. S., Borishanskiy, V. M., SOV/[illegible]
Novikov, I. I., Fedynskiy, O. S.

TITLE: Liquid Metal Heat Carriers (Zhidkometallicheskiye teplonositeli) Chapter 1: Basic Properties of Liquid Metals (Glava 1: Osnovnyye svoystva zhidkikh metallov)

PERIODICAL: Atomnaya energiya, 1958, Supplement 2, pp. 7-22 (USSR)

ABSTRACT: The physical properties are given in form of tables for the liquid state of the following elements:
1.) Mercury
2.) Sodium
3.) Kalium
4.) Lithium
5.) Bismuth
6.) Gallium
7.) Lead.
The theory of the thermodynamical similitude of real bodies is explained and applied to the investigation of the properties of liquid metals. This chapter further deals with the following subjects: Experimental data concerning the velocity of propagation

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Liquid Metal Heat Carriers. SOV/6938

Charter 1: Basic Properties of Liquid Metals

of sound in liquid metals, and a method of estimating this quantity by calculation.
This and the following chapters take data published within the past 10 years into account both in the USSR and in other countries.
The entire compilation was signed by S. S. Kutateladze, V. M. Borishanskiy and I. I. Novikov, as the responsible authors.
O. S. Fedynskiy participated in compiling chapters 1, 3, 5 and 6.
G. M. Lyamkin, N. A. Prikhodchenko and Yu. J. Konyakin assisted in writing the manuscript. There are 3 figures, 12 tables

[illegible]

Card 4/

AUTHORS: Kutateladze, S. S., Borishanskiy, V. M., Novikov, I. I., Fedynskiy, O. S. SOV/698-58-[illegible]

TITLE: Liquid Metal Heat Carriers (Zhidkometallicheskiye teplonositeli) Chapter 2: Ranges of Application of Liquid Metal Heat Carriers (Glava 2. Oblasti primeneniya zhidkometallicheskikh teplonositeley)

PERIODICAL: Atomnaya energiya, 1958, Supplement 2, pp. 23-26 (USSR)

ABSTRACT: The following subdivision offers a survey of the various ranges of application:
a) General considerations.
b) Use of liquid metal heat carriers in steam-producing plants.
c) The use of liquid metal heat carriers in nuclear power plants.
There are 1 figure.

1. Liquid metals--Applications 2. Liquid metals--Heat transfer

Card 1/[illegible]

AUTHORS: Kutateladze, S. S., Borishanskiy, V. M., SOV/[illegible]-3/13
Novikov, I. I., Fedynskiy, O. S.

TITLE: Liquid Metal Heat Carriers (Zhidkometallicheskiye teplonositeli) Chapter 3: The Hydraulic Resistance of Flowing Liquid Metals (Glava 3. Gidravlicheskoye soprotivleniye pri techenii zhidkikh metallov)

PERIODICAL: Atomnaya energiya, 1958, Supplement 2, pp. 27-37 (USSR)

ABSTRACT: The following subdivisions offer a survey of the matter dealt with:
1.) Flow in smooth tubes.
Investigations showed that the laws of resistance for flowing liquid metals in smooth tubes are practically the same as in the case of non-metal liquids.
2.) Flow in rough tubes.
The hydraulic resistance of steel tubes to H_2O, Hg and Sn is graphically represented.
3.) Influence exercised by the heat carrier.
4.) Local resistance.
5.) Friction of a revolving disk.
The consumption of energy necessary for the rotation of a

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Liquid Metal Heat Carriers.
Chapter 3: The Hydraulic Resistance of
Flowing Liquid Metals

SOV/6[illegible]

smooth disk of 270 mm Ø and 10 mm thickness in Hg, oil, H_2O and petroleum is shown by a graph.
6.) Increase of pressure in the case of a hydraulic impact.
There are 10 figures

1. Liquid metals--Hydrodynamic characteristics
2. Fluid flow--Resistance 3. Friction

Card 2/2

AUTHORS: Kutateladze, S. S., Borishanskiy, V. M., Novikov, I. I., Fedynskiy, O. S. SOV/89S-58-2-3/13

TITLE: Liquid Metal Heat Carriers (Zhidkometallicheskiye teplonositeli) Chapter 3: Heat Transfer in Flows Through Tubes (Glava 5 Teplootdacha pri techenii v trubkakh)

PERIODICAL: Atomnaya energiya 1958, Supplement 2, pp. 47-95 (USSR)

ABSTRACT: The following subdivision allows a survey of this matter:

a) Theoretical solutions.
b) Experimental data concerning the heat transfer to mercury.
c) Experimental data concerning the heat transfer to the eutectic lead-bismuth.
d) Experimental data concerning the heat transfer to tin.
e) Experimental data concerning the heat transfer to the eutectic sodium-kalium.
f) Comparison of the empirical values obtained concerning the average heat transfer in tubes with L/D > 30 for:
   1.) mercury
   2.) sodium
   3.) eutectic: sodium-kalium
   4.) influence exercised by additions.

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Liquid Metal Heat Carriers. SOV/89S-58-2-5/17
Chapter 5: Heat Transfer in Flows Through Tubes

g) Comparison of empirical values obtained concerning the heat transfer in slit.

There are 67 figures, 1 table

1. Liquid metals--Heat transfer

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89-4-5-3/26

AUTHORS: Kutateladze, S. S., Borish[illegible]y, V. M., Novikov, I. I.

TITLE: Heat Transfer to Liquid Metals (Teploobmen v zhidkikh metallakh)

PERIODICAL: Atomnaya Energiya, 1958, Vol 4, Nr 5, pp. 422 - 436 (USSR)

ABSTRACT: From foreign and Soviet references a survey of data is given that have as yet been obtained on the heat exchange between solid surfaces and a flow of molten metal. Particularly the experimental data of the heat transfer to liquid metals are given if these metals flow in long or short tubes in plane slits. The available data for the following cases are also given: The tubes or plates are longitudinally coated by liquified metal; cylinders are flowed around transversely; there is free convection; a condensation of the vapor of the liquid metal occurs. As heat carriers, mercury, an eutectic alloy of lead and bismuth, sodium and sodium-potassium are used. The influence od admixtures to these heat carriers on their heat

Card 1/2

Heat Transfer to Liquid Meta s 89-4-5-3/26

transferring capacity is investigated. The respective formulae are derived for the heat transfer in various cases. There are 11 figures, 2 tables and 30 references, 14 of which are Soviet.

SUBMITTED: November 4, 1957

AVAILABLE: Library of Congress

1. Liquid metals—Heat transfer

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SOV/89S-[illegible]-4-[illegible]

AUTHORS: Kutateladze, S. S., Borishanskiy, V. M., Novikov, I. I., Fedynskiy, O. S.

TITLE: Supplementary Table: "Liquid Metallic Heat Carriers"(Prilozheniya: Zhidkometallicheskiye teplonositeli)

PERIODICAL: Atomnaya energiya, 1958, Supplement 5, Inserted between pp 108 and 109) (USSR)

ABSTRACT: This is a supplement to table 12.1 (pp 172-173) and the explanation of the positions 1 - 33 on the drawing 12.1 (pp 177) in connection with the paper published in Atomnaya energiya, 1958, Supplement Nr 2. The table contains data on physical properties of metallic heat carriers. There is 1 table.

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PHASE I BOOK EXPLOITATION SOV/3598

Novikov, I.I., and V.M. Zaytsev

Sbornik zadach po tekhnicheskoy termodinamike (Collection of Problems in Applied Thermodynamics) Moscow, Atomizdat, 1959. 247 p. 7,000 copies printed.

Sponsoring Agencies: Moscow. Inzhenerno-fizicheskiy institut, and RSFSR. Ministerstvo vysshego i srednego spetsial'nogo obrazovaniya.

Tech. Ed.: R.A. Negrimovskaya.

PURPOSE: This collection of problems is intended for engineering and physics majors in technical schools of higher education. The book may also be useful to power and mechanical engineering students, correspondence students, and persons studying independently.

COVERAGE: This book contains solutions of problems compiled for the course in applied thermodynamics at the Moscow Engineering and Physics Institute. Difficult problems are solved step by step.

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Collection of Problems in Applied Thermodynamics SOV/3598

No theoretical considerations are given. The book is based on the textbook "Engineering Thermodynamics" by S.N. Vukalovich and I.I. Novikov. The authors used some material published earlier by the following authors: A.V. Krasnikov; M.V. Nosov and N.A. Kutyrin: S.N. Vasil'yev; Ts. Tsiteman; V.A. Kirillin and A.Ye. Sheyndlin; and others.

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Collection of Problems in Applied Thermodynamics SOV/3598

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SOV/89-7-3-8/29

21(9)
AUTHOR: Novikov, I. I.

TITLE: The Generalized Dependence for the Critical Thermal Stress

PERIODICAL: Atomnaya energiya, 1959, Vol 7, Nr 3, pp 252-253 (USSR)

ABSTRACT: The main characteristic of the boiling crisis - the critical density of the heat flow (or the critical thermal stress, ...s deduced for the case in which a liquid boils in a large volume. The following form of the function was found:

$$q_{crit} = \frac{g^{1/2} R^{1/2} p_{crit} \cdot T_{crit}^{1/2}}{\mu^{1/2}} f\left(\frac{p}{p_{crit}}, \frac{V_{crit}^{1/3}}{a}\right)$$

where R denotes the gas constant, μ - the molecular weight of the substance, p_{crit}, V_{crit}, T_{crit} - the critical parameters of the substance, a - the average radius of the curvature of the inhomogeneous surface of the heating, p/p_{crit} - the reduced pressure, f - a function that is equal for groups of thermodynamically similar substances. From the deduced dependence it follows that in the case of thermodynamically similar substances, which boil under equal conditions, and ha...

Card 1/2

The Generalized Dependence for the Critical Thermal Stress

equal (or very similar) values of V_{crit}, the quantity $\frac{q_{crit} \cdot \mu^{1/2}}{p_{crit} \cdot T_{crit}^{1/2}}$ becomes equal as long as only the ratio p/p_{crit} is also equal. This conclusion agrees well with experimental experience. From the dependence of the expression $\frac{q_{crit} \cdot \mu^{1/2}}{p_{crit} \cdot T_{crit}^{1/2}}$ upon p/p_{crit} for benzene and pentane, which have a similar critical coefficient of 3.76, and the critical volumes (256 and 310 cm^3/mol respectively) are close together, it follows that the measuring points for both substances are on one and the same curve. There are 1 figure and 1 reference.

SUBMITTED: July 10, 1959

Card 2/2

AVDONIN, V.I. (Moskva); NOVIKOV, I.I. (Moskva)

Speed of sound on the steam-liquid phase equilibrium curve. Speed of sound in saturated water vapor. PMTF no.1:58-62 My-Je '60. (MIRA 14:8)

(Sound--Speed) (Phase rule and equilibrium)

NOVIKOV, I.I. (Moskva); TRELIN, Yu.S. (Moskva)

Speed of sound along "vapor--liquid" phase equilibrium curve.
Speed of sound propagation in saturated vapors of carbon dioxide.
PMTF no.2:112-115 Jl-Ag 60. (MIRA 14:6)
(Sound--Speed) (Phase rule and equilibruim) (Carbon dioxide)

NOVIKOV, I.I.; ZAYTSEV, V.M.; YASTRZHEMBSKIY, A.S., prof., doktor tekhn. nauk, retsenzent; MATVEYEVA, A.V., red.; VLASOVA, N.A., tekhn. red.

[Theromodynamics in questions and answers] Termodinamika v voprosakh i otvetakh. Moskva, Gos. izd-vo lit-ry v oblasti atomnoi nauki i tekhniki, 1961. 142 p. (MIRA 15:4)
(Thermodynamics)

PHASE I BOOK EXPLOITATION SOV/5829

Novikov, Ivan Ivanovich, Corresponding Member, Academy of Sciences USSR, Professor, and Kirill Dmitriyevich Voskresenskiy

Prikladnaya termodinamika i teploperedacha (Applied Thermodynamics and Heat Transfer) Moscow, Gosatomizdat, 1961. 547 p. (Series: Osnovy yadernoy energetiki) Errata slip inserted. 7500 copies printed.

Ed.: A. V. Matveyeva; Tech. Ed.: Ye. I. Mazel'.

PURPOSE: This textbook is intended for students specializing in nuclear engineering. The book is part of a series entitled "Fundamentals of Nuclear Engineering" published by Gosatomizdat and based on lecture courses of the authors.

COVERAGE: The book consists of two major parts, each virtually a separate book, entitled "Thermodynamics" and "Heat Transfer", respectively. Part I, by I.I. Novikov, covers the usual subject matter found in a course in engineering thermodynamics, namely, basic concepts, the first and second laws of thermodynamics, thermodynamic processes and cycles, compressors and internal combustion engines,

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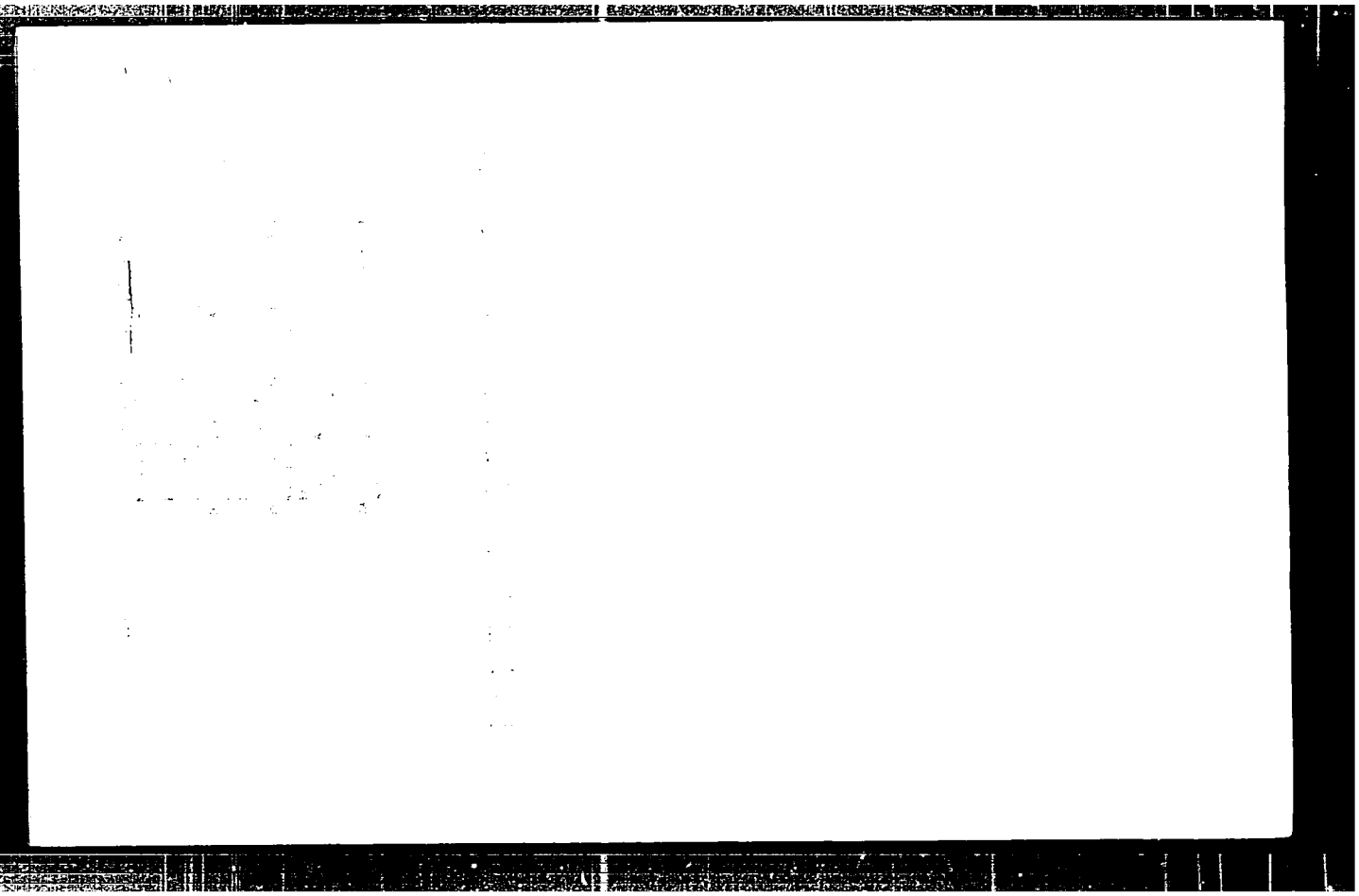

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AUTHOR Novikov, I.I.

TITLE Applying the theory of thermodynamic similarity to the phenomenon of crisis in a boiling liquid

SOURCE Kutateladze, S.S. ed. Voprosy teplootdachi i gidravliki dvukhfaznykh sred; sbornik statey, Moscow, Gosenergoizdat, 1961, 14-17

TEXT The author points out that the critical properties and the molecular mass of a substance describe the qualitative effect of its intermolecular forces. Therefore, viscosity, thermal conductivity, diffusion etc. properties are functions of p_{cr}, T_{cr}, R, $\frac{M}{g}$, and can be obtained by dimensional analysis. In deriving the conditions of similarity only the dimensional factors of these properties or their values at corresponding points (e.g. critical points) need be used. For full similarity, substances under comparison must be thermodynamically similar, especially in the case of boiling. Considering a large volume of boiling liquid, thermodynamic similarity requires that the heat change Q divided by RT Card (1/3)

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Applying the theory of ...

1 soviet bloc and 1 non soviet-bloc. The reference to the english language publication reads as follows: M. Cichelli and C. Bonilla, Trans. Am. Inst. Chem. Engrs., 41, 1946, no. 6, 745.

Card 3/3

NOVIKOV, I.I. (Moskva)

Existence of a jump in the speed of sound at the critical point. (MIRA 14:6)
PMTF no.1:109-110 Ja - F '61.
(Sound--Speed)

VUKALOVICH, M.P. (Moskva); NOVIKOV, I.I. (Moskva)

Remarks on the equation describing the exponent of the adiabatic of wet steam. PMTF no.3:108-110 S-O '61. (MIRA 14:8)
(Differential equations) (Steam)

AVDONIN, V.I.; NOVIKOV, I.I.

Sound propagation in saturated vapors of liquids. Inz.-fiz. zhur. 4 no.12:11-15 D '61. (MIRA 14:11)

1. Inzhenerno-fizicheskiy institut, Moskva.
(Sound—Speed) (Vapors)

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E194/E155

26 3111

AUTHOR: Novikov, I.I., Corresponding Member, AS USSR.

TITLE: Concerning calculation of the flow of saturated and wet vapours from nozzles

PERIODICAL: Teploenergetika, 1961, 8 No.6, pp. 9-11

TEXT: The flow from nozzles of saturated and wet vapours differs in many respects from that of permanent gases. As saturated steam flows through a nozzle it becomes super-saturated and reaches equilibrium again only in the expanding part of the nozzle. It is in the critical section of the nozzle that the steam becomes super-saturated, and because the properties of steam and vapour in this condition are inadequately known the design of supersonic nozzles is very difficult. In wet steam an isentropic process is accompanied by phase conversion. As a sound wave passes through steam, condensation occurs in the rarefaction zone forming fine liquid droplets. The same presumably occurs when a sound wave passes through saturated and super-saturated steam, the difference consisting only in the size of the droplets formed. In supersaturated steam the droplets will be extremely fine and may

Concerning calculation of the flow...

rather be groups of molecules. As the difference between the propagation of sound in saturated and supersaturated steam is quantitative and not qualitative, the relationship between the adiabatic index and the steam condition parameters should be the same in both cases. In an article published in DAN SSSR 59, No.8, 1948 (Ref.1) the author obtained a formula for the adiabatic index and speed of sound in wet and saturated steam. If the pressure is not too high the saturated steam formula for the adiabatic index k and the speed of sound c are of the form:

$$k = \frac{\quad}{1 - \frac{\quad}{RT}\left[\quad\right]} \qquad (1)$$

$$c = \sqrt{\frac{\quad}{1 - \frac{\quad}{RT}\left[\quad\right]}} \qquad (2)$$

where R is the specific gas constant; r is the heat of vaporization at a temperature T; c_p' is the specific heat of the liquid at constant pressure on the phase equilibrium curve.

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Concerning calculation of the flow...

For steam, formulae (1) and (2) are valid up to pressures of 20-30 atm (at pressures of the order of 20-30 atm RT in the formulae should be replaced by pv'). Tests made to check the accuracy of these formulae and reported elsewhere (Ref.2) show that the difference between theory and practice is 3-4%. For steam at pressures of 20-30 atm the term $\frac{RT^2}{r^2}\left(c'_p - \frac{dr}{dT}\right)$

is very small and of the order of 2×10^{-2} and, therefore, formulae (1) and (2) may be simplified to the following form:

$$k = \frac{1}{1 - \frac{2RT}{r}} \qquad (3)$$

$$\ldots = \sqrt{\frac{\ldots}{1 - \frac{2RT}{r}}} \qquad (4)$$

Assuming that formula (3) relates to super-saturated as well as saturated steam, formulae are easily derived for isoentropic flow of saturated steam from nozzles. The following formulae are then

Concerning calculation of the flow...

derived for critical temperature, pressure and volume:

$$T_{KP} = \frac{2}{k_{KP}+1} T_1 \qquad (7)$$

$$p_{KP} = \left(\frac{2}{k_{KP}+1}\right)^{\frac{k}{k_{KP}-1}} \cdot p_1 \qquad (8)$$

$$v_{KP} = \left(\frac{2}{k_{KP}+1}\right)^{\frac{1}{k_{KP}-1}} \cdot v_1 \qquad (9)$$

The method of using these formulae to calculate the outflow of steam from nozzles is briefly explained. It is shown that values calculated by formulae (3)-(9) are of the same form as for an ideal gas but the adiabatic index in these formulae relates to the critical temperature of outflow. Formulae (3)-(9) are recommended for practical use in nozzle design.
There are 1 figure, 1 table and 4 references: 2 Soviet and 2 non-Soviet.

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Concerning calculation of the flow of saturated and wet vapours from nozzles

ASSOCIATION: Institut teplofiziki Sibirskogo otdeleniya AN SSSR (Institute of Thermophysics, Siberian Division, AS USSR)

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AUTHORS: Novikov, I. I., Trelin, Yu. S.

TITLE: The construction of entropy diagrams according to experimental data on the velocity of sound

PERIODICAL: Atomnaya energiya, v. 10, no. 5, 1961, 519-521

TEXT: The construction of thermodynamic diagrams required for the thermal calculation of reactors and the preparation of tables for coolants from the data, for example, on compressibility and specific heat are in many cases difficult and inaccurate, particularly in the neighborhood of the saturation curves and in the critical and transcritical region. The authors have now developed a new method which enables the thermodynamic diagram to be obtained rapidly and accurately from data on the velocity of sound in the coolant. This method is described in the present "Letter to the Editor". It is based on the following: On account of the isentropic change of state of the matter on the propagation of sound the velocity of sound is given by $c = \sqrt{-gv^2(\partial p/\partial v)_s}$. If c and the compressibility are measured one obtains

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B102/B214

The construction of entropy diagrams...

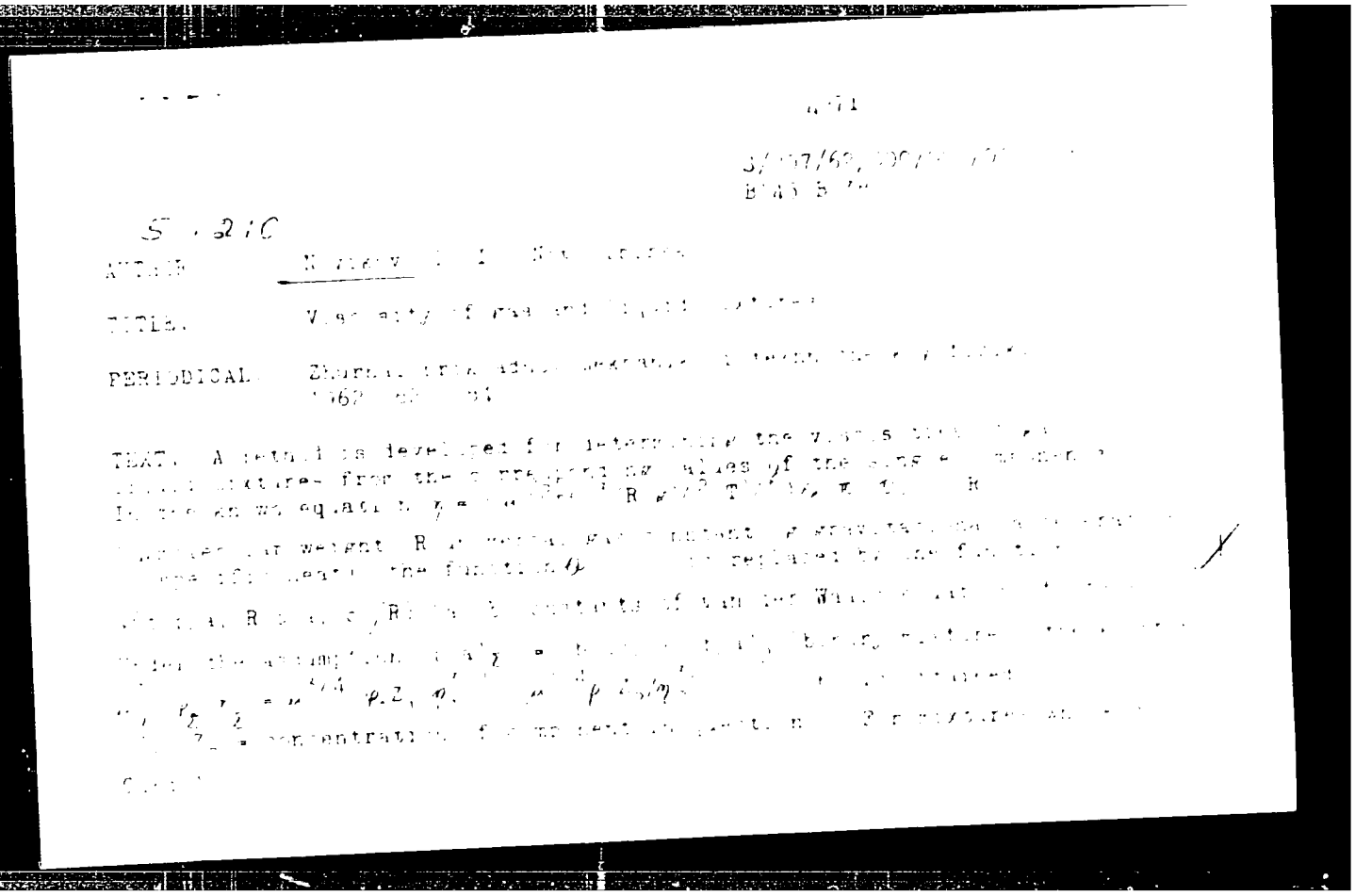
easily $(\partial p/\partial v)_s = -c^2/gv^2$. From it the relationship between the volume change, pressure, and enthalpy at constant s is determined from measurements: $\Delta v = (\partial v/\partial p)_s \Delta p$; $\Delta i = v\Delta p$. As $(\partial v/\partial p)_s$ is determined by the measurement, v, i, and p can be found for any point of the isentropic curves. An additional advantage is that at present the velocity of sound and the temperature can be easily and accurately (0.1-0.3 % error) measured, more simply than, say, the specific heat. The same holds for compressibility. Naturally, the velocity of sound is measured at frequencies where no dispersion occurs. The entropy and enthalpy of the liquid and the gaseous phases must be known on the saturation curve in order to be able to construct the T(s) and i(s) diagrams. These quantities are, however, known with high accuracy for most substances. To verify the method the authors have taken the T(s) and i(s) diagrams of CO_2 in the region of [illegible] atm, and 5-100°C with ultrasonic frequencies of 500 and 1500 kc/sec. Fig. 3 shows the i(s) diagram. D. D. Kalafati and L. Z. Rumynskiy are mentioned. There are 3 figures and 7 references: 3 Soviet-bloc and 4 non-Soviet-bloc.

SUBMITTED: February 6, 1961

Card 2/3

VUKALOVICH, Mikhail Petrovich; NOVIKOV, Ivan Ivanovich; KALAFATI, D.D., dots., kand. tekhn.nauk, retsenzent; SILETSKIY, V.S., red.; BORUNOV, N.I., tekhn. red.

[Technical thermodynamics] Tekhnicheskaia termodinamika. Izd. 3 perer. i dop. Pod red. M.P.Vukalovicha. Moskva, Gosenergoizdat, 1962. 304 p. (MIRA 15:7)
(Thermodynamics)



S/137/62/000/[illegible]/[illegible]
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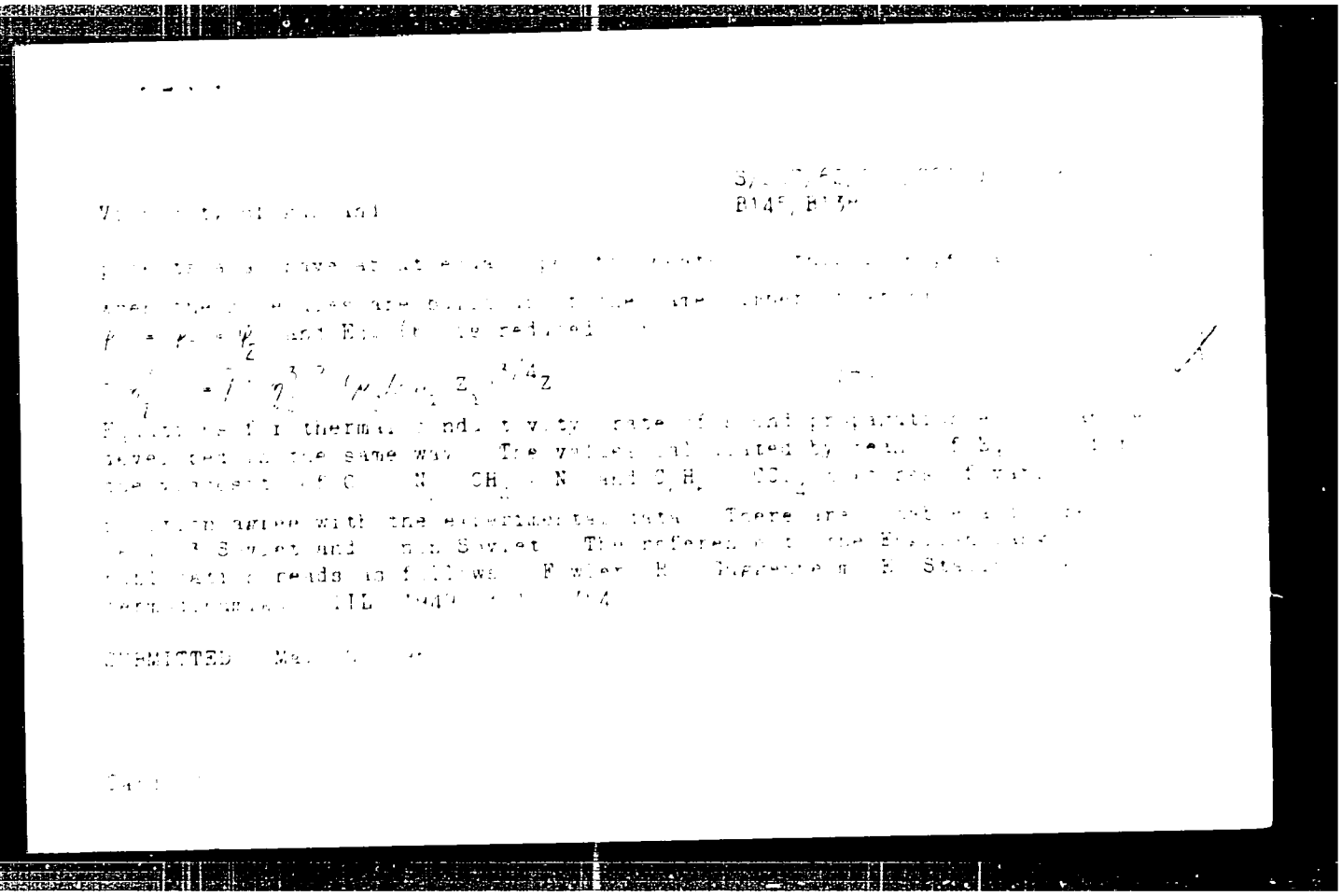
S-32/C

AUTHOR: [illegible]

TITLE: [illegible]

PERIODICAL: [illegible]
1962 [illegible]

TEXT: [illegible]



S/081/62/000/011/025/057
E071/E192

AUTHOR: Novikov, I.I.

TITLE: Conditions of similarity of heat transfer processes at variable properties of a liquid

PERIODICAL: Referativnyy zhurnal, Khimiya, no.11, 1962, 333, abstract 11 I 27. (In the Symposium: "Vopr. teplootdachi i gidravliki dvukhfazn. sred" ("Problems of heat transfer and hydraulics of two-phase media"), M.-L., Gosenergoizdat, 1961, 7-14).

TEXT: In a number of cases of heat transfer which are important in practice (e.g. in critical and supercritical regions) physical properties of a liquid change sharply and thus cannot be considered as constant, requiring changes and modifications of the existing methods of establishing similarity relations of heat transfer. The solution is based on the theory of thermodynamic similarity which permits establishing general functional relationships for the coefficient of viscosity (η) and heat conductivity (λ). For thermodynamically similar (satisfying the same law of the corresponding states) substances, the following equations

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Conditions of similarity of heat ...

were established:

$$\eta = \left[M^{1/2} p_{kr}^{2/3} / \left(g^{1/2} R^{1/6} T_{kr}^{1/6}\right)\right] f\left(\pi, \tau, c_{v_o}/R\right).$$

$$\lambda = \left[g^{1/2} R^{5/6} p_{kr}^{2/3} / \left(M^{1/2} T_{kr}^{1/6}\right)\right] \varphi\left(\pi, \tau, c_{v_o}/R\right).$$

where: f and φ - functions of parameters π, τ and c_{v_o}/R (R.zh. Khim., no.13, 1958, 42482; 42483); c_{v_o} - molar heat capacity at $p \rightarrow 0$; M - mol.wt; p_{kr}, T_{kr} - critical pressure and temperature; R - gas constant; g - gravity. The above equations agree well with experimental data. For a complete similarity in various liquids it is necessary that these liquids should be thermodynamically similar in the corresponding states and possess equal values of similarity criteria, characterising conditions at the boundary of liquid and the confining solid surface. The criteria are obtained by the usual methods from

Card 2/3

NOVIKOV, I.I., doktor tekhn.nauk; TRELIN, Yu.S., inzh.

New method of plotting thermodynamic diagrams of working matter.
Teploenergetika 9 no.2:79-85 F '62. (MIRA 15:2)

1. Moskovskiy inzhenerno-fizicheskiy institut.
(Thermodynamics--Tables, calculations, etc.)

NOVIKOV, I.I.; KUTATELADZE, S.S., prof.; LEONT'YEV, A.I.; MUSLIN, Ye.

Science of fire and cold. Nauka i zhizn' 29 no.1:58-59 ja '62.
(MIRA 15:3)

1. Direktor Instituta teplofiziki Sibirskogo otdeleniya AN SSSR; chlen-korrespondent AN SSSR (for Novikov). 2. Zaveduyushchiy laboratoriyey termogazodinamiki Instituta teplofiziki Sibirskogo otdeleniya AN SSSR (for Leont'yev).
(Thermodynamics)

NOVIKOV, I.I. (Novosibirsk); PICHAKHCHI, L.D. (Novosibirsk)

Heat transfer in the flow of a conducting fluid at small Reynolds numbers. PMTF no.2:143-145 Mr-Ap '64. (MIRA 17:8)

NOVIKOV, I.I.; STRELKOV, P.G.

Study of the physical properties of materials at high temperatures. Vest. AN SSSR 34 no.6:26-30 Je '64
(MIRA 17:8)

1. Chleny-korrespondenty AN SSSR.

L 22203-65 EWT(m)/EWA(d)/EWP(t)/EWP(b) AEDC(a)/ASD(f)-3/ASD(m)-3/AFMD/
MJW/JD
ACCESSION NR: AP5002882 B/0207/64/000/005/0159/0162

AUTHORS: Avdonin, V. I. (Novosibirsk); Novikov, I. I. (Novosibirsk); Sheludyakov, Ye. P. (Novosibirsk) B

TITLE: Experimental determination of sound wave velocity in saturated water vapor at high pressures

SOURCE: Zhurnal prikladnoy mekhaniki i tekhnicheskoy fiziki, no. 5, 1964, 159-162

TOPIC TAGS: sound velocity, high pressure, temperature dependence, stainless steel/1Kh18N9T stainless steel, PMS 48 potentiometer, PPTN 1 potentiometer

ABSTRACT: A new experimental chamber has been devised for measuring sound velocity at temperatures up to 3500. Results are compared with those from previous apparatus, where the temperatures overlap. Both techniques are based on the method of standing waves. In the new apparatus, a new acoustical resonator made of stainless steel is used. The chamber has a length of 803.75 mm, an inner diameter of 65 mm, and a wall thickness of 10 mm. This was used in a new autoclave made of 1Kh18N9T stainless steel with a length of 124.0 cm, an inner diameter of 12.0 cm, and a wall thickness of 1.5 cm. Temperature control was obtained by two heating

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L 22203-65
ACCESSION NR: AP5002882

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elements, one principal, one auxiliary. Temperature was measured in the autoclave by a 100-ohm platinum thermometer and by four copper-constantan thermocouples on PMS-48 and PPTN-1 potentiometers, with an accuracy within 0.2C. Results of measurements on sound velocity in saturated water vapor are shown graphically in Fig. 1 on the Enclosure in comparison with an empirical curve. It is seen that the experimental values between 150 and 350C are in good agreement with the empirical curve, and are in good agreement up to 320C with the theoretical values proposed by I. I. Novikov (Pokazatel' adiabaty* nasy*shchennogo vodyanogo para. Dokl. AN SSSR, 1948, t. 9, No. 8, str. 1425). At higher temperatures the difference becomes marked, and it is concluded that a factor for transition through the saturation curve must be added to the theoretical calculations. Orig. art. has: 3 figures and 2 tables.

ASSOCIATION: none

SUBMITTED: 01May64 ENCL: 01

SUB CODE: GP NO REF SOV: 004 OTHER: 000

Card 2/3

NOVIKOV, I.I. (Novosibirsk); SHELUDYAKOV, Ye.I. (Novosibirsk)

Experimental determination of the speed of sound in saturated vapors of benzene, carbon tetrachloride, and diethyl ether.
PMTF no.6:119-121 N-D '62. (MIRA 16:2)

L 00314-66 EWT(l)/EWP(m)/EPF(n)-2/EWG(m)/EWA(d)/EPA(w)-2/FCS(k)/EWA(l)
ACCESSION NR: AP5016654 IJP(c) AT UR/0382/65/000/002/0067/0079
533.95 : 538.4

AUTHOR: Kushnir, V. S.; Novikov, I. I.; Pichakhchi, L. D.; Fokin, V. N.

TITLE: Theoretical and experimental investigation of self-excitation regimes during the interaction of a traveling magnetic field with the flow of ionized gas

SOURCE: Magnitnaya gidrodinamika, no. 2, 1965, 67-79

TOPIC TAGS: MHD flow, transmission line, traveling wave interaction

ABSTRACT: Study of the interaction between the plasma stream and the transverse magnetic field of the traveling wave moving in an artificial transmission line with localized inductances and capacities is reported. Transmission line theory is adapted with proper simplifications to computation of amplification coefficient, useful power delivered to a resistive load, electrical efficiency and the magnitude of the positive feedback occuring in the self-excitation regime. Both leakage flux and finite ratio of channel width to the characteristic wavelength are taken into account. The computational results were checked with the experi-

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L 00314-66
ACCESSION NR: AP5016654

3

ment performed on a specially constructed test apparatus. The amplification coefficient and other parameters were measured for copper, aluminum and steel discs which simulated the plasma. Orig. art. has: 42 formulas, 5 figures.

31.44,55

ASSOCIATION: none

SUBMITTED: 27Jan65 ENCL: 00 SUB CODE: EM, ME

NO REF SOV: 000 OTHER: 000

Card 2/2

L 12864-66 EWT(1) IJP(c)

ACC NR: AP5021920 SOURCE CODE: UR/0207/65/000/004/0168/0169

AUTHOR: Novikov, I. I. (Novosibirsk); Sheludyakov, Ye. P. (Novosibirsk)

ORG: none

TITLE: Calculation of volumetric concentrations of diatomic molecules in saturated and superheated vapors of mercury using experimental data on the speed of sound

SOURCE: Zhurnal prikladnoy mekhaniki i tekhnicheskoy fiziki, no. 4, 1965, 168-169

TOPIC TAGS: sound wave, ideal gas, thermodynamic equilibrium

ABSTRACT: The authors consider vapors of mercury as an equilibrium mixture of two chemically reacting ideal (monatomic and diatomic)gases. It is assumed that thermodynamic equilibrium exists at every point in space and time during the dispersion of sound waves. In an earlier work, the authors measured the speed of sound in saturated and superheated vapors of mercury at temperatures of 225°-400°C and at a pressure of 0.05-2.2 kg/cm^2. Using these results, volumetric concentrations of diatomic molecules at seven isobars and on the line of saturation were determined. Results of calculations are shown. On each of the isobars, the

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L 12864-66

ACC NR: AP5021920

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maximum concentration of diatomic molecules occurs at temperatures of saturation. Calculation of volumetric concentrations of diatomic molecules based on the speed of sound is shown to be more accurate than previous methods. Orig. art. has: 1 table, 2 formulas.

SUB CODE: 20/ SUBM DATE: 05Apr65/ ORIG REF: 002/ OTH REF: 000

Card 2/2 HW

L 22301-66 EWP(m)/EPF(n)-2/EWT(1)/ETC(m)-6/ETC(f)/EWG(m)/EWA(d)/EWA(l) WW/GS

ACC NR: AT6006906 SOURCE CODE: UR/0000/65/000/000/0111/0119

84
81

AUTHOR: Novikov, I. I.

ORG: Thermophysics Institute of the Siberian Branch of the AN SSSR (Institut teplofiziki SO AN SSSR)

TITLE: Heat transfer in the flow of an incompressible fluid in the presence of a magnetic field

SOURCE: Teplo- i massoperenos. t. II: Teplo- i massoperenos pri vzaimodeystvii tel s potokami zhidkostey i gazov (Heat and mass transfer. v. 2: Heat and mass transfer in the interaction of bodies with liquid and gas flows). Minsk, Nauka i tekhnika, 1965, 111-119

TOPIC TAGS: convective heat transfer, fluid flow, transverse magnetic field, heat transfer, incompressible fluid, viscous fluid, laminar flow

ABSTRACT: The equation of heat transfer in an incompressible electrically conducting fluid has the form:

$$\frac{\gamma}{g}c_p\left(\frac{\partial T}{\partial t}+(w\nabla)T\right)=$$

$$=\frac{\eta}{2}\left(\frac{\partial w_i}{\partial x_k}+\frac{\partial w_k}{\partial x_i}\right)^2+\frac{s^2}{\sigma}+\lambda\Delta T. \qquad (1)$$

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ACC NR: AT6006906

In the analytical treatment in the present article, the dependence of the specific weight , the viscosity , the heat conductivity , and the electrical conductivity on the temperature, T, are not taken into account, that is, the physical properties of the fluid are assumed constant. If the evolution of heat as a result of the dissipation of energy is neglected, Eq. 1 assumes the form:

$$\frac{\gamma}{g} c_p \left(\frac{\partial T}{\partial t} + (w \nabla) T \right) = \lambda \Delta T. \qquad (2)$$

The final equations arrived at by the mathematical development are said to agree completely with exact solutions for the flow of a viscous incompressible fluid in a transverse magnetic field and can, in certain cases, be used for the laminar flow of a fluid in a transverse magnetic field. Orig. art. has: 21 formulas.

SUB CODE: 20/ SUBM DATE: 09Nov65/ ORIG REF: 004

L 26764-66 EWT(l)/EWT(m)/ETC(f)/EPF(n)-2/EWG(m)/ETC(m)-6 IJP(c) JD/WW/JW/JG
ACC NR: AP6013935 SOURCE CODE: UR/0207/66/000/002/0137/0139

AUTHOR: Novikov, I. I. (Novosibirsk); Sheludyakov, Ye. P. (Novosibirsk) 83

ORG: none B

TITLE: Thermodynamic (t,S) diagram for mercury plotted from experimental data on the velocity of sound 18 27

SOURCE: Zhurnal prikladnoy mekhaniki i tekhnicheskoy fiziki, no. 2, 1966, 137-139

TOPIC TAGS: entropy, thermodynamic characteristic, mercury, isobar, acoustic speed

ABSTRACT: The authors use the method proposed by Novikov and Trelin (I. I. Novikov, Yu. S. Trelin, "Constructing Entropy Diagrams from Experimental Data on the Speed of Sound", *Atomnaya energiya*, 1961, v 10, no 5) for plotting the entropy of mercury as a function of temperature. The results are given in the graph and tables. The dotted lines in the graph show the isobars according to data given by Vukalovich and Fokin (M. P. Vukalovich, L. R. Fokin, "Thermodynamic Properties of Mercury", Proceedings of the MEI, 1963). The maximum devergence with respect to temperature is no more than 1% in any case. Orig. art. has: 3 figures, 2 tables.

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L 26764-66

ACC NR: AP6013935

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Isobars in t(°C), S(Kcal/kg gr) coordinates (p--kg/cm^2)

t	S	t	S	t	S	t	S	t	S	t	S
p = 0.05		320	0.1600	400	0.1604	360	0.1557	380	0.1497	400	0.1447
224.5	0.1634	320	0.1609	p = 0.10		380	0.1565	400	0.1504	p = 0.8	
240	0.1643	340	0.1618	268	0.1539	400	0.1573	p = 0.5		341.5	0.1412
260	0.1654	360	0.1626	280	0.1545	p = 0.25		318.8	0.1448	360	0.1419
p = 0.06		380	0.1634	300	0.1554	286.7	0.1504	340	0.1457	380	0.1427
230.9	0.1619	400	0.1642	320	0.1563	300	0.1510	360	0.1465	400	0.1434
240	0.1623	p = 0.12		340	0.1570	320	0.1518	380	0.1476	p = 0.9	
260	0.1633	258.7	0.1569	360	0.1578	340	0.1526	400	0.1482	349.8	0.1403
280	0.1644	260	0.1566	380	0.1585	360	0.1534	p = 0.55		360	0.1407
300	0.1654	280	0.1573	400	0.1593	380	0.1542	322.5	0.1441	380	0.1415
p = 0.08		300	0.1582	p = 0.18		400	0.1550	340	0.1448	400	0.1422
241.0	0.1595	320	0.1591	272.9	0.1530	p = 0.3		360	0.1456	p = 1.0	
260	0.1606	340	0.1599	280	0.1533	294.4	0.1489	380	0.1464	355.0	0.1394
280	0.1614	260	0.16075	300	0.1542	300	0.1492	400	.1471	360	0.1326
300	0.1623	380	0.1616	320	0.1551	320	0.1501	p = 0.6		380	0.1405
320	0.1632	400	0.1624	340	0.1559	340	0.1509	327.0	0.1434	401	0.1413
340	0.1641	p = 0.14		360	0.1567	360	0.1517	340	0.1439	p = 1.2	
360	0.6050	262.7	0.1550	380	0.1574	380	0.1525	360	0.1447	364.0	0.1350
380	0.1659	280	0.1558	400	0.1583	400	0.1532	380	0.14555	380	0.1368
400	0.1668	300	0.1566	p = 0.4		p = 0.4		400	0.14625	400	0.1384
p = 0.1		320	0.1574	277.3	0.1521	308.0	0.1466	p = 0.7		p = 1.5	
249.0	0.1577	340	0.1581	300	0.1532	320	0.1471	335.9	0.1422	373.0	0.1368
260	0.1582	360	0.1589	320	0.1540	340	0.1480	360	0.1432	380	0.13705
280	0.1591	380	0.1597	340	0.1548	360	0.1489	380	0.1440	400	0.13775

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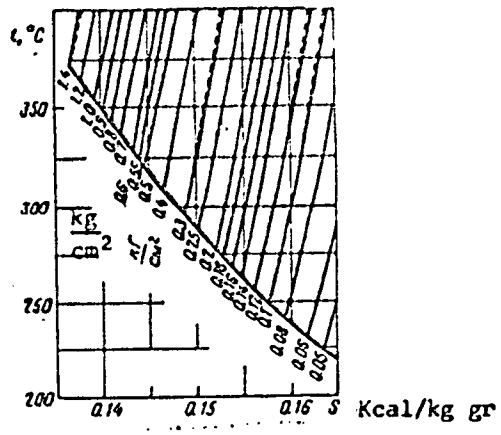
L 26764-66

ACC NR: AP6013935

Isochors in t(°C), S(Kcal/kg gr) coordinates (v--m^3/kg)

t	S	t	S	t	S
	v=0.3	360	0.1436	310	0.1590
371.7	0.1370	350	0.1500	350	0.1595
350	0.1372	400	0.1506	390	0.1600
400	0.1378		v=1.0	400	0.1605
	v=0.3	284.3	0.1508		v=3.0
347.2	0.1404	300	0.1512	237.5	0.1604
360	0.14075	320	0.15175	260	0.1611
380	0.1414	340	0.15225	280	0.16145
400	0.1420	360	0.1528	300	0.1622
	v=0.4	380	0.1533	320	0.1627
330.3	0.1430	400	0.1539	340	0.1632
340	0.1432		v=1.5	360	0.1638
360	0.1436	226	0.1544	380	0.1643
380	0.1441	280	0.1547	400	0.1649
400	0.1446	300	0.1553		v=3.5
	v=0.5	320	0.1558	231.6	0.1617
318.7	0.1448	340	0.1564	260	0.1626
340	0.1453	360	0.1569	280	0.1632
370	0.1458	380	0.15745	300	0.1636
380	0.1463	400	0.1580	320	0.1643
400	0.1468		v=2.0	340	0.1649
	v=0.7	253.6	0.1568	360	0.1655
301.8	0.1476	280	0.1575	380	0.1661
320	0.1482	300	0.1580	400	0.1667
340	0.1488	320	0.1585		



Isobars for mercury in (t,S) coordinates.

SUB CODE: 20/ SUBM DATE: 16Mar65/ ORIG REF: 001/ OTH REF: 002

Card 3/3 pla

NOVIKOV, I.I.

Standardization and science. Standartizatsiia 29 no.7:1-3 Jl '65. (MIRA 18:11)

1. Zamestitel' predsedatelya Gosudarstvennogo komiteta standartov, mer i izmeritel'nykh priborov SSSR.

L 04176-67 EWT(m)/EWP(w)/T/EWP(t)/ETI IJP(c) JD/HW/JG/WB
ACC NR: AT6027302 (N) SOURCE CODE: UR/2817/66/015/000/0047/0056

AUTHOR: Portnoy, V. K.; Zakharov, M. V.; Novikov, I. I.

ORG: none

TITLE: The nature of embrittling temperature zones in high temperature alloys of the copper-nickel-beryllium system

SOURCE: Akademiya nauk Kazakhskoy SSR. Institut metallurgii i obogashcheniya. Trudy, vol. 15, 1966. Prevrashcheniya v splavakh tsvetnykh metallov v tverdom sostoyanii (Transformations in nonferrous metal alloys in a solid state), 47-56

TOPIC TAGS: high temperature metal, copper alloy, mechanical property, ductile material, brittle point, metallographic examination, grain structure, temperature dependence, oxidation resistance

ABSTRACT: High temperature brittleness was studied in the Cu-Ni-Be system. Two alloys containing 0.5 and 2 wt % NiBe were produced and their mechanical and physical properties were determined in the cast condition and after rolling in the annealed, quenched, and aged conditions. In order to determine whether intercrystalline oxidation was the cause of high temperature embrittlement, tests were conducted both in air and vacuum ($3 \cdot 10^{-4}$ mm Hg). The relative elongation was given as a function of temperature up to 900°C. In the cast alloys, embrittlement occured in the 400-800°C range whether or

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not testing was done in a vacuum; in fact the alloy with 0.5% NiBe had a higher ductility when tested in air. Microscopic analysis showed that the cast alloys had a single phase structure at room temperature, similar to quenched alloys, as a result of strong supersaturation upon cooling. When the test temperature was increased to 500°C, microstructural changes began to occur: the grain boundaries thickened and second phase particles began to appear within the grains. A wide two-phase region was observed at the grain boundaries in samples tested at 700°C, while at 860°C precipitation occured in the body of the grains. The fracture appearance in the brittle zone was primarily intercrystalline. The electroconductivity, measured as a function of temperature, increased in a slope at about 500°C, indicating a rise in precipitation. Changes in microhardness between the center and boundary of the grain were greatest in the brittle zone. In the 2% NiBe alloy, after annealing at 960°C for 2 hrs and step cooling to prevent supersaturation, a minimum in ductility also occured although it was much higher than for the cast condition. Metallography showed that in the annealed alloy the fractures were transcrystalline, with the cracks being initiated at the grain boundaries. X-ray analysis gave the lattice parameter for different cooling conditions and showed that a supersaturated solid solution could form even for air cooling at 20 deg/min. By slow furnace cooling at 1 deg/min the lattice parameter approached that of pure copper; however, the significance of supersaturation with regard to high temperature brittleness could not be rationalized. Tests done on the 2% NiBe alloy in both air and vacuum after cooling as slow as 0.03 deg/min still showed a ductility minimum at 500°C. Orig. art. has: 9 figures, 1 table.

SUB CODE: 11/ SUBM DATE: none/ ORIG REF: 010/ OTH REF: 001

ACC NR: AP7000131 SOURCE CODE: UR/0115/66/000/011/0038/0040

AUTHOR: Novikov, I. I.; Borzyak, A. M.

ORG: none

TITLE: The experimental investigation of forward rotational flow of an incompressible viscous liquid in a cylindrical pipe

SOURCE: Izmeritel'naya tekhnika, no. 11, 1966, 38-40

TOPIC TAGS: incompressible fluid, fluid dynamics, turbulent flow, turbulent heat transfer, rotational flow

ABSTRACT: Experiments were conducted to determine the critical flow velocity, the coefficient of hydraulic resistance, and the coefficient of heat transfer from the walls of a pipe to a fluid when it has a rotating forward motion in a cylindrical pipe. The flow system was made of stainless steel while the working region with a diameter of 30 and 12 mm, and a length of 400 mm was made of plexiglass. The working liquid was distilled water. A thin film of water moved in the working section such that centrifugal-capillary waves could be observed on the surface of this film. The pressure inside the rotating film was measured by the height of the operating liquid column. The film thickness was measured with a micrometer probe. A copper tube was used to measure the coefficient of heat transfer. Low voltage ac current was passed through the

UDC: 536.242.001.5

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ACC NR: AP7000131

the tube. The temperature was determined by 30 thermocouples attached to the tube. The results of the experiments are given and are in good agreement with theoretical results obtained earlier by the author. This agreement indicates that the following equations can be recommended for computing hydraulic resistance and heat transfer during the turbulent rotating forward motion of a liquid along a pipe:

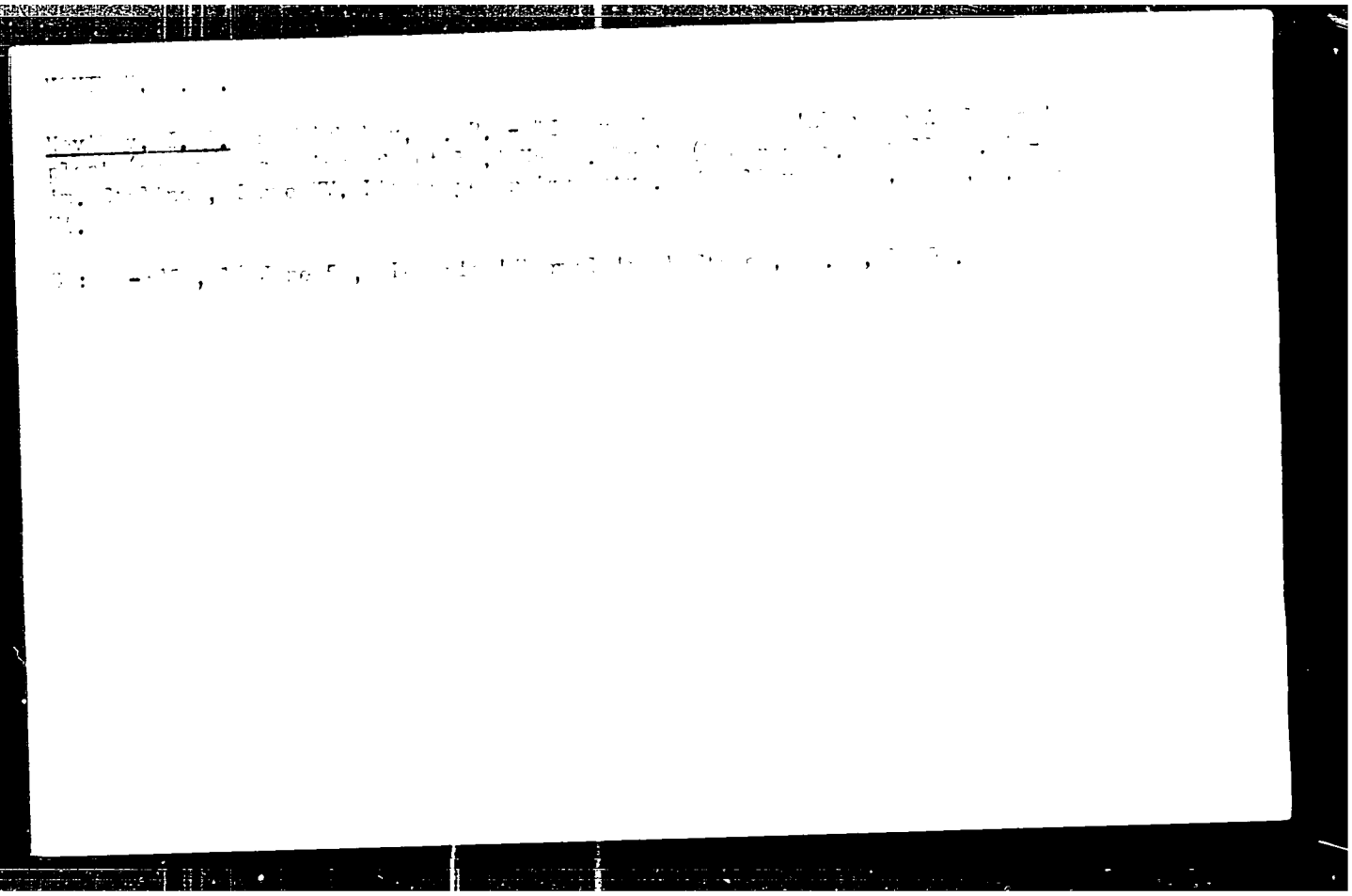
$$\xi = \frac{0,18}{\mathrm{Re}^{0.25}\left(1-\frac{2r_0}{D}\right)^{1.25}}, \qquad \mathrm{Nu} = \frac{0,12\cdot \mathrm{Re}^{0.75}}{\left(1-\frac{2r_0}{D}\right)^{0.25}}.$$

The first equation is valid for any liquid. The second equation is only valid for water; when other fluids are used the numerical coefficient changes its value. Both equations apply to the case when $\mathrm{Re} = \frac{w_0 D}{\nu} < 8\cdot 10^4$.

Orig. art. has: 5 figures, 4 formulas.

SUB CODE: 20,13/ SUBM DATE: 13Jul66/ ORIG REF: 002

Card 2/2



"OVIK ", I. I.

Novikov, I. I."The determination of [illegible] by the method of microanalysis of small samples from the liquid-[illegible] symposium: Mosk. rabochy stu[illegible]ov [illegible], 1951-55, - Bibliography: [illegible]

SO: U[illegible], 29 Oct [illegible], (Letopis 'Zhurnal'nykh Statey, No. 1[illegible]

NOVIKOV, I. I. Cand. Technical Sci.

"Investigation of the Structure and Mechanical Properties of Alloys in a Solid-Liquid State." Sub 5 Nov 51. Moscow Inst of Nonferrous Metals and Gold imeni M. I. Kalinin

Dissertations presented for science and engineering degrees in Moscow during 1951.

SO: Sum. No. 480, 9 May 55

USSR/Metals - Alloys, Structure Feb 52

"On the Solid-Liquid State of Alloys of Various Composition During the Period of Their Crystallization," Acad A. A. Bochvar, I. I. Novikov

"Iz Ak Nauk, Otdel Tekh Nauk" No 2, pp 217-224

Discusses dependence of essential casting characteristics of alloys, such as linear shrinkage, pre-shrinkage expansion, shrinkage stress, hot-shortness, tendency to liquation, on length of temp interval of solid-liquid state, i.e., range between temp of shrinkage beginning and solidus, and on structure and mech properties of alloys in this state.

212T90

Analyzes "casting property-composition" diagram and emphasizes importance of investigation in field of solid-liquid state for certain technological processes as, e.g., ingotless rolling, forging alloys above solidus, obtaining fine powders from alloys, plastic in solid state, and by pulverizing them in solid-liquid state.

(CA 47 no. 14: 6846 '53)

212T90

NOVIKOV, I.I.; DAUTOVA, L.I.

Investigating the copper angle of the system copper -- nickel -- silicon. Zhur. neorg. khim. 2 no.12:2766-2770 D '57. (MIRA 11:2)

1. Moskovskiy institut tsvetnykh metallov i zolota im. M.I. Kalinina i Institut yadernoy fiziki AN KazSSR.
(Copper) (Nickel) (Silicon)

AUTHORS: Matveyev, [illegible] (Alma-Ata, Moscow).

24-5-8/25

TITLE: Healing of [illegible]
(Zalechivaniye [illegible] kristallizatsii).

PERIODICAL: "Izvestiya Akademii Nauk, [illegible] Tekhnicheskikh Nauk", (Bulletin of the A.S., [illegible] Section), [illegible] (U.S.S.R.)

ABSTRACT: In the introduction, [illegible] the views of various authors [illegible] information [illegible] aluminium. Several authors (1-[illegible]) express [illegible] that liquid steel is capable of healing [illegible] view has been [illegible] Rybnikov, A.A. (15). [illegible] cracks [illegible] drawn up to sulphide [illegible] of tears by [illegible] elements; if the [illegible] sulphides can be [illegible] appear as a continuation [illegible] According to R[illegible] "[illegible]rs" in steel castings [illegible] which melt is drawn [illegible] as carbon, [illegible] A.A. [illegible] arrived at the [illegible] cases, the ability of

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24-5-8/25

described if direct ... observation of the ... by melt.
crystallise ... the ... aluminium alloy
The experiments were ... wire (fig.).
periments, ... single slot, to
concentrate the ... the width. The
traction of ... mould and then
minium alloy was ... heated together
with the mould ... C. Following that, the mould with
the alloy was ... second furnace which
was heated to ... C for the purpose of controlling the
cooling speed. ... was fitted with an
arrangement ... possible to observe
the surface ... magnification
of forty times. ... enable the obtaining of
direct proof ... of the eutectic system
... pro-tears by the melt. ... of the eutectic system
... cracks were ... usually did not have
... eutectic ... with an
... eutectic or ... very rare case.
Card 3/5 ... the ... cracked crack does
... the ... of the metals

Healing of shrinkage cracks during crystallisation. (Cont.) 24-5-8/25

surrounding it, the healing of the crack can be observed only relatively rarely on metallographic specimens. Healed cracks can be seen only if the melt which fills up the cracks is intensively enriched with liquating elements (for instance in steels) or if the melt has a eutectic composition or if crystallisation of the melt in the crack took place under conditions of intensive cooling. In cast components only a small fraction of the total number of generated fractures is observed, since numerous microcracks heal during crystallisation. Cracks are healed by the melt due to the effect of the hydrostatic pressure and due to capillary forces. An important technological factor is the condition of feeding of the part of the casting in which microcracks form. Narrowing of the transition zone, creation of directional crystallisation, vibration, increase of the hydrostatic pressure and regulation of the gas content permit intensification of the healing and thereby to reduce rejects caused by shrinkage cracks. The authors express their thanks to A. A. Bochvar for his criticism.

Card 4/5

There are 3 figures, 19 references, 12 of which are Slavic.

SUBMITTED: June 16, 1956.

ASSOCIATION: Physico-Technical Institute, Ac.Sc. Kazakhstan.

Healing of shrinkage cracks during crystallisation.(Cont.)

24-5-8/25

ASSOCIATION (Cont.): (Fiziko-Tekhnicheskiy Institut AN Kazakh SSR).
Moscow Institute of Non-Ferrous Metals and Gold.
(Moskovskiy Institut Tsvetnykh Metallov i Zolota).

AVAILABLE:

Card 5/5

24-10-6/20

AUTHORS: Glagoleva, N. N., Matveyeva, K. T. and Novikov, I. I. (Moscow, Alma-Ata).

TITLE: On the causes of differing hot shortness of alloys with an equal effective crystallisation range. (O prichinakh raznichnoy goryachelomkosti splavov s odinakovym effektivnym intervalom kristallizatsii).

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, 1957, No.10, pp. 41-46 (USSR)

ABSTRACT: In studying the casting properties, including hot shortness, the method of physico-chemical analysis has proved very successful; this method has been used most widely by a number of authors and more recently by a team of the Birmingham University (Refs.9-18). Comparison by means of this method of the diagrams "linear shrinkage-composition" and "hot shortness-composition" with the diagram of state of a two-component system permits detection of the role of the crystallisation range and to establish the fact that hinderances to shrinkage above the solidus are particularly dangerous and lead to the formation of crystallisation cracks. A.A. Bochvar and his team (Refs. 2,3,6) have established that the linear shrinkage begins at a temperature at which a skeleton of

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On the causes of differing hot shortness of alloys with an equal effective crystallisation range.

crystals forms in the casting; in most industrial alloys this temperature is between the liquidus and the solidus temperatures. The part of the crystallisation range between the temperature of formation of the rigid skeleton and the solidus temperature is designated as the "effective" crystallisation interval; the larger this interval the larger will be the linear shrinkage of the alloy during crystallisation and the more pronounced will be its tendency to hot shortness if comparing alloys of a single system. In this paper some results are given relating to the comparative investigation of alloys with practically identical "effective" crystallisation intervals. The experiments were carried out with aluminium alloys containing 6.2% Cu and Al alloys containing 2.7% Si. A tensile test method for aluminium alloys above the solidus temperature is described which has a good reproduceability of the results and it is shown that the strength indices of the alloy in the crystallisation range do not determine its tendency to forming crystallisation cracks. Difference in the hot shortness of alloys with

Card 2/3 equal effective crystallisation intervals is attributed

(Institut Yadernoy Fiziki AN Kazakh.SSR)

AVAILABLE: Library of Congress.

24-11-28/31

AUTHORS: Dautova, L. I. and Novikov, I. I. (Alma-Ata, Moscow)

TITLE: Investigation of the hot brittleness of copper alloys. (Issledovaniye goryachelomkosti mednykh splavov).

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, 1957, No.11, pp. 189-193 (USSR)

ABSTRACT: Since it is easier to carry out experiments with aluminium alloys than with high melting point ferrous and non-ferrous alloys, the authors considered it important to determine whether fundamental relations detected relating to the hot brittleness of light alloys are also valid for other groups of alloys. In this paper some results are described of investigation of the dependence of hot brittleness on the composition in the systems copper-tin and copper-nickel-silicon. The hot brittleness of bronze was investigated by casting into graphite moulds specimens of various cross sections, as shown in Fig.1, the top of the specimens serving as excess material. For specimens with too small a cross section, shrinkage is impeded and this leads to formation of hot cracks in the transition part of the specimen near to its top head but hot cracks were never observed at the foot of the specimen. The test results depend strongly on the geometry of the transition part of

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Investigation of the hot brittleness of copper alloys.

the specimen near its head. The test results showed that hot cracks in binary and ternary alloys are caused in the same way as in aluminium alloys by impeded shrinkage in the crystallisation temperature range and the intensity of the tendency to develop hot cracks is linked with the "effective" temperature range of the solid-liquid state. Zonal liquation may have a strong influence on the character of the dependence on the composition of the tendency to develop hot cracks. The graph, Fig.2, shows the dependence of the hot cracking on the composition for the system Cu-Sn; Fig.3 shows a photo (magnified 400 times) of a healed hot crack in a copper alloy containing 12% Sn; Fig.4 shows the dependence of hot cracking on the composition for the system Cu-Si and for cuts of the system Cu-Ni-Si; Fig.5 shows the curves of equal tendency to hot cracking for the system Cu-Ni-Si for the range of up to 10% Ni and up to 10% Si (rest Cu).
There are 5 figures and 14 references, 11 of which are Slavic.

SUBMITTED: March 11, 1957.
ASSOCIATIONS: Institute of Nuclear Physics Ac.Sc. Kazakh SSR.
Card 2/3 (Institut Yadernoy Fiziki AN Kazakhskoy SSR) and

AUTHORS: Novikov, I.I., Matveyeva, K.T. 32-11-39/60

TITLE: Measuring the Indices of the Durability and Plasticity of Alloys in the Crystallization Interval (Izmereniye pokazateley prochnosti i plastichnosti splavov v intervale kristallizatsii)

PERIODICAL: Zavodskaya Laboratoriya, 1957, Vol. 23, Nr 11, pp. 1369-1372 (USSR)

ABSTRACT: In the introduction a number of Soviet and foreign papers are mentioned, and the authors arrive at the conclusion that the problem of the explanation of the dependence of the durability limit (of alloys) on temperature is sufficiently explained, but with respect to plasticity (plastic properties) this problem has remained more or less unexplained. This is due to the fact that a sample becomes very brittle at a temperature above "solidus" point and that its durability is lost. In connection with the investigation of melting cracks which form in the course of casting, the measurements of durability and plasticity indices with respect to aluminum alloys are dealt with. A cylindrical sample was used for testing, which, with a total length of 76 mm, had a diameter of 5 mm at about 34 mm of its length, i.e. about in the middle. In the direction of the two ends this diameter was increased to about 9 mm and at the ends pins of about 12 mm diameter and 6 mm

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Measuring the Indices of the Durability and Plasticity of Alloys in the Crystallization Interval

length were formed. These pins were provided with a special device for holding the sample. The sample together with the holding device was heated in a furnace. This furnace was arranged in such a manner that it could be pushed in a suspended state over the also suspended sample, and vice versa. While the sample was suspended on a holder, a vessel was suspended on a second holder which contained scrap or a similar material as a weight. The temperature was measured by means of a thermo-couple. After the sample began to expand after the shot was put into the vessel and then was torn, the following moments were fixed: The temperature at the beginning of expansion and of tearing, and also other data such as the weight of the scrap and of the vessel were noted down. In this way the limits of the durability of the alloys were determined and, at the same time, the plastic properties were ascertained according to the data obtained concerning the moment of expansion and the thinning of the sample at a certain point. There are 3 figures and 19 references, 7 of which are Slavic.

ASSOCIATION: Moscow Institute for Nonferrous Metals and Gold, and Physical-Technical Institute of the AS [redacted] SSR (Moskovskiy institut tsvetnykh metallov i zolota i Fiziko-tekhnicheskiy institut Akademii nauk KazSSR)

AVAILABLE: Library of Congress

Card 2/2

NOVIKOV, I.I.

20-1-30/54

AUTHOR: NOVIKOV I.I., LAUTOVA L.I.

TITLE: The Relative Resistance to Heat as Dependent on Composition in the Cu - Ni - Si System.
(Zavisimost'-otnositel'noy zharoprochnosti splavov v sisteme Cu-Ni-Si- Russian)

PERIODICAL: Doklady Akad.Nauk SSSR,1957,Vol 11 ,Nr 1, pp 11[illegible] - 11[illegible]

ABSTRACT: A great number of papers was written on the relation of heat resistance to the phase diagram.The basic types of the diagrams "heat resistance-phase" were derived on the basis of the investigation of concrete double systems and individual cross sections of multicomponent systems.In the studies by Bochvar and Zakharov an important part in the increase of heat resistance is ascribed not only to the composition of the solid fundamental solution but also to the structure and the properties of the excess phase which coexists with that solution.In many works by Kornilov the determining part of the solid solution is emphasized,the maximum of heat resistance often being connected with the highly saturated solid solution.The experimental material accumulated shows that the character of dependence of physical properties on the composition changes under the influence of various factors,e.g.on change of temperature.The influence of the nature of coexisting phases upon the dependence of heat resistance on composition may easily be seen from radial cross sections of a complex ternary system in which second phases with various properties border on the solid fundamental solution.As far as the authors know, the study of heat resistance was approached in this manner.They chose the Cu-Ni-Si system for their investigation in which,at [illegible]°C,phases

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The Relative Resistance to Heat as Dependent on Compo- AG-1-8 4
sition in the Cu-Ni-Si System.

of various nature coexist with the solid solution on a [illegible]
Ni_2Si_2, the β'-phase (Cu-Si) and the ternary compound, the [illegible]
dial cross sections of a ternary system. The maximum of heat re[illegible]
ce generally occurs either in the two-phase (but also in the three-[illegible]
se) range or in the range of unsaturated solid solutions. The coin[illegible]
dence of the maximum of heat resistance with the limit of the solid
solution represents a special case. A strong influence on the position
of the heat-resistance maximum with relation to the limit of the on-
phase range is exerted by the relation of the physical properties of
the solid solution (the basis of composition) to the excess phase. A
fourth one has to be added to the schemata by Zakharov. The following
is of great importance in practice: the increase of heat resistance
up to the maximum which lies in the heterogeneous domain, the decrea-
se to a flat minimum, and, finally, a renewed increase of heat resi[illegible]
up to the composition of the second phase.
[illegible] illustration, 12 Slavic references.

ASSOCIATION Moskovskiy institut tsvetnykh metallov i zolota im. M. I. Kalinina, Fiziko-Tekhnicheskiy institut Akademii nauk Kaz SSR

PRESENTED BY BOCHVAR, A.A., Member of the Academy, January 24, 1957
SUBMITTED 23.1.1957
AVAILABLE Library of Congress.
Card 2/2

GOLOKOLZINA, Ye.A.; NOVIKOV, I.I.; ROGEL'BERG, I.L.

Delay in recrystallization in a thin aluminium foil following cold working. Dokl. AN SSSR 117 no.2:221-224 N '57. (MIRA 11:3)

1. Moskovskiy institut tsvetnykh metallov i zolota im. M.I. Kalinina. Predstavleno akademikom A.A. Bochvarom.
(Metal foils)

NOVIKOV, I. I.

with L. I. Dadt va "Dependence [illegible] - S. System"

with L. I. Dadt va "Study [illegible]"

with K. T. Matveyeva "[illegible]"

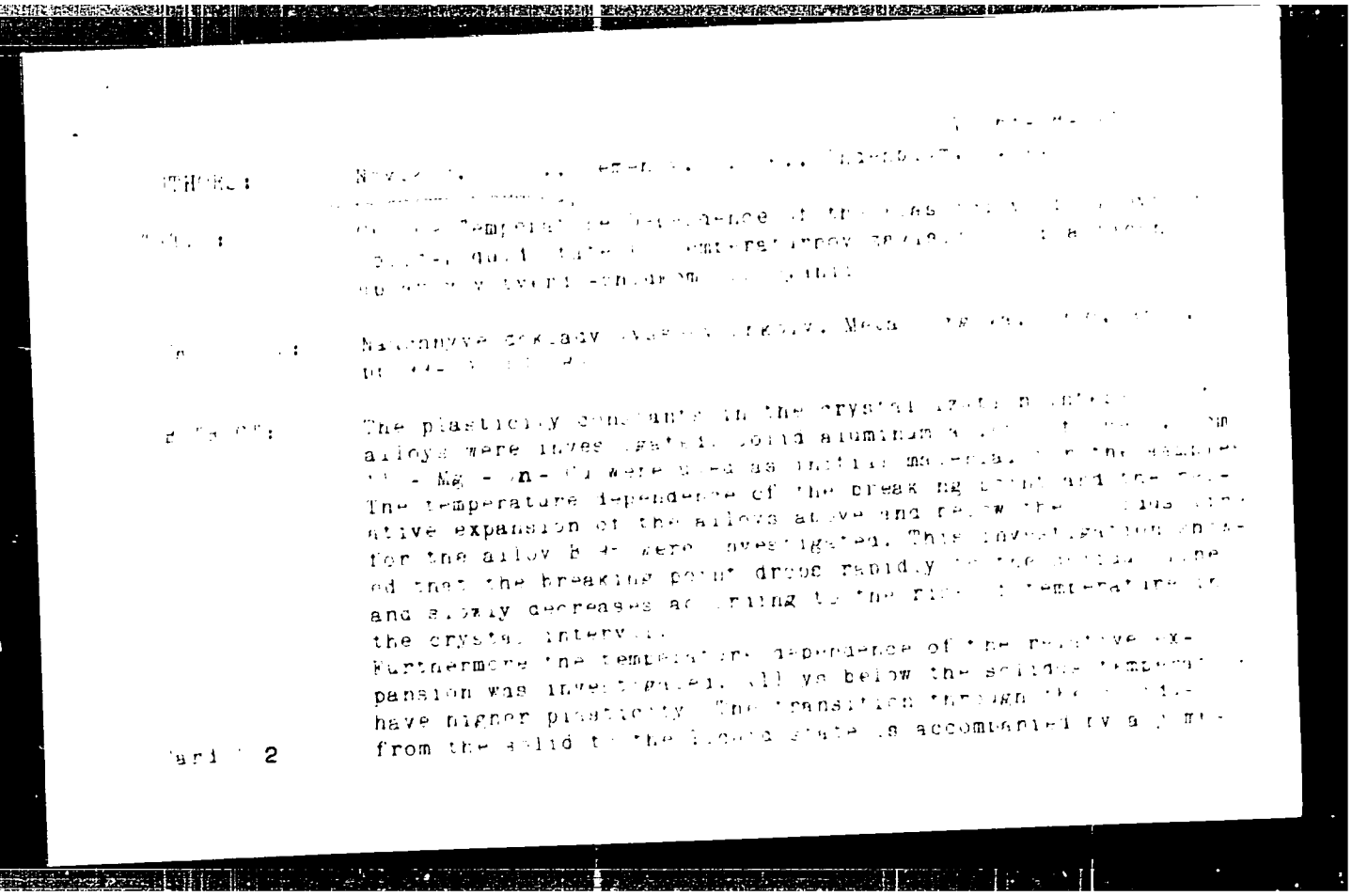
with L. I. Dadt va "Study [illegible] - Nickel - Silicon"

Transactions of the Inst. of Nuclear Physics, Kazakh SSR, Acad. Sci. Kaz. SSR, Alma-Ata, Izd-vo AN Kaz SSR, [illegible].

This vol. contains results [illegible] years [illegible].

NOVIKOV, I.I.; KOROL'KOV, G.A.; SEMENOV, A.Ye.

Using vibration during solidification for the prevention of hot shrinkage cracks. Lit. proizv. no.1:7-8 Ja '58. (MIRA 11:2)
(Solidification) (Foundry machinery and supplies)



n the Temperature Dependence of the [illegible]

like in p[illegible] the positive expansion, which, however, [illegible]
reach the value [illegible], as usual, and in reference, [illegible]
value of [illegible].
The solution line [illegible]
The minimum drive [illegible]
interval of low [illegible]
[illegible]
extansion beyond [illegible]
position of the valve.
The impurities of iron and silicon influence the [illegible]
the aluminum alloys in solid-liquid state [illegible]
[illegible]

[illegible]: Moskovskiy institut [illegible]

[illegible]: [illegible]

SOV/137-58-10-20780

Translation from Referativnyy zhurnal, Metallurgiya, 1958, Nr 10, p 24 (USSR)

AUTHORS Novikov, I.I., Semenov, A.Ye., Indenbaum, G.V.

TITLE The Hot-shortness Zone in Billets Cast Semi-continuously (O zone goryachelomkosti v slitkakh polunepreryvnogo lit'ya)

PERIODICAL Izv. vyssh. uchebn. zavedeniy Tsvetn. metallurgiya, 1958, Nr 1, pp 130-137

ABSTRACT Measurement is made of the mechanical properties of Al alloy V-95 with various amounts of contaminants at temperatures near the solidus by a method making it possible to conduct testing to failure with determination of elongation per unit length in the effective interval of crystallization (a description of the apparatus is provided). It is found that the tendency of an alloy to hot cracks in semi-continuous cast billets is primarily dependent upon its plasticity in the effective interval of crystallization and is not governed by its strength in that interval. In the transition region of the billet it is possible to distinguish a zone of hot shortness. A broadening of that zone carries with it a danger of hot-crack formation. The size of that zone depends upon casting speed, the height of the

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SOV/137-58-10-20780

The Hot-shortness Zone in Billets Cast Semi-continuously

crystallizer mold, and the chemical composition of the alloy. A diminution in Si contents and increase in Fe contents narrows the zone of hot shortness and increases the resistance of V-95 alloy to hot-crack formation.

B L

1. Aluminum alloys--Production [illegible]
2. Aluminum alloys--Fracture

Card 2/2

SOV/137-59-5-11024

Translation from: Referativnyy zhurnal, Metallurgiya, 1959, Nr 5, pp 221-222 (USSR)

AUTHORS: Novikov, I.I., Dautova, L.I.

TITLE: The Dependence of Heat Resistance on the Composition in the Cu - Ni - Si System

PERIODICAL: Tr. In-ta yadern. fiz. AS KazSSR, 1958, Nr 1, pp 249 - 254

ABSTRACT: The authors used the method of long-time hardness at 700°C to investigate the relative heat resistance of cast Cu-Ni-Si alloys on four radial sections passing through the angle at the Cu vertex and the points of chemical compounds such as Ni_5Si_2, Ni_2Si, NiSi, $NiSi_2$, on radial sections at constant Ni - Si ratios of 1:3 and 1:9, and of binary Cu-Ni and Cu-Si alloys. It was established that the optimum heat resistance on the radial sections was generally located either in the bi-phase region or in the region of the non-saturated solid solution. The coincidence of maximum heat resistance and the boundary of the solid solution is a special case. The location of maximum

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NOVIKOV, I.I.; DAUTOVA, L.I.

Investigation of the hot-shortness of copper alloys. Trudy Inst.fiz.AN Kazakh.SSR 1:255-264 '58. (MIRA 12:2)
(Copper alloys--Testing)

MATVEYEVA, K.T.; NOVIKOV, I.I.

Closing up of shrinkage cracks during the crystallization period.
Trudy Inst.iad.fiz.AN Kazakh.SSR 1:265-273 '58. (MIRA 12:2)
(Aluminum alloys--Testing)

SOV 137-59-3-6243

Translation from Referativnyy zhurnal Metallurgiya 1959, Nr 3 p 8 USSR)

AUTHORS: Novikov I I Dautova L I

TITLE: An Investigation of the Phase Diagram of a Cu-Ni-Si System (Issledovaniye diagrammy sostoyaniya sistemy med'-nikel'-kremniy)

PERIODICAL Tr In-ta Yadern fiz AN KazSSR 1958 Nr 1 pp 274-281

ABSTRACT Thermal micrometallographic and X-ray-diffraction analyses combined with microhardness measurements were employed in studying the Cu section of a Cu-Ni-Si system in a region corresponding to concentrations of up to 8% Ni and 8% Si Isotherms for the liquidus line were plotted in increments of 10° C together with the isotherms for the limited solid-state solubility at temperatures of 700 800 900, and 1000° Six polythermal and four isothermal sections were also plotted It was established that none of the chemical compounds of Ni and Si forms a quasi-binary system with Cu The appearance of a fold on the liquidus surface between the Cu-NiSi and the Cu-$NiSi_2$ sections is probably caused by the presence of a ternary ϵ compound in the system This is also corroborated by a microhardness investigation which indicates

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An Investigation of the Phase Diagram of a Cu-Ni-Si System

that a phase having a hardness of 609-865 kg/mm^2 is in equilibrium with the solid Cu-based solution, since the hardness of the other intermetallic compounds in the system is significantly greater the observed phase is, apparently the [illegible] compound

L. V.