L 45650-65 EPA(s)-2/EWA(h)/EWT(1)/EWG(m) Pz-6/Peb TT/AT

ACCESSION NR: AP5013165 UR/0144/64/000/012/1422/1427

AUTHOR: Siunov, N. S.; Rodionov, I. Ye. 20 B

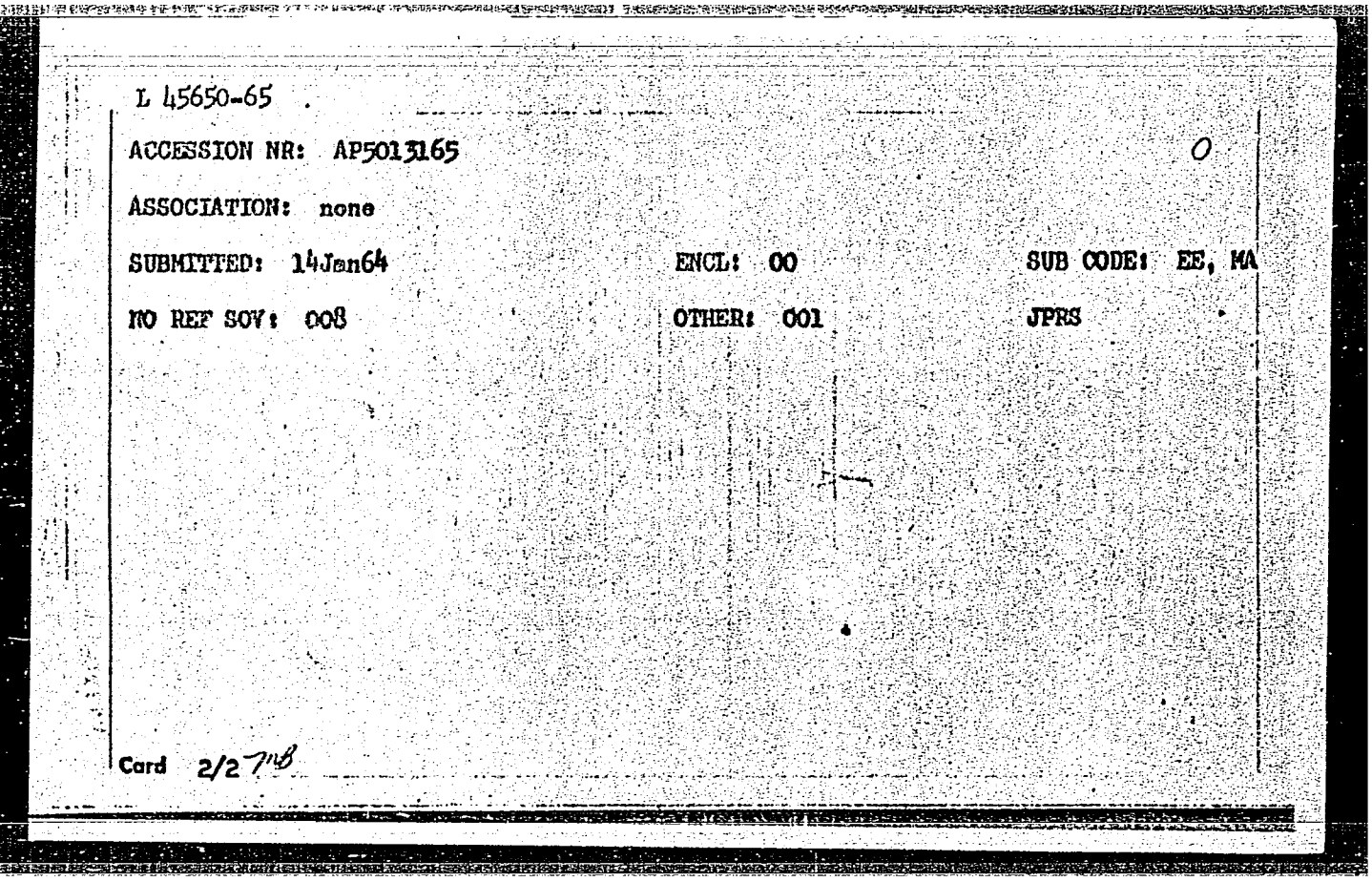
TITLE: Experimental determination of the parameters of synchronous hydro-generators under operating conditions

SOURCE: IVUZ. Elektromekhanika, no. 12, 1964, 1422-1427

TOPIC TAGS: electric generator, 25 electric power engineering

Abstract: The article describes a simple method for determining the parameters of a synchronous salient-pole generator on the basis of steady-state operating conditions. The method consists essentially in measuring and plotting a series of V-curves, i.e. $I = f(i_{field})$ characteristics at constant voltage for various load points and with simultaneous adjustment of the internal angle, the power factor angle and the airgap EMF. The synchronous reactances in the direct and in the quadrature axes can then be calculated. This method makes it possible to determine the actual saturated values of the parameters and thus eliminates the need for accumulating data of other machines for comparison. In addition, this method when applied to salient-pole machines is more reliable and accurate than other existion methods; it can be used for studying not only steady-state but also transient conditions.

Card 1/2 Orig. art. has 5 figures.



L 45650-65

ACCESSION NR: AP5013165 O

ASSOCIATION: none

SUBMITTED: 14Jan64 ENCL: 00 SUB CODE: EE, MA

NO REF SOV: 008 OTHER: 001 JPRS

Card 2/2 748

LUKISHOV, G.I.; RODIONOV, K.D.; NOSKOV, N.I.

Chain of glove boxes for handling radioactive substances. Atom. energ. 19 no.5:486-488 N '65. (MIRA 18:12)

L 62088-65 EPF(c)/EPF(n)-2/EWT(m) Pr-4/Pu-4

ACCESSION NR: AP5016740 UR/0286/65/000/010/0051/0051

AUTHORS: Rodionov, K. D.; Shibanova, M. N.

22
B

TITLE: Container for radioactive sources. Class 21, No. 171052

19

SOURCE: Byulleten' izobreteniy i tovarnykh znakov, no. 10, 1965, 51

TOPIC TAGS: radioactive storage

ABSTRACT: This Author Certificate presents a container for radioactive sources with input and output rotary stop valves mechanically coupled to a locking device. To increase the safety, reliability of locking, and to exclude the simultaneous opening of the stop valves, the locking device is in the form of two rotary disks with cutouts, into which a common spring-loaded pin-stop is inserted (see Fig. 1 on the Enclosure). The device, with a key with a freely fitting securing rod with a slot for passage of the disk, squeezes the spring-loaded pin-stop. Orig. art. has: 1 diagram.

ASSOCIATION: none

SUBMITTED: 22Jun62 ENCL: 01 SUB CODE: NP

NO REF SOV: 000 OTHER: 000

Card 1/2

L 62088-65

ACCESSION NR: AP5016740

ENCLOSURE: 01

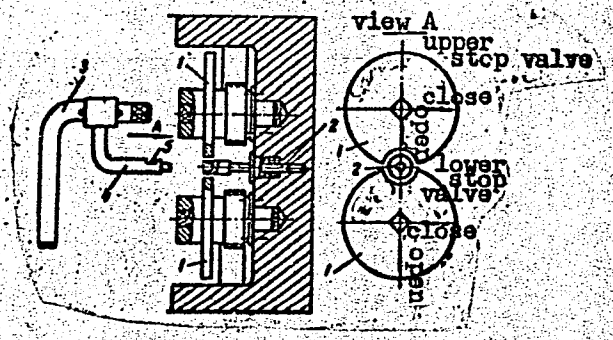


Fig. 1.
1- rotary disks; 2- stop; 3- key; 4- securing rod; 5- slot

Card 2/2

L 11774-66 EWT(m)/T IJP(c)
ACC NR: AP6001573 SOURCE CODE: UR/0120/65/000/006/0093/0097

AUTHOR: Rodionov, K. G.; Wang, Nai Yen; Khen Yeyen Gyn'; Yao, Ch'i Ch'uan

ORG: Joint Institute of Nuclear Research, Dubna (Ob"yedinennyy institut yadernykh issledovaniy)

TITLE: Use of a high-speed coincidence circuit for slow pulses in a neutron detector

SOURCE: Pribory i tekhnika eksperimenta, no. 6, 1965, 93-97

TOPIC TAGS: coincidence circuit, neutron detector, nanosecond pulse

ABSTRACT: The authors describe a coincidence circuit with a theoretical resolving time of $1.5 \cdot 10^{-10}$ sec for use in a detector for measuring the total effective cross section of interaction between neutrons and nuclei by the gating method. The operating principle of the circuit is as follows: If pulses with a steep front are fed to the input of the shaper in the coincidence circuit, the triggering moment of the device at any threshold depends on the height of these pulses. Even when the sensitivity of the circuit is high, the time scatter lies within the limits of the pulse front. Thus the resolving time of the circuit for 100% efficiency has a direct relationship to the rise time of the pulse. This time scatter

Card 1/2 UDC: 539.1.075:539.1.074.8

L 11774-66
ACC NR: AP6001573

may be compensated if a shaper circuit is used with a triggering threshold which varies in proportion to the input amplitude. Block and schematic diagrams are given for a circuit with this type of compensation. Tests with 3.5- and 1-meter shaper cables in the pickup unit of the neutron detector gave resolving times, 2τ = 57 nanosec and 29 nanosec, respectively. Curves are given showing the amplitude spectra of thermal neutrons. In conclusion the authors thank Yu. S. Yazvitskiy and G. I. Zabiyakin for valuable remarks during discussion of the work. Orig. art. has: 5 figures. [08]

SUB CODE: 09, 18 / SUBM DATE: 09Nov64 / ORIG REF: 002 / OTH REF: 003
ATD PRESS: 4180

Card 2/2

GROMOV, S.A.; RODIONOV, K.K.

Clinical aspects and treatment of glomus tumors of arteriovenous anastomoses. Vop. psikh. nevr. no.10:90-97 '64.
(MIRA 18:12)

1. Neyrokhirurgicheskoye i nervnoye otdeleniye Leningradskoy oblastnoy klinicheskoy bol'nitsy (glavnyy vrach - A.P.Yegorova).

POPOV, N.A., prof.; RODIONOV, K.K.

Case of cerebral abscesses. Vop.neirokhir. 22 no.6:43-44 N-D '58. (MIRA 12:2)

1. Nervnoye i neyrokhirurgicheskoye otdeleniya Leningradskoy oblastnoy klinicheskoy bol'nitsy.
(BRAIN, abscess,
case reports (Rus))

RODIONOV, K.K.

Surgical treatment of spinal tuberculous arachnitis. Probl. tub. 38 no. 5:68-71 '60. (MIRA 14:1)
(SPINAL CORD—TUBERCULOSIS)

RODIONOV, K. M. Cand Tech Sci

Dissertation: "Investigation of Interaction of the Bakelite and Casein Coatings for Wood with Petroleum Products and Creolin."

12/6/50

Moscow Forestry Inst.

SO Vecheryaya Moskva
Sum 71

CA RODIONOV, K.M.

General & Applied - 2
Chemistry

In memory of Vladimir Vasil'evich Chelintsev. K. M. Rodionov and E. K. Nikitin. *Zhur. Obshchei Khim.* (J. Gen. Chem.) 22, 1271–8(1952).—Obituary (1877–1947) with portrait and bibliography. G. M. Kosolapoff

ma

The Theory of Goldhammer's Phenomenon in Ferromagnetics. S. V. Vonsovsky and K. P. Rudinsov (*Doklady Akad. Nauk S.S.S.R.*, 1950, **70**, (3), 443–446; *Physics Abs.*, 1951, **54**, 428).—[In Russian]. Theoretical. The nature of the forces responsible for the (Goldhammer effect (the change of elect. resistance in ferromagnetic crystals) has hitherto been obscure. In order to explain these forces a model proposed previously (*Zhur. Eksper. Teoret. Fiziki*, 1946, **16**, 981; see *M.A.*, **14**, 362) is used, in which the electrons of a ferromagnetic crystal that determine its magnetic, elect., and other phys. properties are conventionally divided between the inner *s*-electrons and the external *d*-electrons, between which there exists elect. (vol.) and magnetic (spin and spin orbital) interaction. It is suggested that ferromagnetic properties are determined fundamentally by the internal electrons and elect. properties by external electrons. Equations are deduced which indicate that the Goldhammer effect is completely determined by the magnitude of the spontaneous magnetisation and not by the external magnetic field. The external field is responsible only for the initial orientation of the spontaneous magnetisation.

VONSOVSKIY, S. V., KOBELEV, L. YA., SOBINOV, K. P.

Electromagnetism

Toward the theory of galvanomagnetic phenomena in ferromagnetic materials. Izv. AN SSSR. Ser. fiz. 16 No. 5, 1952.

9. Monthly List of Russian Accessions, Library of Congress, June 1953. Unclassified.

[redacted], S. V.

"Theory of Variation of Electric Resistance of Ferromagnetics I"
Tr. in-ta Fiziki Metallov Uralsk Fil, AN SSSR, No 15, 1954, 3-9

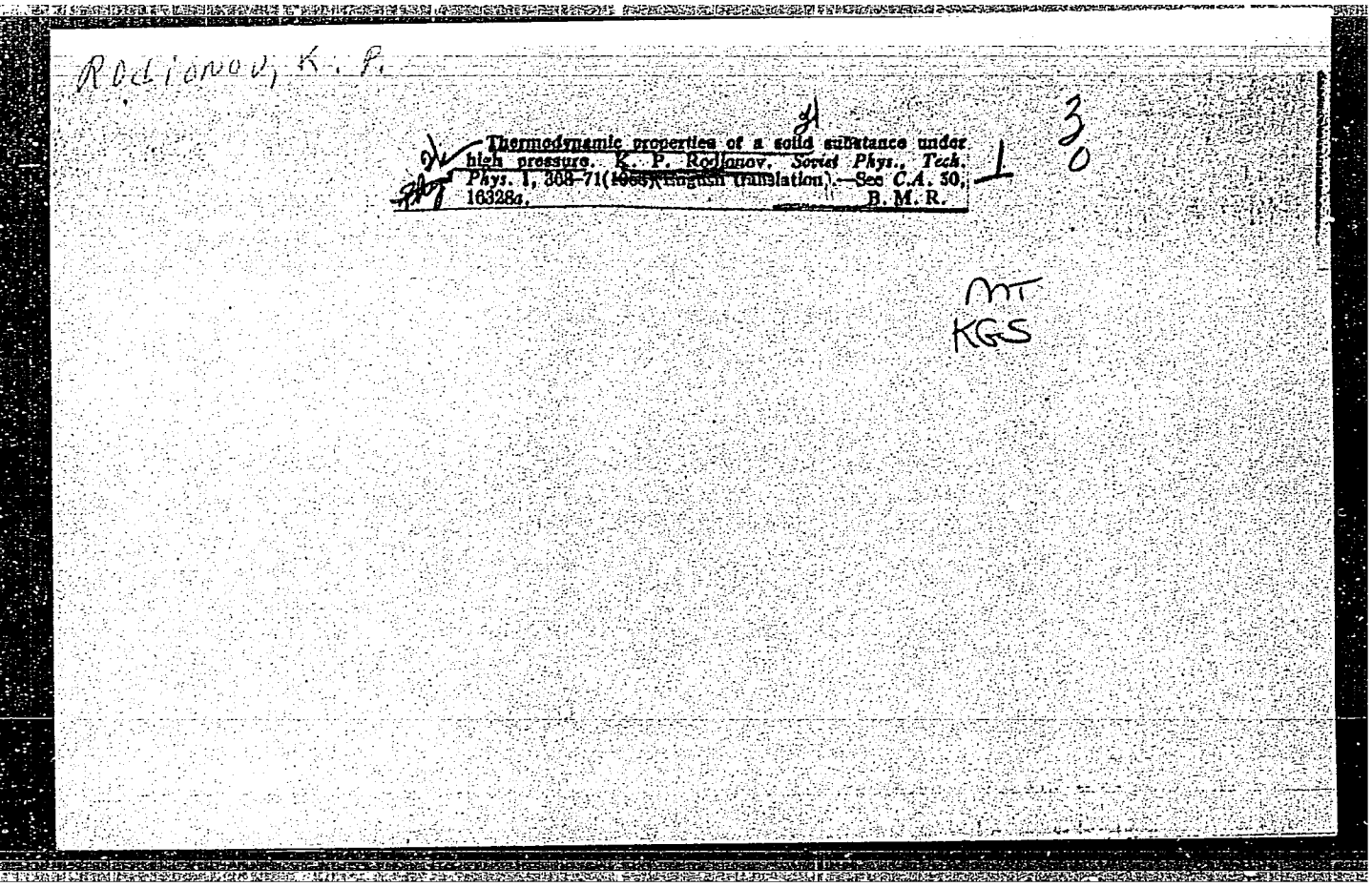
The dependence of the variation of electric resistance of a ferromagnetic on the square of the spontaneous magnetization is clarified by means of a model of interacting external and internal electrons, as described previously (ZhETF 16, 981, 1946) and taking into account the magnetic spin-spin interaction of conducting electons with ferromagnetic electrons. Theoretical and experimental results are in good agreement. (RZhFiz, No 9, 1955)

SO: Sum-No 787, 12 Jan 56

RODIONOV K. P.

TRUDY INSTITUTA FIZIKI METALLOV, AKAD. NAUK. URALSKII FILIAL, 1954, NO. 15

Theory of change of electric resistance of ferromagnetic materials. II. by K. P. Rodionov (p. 10-18) - Using the electron band model and the results reported in the preceding paper, the author derives the components of the electric resistance tensor and the anisotropy of magnetoresistance in cubic and hexagonal crystals. Anisotropy constants are shown to depend only on atomic constants and temperature. Experimental results corroborate the calculated values.



Rodionov, K. P.

Thermodynamic properties of a solid substance under high pressure. K. P. Rodionov, *Soviet Phys., Tech. Phys.* 1, 368–71(1956)(English translation).—See *C.A.* 50, 16328a. B. M. R.

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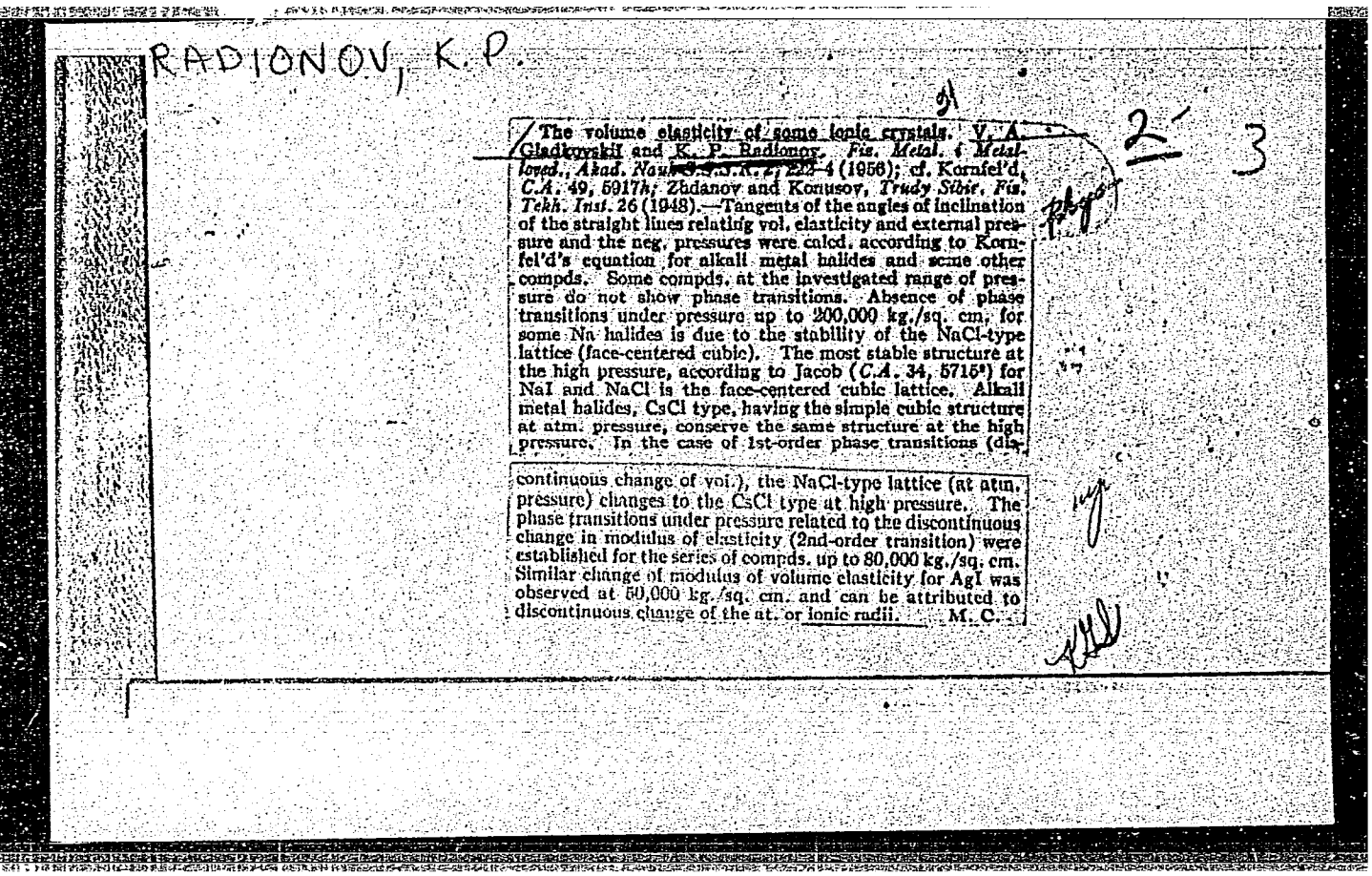

RADIONOV, K. P.

The volume elasticity of some ionic crystals. V. A. Gladkovskii and K. P. Radionov. *Fiz. Metal. i Metalloved., Akad. Nauk S.S.S.R.*, 2, 222–4 (1956); cf. Kornfel'd, *C.A.* 49, 6917*h*; Zhdanov and Konusov, *Trudy Sibir. Fiz. Tekh. Inst.* 26 (1948).—Tangents of the angles of inclination of the straight lines relating vol. elasticity and external pressure and the neg. pressures were calcd. according to Kornfel'd's equation for alkali metal halides and some other compds. Some compds. at the investigated range of pressure do not show phase transitions. Absence of phase transitions under pressure up to 200,000 kg./sq. cm. for some Na halides is due to the stability of the NaCl-type lattice (face-centered cubic). The most stable structure at the high pressure, according to Jacob (*C.A.* 34, 5715[8]) for NaI and NaCl is the face-centered cubic lattice. Alkali metal halides, CsCl type, having the simple cubic structure at atm. pressure, conserve the same structure at the high pressure. In the case of 1st-order phase transitions (discontinuous change of vol.), the NaCl-type lattice (at atm. pressure) changes to the CsCl type at high pressure. The phase transitions under pressure related to the discontinuous change in modulus of elasticity (2nd-order transition) were established for the series of compds. up to 80,000 kg./sq. cm. Similar change of modulus of volume elasticity for AgI was observed at 50,000 kg./sq. cm. and can be attributed to discontinuous change of the at. or ionic radii. M. C.

Kolesnikov, M. D.

$$b_\nu^N = \frac{2}{N}\sum_{k=1}^{N} f(x_k)\sin \nu x_k,$$

$(\nu = 1, 2, \cdots, n;\ x_k = 2\pi k N^{-1},\ N \geq 2n+1)$.

The author proves the following theorem: If $\alpha = 1$, then $E_n^{(N)}(KN^{(\alpha)}, x) = 2K \log n/(n\pi) + O(n^{-1})$. If $0 < \alpha < 1$, then

$$E_n^{(N)}(KN^{(\alpha)}, x) = \frac{4K}{n^{\alpha}\omega^{1-\alpha}} \sum_{k=-\infty}^{\infty} \frac{\sin^2 (2k - Nx)}{|2k - Nx|^{2-\alpha}} + o(n^{-\alpha}),$$

provided $\lim n/N = \omega \neq 0$, as $n \to \infty$, but

$$E_n^{(N)}(KN^{(\alpha)}, x) = \frac{2K\Gamma(\alpha)\sin(\frac{1}{2}\alpha\pi n^{-\alpha})}{\pi(1-\alpha)} + o(n^{-\alpha})$$

when $\alpha = 0$.

S. Kulik (Columbia, S.C.).

2/2

RODIONOV, K.P.

Effect of high pressure on the thermal properties of solids. Fiz. met.i metalloved. 3 no.1:26-30 '56. (MLRA 9:11)

1. Institut fiziki metallov Ural'skogo filiala AN SSSR.
(Pressure (Physics))(Heat capacity) (Expansion (Heat))

RODIONOV, K.P.

Category : USSR/Atomic and Molecular Physics - Physics of high pressure D-6

Abs Jour : Ref Zhur - Fizika, No 1, 1957, No 912

Author : Rodionov, K.P.
Title : Certain Thermodynamic Properties of Solid Bodies Under High Pressure.

Orig Pub : Zh. tekhn. fiziki, 1956, 26, No 2, 375-378

Abstract : Based on ordinary thermodynamics and statistics, an analysis is made of the effect of pressure on the properties of a solid body. Assuming the ion interaction potential to be in the form $U(r) = \left[\exp(-\gamma r)\right]\left(A + Br + Cr^2 + Dr^{-1}\right)$, where r is the distance between ions and γ, A,B,C, and D are constants, the author finds the maximum frequency of the elastic collisions of the linear monatomic chain, compressed with a force f, and derives an equation for the dependence of the Debye temperature Θ on f. The equation contains an exponential factor and consequently Θ should increase sharply at sufficiently large f. The dependence of Θ on the pressure ρ is derived for a three dimensional crystal lattice with cubical symmetry.

Card : 1/1

126-3-1/34

AUTHORS: Rodionov, K. P. and Shavrov, V. G.

TITLE: On the problem of anisotropy of the electric conductivity in ferromagnetics. (K voprosu ob anizotropii elektroprovodnosti v ferromagnetikakh).

PERIODICAL: "Fizika Metallov i Metallovedeniye" (Physics of Metals and Metallurgy), 1957, Vol.IV, No.3, pp.385-391 (U.S.S.R.)

ABSTRACT: The problem of anisotropy of the electric conductivity was considered by several authors (2-4). Baroody, E.M.(5) determined the anisotropy of the electric conductivity by solving the kinetic equation. He investigated two cases, namely, when the function characterising the inter-relation of the electrons with the lattice oscillations is isotropic and the energy depends on the wave vector (and not on $|\vec{k}|$) and when the energy is isotropic and the anisotropy is taken into consideration as a function of the inter-relation of the electrons with the lattice oscillations. The work of these authors related to non-ferromagnetic metals and were based on the single electron approximation. Akulov,N.S. (6) has shown that the anisotropy of electric conductivity in ferromagnetics can be determined phenomenologically from the symmetry properties of the crystal alone. On the basis of the quantum mechanical model of the ferromagnetic,

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On the problem of anisotropy of the electric conductivity in ferromagnetics. (Cont.)

Vonsovskiy, S. V. and Rodionov, K. P.(7) calculated semi-phenomenologically the anisotropy of the electric conductivity approximating the free electrons in a metal by means of the Drude formula. Of considerably greater interest is accurate calculation based on taking into consideration the microscopic anisotropy in the kinetic equation. The aim of this paper is to determine the anisotropy of the electric conductivity of the ferromagnetic metal by solving the kinetic equation,using the concrete type of energy spectrum of the conductivity electrons determined in the dissertation of Turov, Ye. A. (Sverdlovsk, 1954). It can be seen from the derived relations that,in agreement with experimental results,the change in the electric conductivity,after taking into consideration the spin-spin interaction of the s- and d-electrons in the longitudinal and transverse cases, is proportional to the square of the magnetisation of the ferromagnetic (Thomson-Goldhammer effect). The (s-d) exchange model used by the authors does not take into consideration all the features of ferromagnetics. However, the effected calculations indicate that,within the framework of this model,deviations from the law of the even effects of Akulov are obtained if the microscopic anisotropy is taken into

On the problem of anisotropy of the electric conductivity in ferromagnetics. (Cont.)

consideration in the kinetic equation. The magnitudes σ_2 and σ_2', eq.(19), to which these deviations are due, include the isotropic as well as the anisotropic part. Eqs. (20 and 21), p.390, express the resulting relative changes in the electric conductivity as a function of the direction of measurement and it can be seen that the signs of the longitudinal and transverse effects coincide, which is in agreement with experimental data. Bates, L.F. (10) has established that there is an anomaly in the relation between the signs of the longitudinal and the transverse effects in the case of high coercive alloys, whilst Drozhzhina, V.I. and Shur Ya. S. (11) have established the existence of such anomaly for high coercive as well as magnetically soft materials; the signs of the effects were equal. On the basis of general symmetry considerations, Vonsovskiy, S. V. (12) explained this anomaly by the presence of "volume" effects and he established a criterion governing equality of signs of the two effects, pointing out that the microscopic theory should explain, at least in principle, the possibility of existence of this criterion. The eqs.(20 and 21) derived in this paper indicate that this

126-3-1/34

On the problem of anisotropy of the electric conductivity in ferromagnetics. (Cont.)

criterion is fulfilled in the given case. Acknowledgments are made to S. V. Vonsovskiy for his valuable comments. There are 12 references, 5 of which are Slavic.

SUBMITTED: June 18, 1956.

ASSOCIATION: Institute of Metal Physics, Ural Branch of the Ac.Sc., U.S.S.R. (Institut Fiziki Metallov Ural'skogo Filiala ANSSSR)

AVAILABLE: Library of Congress

Card 4/4

126-5-3-27/31

AUTHORS: Yekhlakov, A.D., Gladkovskiy, V.A. and Rodionov, K. P.

TITLE: The Effect of Pressure on Young's Modulus for Certain Metals (O vliyanii davleniya na modul' Yunga nekotorykh metallov)

PERIODICAL: Fizika Metallov i Metallovedeniye, 1957, Vol 5, Nr 3, pp 559-560 (USSR)

ABSTRACT: An apparatus dependent on observations on bending (not described in detail) is used at hydrostatic pressures up to 5000 kg/cm^2. Electrolytic copper and aluminium, 99.85-99.95% pure, and medium-carbon steel are used; the results are given in Table 1 (left column: Al, Cu, Steel; units cm^2/kg; columns: from (2), from experiment), for pressures up to 4000 kg/cm^2. These metals were used because the bulk (K) and shear (G) moduli are known for high hydrostatic pressures. Eq.(2) is derived by differentiating the standard Eq.(1); Eq.(3) is an approximate formula relating K to p due to Bridgman. Table 2 is similar to Table 1 (same materials); the units are cm and kg. There are 7 references, none of which is Soviet.

Card 1/1

ASSOCIATION: Institut fiziki metallov Ural'skogo filiala AN SSSR (Institute of Metal Physics, Ural Branch of the AS USSR)

SUBMITTED: May 15, 1957

1. Metals--Elasticity 2. Metals--Pressure

Rodionov K.P.

PHASE I BOOK EXPLOITATION SOV/3847
SOV/26-M-20

Akademiya nauk SSSR. Ural'skiy filial. Institut fiziki metallov

Trudy, vyp. 20 (Transactions of the Institute of the Physics of Metals, Ural Branch, Academy of Sciences USSR, No. 20) Sverdlovsk, 1958. 402 p. Errata slip inserted. 1,000 copies printed.

Resp. Eds.: S.V. Vonsovskiy, Corresponding Member, Academy of Sciences USSR, and V I. Arkharov, Doctor of Technical Sciences.

PURPOSE: This book is intended for scientists working in the field of physical metallurgy.

COVERAGE: This is a collection of 28 articles written by members of the Institute of the Physics of Metals, Ural Branch of the Academy of Sciences USSR, on problems investigated at the Institute. Studies at the Institute have concentrated on two basic problems: 1) developing a theory of metals and alloys and finding ways to improve the properties of engineering materials; and 2) developing new physical methods for investigating and controlling the quality of materials and metal articles. In connection with these basic problems the articles in the collection treat the following subjects: problems of the multielectron quantum-mechanical theory of solids; the laws of distribution and diffusion of admixtures in various metallic alloys (internal adsorption theory); strength and plasticity of polycrystalline materials in relation to interatomic binding forces, distortions in the crystal lattice; structural theory of diffusion reaction, i.e. diffusion due to chemical reactions in solid phases; theory of the magnetic structure of ferromagnetic substances; theory of the heat treatment of steel; and the physical theory of magnetic measurements (magnetic flaw detection and structural analysis). The first article gives a description of the work being done by the Institute and a list of departments and laboratories along with their chief personnel. Several persons are cited for their work at the Institute. References accompany each article.

AVAILABLE: Library of Congress (TN607.A4)

JA/cdw/jb
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22

Card 6/6

SOV/126-6-4-25/34

AUTHOR: Rodionov, K.P.

TITLE: On the Effect of Omnidirectional Pressure on Thermal Conductivity of Insulators (K voprosu o vliyanii vsestoronnego davleniya na teploprovodnost' izolyatorov)

PERIODICAL: Fizika Metallov i Metallovedeniye, 1958, Vol 6, Nr 4, pp 745-749 (USSR)

ABSTRACT: According to current physical ideas (Ref.1-4) the finite thermal conductivity of the crystal lattice of insulators is due to the anharmonic nature of the interatomic interaction potential. Since thermal expansion of a solid depends also on the anharmonicity of the vibrations of the lattice atoms, thermal expansion of the lattice is directly related to its thermal conductivity. Under omnidirectional (uniform) external pressure, the atoms in a crystal lattice are brought closer together and this decreases the anharmonicity of their thermal vibrations and, consequently, thermal expansion of the crystal. It is difficult to find experimentally the pressure dependence of thermal conductivity of a solid; such experiments

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On the Effect of Omnidirectional Pressure on Thermal Conductivity of Insulators

have not in fact been carried out as yet. The present paper gives a theoretical analysis of behaviour of thermal conductivity of a crystal subjected to uniform pressure. The analysis assumes the existence of a free mean path length for a phonon in the crystal lattice of an insulator. The author derives two expressions for the thermal conductivity of an insulator at high (Eq.7) and very high (Eq.8) pressures. It is not possible to give a quantitative estimate of thermal conductivity using Eq.7 or 8, because for the majority of insulating crystals there are no reliable theoretical or experimental data on the variation of thermal expansion and heat capacity with pressure, which appear in these equations. For NaCl, NaBr, CsCl, CsBr and CsI, whose thermal expansion coefficients are known as a function of pressure up to 50,000 kg/cm^2, the author found that their thermal conductivities at 50,000 kg/cm^2 are higher than at atmospheric pressure (Table, p 748). The data used do not yield any clear information how thermal conductivity varies with

SOV/126-6-4-25/34

On the Effect of Omnidirectional Pressure on Thermal Conductivity of Insulators

pressure and with the lattice structure between the atmospheric pressure and 50,000 kg/cm^2. The author makes also a qualitative prediction that thermal conductivity at any given pressure will be higher in insulators with low compressibility than in those which can be compressed more easily. The paper is entirely theoretical. There is 1 table and 13 references of which 2 are Soviet, 8 English, 2 German and 1 French.

ASSOCIATION: Institut Fiziki Metallov AN SSSR (Institute of Metal Physics, Ac.Sc. USSR.)

SUBMITTED: 11th April 1957.

Card 3/3

AUTHOR: Rodionov, K.P. SOV/126-6-5-4/43

TITLE: On the Problem of Determination of Compressibility and Bulk Modulus of a Solid (K voprosu ob opredelenii koeffitsiyentov szhimayemosti i moduley ob"yemnoy uprugosti tverdogo tela)

PERIODICAL: Fizika Metallov i Metallovedeniye, 1958, Vol 6, Nr 5, pp 786 - 793 (USSR)

ABSTRACT: The author shows that compressibility and bulk modulus of a solid can be defined in three different ways. These are given below:

1. Compressibility is usually defined by the following equation:

$$\varkappa_1 = -\frac{1}{V_o}\left(\frac{\partial V}{\partial p}\right)_T \qquad (1) .$$

The usual definition of bulk modulus is as follows:

$$K_1 = -V_o\left(\frac{\partial p}{\partial V}\right)_T \qquad (1,a)$$

Cardl/6

On the Problem of Determination of Compressibility and Bulk Modulus of a Solid

where V_o is the volume of a solid at atmospheric pressure and the derivative $\partial V/\partial p$ is defined as follows:

$$\frac{\partial V}{\partial p} = \frac{\partial \Delta V}{\partial p} = \lim_{\Delta p \to 0} \frac{V(p + \Delta p) - V(p)}{\Delta p} \qquad (1,6) .$$

Here, $\Delta V = V(p) - V(0)$; $V = V(p)$ is the volume of the solid at a pressure p.

2. Intrinsic or "instantaneous" compressibility is given by:

$$\varkappa = -\frac{1}{V}\left(\frac{\partial V}{\partial p}\right)_T \qquad (2) .$$

Intrinsic bulk modulus is given by:

$$K = -V\left(\frac{\partial p}{\partial V}\right)_T \qquad (2,a) .$$

On the Problem of Determination of Compressibility and Bulk Modulus of a Solid

3. Initial compressibility is defined by means of the following expression:

$$\kappa_0 = -\frac{1}{V'_0}\left(\frac{\partial V}{\partial p}\right)_{T = 0^\circ K,\ p = 0} \qquad (3)$$

where V'_0 is the volume of the solid at $T = p = 0$.

Initial bulk modulus is:

$$K_0 = -V'_0\left(\frac{\partial p}{\partial V}\right)_{T = 0^\circ K,\ p = 0} \qquad (3,a).$$

Important differences between these three sets of definitions are brought out in the derivatives of compressibility and bulk modulus with respect to pressure. These derivatives are given below:

On the Problem of Determination of Compressibility and Bulk Modulus of a Solid

$$\frac{d\varkappa_1}{dp} = -\frac{1}{V_o}\left(\frac{\partial^2 V}{\partial p^2}\right)_T \qquad (4),$$

$$\frac{d\varkappa}{dp} = \varkappa^2 + \frac{V_o}{V} \cdot \frac{d\varkappa_1}{dp} \qquad (5),$$

$$\frac{d\varkappa_o}{dp} = 0 \qquad (6),$$

$$\frac{dK_1}{dp} = -\frac{1}{\varkappa_1^2} \cdot \frac{d\varkappa_1}{dp} \qquad (4a)$$

Card4/6

$$\frac{dK}{dp} = -1 + \frac{V}{V_0} \cdot \frac{dK_1}{dp} \qquad (5a),$$

$$\frac{dK_0}{dp} = 0 \qquad (6a).$$

The differences between the definitions can also be seen when each of the quantities in Eqs (1) - (6a) is redefined by substituting into these equations Bridgman's empirical expression (Ref 2):

$$-\frac{\Delta V}{V_0} = Ap - Bp^2 + \ldots \qquad (7),$$

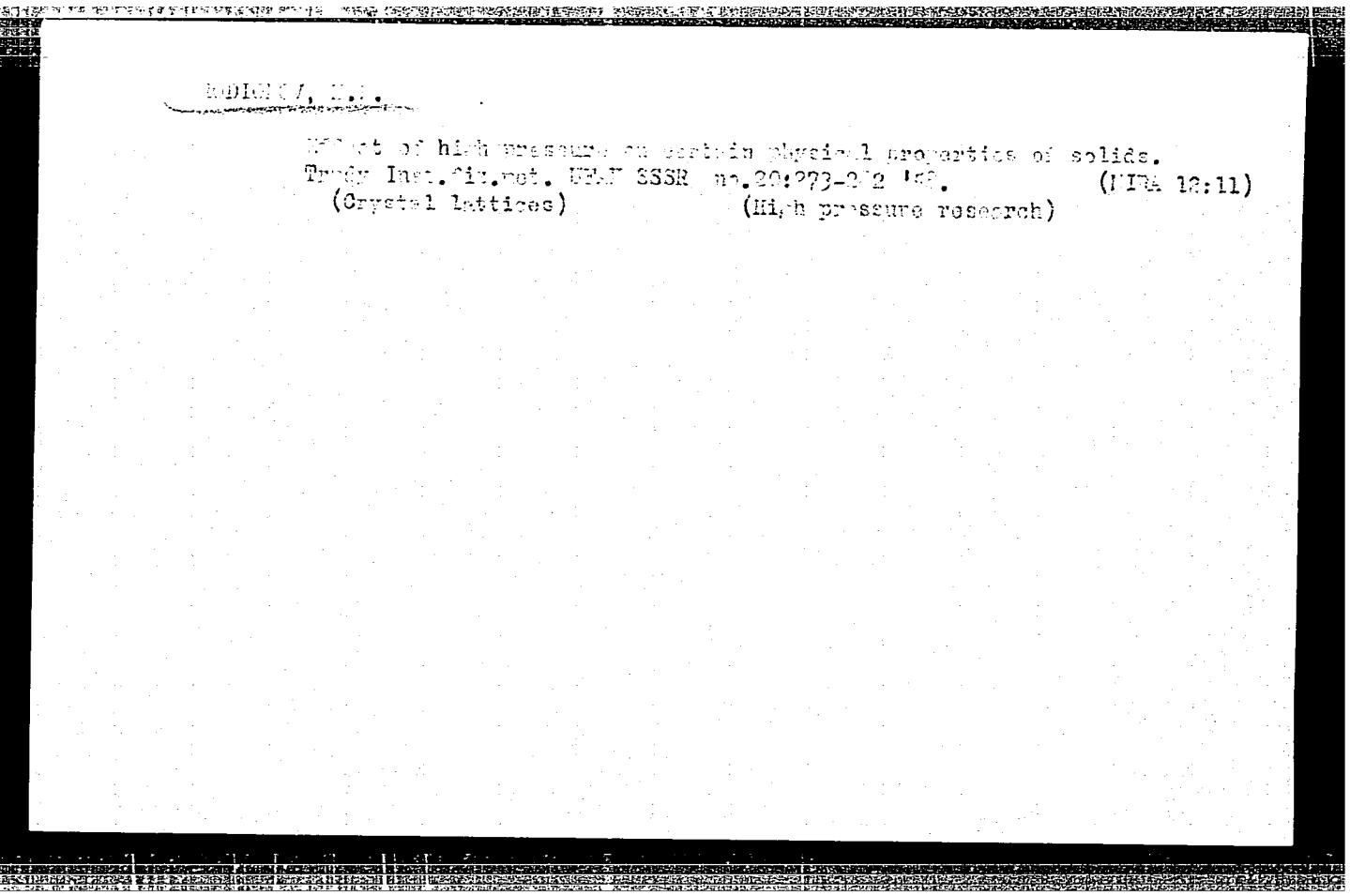
where A and B are constants. A is of the order of 10^{-7} cm^2/kg and B is of the order of 10^{-12} cm^4/kg^2.

On the Problem of Determination of Compressibility and Bulk Modulus of a Solid

The results of such substitutions are given in Eqs (8)-(13a). The author shows that the best representation of properties of a solid under high pressure is given in terms of the intrinsic or "instantaneous" values of compressibility and bulk modulus (Eqs 2, 2a, 5, 5a or Eqs 9, 9a, 12 and 12a). The author uses Eqs (8), (8a), (9) and (9a) to calculate changes in the bulk-elastic part of the lattice energy and changes in the Debye temperature (Figure 1) with increase of pressure. There are 1 figure and 7 references, 4 of which are Soviet and 3 English.

ASSOCIATION: Institut fiziki metallov Ural'skogo filiala AN SSSR (Institute of Metal Physics, Ural Branch of the Ac.Sc.USSR)

SUBMITTED: February 12, 1957



[illegible], L.I.

Effect of high pressure on certain physical properties of solids. Trudy Inst.fiz.met. UFAN SSSR no.20:273-282 '58. (MIRA 12:11)
(Crystal lattices) (High pressure research)

S/126/60/009/06/020/025
E111/E352

AUTHORS: Yekhlakov, A.D. and Rodionov, K.P.

TITLE: Hydrostatic Method for Measuring the Compressibility of a Liquid at High Pressure

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol 9, Nr 6 pp 932 - 935 (USSR)

ABSTRACT: One of the authors (Yekhalov) has previously indicated the possibility of using a static method for determining the pressure coefficient of Young's modulus of solids for studying the compressibility of liquids. (Ref 4) The present article gives the method of calculation and results for several liquids, some based on published data (Refs 7,8). The apparatus has been described previously (Ref 4) and consists (figure) essentially of a pressure-chamber which can be inclined at various angles, containing a duralumin weight attached to a flexible steel rod rigidly fixed at its other end. The free end of the rod operates a contact. Increase in pressure in the chamber causes the weight to rise, opening the contact: the inclination of the chamber is then altered to close it. The authors

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S/126/60/009/06/020/025
E111/E352

Hydrostatic Method for Measuring the Compressibility of a Liquid at High Pressure

now give an improved equation for calculating the compressibility and tabulate results for paraffin, paraffin + 25-75% transformer oil and transformer oil at 20 - 80 °C and 1 to 5 000 kg/cm^3. The accuracy of determination is within 0.5%.
There are 1 figure, 1 table and 8 references, 7 of which are Soviet and 1 English.

ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of Physics of Metals of the Ac.Sc., USSR)

SUBMITTED: December 14, 1959

Card 2/2

Rodionov, K.P.

S/126/60/010/01/016/019
E032/E514

AUTHORS: Ryabinin, Yu.N., Rodionov, K.P. and Alekseyev, Ye.S.

TITLE: An Estimate of Certain Physical Characteristics of Strongly Compressed Metals 18

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol.10, No.1, pp. 150-152

TEXT: Since a quantum mechanical theory of solids subjected to high pressure has not yet been developed, physical characteristics of such solids must be estimated with the aid of the classical models put forward by Debye (Ref.1), Grüneisen (Ref.2) and Lindemann (Ref.3). It is well known that the characteristic frequency ν of oscillations in a crystal lattice and hence the Debye temperature also, increases with pressure. For an isotropic body the Debye temperature is given by

$$\Theta_D = \frac{hc}{R}\left(\frac{3N}{4\pi V}\right)^{1/3} \qquad (1)$$

where c is the mean velocity of propagation of elastic vibrations in an isotropic body. This velocity in turn depends

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E032/E514

An Estimate of Certain Physical Characteristics of Strongly Compressed Metals

on the elastic moduli so that if the latter are known as functions of pressure, then the Debye temperature given by Eq.(1) can be estimated. Other physical characteristics such as specific heat, melting point, thermal expansion coefficient etc. can then be expressed in terms of the Debye temperature. This approach is used in the present paper to calculate the Debye temperature as a function of pressure for aluminium, silver, copper and iron and the melting point as a function of pressure for iron and aluminium. The results obtained are shown in Figs. 1 and 2. In Fig.2 the continuous line represents the experimental results obtained by Strong (Ref.11) and Butuzov (Ref.12) and the dotted line shows the theoretical results obtained by the present authors. The agreement is good and hence it is concluded that the classical models employed lead to correct estimates for the parameters of a solid body as functions of pressure. Acknowledgments are made to R.G.Arkhipov for discussions and advice. There are 2 figures and 12 references, 2 of which are Soviet, 3 German and 7 English.

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S/126/60/010/01/016/019
E032/E514

An Estimate of Certain Physical Characteristics of Strongly Compressed Metals

ASSOCIATIONS: Institut fiziki vysokikh davleniy AN SSSR (Institute of High Pressure Physics, AS, USSR) and Institut fiziki metallov, AN SSSR (Institute of Physics of Metals, AS, USSR)

SUBMITTED: February 6, 1960

VC

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1.1200 1413

S/126/61/011/001/011/019
E193/E483

AUTHORS: Beresnev, B.I., Bulychev, D.K. and Rodionov, K.P.

TITLE: Specific Features of Extrusion of Metals at Elevated Temperatures With the Aid of Pressurized Fluids

PERIODICAL: Fizika metallov i metallovedeniye, 1961, Vol.11, No.1, pp.115-122

TEXT: The limits of application of the process in which deformation-resistant alloys are extruded with the aid of hydrostatic pressure are set at present by the maximum power rating of the high pressure generating equipment. While it is true that the extrusion pressure can be greatly reduced by increasing the temperature of the extruded metal, this expedient cannot be used until the effects of temperature on the fluid medium, used in the process under consideration, and on the parameters of the process are known. It was for this reason that the investigation described in the present paper was undertaken. A special extrusion press was constructed for this purpose in which pressures up to 10000 kg/cm^2 could be attained and in which provision was made for heating both the container and the metal to temperatures $\leqslant$ 400°C. The liquid medium, delivered under pressure from a hydraulic

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Specific Features of Extrusion of Metals at Elevated Temperatures With the Aid of Pressurized Fluids

compressor, is fed through a receiver into the extrusion head, illustrated schematically in Fig.1. The extrusion billet (9) is set in the die (10) and then inserted in the container (7), filled already with the appropriate working liquid. To prevent mixing of the working liquid with that fed from the compressor, a return ball valve (3) separates the container from the receiver (1). A nut (12) ensures pressure-tight fit between the die and its seating in the container. A conical, cut-off valve (8) prevents a sudden drop of pressure in the container when the metal is forced out of the die aperture. The extruded metal, working liquid, and the die are heated by an electric furnace (6) mounted directly on the container. The temperature of the die and extruded metal is measured by a thermocouple (12) with the accuracy of ± 5°C. High-alloy steels 45ХНМФА (45KhNMFA) and 3Х2В8 (3Kh2V8) were used as the materials of the container and die, respectively. All experiments described in the present paper were carried out on an aluminium-base alloy АД1 (AD1) containing 0.23% Si and 0.25% Fe

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E193/E483

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which was extruded through a die with the die angle $2\alpha = 90°$ and the die aperture diameter of 4.715 mm. The object of the first series of experiments was to determine to what extent the extrusion pressure at various temperatures is affected by the nature of the working liquid. The results are given in Fig.2, where the extrusion pressure P kg/cm^2 (required to attain reduction of area $\Psi = (F - f_o)F = 0.72$) is plotted against the temperature (°C), graphs 1 to 6 relating to the following working media: 1 - transformer oil; 2 - 75/25 mixture of kerosene and transformer oil; 3 - 50/50 mixture of kerosene and graphite; 4 - solidol; 5 - graphite; & 6 - 50/50 mixture of solidol and graphite. (Graphs 1' and 2', representing the theoretical temperature-dependence of P, were constructed on the assumption that P depends only on the mechanical properties of the extruded metal and is not affected by the variation of the properties of the working medium.) In the case of transformer oil (graphs 1, 1'), it will be seen that the extrusion conditions

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deteriorated with raising temperature (higher P is required) whereas they improved when the kerosene/graphite (graphs 3, 2') or kerosene/transformer oil (graphs 2, 2') mixtures were used. Since the experiments described above were conducted for a constant degree of deformation, the next series of experiments consisted in extruding the alloys studied in the 75/25 mixture of kerosene and transformer oil at 20, 150 and 300°C to various degrees of total deformation. The results confirm the previously established fact that the relationship between P and $S_f = \ln F/f_o$ (where F and f_o denote the cross-section areas of the extrusion billet and extruded rod, respectively) is linear. The results of the next series of experiments, in which the combined effect of temperature and the nature of 30 various working media (pure substances and their mixtures) on the magnitude of P was investigated, indicated that the substances studied can be divided into two groups, Group I consisting of substances which increase P at elevated temperatures and Group II comprising substances in which P

Specific Features of Extrusion of Metals at Elevated Temperatures With the Aid of Pressurized Fluids

decreases with rising temperature. The substances in Group I represent high-boiling point mineral oils containing a larger or smaller proportion of fatty acids which form a stable lubricating film at low, but not at high, temperatures. The effect of fatty acids content on the lubricating properties of a 25/75 mixture of transformer oil and kerosene, at various temperatures, is illustrated in Fig.5, where the extrusion pressure P (kg/cm^2) at 20 (crosses) and 120°C (dots) is plotted against the oleic acid content (%) in the above mixture used for extruding aluminium ($\psi = 0.72$). Since it has been stated by some Soviet workers (Ref.12,13,15) that thermal stability of lubricating films can be increased by the addition of Cl-, S- or P-bearing components, the present authors studied the effect of 5% addition of CCl_4 on the properties of transformer oil. When the above mixture was used, the extrusion pressure at 120°C was equal to that required at 20°C; however, the pressure required when working with this mixture at 20°C was 4700 kg/cm^2 against 3700 kg/cm^2 required when pure

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transformer oil was used. The substances in Group II comprise kerosene, ethyl alcohol, water and graphite flakes. Even at room temperature, the first 3 of these substances cannot form a stable lubricating film under conditions of critical or semi-fluid friction. Consequently, the fact that lower P is required at high temperature to extrude aluminium with the aid of these media must be attributed to the decrease in the strength of aluminium at elevated temperatures. Most interesting results, obtained in the course of the present investigation, were yielded by experiments in which mixtures of substances, belonging to either one or both groups discussed above, were used. In the case of mixtures containing one substance of each group, the extrusion pressure at room temperature was somewhere between those corresponding to pure substances. The same applied to mixtures of substances belonging to either group, used both at room and elevated temperatures. However, when a mixture of substances from different groups was used at elevated temperatures, at a certain concentration (usually > 50%) of the

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Specific Features of Extrusion of Metals at Elevated Temperatures With the Aid of Pressurized Fluids

substance lowering the extrusion pressure at high temperatures, the extrusion pressure for that mixture was lower than that corresponding to either of the substances used alone. Although the causes of this effect are not yet understood, it was used as a basis for the formulation of mixtures most suitable for the application under consideration. The maximum reduction in extrusion pressure was attained when a 50/50 mixture of graphite and solidol or hypoid oil was used. The thickness of the lubricating film in the die aperture, measured at room temperature during the steady stage of the process, was 8 to 10 microns in the case of mineral oils, 3 to 4 microns for kerosene, water and alcohol and 12 microns for graphite; the corresponding figures at 120°C were 10 to 12 microns, 6 to 7 microns and 15 microns respectively. The thickness of the lubricating film at the moment when the metal just begins to flow through the die is 2 to 3 times less, and it is pointed out by the present authors that the values of extrusion pressures quoted in the present paper relate to this stage of the

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Specific Features of Extrusion of Metals at Elevated Temperatures With the Aid of Pressurized Fluids

extrusion process taking place under conditions of semi-fluid friction, whereas fluid friction conditions exist during the steady stage of the process. During the final stage of the present investigation, the effect of the working medium on the quality of extruded material was studied. It was found that with increasing extrusion pressure which causes an increase in the viscosity of the working liquid, the tendency of the metal to fracture increased. The nature of the defects depend on the extrusion temperature. Extrusion at room temperature under $P = 4500$ kg/cm^2 resulted in pronounced "kinking" of the rod. Extrusion at 150°C with water, alcohol or kerosene used as the working media, resulted in flaking off of the surface layers of the extruded rod. Finally, if the critical temperature of the working medium was exceeded, bringing about a breakup of the lubricating film, seizure took place and smaller or larger chunks of metal were torn from the surface of the extruded rod. However, when the optimum working media and correspondingly low extrusion pressures were used, extruded rod was

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E193/E483

Specific Features of Extrusion of Metals at Elevated Temperatures With the Aid of Pressurized Fluids

obtained which was free from surface defects and which had surface finish corresponding to class 13 of the ГОСТ (GOST) specifications. Acknowledgments are made to Assistant Mechanic V.P.Ivkov for his assistance. There are 7 figures and 16 Soviet references.

ASSOCIATION: Institut fiziki metallov AN SSSR
(Institute of Physics of Metals AS USSR)

SUBMITTED: June 7, 1960

Card 9/12

20453

24.7600 1043, 1158, 1164 also 1413, 1045

S/056/61/040/002/006/047
B113/B214

AUTHORS: Grazhdankina, N. P., Gaydukov, L. G., Rodionov, K. P., Oleynik, M. I., Shchipanov, V. A.

TITLE: Effect of pressure on the electrical resistance and the galvanomagnetic effect in chromium telluride

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 40, no. 2, 1961, 433-440

TEXT: The temperature dependence of the electrical resistance and the isothermal lines of the galvanomagnetic effect $r = \Delta R/R$ were measured in the temperature range of magnetic transformation at a pressure of 4600 kg/cm^2. A high-pressure chamber of austenitic steel was used for the measurement. The object to be observed was placed in the lower part of the chamber which was situated between the poles of an electromagnet. There were five electric leads in the upper part of the chamber. One of these was used for measuring the electrical resistance of a Manganin manometer. The other four leads were used for the measurement of the electrical resistance of the preparation and the measurement of

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Effect of pressure on the...

temperature. The hydrostatic pressure in the chamber was produced by means of a high-pressure compressor according to the system of L. F. Vereshchagin. Measurements showed that the electrical resistance of chromium telluride increased with the pressure; no hysteresis effect was observed. In the pressure range used $R_T^{-1}dR/dp$ was equal to $(1\pm1.5)10^{-4}kg^{-1}cm^2$. On the basis of this, it was assumed that a compression on all sides must lead to a shift of the Curie point of chromium telluride toward lower temperatures. However, this effect must be sufficiently large. Direct measurements of the temperature dependence of the electrical resistance at atmospheric pressure and a pressure of 4600 kg/cm^2 gave for the Curie point the values 58°C and 31°C, respectively. The following formula holds for the change of the Curie point $d\theta_f/dp$ of chromium telluride caused by a change in the pressure on all sides: $d\theta_f/dp = (-5.9\pm0.3)\cdot10^{-3}deg.kg^{-1}cm^2$ (1). This was checked by a measurement of the galvanomagnetic effect $r = \Delta R/R$ at high pressure. In this case, $d\theta_f/dp$ was determined for a pressure of

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Effect of pressure on the...

4600 kg/cm^2 and a field of 8000 oe from the shift of the maximum of the galvanomagnetic effect. It was found that $d\theta_f/dp = -6.2 \cdot 10^{-3}$ deg·kg^{-1}·cm^2. By means of the compressibility $\varkappa = (22 \pm 3) \cdot 10^{-7}$ cm^{2}kg, $d\theta_f/dV$ was determined to be $3.2 \cdot 10^{25}$ deg·cm^{-3}. The change of Curie temperature is related to the reduction in the interatomic distance on account of the substitution of tellurium atoms by selenium ($CrTe_{1-x}Se_x$). In order to obtain exact results on the temperature of magnetic transformation of the alloy $CrTe_{1-x}Se_x$, and on the dependence of its change on the volume of the unit cell, three different methods were used for the determination of θ_f. First, it was determined from the bend of the R(T) curves; secondly, from the maximum of the galvanomagnetic effect; and thirdly, from the vanishing of spontaneous magnetization, determined by the method of "thermodynamic coefficients" ($T = \theta_f$ for $\alpha = 0$). Always the same value was obtained for $d\theta_f/dV$, which showed that the integral of volume interaction in the

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Effect of pressure on the...

system Cr-Te is proportional to the decrease of the volume of the unit cell. The dimensions of the unit cell were determined by X-ray analysis. It was possible to obtain the law of the dependence of the galvanomagnetic effect on the magnetic field strength at the Curie point by using the theory of thermodynamics. It was found that for chromium telluride and $CrTe_{0.93}Se_{0.07}$, $r \sim H^{2/3}$; for $T > \theta_f$ the authors obtained $r \sim H^2$. The dependence of the galvanomagnetic effect on the temperature in CrTe and in $CrTe_{0.93}Se_{0.07}$ at atmospheric pressure as well as at a pressure of 4600 kg/cm^2 was studied. It was found that for $T < \theta_f$ the pressure leads to an increase in the absolute value of the galvanomagnetic effect in CrTe, but for $T > \theta_f$ (in the paramagnetic range) the $r(T/\theta_f)$ curves for atmospheric pressure and for p = 4600 kg/cm^2 coincide. This shows that the change in the galvanomagnetic effect caused by pressure is related to the change in magnetization. In the range of investigation, the curves for $CrTe_{0.93}Se_{0.07}$ lie lower than

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those for CrTe. If it is assumed that c in the equation $a = c\beta^{-2/3}\sigma_0^{8/3}$ (4), in which c is given by $c = r_s/\sigma_s^2$ (σ_s - spontaneous magnetization), is not affected by pressure, the change in the spontaneous magnetization of CrTe caused by pressure may be considered to be due only to the change in the exchange integral for a constant value of the magnetic moment at absolute saturation. It can then be said that the observed increase of the intensity of the para process under pressure is related to the decrease of the thermodynamic coefficient β in Eq. (4).

I. G. Fakidov and S. D. Margolin are thanked for the magnetic measurements. Yu. A. Bazhin, N. S. Akulov, K. P. Belov, G. A. Zaytseva, Ye. I. Kondorskiy, and V. L. Sedov are mentioned. There are 6 figures, 2 tables, and 15 references: 7 Soviet-bloc and 8 non-Soviet-bloc.

ASSOCIATION: Institut fiziki metallov Akademii nauk SSSR (Institute of the Physics of Metals of the Academy of Sciences USSR)

SUBMITTED: July 30, 1960

S/181/62/004/006/035/051
B108/B138

AUTHORS: Frolov, A. P., Vereshchagin, L. F., and Rodionov, K. P.

TITLE: Changes in the lattice parameters of pentaerythrite under pressures of up to 10,000 kg/cm^2

PERIODICAL: Fizika tverdogo tela, v. 4, no. 6, 1962, 1608-1612

TEXT: A radiographic investigation of the lattice parameters a and c of pentaerythrite: $C(CH_2OH)_4$ was made in a beryllium high-pressure chamber. At room temperature with pressures up to 10,000 kg/cm^2, pentaerythrite has a tetragonal crystal lattice with the parameters a = 6.10 Å and c = 8.73 Å. At a pressure of 9,000 kg/cm^2, a = 5.99 Å and c = 8.46 Å. A discontinuity of a and c was observed between 4200 and 5600 kg/cm^2. The volume also changed suddenly by some 2.6%. These data are evidence of a phase transition in which, however, the crystal structure below and above the transition pressure remained the same. The behavior of pentaerythrite under pressure can be described by two empirical third-order equations of state:

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Changes in the lattice ...

Before transition: $-\frac{\Delta V}{V_o} = 1.584 \cdot 10^{-5} P - 2.380 \cdot 10^{-9} P^2 + 0.330 \cdot 10^{-13} P^3$;

after transition: $-\frac{\Delta V}{V_o} = 2.404 \cdot 10^{-5} P - 3.848 \cdot 10^{-9} P^2 + 2.202 \cdot 10^{-13} P^3$.

Above the pressure of transition, compressibility increases with increasing pressure. There are 5 figures and 1 table.

ASSOCIATION: Institut fiziki metallov AN SSSR, Sverdlovsk (Institute of Physics of Metals AS USSR, Sverdlovsk). Institut fiziki vysokikh davleniy AN SSSR, Moskva (Institute of High-pressure Physics AS USSR, Moscow)

SUBMITTED: February 15, 1962

Card 2/2

FROLOV, A.P.; VERESHCHAGIN, L.F.; RODIONOV, K.P.; OLEYNIK, M.I.

Methods of X-ray investigation of materials under high pressures. Part 2: Equipment for the preparation of X-ray pictures of powders under pressure of up to 18,000 kg/cm^2. Fiz. met. i metalloved. 14 no.1:80-84 Jl '62. (MIRA 15:7)

1. Institut fiziki metallov AN SSSR i Institut fiziki vysokikh davleniy AN SSSR.
(Metal powders) (X rays—Diffraction)

44223
S/056/62/043/006/010/067
B154/B102

24 7/600

AUTHORS: Grazhdankina, N. P., Rodionov, K. P.

TITLE: Influence of pressure on the magnitude of the threshold field and temperature of the antiferromagnetic transformation of $MnAu_2$

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 43, no. 6(12), 1962, 2024 - 2027

TEXT: The influence of hydrostatic pressures up to 10000 kg/cm^2 on the Neel temperature T_N and the threshold field H_{th} of $MnAu_2$ is investigated. For this purpose, measurements of the galvanomagnetic effect $\Delta R/R$, the resistance R, the temperature T, and the uniform pressure P were carried out as described by N. P. Grashdankina, L. G. Gaydukov, K. P. Rodionov (ZhETF, 40, 433, 1961). T_N was determined via measurement of R(T) at 1 kg/cm^2, 4600 kg/cm^2 and at 8850 kg/cm^2 and R_p/R_o as a function of P at room temperature. The barometric coefficient $R_T^{-1} \cdot dR/dP$ is at room

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Influence of pressure on...

temperature $7.6 \cdot 10^{-6}$ kg/cm^2. For T_N the values 364.6°K at atmospheric pressure, 368°K at 4600 kg/cm^2, and 370.7°K at 8850 kg/cm^2 were obtained. From these data $dT_N/dP = (0.68 \pm 0.05) \cdot 10^{-3}$ deg·cm^2/kg followed.

Measurements of the transverse galvanomagnetic effect $\Delta R_\perp/R$ and of the specific magnetization σ as functions of H at room temperature and atmospheric pressure gave similar curves. For $8000 \leq H \leq 16000$ oe σ increased rapidly and R decreased with growing H; for $H \leq 8000$ oe $\sigma \sim H$ and $\Delta R/R = 0$, and for $H > 17000$ oe σ and $\Delta R/R$ tend to saturation. From this it could be concluded that between 8000 and 17000 oe the helicoidal antiferromagnetism is destroyed and ferromagnetic ordering of the spins takes place; $H_{th} = 8000$ oe. Measurements of $\Delta R/R = f(H)$ at room temperature and the pressures: atmospheric, 2600, 5400, 7025, 8850, and 10800 kg/cm^2 were carried out. H_{th} decreases linearly with increasing P: $dH_{th}/dP = -0.67 \pm 0.07$ oe·cm^2/kg . Observed deviations of T_N and H_P can be explained by structural effects. There are 5 figures.

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Influence of pressure on...

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B154/B102

ASSOCIATION: Institut fiziki metallov Akademii nauk SSSR (Institute of the Physics of Metals of the Academy of Sciences USSR)

SUBMITTED: July 9, 1962

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L 57002-65 EWT(m)/EWP(w)/EWA(d)/T/EWP(t)/EWP(k)/EWP(b)/EWA(c) Pf-4 IJP(c)
JD/HW

ACCESSION NR: AR5014254 UR/0276/65/000/005/V031/V031

AUTHOR: Bulychev, D.K.; Beresnev, B.I.; Vostrikov, G.A.; Rodionov, K.P.

31
B

TITLE: Extrusion of profiled tubing with high-pressure liquid

SOURCE: Ref. zh. Tekhnologiya mashinostroyeniya. Svodnyy tom, Abs. 5V285

CITED SOURCE: Tr. Ural'skogo n.-i. in-ta chern. met., v. 3, 1964, 3-5

TOPIC TAGS: extrusion, hydrostatic extrusion, tube extrusion

ABSTRACT: A description is given of laboratory tests of the hydrostatic extrusion of tubing, conducted by the Institute of Metal Physics and of High-pressure Physics, AN SSSR. Six- and ten-rib tubes made of Cu, Al, and other nonferrous metals were extruded. The tests were carried out under conditions of hydrodynamic friction, which improves the surface quality of the products, lowers the extrusion pressure by 3-4 times, and decreases tool wear. Orig. art. has: 2 figures.

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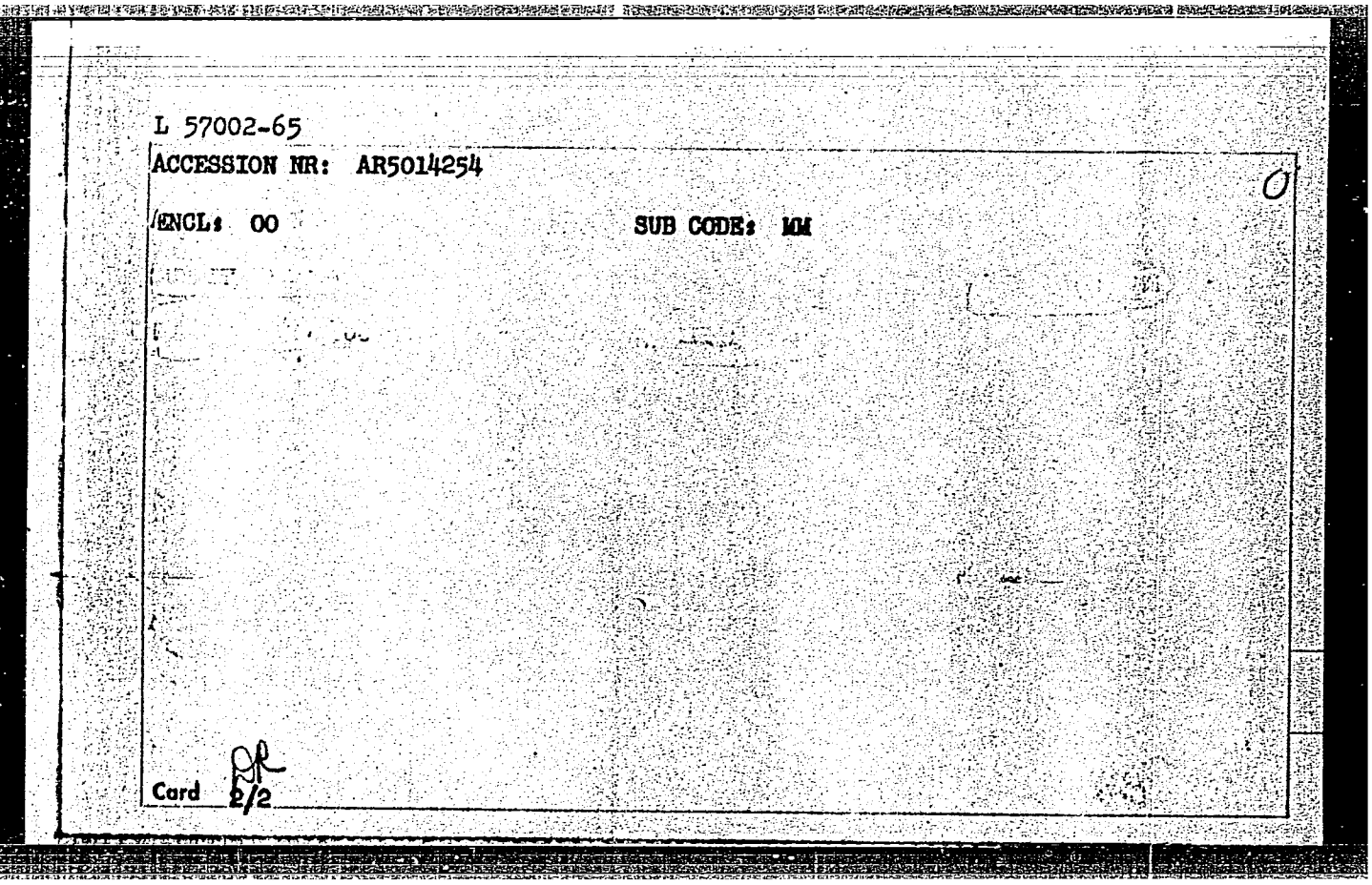

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ACCESSION NR: AR5014254

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ENCL: 00 SUB CODE: MM

Card 2/2

L 15796-65 EWT(m)/EWP(w)/EWA(d)/EWP(t)/EWP(b) LJP(c)/ESD(gs)/AEDC(a)/AFWL JD/JG
ACCESSION NR: AP4042037 S/0126/64/017/006/0813/0818

AUTHOR: Rodionov, K. P.

TITLE: Determination of the compressibility of metals and alloys B

SOURCE: Fizika metallov i metallovedeniye, v. 17, no. 6, 1964, 813-818

TOPIC TAGS: compressibility, pressure, quantitative evaluation, Lindeman law, cubic lattice, complex lattice, alkaline metals

ABSTRACT: The available experimental data on the compressibility of metals and its changes under pressure are very scarce. The author proposes a simple relationship for a quick quantitative evaluation of the value of compressibility according to pressure and melting temperature. The author developed his calculation from the generalized Lindeman law for metals with a cubic symmetry as amended by Gilvarry.

$$\varkappa_{0p} \approx \frac{\Omega V_{00}}{T_{mp}} \cdot \frac{(1-0{,}5\varkappa_{00}p)[1+\alpha_{00}(1-\eta_0\varkappa_{00}p)\Delta T_{mp}]}{[1+\eta_0\varkappa_{00}(1-\eta_0\varkappa_0{}^{\circ}p)\Delta T_{mp}]+1/2\Omega V_{00}p[1+\alpha_{00}(1-\eta_0\varkappa_{00}p)\Delta T_{mp}]} \quad (7)$$

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Equation (7) expresses the effects of pressure and melting temperatures on compressibility with T_0 being the measuring temperature. Under normal conditions initial compressibility $\varkappa_{00}$ is defined by

$$\varkappa_{00} \approx \frac{\Omega V_{00}}{T_{m0}} \cdot \frac{1 + \alpha_{00} \cdot \Delta T_{m0}}{1 + \gamma_{0=00} \Delta T_{m0}} . \qquad (7a)$$

The compressibility of Li, Na, K, Ro, Al, Pb, Cu and Cs (cubic lattice) as well as that of Zn and Sn (complex lattice) was calculated. For alkaline metals exposed to a maximum pressure of 1200 atm the calculated results stood in good agreement with experimental results. For metals with a cubic and a more complex lattice structure experimental and calculated data revealed satisfactory coincidence for pressures of up to 20,000 atm. Maximum deviation between experimental and calculated results was 5 to 6%. The author expresses thanks to Yu. S. Genshaft and Yu. A. Bazhin for making available experimental data on the compressibility of Cr - Te measured on a Bridgeman piezometer and a tensometer respectively.

ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of Metal Physics AN SSSR)

L 15796-65
ACCESSION NR: AP4042037

SUBMITTED: 10Jul63 ENCL: 00

SUB CODE: MM NO REF SOV: 003 OTHER: 013

Card 3/3

L 16301-65 EWT(m)/EWP(w)/EWA(d)/EWP(t)/EWP(k)/EWP(b) Pf-4 IJP(c)/AFWL MJW/
ACCESSION NR: AP4046094 JD/HW/JT S/0126/64/018/003/0437/0442

AUTHOR: Buly*chev, D. K.; Beresnev, B. I.; Gaydukov, M. G.; Marty*nov, Ye. D.; Rodionov, K. P.; Ryabinin, Yu. N.

TITLE: Healing porosity and cracks in metals by plastic deformation under high hydrostatic pressure

SOURCE: Fizika metallov i metallovedeniye, v. 18, no. 3, 1964, 437-442

TOPIC TAGS: metal defect, hydrostatic pressure, defect healing

ABSTRACT: Experiments have been conducted to explore the possibility of eliminating defects in metals with high hydrostatic pressure. The M2 copper specimens with artificial defects such as microcavities and microcracks were subjected to a hydrostatic pressure of up to 100,000 atm. Compression on accompanied by plastic deformation was found to have no effect on the number or size of defects, since it created mainly elastic deformation and only an insignificant amount of plastic deformation. However, when defective specimens were subjected to a tensile test under hydrostatic pressure, the defects were either

Card 1/3

ACCESSION NR: AP4046094

entirely eliminated or was reduced in size to such an extent that they could not be discovered by optical microscope and did not effect adversely mechanical properties of the metal (see Fig. 1 of the Enclosure). The intensity of defect healing increases with the increasing pressure and plastic deformation. Orig. art. has: 4 figures.

ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of Physics of Metals, AN SSSR); Institut fiziki zemli AN SSSR (Institute of Physics of Earth, AN SSSR)

SUBMITTED: 20Nov63 ENCL: 01 SUB CODE: MM

NO REF SOV: 009 OTHER: 002

L 16301-65
ACCESSION NR: AP4046094

ENCLOSURE: 01

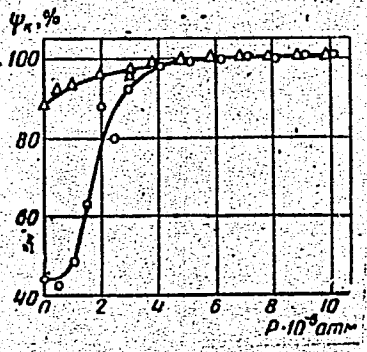


Fig. 1. Ductility of sound (1) and defective (2) specimens of M2 copper versus hydrostatic pressure

Card 3/3

Rodionov, K. P. Nov 52

USSR/Medicine - New Culture Medium

"Comparative Evaluation of a New Fermentation Culture Medium Prepared From the Mycelium of Aspergillus terricola," K. P. Rodionov, Lab of the Baku Waterworks and Cen Sanitation and Hygiene Lab, Baku Municipal Sanitation and Edipemiological Sta

Gig i San, No 11, pp 56,57

Concern over the high cost of the Eijkman culture medium, used in testing of water for B. coli, prompted the search for a cheaper substitute. Exptl use was made of meat by-products, derivs of soya beans, corn, and other vegetables, in the prepn of peptones. A product discovered by L. A. Avanyan, a biochemist at the Inst of Epidemiology and Microbiology, Az SSR, proved superior in its properties to the Eijkman medium. It is easily prepd, cheap, and suitable for mass production. Gives compn of this autolysate obtained from the fungus Aspergillus terricola that has been grown on wheat.

265 T 23

RODIONOV, K.P.; GEYTNER, N.S.; ALIVERDIYEVA, Sh.S.; SHIRYAMOVA, M.Kh.

Detection and identification of diphtheria cultures with the indicator method. Azerb. med. zhur. 40 no.8:82-84 Ag '63. (MIRA 17:12)

RODIONOV, K.P

1. YEFENDI-ZADE, M.M., MELIKOVA, YE. N., RODIONOV, K.P.

2. USSR (600)

4. Intestines-Bacteriology

7. B. coli citrovarum and B. coli aerogenes in human organism and their significance as a sanitation index. Gid i san No. 12 1952.

9. Monthly List of Russian Accessions, Library of Congress, April 1953, Uncl.

L 18318-65 EWT(m)/EWA(d)/EWP(t)/E[illegible]t /EWP(k)/EWP(b) Pf-4 IJP(c) JD/HW

ACCESSION NR: AP5001248 S/0126/64/018/005/0778/0783

AUTHOR: Beresnev, B. I.; Bulychev, D. K.; Gaydukov, M. G.; Martynov, Ye. D.; Rodionov, K. P.; Ryabinin, Yu. N.

TITLE: Healing of pores and cracks in copper by extrusion with a high-pressure fluid

SOURCE: Fizika metallov i metallovedeniye, v. 18, no. 5, 1964, 778-783

TOPIC TAGS: copper, copper defect, metal defect, density defect healing

ABSTRACT: The healing of microscopic pores and cracks in metal by plastic deformation has been investigated. Specimens of sound copper and copper with artificially produced pores and cracks were hydrostatically extruded or drawn with a 5—68% reduction at room temperature. Both methods of deformation increased the tensile and yield strengths, reduction of area, and density of both sound and defective specimens; extrusion did so to a greater extent than drawing (see Figs. 1 and 2 of the Enclosure). The mechanical properties and density of defective copper changed slightly with small reductions (5—8%) but increased appreciably with increasing reduction; with a reduction of 40% they

Card 1/[illegible]

L 18318-65
ACCESSION NR: AP5001248

2

practically equalled those of the sound copper, evidently due to the elimination of pores and cracks. In drawing, the strength of defective copper at a reduction of 75% decreased, probably because the metal began to fail. Examination of the microstructure showed the number of pores decreases with increasing reduction, regardless of the deformation method. However, the pores completely disappeared after a 40% reduction by extrusion, but still remained after a 60—70% reduction by drawing. Orig. art. has: 5 figures.

ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of the Physics of Metals, AN SSSR); Institut fiziki Zemli AN SSSR (Institute of Physics of the Earth, AN SSSR)

SUBMITTED: 22Nov63 ENCL: 02 SUB CODE: MM

NO REF SOV: 006 OTHER: 004 ATD PRESS: 3155

Card 2/4

L 18839-65 EEC(b)-2/EPF(c)/EPF(n)-2/EPR/EPA(w)-2/EWG(k)/EWP(k)/EWT(1)/EWT(m)/
EEC(t)/EWP(b)/EPA(sp)-2/T/EWA(m)-2/EWA(d)/EWP(t) Pf-4/Pi-4/Po-4/Pr-4/Ps-4/
Pu-4/Pz-6/Pab-10 AFETR/ASD(p)-3/AEDC(a)/ASD(f)-2/AFWL/AS(mp)-2/ESD(gs)/ESD(t)/
IJP(c) GG/AT/RM/WW/JD/HW/JG

ACCESSION NR: AP4049031 S/0057/64/034/011/1913/1932

AUTHOR: Ryabinin, Yu.N.; Rodionov, K.P.; Alekseyev, Ye.S. B

TITLE: Some concepts relating to the behavior of solid bodies under pressure

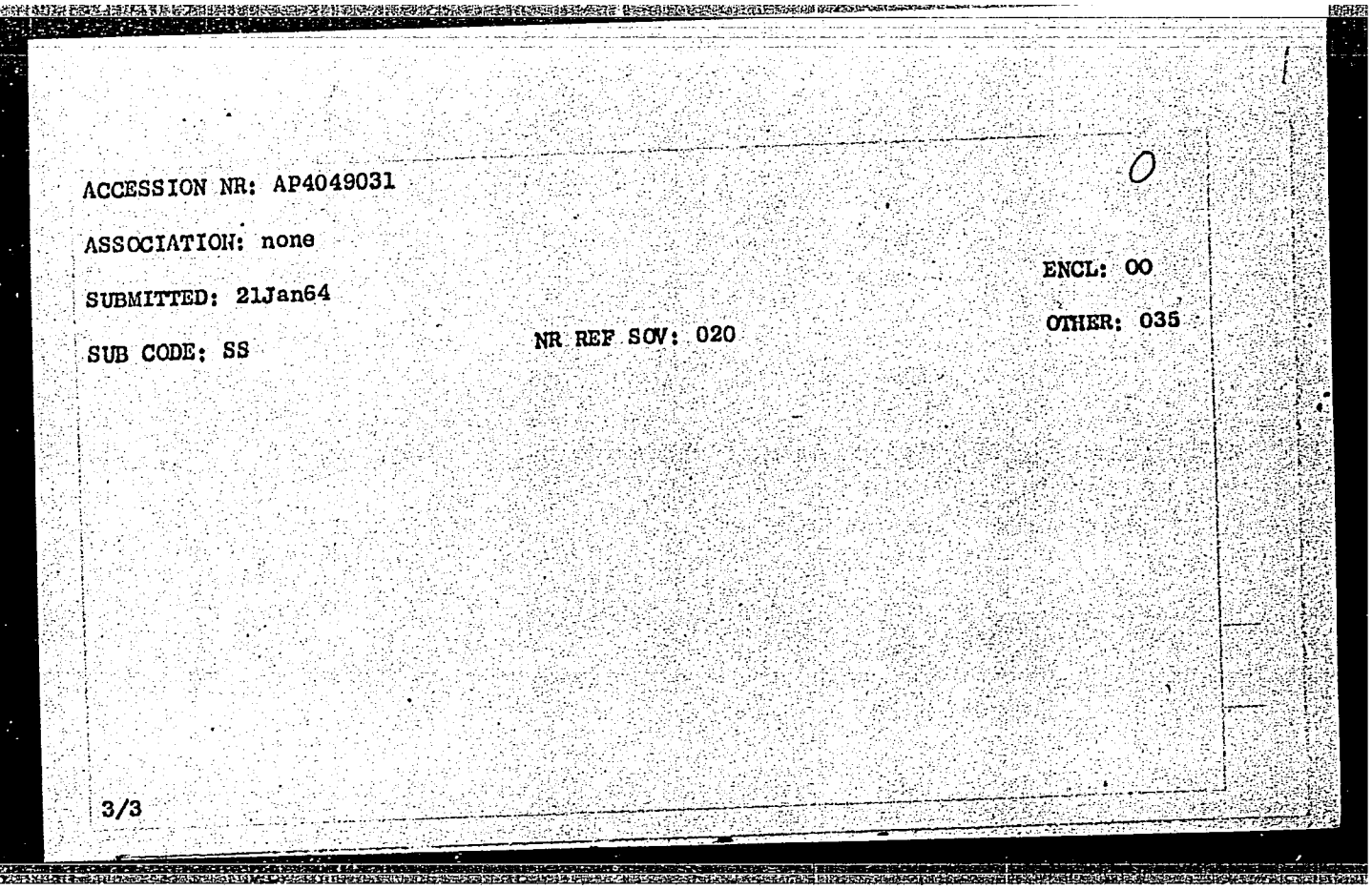
SOURCE: Zhurnal tekhnicheskoy fiziki, v.34, no.11, 1964, 1913-1932

TOPIC TAGS: solid state physics, high pressure, elastic property, thermodynamic characteristic, state equation, phase transition, electron shell

ABSTRACT: The paper is a selective review of experimental data and classical theoretical derivations relating to the behavior of solids at high pressures. An exhaustive review is not attempted, but rather a certain generalization of some problems of the volume-elastic behavior of solids. Thermodynamic properties are first considered, and the behavior under pressure of the entropy, energy, free energy, Debye temperature, heat capacity, and melting point is discussed. In the discussion of the Debye temperature and quantities depending on it, it is assumed that Poisson's ratio is independent of pressure. Following this, a number of equations of state are discussed. It is pointed out that at accessible pressures the energy of compression may exceed the heat of sublimation and become comparable with the [illegible]

1/3

zation energy. The compressibilities and atomic volumes of the elements are plotted against atomic number at several pressures up to 5 x 10^5 kg/cm^2. The data were obtained partly from direct experiment and partly by extrapolation with the aid of an equation of state. As the pressure increases, the periodic variations of the compressibility and atomic volume become less marked. It is curious that at sufficiently high pressures the alkali metals cease to be the most compressible elements, and this distinction passes to the alkaline earths. Phase changes are discussed in the third and final section, together with the influence of pressure on the electron band structure. As the lattice ions approach each other under the influence of pressure, the electron bands widen and eventually overlap. This leads to changes in chemical properties. The authors, however, do not consider it entirely accurate to speak of an essentially new chemistry of high pressure, as did T.Hall (J.Wash.Acad.Sci.47,9,300,1957). Finally, at very high pressures not yet attainable in the laboratory, all the energy bands are expected to cross completely. The atoms will then no longer have their individual electron shells and the material will be in a state that the authors characterize as that of a "solid cold plasma". Orig.art.has: 58 formulas, 8 figures and 1 table.



ACCESSION NR: AP4049031

0

ASSOCIATION: none

ENCL: 00

SUBMITTED: 21Jan64

OTHER: 035

SUB CODE: SS

NR REF SOV: 020

3/3

L 1262[illegible] EWT(m)/EWA(d)/EWP(t)/EWP(k)/EWP(h) Pf-4 IJP(c)/AFETR/

AFWL/AS(mp)-2/ESD(ga)/ESD(t) JD/HW

ACCESSION NR: AP4035812 S/0020/64/156/001/0067/0068

AUTHOR: Buly*chev, D. K.; Berasnev, B. I.; Gaydukov, M. G.; Marty*nov, Ye. D.; Rodionov, K. P.; Ryabinin, Yu. N.

TITLE: Structural defects and plastic deformation of copper at high pressures

SOURCE: AN SSSR. Doklady*, v. 156, no. 1, 1964, 67-68, and top half of insert facing p. 68

TOPIC TAGS: metal plasticity, structural defect, copper, high pressure metallurgy, self healing, dislocation, vacancy, solid state physics

ABSTRACT: The present paper describes experiments designed for the elucidation of the influence of defects in solids on the increase of plasticity under pressure. The experimental technique is essentially the same as described by I. N. Greenwood and D. R. Miller (Acta Metallurgica, 2, no. 2, 1954, 250. The true deformation $e = \ln(f_0/f)$ where f_0 is the initial cross section of the specimen of copper M2, f - that at rupture, was measured. In addition, the microstructures of samples ruptured under pressure were observed with an optical micro-

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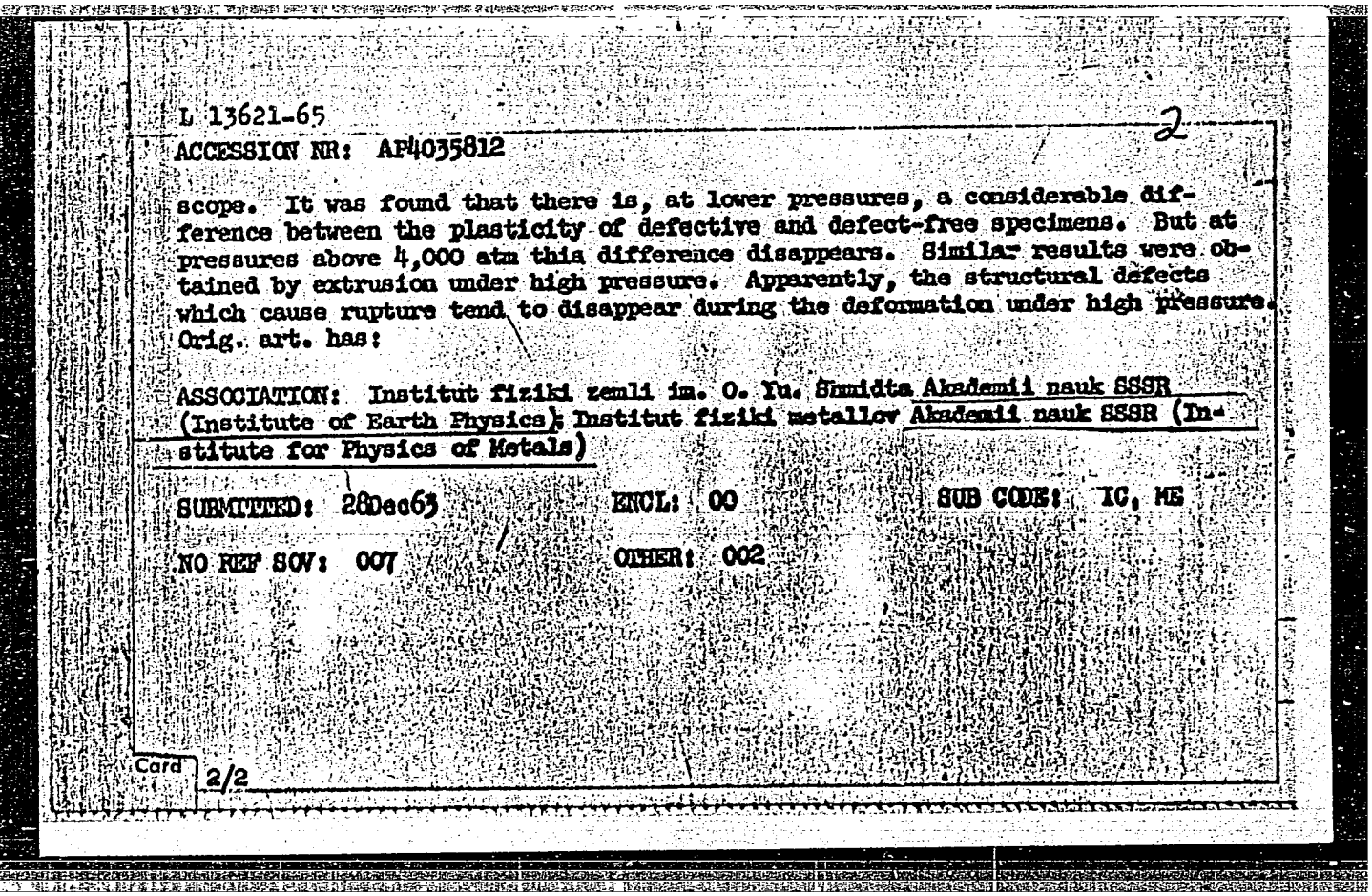

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ACCESSION NR: AP4035812

2

scope. It was found that there is, at lower pressures, a considerable difference between the plasticity of defective and defect-free specimens. But at pressures above 4,000 atm this difference disappears. Similar results were obtained by extrusion under high pressure. Apparently, the structural defects which cause rupture tend to disappear during the deformation under high pressure. Orig. art. has:

ASSOCIATION: Institut fiziki zemli im. O. Yu. Shmidta Akademii nauk SSSR (Institute of Earth Physics); Institut fiziki metallov Akademii nauk SSSR (Institute for Physics of Metals)

SUBMITTED: 28Dec63 ENCL: 00 SUB CODE: IC, ME

NO REF SOV: 007 OTHER: 002

Card 2/2

L 00684-66 EWP(k)/EWA(c)/EWT(1)/EWT(m)/EWP(b)/EWP(t) IJP(c) JD/HW

ACCESSION NR: AP5012579 UR/0181/65/007/005/1561/1562

AUTHOR: Demchuk, K. M.; Tsidil'kovskiy, I. M.; Rodionov, K. P.

TITLE: Transport phenomena in doped indium antimonide at high pressures

SOURCE: Fizika tverdogo tela, v. 7, no. 5, 1965, 1561-1562

TOPIC TAGS: indium antimonide, electric conductivity, Hall constant, thermo emf, Nernst effect, pressure effect, electron mobility, optic scattering, acoustic scattering

ABSTRACT: The authors investigated the electric conductivity, the Hall effect, the thermal emf, and the transverse Nernst-Ettingshausen effect in n-InSb single crystals with $n = 2.4 \times 10^{-8}$ cm^{-3} under pressures up to 25,000 kg/cm^2 at 290K. The measurements were made in a Butuzov type multiplicator (V. P. Butuzov et. al., Tr. Inst. kristallogr. AN SSSR v. 11, 233, 1955). The Hall constant remains practically unchanged during the entire range of temperatures, the thermal emf decreases from 80 to 70 μV/deg, the mobility (the product of the Hall effect by the electric conductivity) decreases by a factor of 2.7, and the Nernst-Ettingshausen effect decreases by a factor of 4. The observed positive sign of the Nernst-Ettingshausen effect offers evidence that the optical scattering is not the decisive mechanism,

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L 00684-66

ACCESSION NR: AP5012579

9

and that acoustic scattering is predominant. The measured quantities were also calculated theoretically, using the formulas of G. I. Guseva and I. M. Tsidil'kovskiy (FTT v. 4, 2490, 1962) under certain assumptions, and the agreement between theory and experiment was satisfactory at high pressure (within 25%) but poor at atmospheric pressure. The discrepancy is attributed to improper approximation of the dispersion. Orig. art. has: 1 figure.

ASSOCIATION: Institut fiziki metallov SO AN SSSR, Sverdlovsk (Institute of Metal Physics, SO AN SSSR)

SUBMITTED: 14Dec64 ENCL: 00 SUB CODE: SS

NR REF SOV: 003 OTHER: 003

Card 2/2

L 57816-65 EPR/EWP(k)/EWA(c)/EWT(m)/EWP(b)/T/EWA(d)/EWP(t) Pf-4/Ps-4
ACCESSION NR: AP5008792 IJP(c) JD/HW S/0126/65/019/003/0447/0450
539.292; 543.4

AUTHOR: Zakharova, R. R.; Buynov, N. N.; Buynova, L. N.; Bulychev, D. K.; Rodionov, K. P.

TITLE: Electron microscope investigation of the effect of plastic deformation on the structure of an Al-Cu (4%) age hardening alloy

SOURCE: Fizika metallov i metallovedeniye, v. 19, no. 3, 1965, 447-450

TOPIC TAGS: plastic deformation, copper alloy, aluminum alloy, alloy structure

ABSTRACT: The effect of plastic deformation on the structure of an Al-Cu (4% Cu) alloy preliminarily artificially aged at 200 and 250°C is examined by electron microscope. It is established that the effect of plastic deformation on particles of the θ'-phase depends on the degree of preliminary age hardening. This effect increases with higher temperatures and longer periods of artificial age hardening. No difference was observed with different types of deformation. Orig. art. has: 2 figures.

Card 1/2

L 57816-65
ACCESSION NR: AP5008792

ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of Physics of Metals, AN SSSR)

SUBMITTED: 13Apr64 ENCL: 00 SUB CODE: MM

NO REF SOV: 007 OTHER: 003

bjp

Card 2/2

UC

L 24468-66 EWT(m)/EWP(w)/T/EWP(t)/EWP(k) IJP(c) JD/HW/GS

ACC NR: AT6010571 (N) SOURCE CODE: UR/0000/65/000/000/0004/0028

44

AUTHOR: Martynov, Ye. D.; Veresnev, B. I.; Bulychev, D. K. Rodionov, K. P.; Ryabinin, Yu. N. 43 B+1

ORG: Institute of Physics of the Earth, AN SSSR, Moscow (Institut fiziki Zemli AN SSSR); Institute of Physics of Metals, AN SSSR, Sverdlovsk (Institut fiziki metallov AN SSSR)

TITLE: Effect of high pressure 18 on ductility 18 and fracture of metals

SOURCE: AN UkrSSR. Mekhanizm plasticheskoy deformatsii metallov (Mechanism of the plastic deformation of metals). Kiev, Naukova dumka, 1965, 4-28

TOPIC TAGS: pressure effect, material fracture, crystal defect, yield stress, ductility

ABSTRACT: The effect of pressure on ductility of metals is studied from the standpoint of origin and development of flaws in materials subjected to deformation. The specimens were placed in a chamber (cylinder) and subjected to high hydrostatic pressure P, followed by tensile force Q (see figure). Several types of metals were studied. Formulas are given for critical stresses and pressures in cases where the

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Card 1/3

L 24468-66

ACC NR: AT6010571

joint action of plastic deformation and high pressure causes secondary changes in the metal such as recrystallization, phase transformations, etc. It is shown that high pressure retards or completely suppresses the process of crack formation during deformation. Healing of flaws during deformation of metals under high pressure is discussed. It is found that a flaw may be completely closed by the application of external pressure only when this flaw has an infinitely thin wall (i.e. when it touches the outside surface of the specimen). Otherwise infinite pressure is needed to heal the flaw. Theoretical analysis shows that extremely high pressures are necessary for healing flaws even when pressure and deformation are combined (several orders of magnitude greater than the yield stress of the material). However, experiments show that this conclusion does not correspond to the observed facts. The reason for this discrepancy is that the anisotropy of actual polycrystals is disregarded in the theoretical calculations. Experiments combining the effect of pressure and deformation showed that flaws are noticeably closed by pressures of the same order as the stress of the material. The differences between the behavior of a theoretical isotropic solid and an actual anisotropic polycrystalline material subjected to pressure and deformation are analyzed. Orig. art. has: 15 figures, 38 formulas.

Card 2/3

L 24468-66
ACC NR: AT6010571

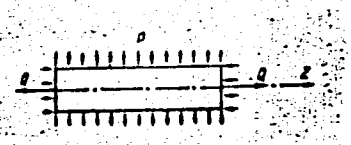

Fig. 1.

SUB CODE: 11 / SUBM DATE: 22Oct64/ ORIG REF: 012/ OTH REF: 007

Card 3/3 dda

L 5327-66 EWT(l)/EWT(m)/EPF(c)/T/EWP(t)/EWP(b)/EWA(c) IJP(c)
JD/JG/GG

ACCESSION NR: AP5021108 UR/0056/65/049/002/0452/0455

AUTHORS: Sokolova, G. K.; Demchuk, K. M; Rodionov, K. P.; Samokhvalov, A. A.

TITLE: Influence of uniform compression on the Curie temperature of the ferromagnetic compound EuO

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 49, no. 2, 1965, 452-455

TOPIC TAGS: second order phase transition, europium compound, Curie point, ferromagnetism, crystal lattice structure

ABSTRACT: To investigate the effect of various factors on the exchange interaction in solids, and especially the dependence of the exchange interaction on the lattice parameters, the authors investigated the dependence of the Curie temperature of the compound EuO under uniform compression at pressures up to 12,000 atm. The method used to determine the ferromagnetic Curie temperature of the europium oxide was that of L. N. Tul'chinskiy (Zavodskaya laboratoriya no. 2,

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L 5327-66

ACCESSION NR: AP5021108

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232, 1960), in which the sample is placed in one of two sections of a differential measuring coil and the Curie temperature is determined from the sharp discontinuity in the induced emf when the sample is cooled. The sample together with its measuring and magnetizing coils was placed in a high-pressure chamber, with quasihydrostatic high pressure applied at liquid nitrogen-temperature by the method of Ye. S. Itskevich (PTE no. 4, 148, 1963). The method of determining the Curie point from the measurements is described. The results show that in the range of pressures up to 12,000 atm the Curie temperature of EuO increases linearly with the pressure, at a rate of $(4 \pm 1) \times 10^{-4}$ deg/atm. No permanent change in the Curie temperature was observed after the removal of the high pressure. The influence of the elastic stress on the ferromagnetic transition temperature is explained by means of the thermodynamic theory of second-order phase transitions. The dependence of the Curie temperature of EuO on changes in the lattice parameters are estimated from data on the compressibility of the paramagnetic phase of EuO at room temperature.

The authors thank V. G. Bamburov 44,55 and A. A. Ivakin 44,55 for synthesizing

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L 5327-66 6

ACCESSION NR: AP5021108

the EuO samples, and G. A. Matveyev 44,55 for measuring the compressibility.
Orig. art. has: 2 figures and 2 formulas.

ASSOCIATION: Institut fiziki metallov Akademii nauk SSSR (Institute of Metal Physics, Academy of Sciences, SSSR)

SUBMITTED: 24Mar65 ENCL: 00 SUB CODE: SS

NR REF SOV: 007 OTHER: 005

Card 3/3 hdl

ACC NR: AP6023633 SOURCE CODE: UR/0386/66/004/001/0011/0015

AUTHOR: Demchuk, K. M.; Tsidil'kovskiy, I. M.; Rodionov, K. P.

ORG: Institute of Metal Physics, Academy of Sciences SSSR (Institut fiziki metallov Akademii nauk SSSR)

TITLE: Pressure dependence of electron effective mass in indium antimonide

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 4, no. 1, 1966, 11-15

TOPIC TAGS: indium compound, antimonide, forbidden band, hydrostatic pressure, pressure effect, thermal emf, Hall constant, electron density, energy band structure

ABSTRACT: The authors investigated experimentally the effect of hydrostatic pressure up to 16.5 katm on the effective mass m_n of the electrons in InSb at 96K, with an aim at checking on the linear relation between these two quantities which follows from Kane's theory. The experiment consisted of measuring the thermal emf and the Hall constant in classically strong fields. The pressure was produced at nitrogen temperatures by a method proposed by Ye. S. Itskevich (PTE No. 4, 148, 1963). The measurements were made at temperature gradients 3 - 6 deg/cm on samples measuring 10 x 30 x 2 mm. Samples with two values of the electron density (2.2×10^{14} and 4.7×10^{13} cm^{-3}) were tested. It is concluded from the disparity between the theoretical and experimental data that the influence of hydrostatic pressure on the electron effective mass cannot be explained within the framework of Kane's theory and that a quantitative

Card 1/2

L 30249-66

ACC NR: AP6023633 O

theore, in which account is taken of the dependence of the band structure on the lattice period, must be developed for this purpose. A possible interpretation of the pressure dependence of the electron density is offered, but it is still concluded that this dependence is still not adequately explained. Orig. art. has: 3 figures and 3 formulas.

SUB CODE: 20/ SUBM DATE: 26Apr66/ ORIG REF: 002/ OTH REF: 003

Card 2/2

L 40301-66 EWT(m)/EWP(w)/EWP(j)/T/EWP(t)/ETI IJP(c) RM/WW/JD

ACC NR: AP6007348 SOURCE CODE: UR/0126/66/021/002/0192/0198

47
B

AUTHOR: Rodionov, K. P.

ORG: Institute of Metal Physics, AN SSSR (Institut fiziki metallov AN SSSR)

TITLE: Relationship between the barometric and thermal coefficients of compressibility and thermal expansion of solids

SOURCE: Fizika metallov i metallovedeniye, v. 21, no. 2, 1966, 192-198

TOPIC TAGS: thermal expansion, compressibility coefficient, theory of solids, equation of state

ABSTRACT: Based on the results of the classical theory of solids (Grueneisen-Debye) and on the equations of state, approximate relationships between the barometric and thermal coefficients of compressibility and thermal expansion are derived. Using the classical theory of solids and following K. H. Schramm's (Zs. Phys., 1962, 167, 29) derivation, the relationships between the partial derivatives are derived in the form

$$a_1 = -\frac{1}{\varkappa^2}\left(\frac{\partial \varkappa}{\partial p}\right)_T \simeq 1 + \frac{1}{a\varkappa}\left(\frac{\partial \varkappa}{\partial T}\right)_p;$$

$$a_2 = \frac{1}{a^2}\left(\frac{\partial a}{\partial T}\right)_p \simeq -1 + \frac{1}{a\varkappa}\left(\frac{\partial \varkappa}{\partial T}\right)_p;$$

$$-\frac{1}{\varkappa^2}\left(\frac{\partial \varkappa}{\partial p}\right)_T \simeq 2 + \frac{1}{a^2}\left(\frac{\partial a}{\partial T}\right)_p.$$

UDC: 548.0:536+539.3.01

Card 1/2

L 40301-66

ACC NR: AP6007348

Starting with the equations of state for a solid, similar equations are derived using the work of R. Fürth (Proc. Roy. Soc., 1944, 183A, 87). These equations hold only for p = 1, T = OK, and h/g = 1 (where h, g are combinations of lattice sums). Using a correction Δ, these equations are extended to the case of h/g ≠ 1, and the coefficients of compressibility and thermal expansion as a function of pressure and temperature are finally expressed as

$$\varkappa_{0p} \simeq \varkappa_{00}[1 - \varkappa_{00}(a_3 + 1 - \Delta)\Delta p];$$
$$\varkappa_{T0} \simeq \varkappa_{00}[1 + \alpha_{00} a_3 \Delta T];$$
$$\alpha_{0p} \simeq \alpha_{00}[1 - \varkappa_{00} a_3 \Delta p];$$
$$\alpha_{T0} \simeq \alpha_{00}[1 + \alpha_{00}(a_3 - 1 + \Delta)\Delta T]$$

where

$$a_1 = a_3 + 1 - \frac{1}{3}\left(\frac{h}{g} - 1\right)s = 2 + a_2 - \Delta;$$
$$a_4 = a_3 - 1 + \frac{1}{3}\left(\frac{h}{g} - 1\right)s = -1 + a_3 + \Delta;$$
$$a_3 = a_1 - 1 + \Delta,$$
$$\Delta = \frac{1}{3}\left(\frac{h}{g} - 1\right)s.$$

The correction Δ is tabulated for 18 elements. Orig. art. has: 18 formulas and 3 tables.

SUB CODE: 20/ SUBM DATE: 08Apr65/ ORIG REF: 001/ OTH REF: 010

Card 2/2

L 02209-67 EWT(1)/EWT(m)/EWP(w)/T/EWP(t)/ETI IJP(c) JD/WW/JG

ACC NR: AP6025258 SOURCE CODE: UR/0057/66/036/007/1287/1291

AUTHOR: Rodionov,K.P. 108

ORG: Institute of Metal Physics, Sverdlovsk (Institut fiziki metallov) B

TITLE: Effect of pressure on the heat capacity of metals 14 21

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 36, no. 7, 1287-1291

TOPIC TAGS: heat capacity, metal, pressure effect, high pressure, thermodynamics, lithium, sodium, potassium, magnesium, lead, aluminum, molybdenum, nickel

ABSTRACT: The author has employed thermodynamic formulas for the pressure derivatives at constant temperature of the heat capacities C_p and C_V at constant pressure and constant volume, respectively, to discuss the heat capacities of several metals at high pressures. The thermodynamic formulas are written in the form $(dC_p/dp)_T = -TV\alpha^2A$, $(dC_V/dp)_T = -TV\alpha^2B$, where T is the temperature, V is the specific volume, α is the thermal expansion coefficient, and the quantities A and B depend on the temperature derivative of α and the temperature and pressure derivatives of the compressibility. Experimental data from different sources show that A and B are nearly independent of pressure. For the present calculations A and B were assumed to be pressure independent and were evaluated at atmospheric pressure; they are tabulated (together with the pressure derivatives of the heat capacities and other quantities of interest) for lithium, sodium, potassium, magnesium, lead, aluminum, molybdenum, and nickel. The 27 27 27 27 27 27 27 27

Card 1/2

L 02269-67

ACC NR: AP6025258

pressure derivatives of the heat capacities are all negative. For lithium, sodium, and potassium, for which the most complete experimental data are available, the heat capacity equations were numerically integrated and the resulting heat capacities are tabulated for pressures up to 20 000 kg/cm^2. For all three metals C_p decreased much more rapidly with increasing pressure than did C_V, and if the trend should continue, $C_p - C_V$ would become negative at a pressure of about 60 000 atm, which is thermodynamically impossible. It is suggested that the assumed constancy of the coefficients A and B does not persist to such high pressures. Orig. art. has: 8 formulas and 2 tables.

SUB CODE: 20 / SUBM DATE: 13Apr65 ORIG. REF: 004 OTH REF: 009

Card 2/2

ACC NR: AP6033055 SOURCE CODE: UR/0126/66/022/002/0289/0292

AUTHOR: Romanova, R. R.; Buynov, N. N.; Dolgikh, G. V.; Rodionov, K. P.; Bulychev, D. K.

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TITLE: Electron-microscope investigation of the effect of plastic deformation on the structure of Al-Zn (20%) heat-treatable alloy

SOURCE: Fizika i metallov i metallovedeniye, v. 22, no. 2, 1966, 289-292

TOPIC TAGS: plastic deformation, aluminum base alloy, zinc alloy, metal structure, electron microscopy, aluminum zinc alloy, heat treatable alloy, alloy hydrostatic extrusion, alloy rolling, alloy structure / Al20Zn alloy

ABSTRACT: Small, 10 mm in diameter ingots of an aluminum-base alloy containing 20% zinc were rolled into 6 x 6 mm bars which were homogenized, solution annealed at 485C, water quenched, and aged at 200C for 5 hr. The structure of heat-treated bars was characterized by a Widmanstätten type network with lamellar particles of a metastable α' phase. Heat-treated bars were subjected to plastic deformation with a reduction of 65% either by rolling or by hydrostatic extrusion. Under the effect of deformation, the network and most of the α' phase par-

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ticles disappeared; simultaneously, a small number of equiaxial and also elongated particles of a stable α phase was formed in both rolled and hydrostatically extruded specimens. Additional aging at 200C brought about no significant change in the structure of rolled specimens, except for an increase of the number of both α and α' particles. In the hydrostatically extruded specimens, a great number of α particles and only a small number of the α' particles were observed. It is concluded that in hydrostatic extrusion, a much higher number of vacancies is generated, which intensifies the aging. V. T. Shmatov is thanked for his interest in this study and discussion of the results. Orig. art. has: 5 figures.

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L 00507-67 EWT(m)/EWP(t)/ETI/EWP(k) IJP(c) RDN/JD/IW

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TITLE: Apparatus for the extrusion of metals using a high pressure fluid

SOURCE: Moscow. Inzhenerno-fizicheskiy institut. Metallurgiya i metallovedeniye chistykh metallov, no. 5, 1966, 173-188

TOPIC TAGS: metal extrusion, high pressure extrusion, hydraulic fluid

ABSTRACT: The article gives design details of an extrusion apparatus of the the type shown in Fig. 2.

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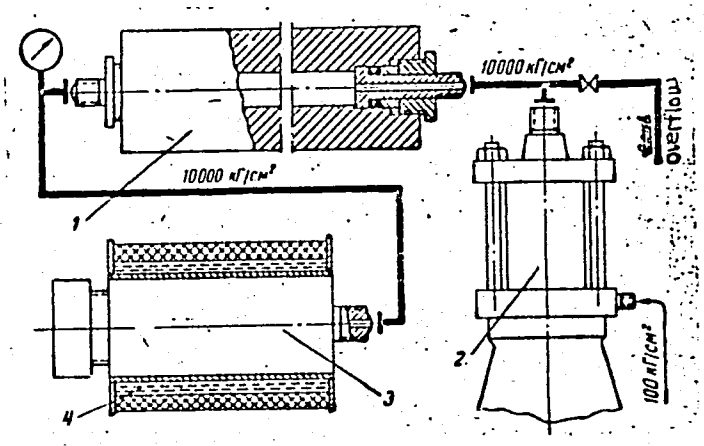

Fig. 2. Scheme of extrusion unit for pressure up to 12,000 kg/cm^2. 1--reservoir; 2--hydrocompressor; 3--container; 4--electric furnace

The unit consists basically of a container connected between a reservoir and a hydrocompressor, and a liquid-gas accumulator (not shown in Fig. 2). The article also