L 6734-65 EWT(m)/EWP(q)/EWP(b) ASD(a)-5/AS(mp)-2/ASD(m)-3/ESD(gs)/RAEM(t) JD
ACCESSION NR: AP4044878 S/0020/64/157/006/1338/1341

52
57

AUTHOR: Orlov, A. N.

TITLE: Kinetic equations for the elements of crystal dislocation structures 18

SOURCE: AN SSSR. Doklady*, v. 157, no. 6, 1964, 1338-1341

TOPIC TAGS: dislocation net formation, lattice defect, crystal structure, cubic crystal lattice, kinetic equation

ABSTRACT: It is shown that it is possible to investigate phenomenologically the kinetics of dislocation-structure elements such as

structures. A face-centered cubic lattice as used

Card 1/2

L 6734-65
ACCESSION NR: AP4044878

but the analysis extends to all other structures. The article deals briefly with elements of the dislocation structure of the crystal, elementary acts involving realignment of the dislocation structure, and a derivation of the kinetic equations. The assumptions under which the kinetic equations are derived are spelled out. This report presented by G. V. Kudryumov. Orig. art. has: 10 formulas.

SUBMITTED: 25Mar64 ENCL: 00

SUB CODE: SS NR REF SOV: 003 OTHER: 004

Card: 2/2

[illegible], A. P.

"A Theory of the Formation of Oxide Films on Alloys." Dok. AN. 235, No. 5, Vol. XXII, 1967. Ural Br. of Acad. of Sci. of USSR, Inst. of Metal-Physics, Laboratory of Phase Transitions, Sverdlovsk. c1967.

USSR/Metals
Oxide Films
Alloys

May 49

"Theory of Oxide-Film Formation on Alloys," A. N. Orlov, A. A. Smirnov, Inst of Metallophys, Ural Affiliate Acad Sci USSR, 10 pp

"Zhur Tekh Fiz" Vol XIX, No 5

Further develops theory of high-temperature oxidation of binary alloys, using model described in previous report ("Zhurnal Eksperimental'noy i Teoreticheskiy Fiziki," Vol XIV, 1944, p 46). Gives problem for case when coefficient of

51/49T41

USSR/Metals (Cont'd) May 49

diffusion of both metals in the oxide depends on its composition. Considers problem of influence of temperature on speed of oxidation at greater length. Submitted 17 May 47.

51/49T41

ORLOV, A. N.

PA 51/49T41

USSR/Physics - Crystallography Oct 51

"Calculation of Dependence of Lattice Constant of Binary Solid Solutions on Composition," A. N. Orlov, Inst Phys of Metals, Ural Affiliate, Acad Sci USSR

"Zhur Eksper i Teoret Fiz" Vol XXI, No 10, pp 1081-1089

Orlov calculates energy of cryst lattice of solid soln as a function of its compn and concn on basis of a model in which conducting electrons are distributed in crystal with even density and their

LC 197T103

USSR/Physics - Crystallography (Contd) Oct 51

interaction with ions and mutual ion interaction is computed approximately. Orlov acknowledges Prof A. A. Smirnov's guidance. Submitted 29 Dec 50

LC 197T103

ORLOV, A. N.

PA 197T103

ORLOV, A. N.

USSR/Physics - Crystallography Oct 51

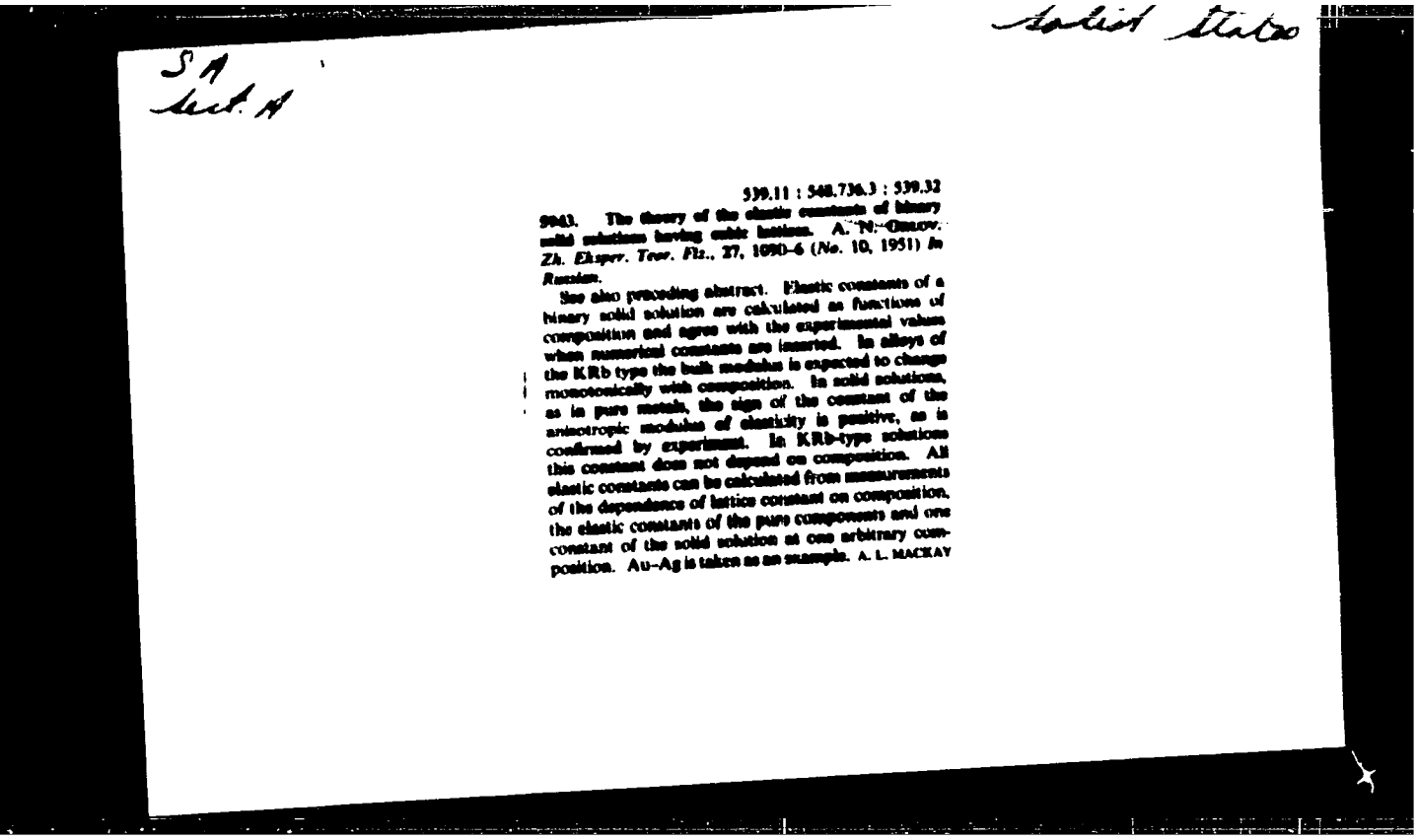
"Theory of Elastic Modulus of Binary Solid Solutions With Cubic Lattice," A. N. Orlov, Inst Phys of Metals, Ural Affiliate, Acad Sci USSR

"Zhur Eksper i Teoret Fiz" Vol XXI, No 10, pp 1090-1095

Orlov refers to model of preceding article (ibid. 1081-1089) and calculates dependence of elastic modulus of solid soln on compn. Exptl data may be explained by adequate choice of consts in theoretical formulas. Orlov acknowledges Prof A. A. Smirnov's guidance. Submitted 29 Dec 50.

197T104

LC



Soviet Union

SA
Sect. A

539.11 : 548.736.3 : 539.32

9943. The theory of the elastic constants of binary solid solutions having cubic lattices. A. N. Gerasov. *Zh. Eksper. Teor. Fiz.*, 27, 1950–6 (*No.* 10, 1951) *In Russian.*

See also preceding abstract. Elastic constants of a binary solid solution are calculated as functions of composition and agree with the experimental values when numerical constants are inserted. In alloys of the KRb type the bulk modulus is expected to change monotonically with composition. In solid solutions, as in pure metals, the sign of the constant of the anisotropic modulus of elasticity is positive, as is confirmed by experiment. In KRb-type solutions this constant does not depend on composition. All elastic constants can be calculated from measurements of the dependence of lattice constant on composition, the elastic constants of the pure components and one constant of the solid solution at one arbitrary composition. Au-Ag is taken as an example. A. L. MACKAY

260T96

ORLOV, A. N.

USSR/Physics - Oscillation Spectra 11 Jun 53

"Spectrum of Oscillatory Frequencies of the Simplest Model of an Ordered Alloy," A. N. Men' and A. N. Orlov, Inst of Phys of Metals, Ural Affiliate, Acad Sci USSR

DAN SSSR, Vol 90, No 5, pp 753-756

Using the method of effective atoms (A. A. Smirnov, Zhur Eksper i Teoret Fiziki 17, 740 (1947)), the authors consider oscillations of the simplest model of an ordered solid soln, namely, a linear chain constructed of atoms of 2 kinds which are disposed along the nodes of the chain with arbitrary degree of distant order eta and with arbitrary relative concn c which interact elastically. In this method, the true crystal of the binary alloy with arbitrary values of c and eta, which crystal is made up of atoms of two kinds closely alike in their properties, is replaced by a perfectly ordered crystal of stoichiometric compn composed of effective atoms whose properties depend on c and eta. Presented by Acad M. A. Leontovich 10 Mar 53.

260T96

7

USSR

548.7

7983. On the possible development of the theory of dislocations. V. I. ARKHAROV, G. N. KUZNETSOV AND A. N. ORLOV. *Dokl. Akad. Nauk SSSR*, 92, No. [illegible] (1953) *In Russian*. English translation, *U.S. National Sci. Found. NSF-tr-212*.

The authors try to explain the origin of dislocations in crystals by a generalization of Seitz's vacancy condensation mechanism. Two pairs of edge dislocations of finite length and lying in parallel planes with their ends connected by eight [sic] screw dislocations form a "bounded" dislocation. In the limit when the slip planes are one atomic spacing apart, and the edge dislocations one atom long, the bounded dislocation becomes a single interstitial atom and a single vacancy. It is suggested that single defects are formed thermally, and continually condense and disperse. Under stress, the dislocations associated with large groups may move as such, but at high temp. vacancies will diffuse away from groups too small to move the dislocations under the applied stress, thus explaining the change over to diffusion creep.

W. M. LOMER

Evaluation B-78539...8 Sep 54

ORLOV, A.N.

5

IRML

USSR

Change in electric conductivity of some ferrites by γ-rays. N. V. Vol'kenshtein and A. N. Orlov. *Bull. Acad. Sci. U.S.S.R.*, Ser. Phys. 18, 181-[illegible] (Engl. translation).—See *C.A.* 49, 5113c. H. L. H.

PH

BB

①

USSR/ Physics

Card 1/2 Pub. 43 - 8/11

Author : Volkenshteyn, N. V., and Orlov, A. N.

Title : Change of the electric conductivity of some ferrites when subjected to γ-rays

Periodical : Izv. AN SSSR ser. fiz. 18/4, 494-501, Jul - Aug 1954

Abstract : A description is given of experiments conducted with the electric conductivity of some ferrites subjected to γ-rays were: the experiments which were conducted from the point of view of the zone theory of semi-conductors for the electric conductivity of a ferrite can be expressed as follows:

$$\sigma = A_0 - B/T,$$

which is similar to that for semi-conductors (B corresponds to the energy level). The following results were obtained by the experiments: 1) the electric conductivity of some ferrites is noticeably increased after they have been subjected to a γ-ray treatment; 2) the lower the temperature of γ-rays, the higher the maximum of the ferrite electric conductivity will be; 3) the time of relaxation for the electric conductivity at room temperature is of the order of minutes; 4) the zone theory is quite applicable to ferrites in

Card 2/2 Pub. 43 - 8/11 (Additional card)

Izv. AN SSSR ser. fiz. 18/4, 494-501, Jul - Aug 1954

Abstract : explanation of the observed phenomena in ferrites subjected to the γ-rays. The references 1-German; 2-USSR (1947-1951). Diagrams.

Institution : Institute of the Physics of Metals of the Ural Branch of the Acad. of Scs. of the USSR

Submitted : May 3, 1954

ORLOV, A. N.

"Calculating the optimum blackening density in gamma defect detection", page 5.

"Calculating the influence of dispersed rays on the sensitivity by the radiographic method", p 22, both appearing in the "Dectection of Defects in Metals by Gamma -- Collection of Papers", (Gamma Defektoskopiya Metallov -- Sbornik Statei), published by the Academy of Sciences USSR, 1955.

Category : USSR/Magnetism - Ferrites F-5

Abs Jour : Ref Zhur - Fizika, No 1, 1957 No 1432

Author : Men', A.N., Orlov, A.M.
Inst : Inst. of Metal Physics, Sverdlovsk
Title : Temperature Dependence of the Degree of Inversion of Mixed Ferrites

Orig Pub : Fiz. metallov i metallovedeniye, 1955, 1, No 3, 410-416

Abstract : Mixed ferrites having a composition $A_cB_{1-c}O.Fe_2O_3$ are examined. The free energy F of the spinel lattice is found as a function of the temperature T, of the concentration c, and of the degree of inversion λ. The dependence of λ on T is obtained from the condition that F must be a minimum. For the case when the ion charges A and B are equal and only the A ions shift in the octahedral sites, the following expression is obtained

$$kT = -\frac{\lambda + b_2/b_1}{\ln (c-\lambda)(2-\lambda)/\lambda^2}$$

where b_1 and b_2 are constants independent of λ and c. The range of possible values of λ was studied as a function of the values of b_2 and of $|b_2|/b_1$. A prediction is made that at low temperatures there may exist a metastable phase, which is inverse if the stable phase is not inverse, and vice versa. The

Card : 1/2

Category : USSR/Magnetism - Ferrites

Abs Jour : Ref Zhur - Fizika, No 1, 1957 No 1459

character of the function λ (T,c) and an analysis of the configuration energy shows that the equilibrium value of λ may change relatively rapidly with T near room temperature for certain values of the theoretical constants. A relationship is derived for the Madelung constant of the spinel lattice and the parameter characterizing the distortion of the cubic packing of the oxygen ions.

Card : 2/2

USSR/Nuclear Physics - Penetration of Charged and Neutral Particles Through Matter. C-6

Abs Jour : Ref Zhur - Fizika, No 4, 1957, 8850

Author : Orlov, A.N., Fedorov, G.V.
Inst : Ural' Branch, Academy of Sciences, USSR.
Title : Absorption of Bremsstrahlung of the Betatron in a Two-Layer Absorber.

Orig Pub : Zh. tekhn. fiziki, 1956, 26, No 9, 1991-1993

Abstract : It is shown that when radiation passes through a couble-layer absorber the intensity of the transmitted radiation depends on the selected sequence of absorbers: the attenuation will be greater if the heavy absorber is ahead of the light one. Experiments carried out with a betatron with a maximum energy of 20 Mev and absorbers made of steel and water confirm this conclusion.

Card 1/1

137-58-6-13091

Translation from Referativnyy zhurnal, Metallurgiya, 1958, Nr 6, p 272 (USSR)

AUTHORS Men', A.N., Orlov, A.N

TITLE Calculation of the Cohesive Forces in Some Oxides of Transition Metals (Raschet sil svyazi v nekotorykh okislakh perekhodnykh metallov)

PERIODICAL V sb.: Issled. po zharoprochn. splavam. Vol 2. Moscow, AN SSSR, 1957, pp 44-51

ABSTRACT The cohesive energy (CE) of a crystal was determined by the use of the statistical theory of electron gas. The Thomas-Fermi equation was set up with due account for the energy exchange of the electrons. It is taken into consideration that the numbers of electrons with right and left rotation are not equal, and either variety is examined separately. A system was developed for the solution of the Thomas-Fermi equation, without accounting for the exchange, by expansion into series. The simplest version of the theory was applied to determine the CE of oxides of transition metals with spinel structure. An expression for the period of crystal lattice, a_o, was developed from the condition of minimum CE. Experimental data show

Card 1/2

137-58-6-13091

Calculation of the Cohesive Forces in Some Oxides of Transition Metals

that an increase in concentration of atoms with high atomic number leads to a decrease in a_o. An equation is adduced for the degree of conversion, applicable to some types of spinels. The temperature dependencies of λ calculated for certain values of the constants correspond to the experimental values. Concurrence is received therein for values of constants that correspond to not purely ionic cohesive forces.

M K

1 Crystals--Energy 2. Crystals--Lattices 3. Electron gas--Theory
4. Thomas-Fernic equation--Application 5. Metal oxides--Properties

Card 2/2

ORLOV, A.N.

126-3-23/34

AUTHORS: Orlov, A.N., Plishkin, Yu.M. and Shepeleva, I. M.

TITLE: Conditions of equilibrium of an atom chain.
(Usloviya ravnovesiya tsepochki atomov)

PERIODICAL: "Fizika Metallov i Metallovedeniye" (Physics of Metals and Metallurgy), 1957, Vol.4, No.3, pp. 540-542 (U.S.S.R.)

ABSTRACT: Simple considerations given in the work of Frenkel', Ya.I. (1) indicate that in an atomic chain, which is not subjected to external forces, all the interatomic distances are equal in the equilibrium position. In a strongly stretched chain the equilibrium configuration of the atoms is non-symmetrical. So far it has not been mentioned that in a sufficiently long chain the disturbance of the ideal periodicity in the form of anomalously large distances between certain atoms corresponds to minimum energy even for an insignificant stretching of the chain. Some of the results are given of investigations of the conditions of stability of an atomic chain with a given type of dependence of the potential energy of the interaction of the nearer neighbouring atoms; the interaction of the distant atoms are not taken into consideration. On the basis of the obtained results it is stated that any conclusion on the disturbance of periodicity in a stressed three-dimensional ideal crystal would be premature. More detailed consideration

Card 1/2

ORLOV, A. N.

"Sensitivity of ionization counters in gamma defect detection", appearing in the "Detection of Defects in Metals by Gamma -- Collection of Papers", (Gamma Defektoskopiya Metallov — Sbornik Statei), published by the Academy of Sciences USSR, p 129, 1955.

ORLOV A. N.

126-2-3/35

AUTHOR: Orlov, A. N.

TITLE: On the Theory of the Elasticity Constants of Alloys of the β-brass type. (K teorii konstant uprugosti splavov tipa β-latuni).

PERIODICAL: Fizika Metallov i Metallovedeniye, 1957, Vol.5, No.2, pp. 212-219 (USSR)

ABSTRACT: Solid solutions of β-brass type with a space centred cubic lattice are of interest from the point of view of investigating the character of the inter-atomic interactions in metallic phases, since in these crystals the charges of ionic skeletons are screened only partially by conductivity electrons. If the ion distribution is an ordered one, electrostatic forces appear which are characteristic for the ionic crystal of the type CsCl. In contrast to ionic crystals, it is possible in metallic β-phases to change the effective charge of the ions by changing the composition of the alloy and the order of distribution of the atoms in the lattice. It was found experimentally (Refs.2-4) that the elasticity constants of the alloys under consideration show a strong dependence on the long range order parameter η and change considerably if the composition of the alloy is made to differ from the stechiometric composition.

Card 1/4

126-2-3/35

On the Theory of the Elasticity Constants of Alloys of the β-trass type.

Mott, N.F. (Ref.1) and Samoylovich, A. G. (Ref.5) investigated theoretically the dependence of the bond energy and of the elasticity constants on η. On the basis of a simplified statistical model of a crystal of stechiometric composition, Mott calculated that the electrostatic fraction of the ordering energy of β-brass equals 0.027 eV per atom, whilst a second important component, the energy of overlapping of the ionic skeletons is 0.013 eV. Using the same model, Samoylovich investigated the constants of shear elasticity $C' = C_{11} - C_{12}$ and C_{44} and found that the electrostatic interactions have practically no influence on the dependence of the elasticity constants on η. Samoylovich carried out his calculations for a crystal of stechiometric composition. In calculating the electrostatic energy of the deformed lattice some components were not taken into consideration. In this paper, using the same model, the results of Samoylovich are extended for the case of alloys of non-stechiometric composition, taking into consideration all the energy

Card 2/4

On the Theory of the Elasticity Constants of Alloys of the β-brass type.

components. The final formulae, derived by the author for the elasticity constants C' and C_{44}, are the Eqs. (34) and (35), p.219. These formulae lead to the following conclusions: the dependence of the elasticity constants on the long range order is a parabolic one; if the composition of the alloy differs from the stechiometric composition, this dependence is less pronounced. Taking into consideration the electrostatic energy, which was disregarded by Samoylovich (Ref.5), does not change the form of the dependence of C' and C_{44} on η, it remains parabolic but is determined fundamentally by the energy of the deformed atomic spheres; the relative magnitude of the components of the elasticity constants, caused by the electrostatic interaction, is larger than that calculated by Samoylovich. Acknowledgments are made to Professor A. A. Smirnov for his useful advice and criticism. There are 13 references, 5 of which are Slavic.

SUBMITTED: November 9, 1956.

Card 3/4

On the Theory of the Elasticity Constants of Alloys of the β-brass type. 126-2-3/35

ASSOCIATION: Institute of Physical of Metals, Ural Branch Ac.Sc. U.S.S.R. (Institut Fiziki Metallov Ural'skogo Filiala AN SSSR).

AVAILABLE: Library of Congress.

Card 4/4

AUTHORS: Orlov, A. N. and Sokolov, A. V. 126-5-3-2/31

TITLE: The Structures of X-ray Emission Spectra from Alloys Showing Order-Disorder Phenomena (Raschet struktury rentgenovskikh emissionnykh spektrov uporyadochivayushchikhsya splavov)

PERIODICAL: Fizika Metallov i Metallovedeniye, 1957, Vol V, Nr 3, pp 390-4 (USSR)

ABSTRACT: The intensities of the L-series lines emitted by transitions from the conduction band are calculated for binary alloys with body-centred cubic lattices from the one-electron theory. In these alloys (of arbitrary concentration) there can be a forbidden band within the conduction band, of a width which is dependent on the degree of long-range order, if there is more than one conduction electron per atom; this forbidden band can lie above or below the Fermi level, depending how full the conduction band is. The calculations are performed in the strong-coupling approximation. Eq.(1) is taken from Wilson's Theory of metals; the conduction electrons are assumed to be in s-states, which automatically restricts the argument to L-series lines. A major assumption made in developing the argument is that the volume within the

Card 1/2

The Structures of X-ray Emission Spectra from Alloys Showing Order-Disorder Phenomena 126-5-3-2/21

Fermi surface is constant. It is concluded that the long-wave emission edge moves to longer wavelengths, and the short-wave edge to shorter wavelengths, when ordering occurs; if there is more than one conduction electron per atom the forbidden band noted above gives rise to a gap in the emission band. No such effect has been found in the weak-coupling approximation, so it is concluded that in a real alloy we may only get a dip in the centre of the band. Acknowledgments are made to I. M. Shepelava for carrying out the numerical calculations.
There are 1 figure and 10 references, 6 of which are Soviet, 4 English.

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

SUBMITTED: December 26, 1956.

Card 2/2 1. Alloys--Spectra 2. X-ray spectrum--Analysis 3. Alloys --Electron transitions 4. Mathematics

ORLOV, A. N.

72-12-9/14

AUTHOR: Orlov, A. N.

TITLE: Moistening of the Layer in the Charging Box of the Glass Melting Furnace (Uvlazhneniye shikhty v zagruzochnom karmane steklo-varennoy pechi).

PERIODICAL: Steklo i Keramika, 1957, Nr 12, pp. 21-21 (USSR).

ABSTRACT: The previous moistening of the layer (up to 4 - 5 %) takes place in the glass works usually in the department for ore mixtures where the layer is composed and mixed. However, a considerable time passes up to the charging of the furnace during which the layer dries again gradually and therefore dusts when the furnace is charged. In order to avoid this it is expedient to moisten the layer a second time, i. e. during the charging of the furnace (see figure). For this purpose one or more dispersers are installed above the charging box of the glass melting furnace in an approximative height of 1,5 m, dependently on the breadth of the box. These dispersers disperse water by means of compressed air or vapor by which the moisture of the layer in the charging box is re-established up to 5 - 5,5 %. The creation of moist air over the charging box supports moreover an additional cooling down of the front part of the mechanical charging plants and of the vault of the box which are exposed to high

Card 1/2

Moistening of the Layer in the Charging Box of the Glass 72-12-9/14
Melting Furnace.

temperatures. The moistening of the layer (furnace melting area approximatively loo m) introduced in the works of Tiraspol in 1955 on the suggestion of the author reduced the dusting of the layer, improved the process of glass melting, and reduced the wearing out of the furnace. In spite of the increased furnace temperature (1480 - 1500°) the furnace campaign increased by 1,5 - 2 months. The moistening system consists of 2 dispersers with double dispersion (suggested by working engineer Prokhorov) and with an output aperture of 3 mm. The water consumption of a disperser amounts to ≅0,6 -0,8 m^3 a day. The dispersion has to be very fine in order to avoid local concentration of moisture, as well as the formation of sand nodules which can be melted only with difficulties.
There is 1 figure.

ASSOCIATION: Tiraspol Glass Works (Tiraspol'skiy stekol'nyy zavod).

AVAILABLE: Library of Congress.

Card 2/2

Card 1/2

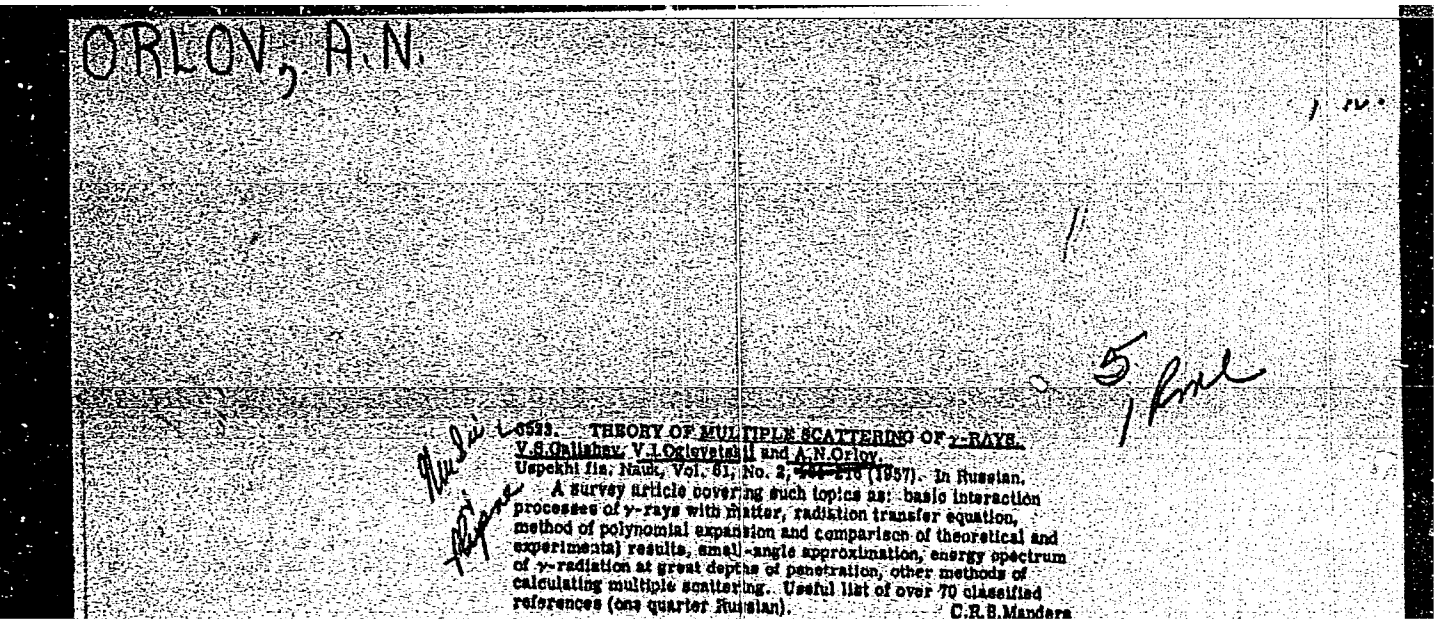
48-10-2/20

AUTHOR: None given

TITLE: Materials of the 2nd All-Union Conference on X-ray Spectroscopy; Moscow, January 31 to February 4, 1957 (Materialy II Vsesoyuznogo soveshchaniya po rentgenovskoy spektroskopii; Moskva, 31 yanvarya - 4 fevralya 1957 g.)

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya fizicheskaya, 1957, Vol 21, Nr 10, pp 1341 - 1342 (USSR)

ABSTRACT: The Second All-Union Conference on X-ray Spectroscopy was held from January 31 to February 4, 1957. Thirty-three reports were given, 18 of which appear in this issue. The remaining are: Introductory Remarks by Ya. S. Umanskiy; Calculating the Structure of X-ray Emission Spectra of Self-Regulating Alloys by A. N. Orlov and A. V. Sokolov (UFAN SSSR); Contemporary Methods of X-ray Spectra Registration by M. A. Blokhin and A. I. Froyman (RGU and Khimfak MGU); High Stability lower Sources for X-ray Spectra Installations by A. I. Froyman; Prospective Applications of Electrostatic Photography (xerography) in X-ray Spectral and X-ray Structural Analysis by A. I. Froyman; Investigation of the Fine Structure of X-ray K-Spectra of Absorption and Emission of Some Elements of the Iron Group by I. B. Borovskiy, V. P. Bykov and



ORLOV, A.N.

0539. THEORY OF MULTIPLE SCATTERING OF γ-RAYS. V.S.Gallshev, V.I.Oglevetskii and A.N.Orlov. Uspekhi fiz. Nauk, Vol. 61, No. 2, 244-276 (1957). In Russian.

A survey article covering such topics as: basic interaction processes of γ-rays with matter, radiation transfer equation, method of polynomial expansion and comparison of theoretical and experimental results, small-angle approximation, energy spectrum of γ-radiation at great depths of penetration, other methods of calculating multiple scattering. Useful list of over 70 classified references (one quarter Russian). C.R.B.Mandera

ORLOV A. N.

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

Card 1/6

...activity at the

SOV/3847

Card 3/6

ORLOV, A. N. and PLISHKIN, G. M.

"Equilibrium Conditions of One-Dimensional Model of a Crystal."

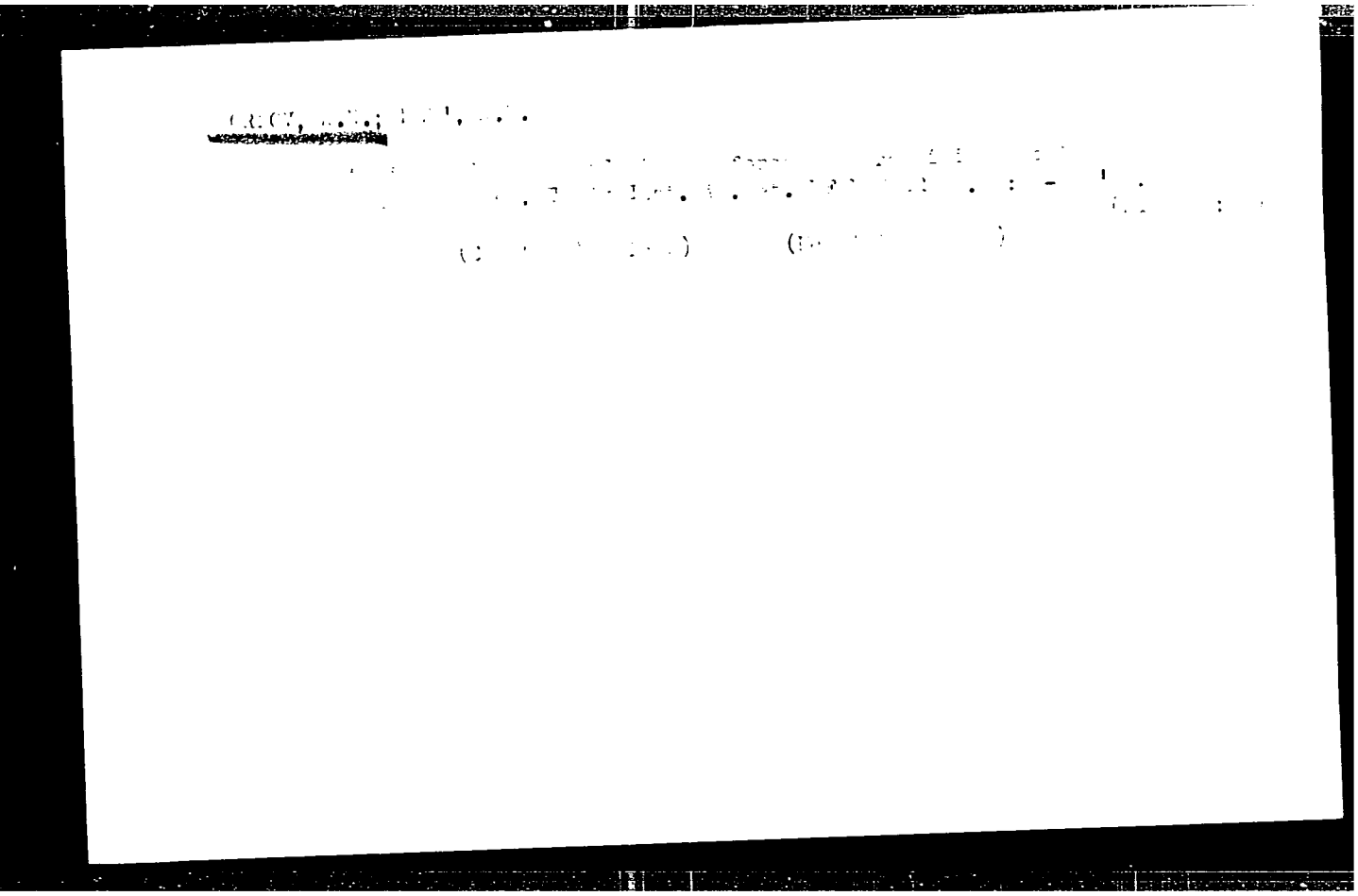
paper presented at the Conf. on Mechanical Properties of Non-Metallic Solids, Leningrad, USSR, 19-26 May 58.

Institute of Physics of Metals of the Academy of Sciences of the USSR, Sverdlovsk.

APPROVED FOR RELEASE: Wednesday, June 21, 2000 CIA-RDP86-00513R001238

MEN', A.N.; ORLOV, A.N.

Binding energy theory of transition metal oxides. Issl. po zharopr. splav. 3:364-371 '58. (MIRA 11:11)
(Crystal lattices) (Metallic oxides)



ORLOV, A.N.

18(7) PHASE I BOOK EXPLOITATION SOV/3355

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

Issledovaniya po zharoprochnym splavam, t. IV (Studies on Heat-resistant Alloys, vol. 4), Moscow, Izd-vo AN SSSR, 1959. 400 p. Errata slip inserted. 2,200 copies printed.

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

PURPOSE: This book is intended for metallurgists concerned with the structural metallurgy of alloys.

COVERAGE: This is a collection of specialized studies of various problems in the structural metallurgy of heat-resistant alloys. Some are concerned with theoretical principles, some with descriptions of new equipment and methods, others with properties of specific materials. Various specimens were studied. For details, specified conditions are studied and reported on by a number of references, both Soviet and non-Soviet.

TABLE OF CONTENTS:

Card 4/12

ORLOV, A.N.; MEN', A.N.

Statistical theory of bond energy in spinel-type crystals.
Fiz. tver. tela 1 no.2:195-202 F '59. (MIRA 12:5)
(Spinel group) (Crystal lattices)

KLOTSMAN, S.M.; ORLOV, A.N.

Diffusion mechanism along grain boundaries. Issl.po zharopr. splav. 4:90-95 '59. (MIRA 13:5)
(Metal crystals) (Diffusion)

MEN', A.N.; ORLOV, A.N.

Vibrational frequency spectrum of a simple model of an ordering alloy. Issl.po zharopr.splav. 4:96-101 '59.
(MIRA 13:5)
(Crystal lattices) (Spectrum, Atomic)

SOV/126-7-3-3/44

AUTHORS: Men', A.N. and Orlov, A.N.

TITLE: The Spectrum of Vibrational Frequencies on the Simplest Model of an Ordering Alloy. II.

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 7, Nr 3, pp 335-340 (USSR)

ABSTRACT: In Ref 1 the present authors have considered the vibrations of a chain consisting of atoms of two types having almost equal masses and located over the chain sites with an arbitary degree of long-range order η, an arbitrary relative concentration c, and interacting elastically in such a way that the elastic coupling coefficients between any two neighbouring atoms are the same. In the present paper the treatment is generalized to the case in which the elastic coupling coefficients are different but not very different. An approximate calculation of the frequency spectrum shows that such a chain may be replaced by a completely ordered chain made up of effective atoms whose properties depend on c and η according to Eqs (2) and (3). It is shown that the maximum (Debye) frequency, as a function of the ratio of masses and coupling coefficients, may

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The Spectrum of Vibrational Frequencies on the Simplest Model of an Ordering Alloy. II.

either increase or decrease as the degree of long-range order in the chain increases. The theory is in general agreement with the reduction in the Debye temperature which was observed by Iveronova et al (Ref 4) in ordering Cu_3Au and Ni_3Fe alloys.

There are 1 figure and 4 Soviet references.

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

SUBMITTED: November 22, 1957

Card 2/2

24.6200

66905
SOV/126-8-1-23/25

AUTHORS: Men', A.N. and Orlov, A.N.

TITLE: On the Theory of Vibrational Spectra of Solid Solutions

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 8, Nr 1, pp 154-156 (USSR)

ABSTRACT: The authors have calculated (Refs 1 and 2) the frequency spectrum of elastic vibrations on a one-dimensional model of an ordering binary solid solution, using the method of "effective atoms". Lifshits and Stepanova (Ref 3) have also introduced this idea in their work on the vibrational spectrum of the three-dimensional binary solid solution of isotopes. The method of "effective atoms" may be used when the mass difference between atoms of different kind $M_j - M_{j'}$ and the difference between the elastic coupling coefficients $A^{jj'}_{qq'} - A^{j''j'''}_{qq'}$ are small, as a result of which the change in the vibrational spectrum of an ideal monoatomic crystal of given symmetry, due to the fact that the atoms are not identical and their distribution over the sites is different from the ordered distribution, may be

Card 1/2

18.1000, 5.4130

66220
SOV/126-8-3-3/33

AUTHORS: Men', A. N. and Orlov, A.N.

TITLE: On Binary Solid Solutions with Interatomic Bonding of Two Types

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 8, Nr 3, pp 337-341 (USSR)

ABSTRACT: In the theory of binary alloys the energy of the crystal is often represented in the form of a sum of the energies of interactions between pairs of atoms. It is assumed that the interaction energy for a given pair is determined only by the type of the two atoms. However, in general this energy depends on the nature and the disposition of all the atoms surrounding the given pair XY. Moreover, even if one limits ones attention to the interaction of the pair XY with the nearest neighbours, then the energy of the pair V_{XY} can take on a number of values $V_{XY}^{(i)}$, where i denotes the number of the configuration surrounding the pair XY. One could try to take this into account by expressing the energy of the crystal not as a sum of all the possible XY and i but as the sum of energies of complexes formed by each atom with its

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On Binary Solid Solutions with Interatomic Bonding of Two Types

nearest neighbours. In that case the energy of each complex is taken as equal to the sum of energies $V_{XY}^{(\alpha)}$ corresponding to a given pair of atoms of given type XY in the complex of type α. If the energy levels of electrons in the atoms of a complex are close (almost degenerate), then the formation of resonating orbits becomes possible. This case is realised in pure metals. If the levels are very distant, then the resonance is less probable but, under certain conditions, localized covalent bonds may be formed. If the atoms of a complex do not have a sufficient number of electrons in order to ensure the saturation of all the localized covalent bonds, then some of them will become unsaturated. One might expect that this would lead to a relatively stable local distortion of valence angles and interatomic distances in a complex. The distance between atoms which take part in covalent bonding will be smaller and the interaction energy greater between neighbouring atoms of the same type but not coupled in this way. This leads to the appearance of interatomic bonding of two types which can conventionally be designated as weak and

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SOV/126-8-3-3/33

On Binary Solid Solutions with Interatomic Bonding of Two Types

strong. An expression is derived for the free energy of a binary solid solution with these two types of bonding. From the condition for a minimum in this energy the authors obtained at a given temperature the number of strongly and weakly bonded pairs of neighbouring atoms of different types. It is found that the number of pairs of different types does not depend monotonically on temperature. It is suggested that this effect may lead to an anomalous temperature behaviour of resistivity in certain alloys of transition metals.
There are 1 figure, 1 table and 6 references, 3 of which are Soviet, 1 German and 2 English.

ASSOCIATIONS: Institut fiziki metallov AN SSSR and Sverdlovskiy sel'skokhozyaystvennyy institut (Institute of Physics of Metals, Ac.Sc., USSR and Sverdlovsk Agricultural Institute)

SUBMITTED: September 4, 1958

Card 3/3

18.9200

AUTHOR: Orlov, A.N.

SOV/126-8-4-1/22

TITLE: A Study of the Stability of Cracks in the Microscopic Model of a Crystal

PERIODICAL: Fizika metallov i metallovedeniye, Vol 8, Nr 4, 1959, pp 481-493 (USSR)

ABSTRACT: The following model of a crystal is considered. The crystal consists of point atoms which interact according to the law

$$v(\ell) = -a_1 \ell^{-\mu} + a_2 \ell^{-\nu} ,$$

where v is the potential energy of interaction of two atoms at a distance ℓ from each other, a_1, a_2, μ, ν are constants, and $\mu < \nu$. If we carry out the substitution given by Eq (4), where ℓ_0 is the equilibrium distance between two free atoms, then the expression for $v(\ell)$ may be replaced by Eq (5). It is assumed that the energy u(x) is independent of the disposition of other atoms surrounding the given pair. Thus only central forces are taken into account. It is further assumed that it is sufficient to take only the interaction of nearest neighbour atoms into account.

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A Study of the Stability of Cracks in the Microscopic Model of a Crystal

only if $r_0 \approx 0.4N^{\frac{1}{2}} < N$, it follows that stable cracks cannot occur inside an elastically stretched ideal crystal.

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There are 4 figures, 1 table and 18 references, of which 5 are English and 13 Soviet.

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

SUBMITTED: February 14, 1959

A Study of the Stability of Cracks in the Microscopic Model of a Crystal

Since such a model can lead to only qualitative results, the theory applies not to the general case, but to a simple cubic lattice. The lattice is assumed to be in a state of tensile stress $\varepsilon = [(L - L_0)/L_0]$ in the direction of Oz (Fig 2). At a height $z = 0$ there is a disc-shaped crack between the N/2-th and the (N/2 + 1)th layers. The radius of the disc is r_0 and it has sharpened edges as shown in Fig 2. The change in the energy of the crystal during the formation of the crack at constant stress is given by Eqs (15) - (20). When $N \geq 10^4$, and $N\varepsilon^2\beta\nu \approx 14$, this energy has a minimum (β is equal to the ratio of the radius of the flat part of the disc to the total radius; cf Fig 2). Moreover, the parameters r_0, μ and β, which describe the form of a stable crack (Fig 2), then have the following values: $\beta \approx 2.75$, $\mu = 0.24\ N\varepsilon$, and r_0 is given by Eq (44).

Since in accordance with the theory of elasticity, the above model can only be used if $r_0 \geq N$ and the conditions for the stability of a crack are realised

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67749

SOV/126-8-5-1/29

IP.9100

AUTHORS: Galishev, V.S., Orlov, A.N. and Shvarts, I.A.

TITLE: An Estimate of the Conditions Necessary for the Autoradiographic Detection of Adsorptional Irregularities in Concentration

PERIODICAL: Fizika metallov i metallovedeniye, Vol 8, 1959, Nr 5, pp 641-647 (USSR)

ABSTRACT: Arkharov et al (Ref 1) have discussed the autoradiographic method employing β-active isotopes. They have considered a specimen in the form of a plane-parallel plate having a thickness b in the direction of the y axis, and infinite in the direction of the x and z axes. A part of the plane x=0, defined by the planes y=0 and y=b, forms an infinitely thin intercrystallite zone on which β-active atoms become adsorbed. It is then necessary to calculate the electron density $F(\gamma, r)$ for electrons having energy E. Bethe et al (Ref 2) have shown that if the condition given by Eq (1) is satisfied, then the determination of the function F, which can be found by solving a diffusion equation, is particularly simple. In Eq (1), $\lambda(E)$ is the mean free path of an electron having energy E (Ref 3). Under this condition,

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An Estimate of the Conditions Necessary for the Autoradiographic Detection of Adsorptional Irregularities in Concentration

the electron density emitted by the intercrystallite zone near the surface of the specimen and at the distance x from the zone, is given by Eq (2), where s_0 is the number of electrons emitted per unit area of the zone. The electron density emitted uniformly over the volume of a grain by distributed sources, and measured at the surface of the specimen, is given by Eq (3), where v_0 is the number of electrons emitted per unit volume of the grain. The spectral density of the electron flux at y=o and y=b is given by Eq (4). Galishev et al (Ref 3) have treated the problem more exactly and considered the systems Al+0.1%Ag^{110} and Cu+0.1% Sb^{124}. They assumed that the concentration of the active component in the intercrystallite zone is 10% and that the criterion for the detection of this zone is that the difference between the blackening of the photographic plate due to the zone and the background should be greater than 0.1 (Eq 5). The blackening of the photographic plate is proportional to the radiation dose D which is given by Eq (6) where λ is the absorption coefficient of the

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An Estimate of the Conditions Necessary for the Autoradiographic Detection of Adsorptional Irregularities in Concentration

photographic emulsion and $c'(E)$ is the probability of absorption of an electron with energy E during the formation of the latent image. The present paper gives a critical discussion of the criteria derived in the above papers and takes into account the form of the function $n(x)$ and the dependence of c on energy. A condition for optimum blackening of the photographic plate is derived (Eq 13). If the function $c(E)$ is assumed to be linear (there are no experimental data to contradict this) then the condition takes the form of Eq (14'). The integrals involved in this condition have been computed by the authors for electrons between 0.02 and 0.35 Mev for aluminium, copper and lead, and specimen thicknesses of 10^{-4}, 10^{-3} and 10^{-2} cm. The results obtained are summarized in one figure and two tables. There are 9 references, of which 3 are English and 6 are Soviet.

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An Estimate of the Conditions Necessary for the Autoradiographic Detection of Adsorptional Irregularities in Concentration

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

SUBMITTED: July 28, 1959

Card 4/4

21 (8)
AUTHORS: Orlov, A. N., Galishev, V. S., Taluts, G.G. SOV/21-126-[illegible]

TITLE: Calculation of the Multiple Scattering of Gamma Rays of t. Uranium and Thorium Series (Raschet mnogokratnogo rasse[illegible] gamma-luchey semeystv urana i toriya)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 126, Nr [illegible] (USSR)

ABSTRACT: This article presents several new methods and results [illegible] calculation of multiple scattering of gamma rays (E > [illegible] of the elements of the uranium and thorium series. The ex[illegible] mental data utilized is mentioned in references 2-4 and listed in table 1. The authors first investigated a point source in an unlimited medium. The authors caloulated the spectra of the scattered radiation of a monochromatic point source in an infinitely extended absorber (water, graphite, aluminum, iron) by the polynomial method (Ref 9) for the energies E_0=0.5, 1.0, 1.33, 1.50, 2.0 and 2.6 Mev. By interpolation and superposition of the scattering spectra calculated, the distances $\mu_0 r$ = 1, 2, 3, 5, 6, 10, 15, 20 (μ_0 denotes the absorption coefficient for

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quanta with the energy E_o) were determined. As an example, figure 1 shows the intensity spectrum at r = 80 cm for aluminum absorbers (both for uranium and thorium sources). In the following, absorbers consisting of several layers are investigated, namely, plane-parallel layers of equal thickness. The result is practically used for the numerical computation of a geophysical example: a granite plate of known composition, given thickness and density, containing uranium or thorium sources, and lying beneath an inactive layer of the same granite is investigated. In conclusion, the authors briefly discuss in the third part of this article some particularities of the radiation of an active layer, and in the last part special effects of absorption in an inactive layer. Figure 2 shows the spectrum lg I λ = f(E) of the radiation of an active layer after passing through an inactive graphite layer of the thickness h (for various values of h) and of the density 2.7. The E- and h-dependence are discussed. Contributors were : R. I. Anishchenko, Yu. M. Plishkin, I. M. Shepeleva, Yu. P. Bulashevich and the staff members of the Vychislitel'nyy tsentr AN SSSR (Computing Center of the AS USSR).

Calculation of the Multiple Scattering of Gamma Rays of the Uranium and Thorium Series SOV/20-126-5-17/69

There are 1 figure, 1 table, and 11 references, 5 of which are Soviet.

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

PRESENTED: January 16, 1959, by L. A. Artsimovich, Academician

SUBMITTED: January 15, 1959

Card 3/3

ORLOV, A.N.; FISHMAN, S.N.

Mechanisms of the self-duplication of elementary cell structures.
Pt. 4: One possible mechanism for the replication of chain molecules.
TSitologiia 2 no.1:68-73 Ja-F '60. (MIRA 13:5)

1. Otdel teoreticheskoy fiziki Instituta fiziki metallov AN SSSR.
(MOLECULES)

S/030/60/000/05/37/056
B015/B008

AUTHOR: Orlov, A. N., Candidate of Physical and Mathematical Sciences

TITLE: The Influence of Small Admixtures on the Mechanical Properties of Metals

PERIODICAL: Vestnik Akademii nauk SSSR 1960, No. 5, pp. 94-96

TEXT: An All-Union Conference which dealt with the discussion of studies made in the above mentioned field was held in Sverdlovsk from December 14 to 18, 1959. The Conference was convened by the Otdeleniye fiziko-matematicheskikh nauk (Department of Physical and Mathematical Sciences) and the Institut fiziki metallov Akademii nauk SSSR (Institute of the Physics of Metals of the Academy of Sciences USSR). 34 lectures were delivered, among them a number of surveys prepared on the initiative of the organization committee of the Conference. M. A. Krivoglaz, A. N. Orlov, and A. A. Smirnov dealt with theoretical problems of diluted solid solutions. K. P. Gurov, I. B. Borovskiy, and M. I. Korsunskiy reported on assumptions in connection with the clarification of the influence of small admixtures on diffusion. X-ray spectra and other properties of the transi-

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tion metals. V. M. Danilenko dealt with the peculiarities of the formation of "Cottrell Clouds" in solid solutions. R. I. Garber described the physical properties of metals of a high degree of purity. V. A. Pavlov and L. S. Moroz delivered survey reports on the influence of small admixtures on the process of the plastic deformation. N. N. Davidenkov and collaborators and I. A. Gindin conducted experiments with repeated loading at various temperatures. S. N. Zhurkov and his collaborators determined the temperature-time dependence of the strength of metals. V. I. Arkharov reported on problems of the physics of metals. V. I. Likhtman made a survey made a survey on the effect of surface-reactive materials which are systematically investigated by the school of Academician P. A. Rebinder. Academician G. V. Kurdyumov underlined in his closing address the importance of the role of impurities in the solid state physics. The introductions of survey reports are finally described as being valuable and are to be published in compilations by the Izdatel'stvo Akademii nauk SSSR (Publishing House of the Academy of Sciences USSR). The author believes that the Conference has shown the way for conducting new experimental and theoretical investigations in the field of the influence of small admixtures on the mechanical properties of the metals, and that this will lead to the

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B015/B008

discovery of new methods for increasing the strength of metals.

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APPROVED FOR RELEASE: Wednesday, June 21, 2000 CIA-RDP86-00513R001238

GALISHEV, V.S.; ORLOV, A.N.; SHVARTS, I.A.

Autoradiographic revealing of heterogenous adsorption concentrations. Issl. po zharopr. splav. 6:158-162 '60. (MIRA 13:9)
(Autoradiography) (Crystal lattices)

S/126/60/010/003/008/009/XX
E201/E391

AUTHORS: Orlov, A.N. and Shvarte, I.A.

TITLE: Mechanical Stability of Large-angle Dislocation Boundaries Between Grains

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol. 10 No. 3, pp. 492 - 494

TEXT: Electron-microscopic observations (Ref. 1) showed that in some cases large-angle grain boundaries in metals possess fine structure in the form of several parallel dislocation walls. This observation is confirmed by indirect information from internal adsorption (Ref. 2) which indicates that grain boundaries are defect regions of several hundred angstrom width. The present note gives equations for equilibrium distances between dislocation walls for any number (n) of such walls. The case of $n = 5$ is discussed in detail and the energies of grain boundaries meeting at a given angle are compared for $n = 1, 3,$ and 5. The calculations show that for a given angle between boundaries, the boundary energy rises with increase of n. Assuming that the dislocation model of

S/126/60/010/003/008/009/XX
E201/E391

Mechanical Stability of Large-angle Dislocation Boundaries Between Grains

grain boundaries is applicable for dislocations closer to one another than 10 interatomic distances, the maximum angles between neighbouring grains are found to be $5^{\circ}45'$, $7^{\circ}27'$ and $12^{\circ}35'$ for n = 1 3 and 5, respectively. The authors consider also dislocation walls where the dislocation density varies from wall to wall The paper is entirely theoretical. Acknowledgment is made to Yu A. Shakov for communicating the results of his work (Ref. 1) before publication
There are 6 references: 2 Soviet and 4 non-Soviet.

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

SUBMITTED: May 3, 1960

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S/020/60/132/03/59/066
B011/B005

AUTHORS: Orlov, A. N., Fishman, S. N.

TITLE: On the Kinetic Mechanism of Reduplication of Chain Molecules

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 132, No. 3, pp. 700 - 703

TEXT: According to the hypothesis (Ref. 3), desoxyribonucleic acid (DNA) is a carrier code of hereditary information. This information is determined by the order of purine- and pyrimidine bases in the DNA chain. It is a priori not clear whether an accurate reproduction of this order of nucleotides is possible by means of any simple physical structure mechanism of the complex DNA molecule, or if specific interaction forces are necessary which occur in such complex systems as the substance of the nucleus. In the present paper, the authors want to study one of the possible, simplest reduplication mechanisms. They presuppose that reduplication takes place over the whole chain length at the same time. By means of calculations on a nuclear model, the authors arrive at equation (13). From their calculations, the authors draw the following conclusions:

ORLOV, A.N., otv. red.; FAKIDOV, I.G., otv. red.; YAKOBSON, A.M., red. izd-va; RYLINA, Yu.V., tekhn. red.

[Betatron gamma defectoscopy of steel] Betatronnaia gamma-defektoskopiia stali. Moskva, Izd-vo Akad.nauk SSSR, 1961. 56 p. (MIRA 14:11)

1. Akademiya nauk SSSR. Institut fiziki metallov.
(Steel—Testing) (Gamma rays—Industrial applications)

S/181/61/003/002/025/050
B102/B212

18 8200 1418 1035, 1160, 1143

AUTHOR: Orlov, A. N.

TITLE: Durability and steady creep of polycrystalline bodies

PERIODICAL: Fizika tverdogo tela, v. 3, no. 2, 1961. 500-504

TEXT: S. N. Zhurkov and T. P. Sanfirova have shown experimentally that steady creep velocity $\dot{\varepsilon}$ and durability τ of a number of metals are given by $\dot{\varepsilon} = \dot{\varepsilon}_0 \exp(-(U-\gamma\sigma)/kT)$; these formulas are valid over a range of eight orders of magnitudes for $\dot{\varepsilon}$ and τ; U denotes the activation energy, γ the activation volume, $\dot{\varepsilon}_0$ and τ_0 are constants independent of σ and T, σ is a constant stress. Also $\dot{\varepsilon}\tau = \dot{\varepsilon}_0\tau_0 = \text{const}$, which leads to the assumption that $\dot{\varepsilon}$ and τ are a function of the same mechanism but the present theory needs two different models to describe it; one model is based on diffusion processes and the other one on a growth of micro-cracks without diffusion. The paper discusses a model which is valid for $\dot{\varepsilon}$ and τ, and the growth of micro-cracks without diffusion is accompanied by a significant plastic deformation. A grain (Figs. 1a, b) with

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Durability and steady creep...

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B102/B212

linear dimensions d is examined in a polycrystalline metal, and in order to simplify the problem, it is assumed that creep can only take place in planes which are parallel to y = 0. The dislocation density in the xy-plane is assumed to be equal to ϱ cm^{-2}. An initial crack will grow suddenly from slide plane to planing surface; in each slide plane it is fed by dislocations which enable it to grow and reach another planing surface (Fig. 1b). The dislocation sources which are released during a crack expansion will emit new dislocations, and macroscopically this will show up in a plastic deformation of the sample. The growth of a crack along the grain boundaries will happen in an analogous manner, and the crack will be fed with dislocations of both grain boundaries. These dislocations have opposite signs (s. Fig. 2) and stresses at the front of a crack are determined by the excess of dislocations which belong to one of the two signs. If cracks will grow along grain boundaries probably coarse holes will be formed. Various relations between $\dot{\varepsilon}$ and τ are discussed and also numerical estimations are given. $\tau = d/v$ is valid if the front of a crack is spreading with a mean velocity of v, from this it follows that $\dot{\varepsilon} = vmb\varrho/2dh$, where m is the amount of dislocations, $h = (\varrho d)^{-1}$ denotes the mean distance between slide planes;

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the displacement quantity b/2d is determined by passage of one dislocation taken from the source to the crack, Q denotes the number of crack nuclei in one grain. The following expression is obtained $\dot{\varepsilon}\tau \approx dmbQQ$. If $\varrho = 10^{8}$ cm^{-2}, $b = 10^{-8}$ cm, $d = 10^{-3}$ cm, and $Q = 1$ then $\dot{\varepsilon}_{o}\tau_{o} = 10^{-1}$, this agrees with experimental results for several metals. In order to calculate $\dot{\varepsilon}$ and τ, v has to be known, it can be determined from $v = l'\nu_{o}\exp(-U-\gamma\sigma_{n})/kt)$, where ν_{o} is the lattice vibration frequency, σ_{n} the normal stress in the crack front, l' the mean distance between obstacles, $\gamma = \gamma(l')$. If $d = 10^{-3}$ cm, $l' = 10^{-6}$ cm and $\nu_{o} = 10^{13}$ sec^{-1}, then $\tau_{o} = 10^{-10}$ sec, this agrees well with experimental results. There are 2 figures and 24 references: 15 Soviet-bloc and 9 non-Soviet-bloc.

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

SUBMITTED: May 23, 1960

Card 3/4

KLASSEN-NEKLYUDOVA, M.V.; ORLOV, A.N.; MIUSKOV, V.F.; TYAPUNINA, N.A.; SHASKOL'SKAYA, M.P.

Symposium on dislocations in and mechanical properties of solids, held in Cambridge (England). Kristallografiia 6 no.5:809-812 S-O '61. (MIRA 14:10)

1. Institut kristallografii AN SSSR.
(Dislocations in crystals—Congresses)

GRINBERG, B.A.; ORLOV, A.N.

Microscopic calculation of the spacing of atoms in a dislocation. Fiz. met. i metalloved. 11 no. 4:481-488 Ap '61. (MIRA 14:5)

1. Institut fiziki metallov AN SSSR.
(Dislocations in metals) (Metallography)

11.9100
24.7400 1160, 1395, 1555

26342
S/076/61/035/007/013/019
B127/B102

AUTHORS: Orlov, A. N., and Fishman, S. N.

TITLE: The theory of dissolution of inhomogeneous surfaces of solids

PERIODICAL: Zhurnal fizicheskoy khimii, v. 35, no. 7, 1961, 1529-1533

TEXT: The authors conducted quantitative studies on the dissolution of an inhomogeneous metal surface in the solution of an etching agent by means of an elementary macroscopic model. It is tried to give a mathematical description of the dissolution mechanism. The particle flux density from the metal into the solution is given by $\vec{j} = -a\nabla\mu$. a is related to the diffusion coefficient D:

$D = \frac{\alpha}{\varrho}\frac{\partial\mu}{\partial c}$; in ideal gases: $D = \frac{\alpha}{\varrho}\frac{RT}{cM}$, where c is the concentration of the dissolved substance ϱ the density of the solution, and M the molecular weight. The authors start with the calculation of the corrosion rate. The chemical potential $\mu(\vec{r})$ is assumed to have cylindrical symmetry, with the axis of symmetry Oz being oriented perpendicular to the initial surface of

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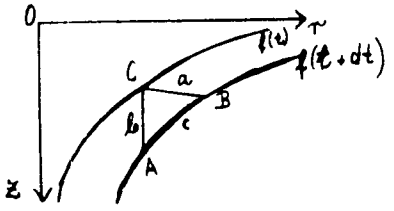
the specimen. The surface is described by $z = f(r,t)$. After $t + dt$ it is shifted by r. The ordinate change of a point C during the time dt equals $b = -\frac{\partial f}{\partial t} dt$; the point which has the coordinates r and $f(r,t)$ at the moment t, is shifted during dt by the distance $a = \varrho_M^{-1} |\vec{j}| dt$ in the direction of $\vec{j}$, ϱ_M being the metal density. Considering the relations $\sin C = (j_r/|\vec{j}|)_{z=f(r,t)}$, $\cos C = (j_z/|\vec{j}|)_{z=f(r,t)}$, $\operatorname{ctg} A = \frac{\partial f}{\partial r}$, it follows from the triangle ABC that

$$\frac{\partial f}{\partial t} = -\frac{1}{\varrho_M}\left(j_z|_{z=f(r,t)} + \frac{\partial f}{\partial r} j_r|_{z=f(r,t)}\right) \quad (5)$$

If the dependence of the chemical potential on the surface curvature (AB) is neglected, the function $\mu(z,r)$ at the surface $f(r,t)$ is a function of r only and is expressed by $\xi(r)$:



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$$\mu(r,z,t)|_{z=f(r,t)} \equiv \bar{\mu}(r,f(r,t),t) = \varepsilon(r) \quad (6).$$

In the general case ε depends on $\partial f/\partial r$ and $\partial^2 f/\partial r^2$:

$$\bar{\mu}(r,f(r,t),t) = \varepsilon(r,f(r,t),\partial f/\partial r,\ \partial^2 f/\partial r^2) \quad (6a).$$

If (6) is solved with respect to $f(r,t)$, one obtains $f(r,t) = v(r,\varepsilon(r);\ t)$ (7). Differentiation of (6) and (7) yields

$$\frac{\partial \varepsilon}{\partial r} = \bar{\mu}_r' + \bar{\mu}_f' \frac{\partial f}{\partial r};\ \frac{\partial f}{\partial r} = v_r' + v_\varepsilon' \frac{\partial \varepsilon}{\partial r}. \quad (8)$$

$$\frac{\partial \varepsilon}{\partial r} = \bar{\mu}_r' + \bar{\mu}_f' \left(v_r' + v_\varepsilon' \frac{\partial \varepsilon}{\partial r}\right).$$

and one may write $\bar{\mu}_f' = (v_\varepsilon')^{-1}$, $\bar{\mu}_r = -v'_r/v'_\varepsilon$ (9). Now, the component of the current density with respect to the surface may be expressed by the

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derivative of the function v by the following formula

$$\left.\frac{\partial\mu}{\partial z}\right|_{z=f(t)} = \bar{\mu}_z = \frac{1}{v_z}, \quad \left.\frac{\partial\mu}{\partial r}\right|_{z=f(r,t)} = \bar{\mu}_r = -\frac{v_r}{v_z}$$

With (5) one obtains $\frac{\partial v}{\partial t} \cdot \frac{\partial v}{\partial \varepsilon} = \frac{\alpha}{\rho_M}\left[1 - \frac{\partial v}{\partial r}\left(\frac{\partial v}{\partial r} + \frac{\partial v}{\partial \varepsilon}\frac{\partial f}{\partial r}\right)\right]$ (10). If (10) satisfies the conditions v=0 at t=0 and v=0 at ε =0, one obtains

$$v = -2\left[\frac{t}{\rho_M}\int_0^{\varepsilon}\alpha(\varepsilon)\,d\varepsilon\right]^{1/2} \quad (13).$$

If concentration effects are negligible, one may assume: c=1 or, according to (9):

$$\varkappa = n^2e^2\frac{ND}{RT}\rho\frac{N}{M}, \quad (15)$$

$$v = -2\,(\varkappa t e M^2/n^2\rho_M F^2)^{1/2}, \quad (16)$$

Card 4/6

The theory of dissolution ...

F is the Faraday number, n the valence of the metal ions in the solution. The solution of equation (10) holds for the dissolution of an isotropic solid, while equation (16a) holds for the dissolution of an anisotropic substance. The particle flux density of substances on the surface is determined by the potential difference $\Delta\varphi$ between the sample and the solution

$$\Delta\mu = \frac{nF}{M}\Delta\varphi = \frac{1}{\rho_M}\left(-\varepsilon_0 + \frac{Gb^2}{8\pi r^2}\right) + \frac{nF}{M}\varphi_0 \quad (17).$$

In this case ε_0 denotes the binding energy per unit volume of an ideal crystal φ_0 the residual components of the potential jump at the surface, G the shearing modulus, b is Bürger's vector. ε substituted by $\Delta\mu$ in (16)

$$h = v(\infty, t) - \dot{v}(r_0, t) = C_0\sqrt{t}\left(\sqrt{1 + C_1/r_0^2} - 1\right), \quad (19)$$

$$C_0 = 2\sqrt{\frac{\varkappa}{\rho_M}U}\,\frac{M}{nF}, \quad C_1 = Gb^2/8\pi U, \quad U = -\varepsilon_0 + \rho_M nF\varphi_0/M.$$

Card 5/6

The theory of dissolution ...

There are 1 figure and 10 references: 4 Soviet and 6 non-Soviet. The four references to English-language publications read as follows: Ref. 1: J. J. Gilman et. al. Sears. J. Appl. Phys. 29, 1958. Ref. 4: N. Cabrera et al. Phys. Rev. 96, 1153, 1954; Ref. 5: J. J. Gilman et. al. J. Appl. Phys., 27, 1018, 1956; Ref. 7: S. Amelinckx, Philos. Mag., 1, 269, 1956.

ASSOCIATION: AN SSSR Institut fiziki metallov g. Sverdlovsk (AS USSR Institute of Metal Physics in Sverdlovsk)

SUBMITTED: November 5, 1959

Card 6/6

ORLOV, A. N.

9C

SOV/6176

PHASE I BOOK EXPLOITATION

Konobeyevskiy, S. T., Corresponding Member, Academy of Sciences USSR, Resp. Ed.

Deystviye vadernykh izlucheniy na materialy (The Effect of Nuclear Radiation on Materials). Moscow, Izd-vo AN SSSR, 1962. 383 p. Errata slip inserted. 4000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Otdeleniye tekhnicheskikh nauk; Otdeleniye fiziko-matematicheskikh nauk.

Resp. Ed.: S. T. Konobeyevskiy; Deputy Resp. Ed.: S. A. Adasinskiy; Editorial Board: P. L. Gruzin, G. V. Kurdyumov, B. M. Levitskiy, V. S. Lyashenko (Deceased), Yu. A. Martynyuk, Yu. I. Pokrovskiy, and N. P. Pravdyuk; Ed. of Publishing House: M. G. Makarenko; Tech. Eds: T. V. Polyakova and I. N. Dorokhina.

Card 1/14

SOV/6176

The Effect of Nuclear Radiation (Cont.)

PURPOSE: This book is intended for personnel concerned with nuclear materials.

COVERAGE: This is a collection of papers presented at the Moscow Conference on the Effect of Nuclear Radiation on Materials, held December 6-10, 1960. The material reflects certain trends in the work being conducted in the Soviet scientific research orginization. Some of the papers are devoted to the experimental study of the effect of neutron irradiation on reactor materials (steel, ferrous alloys, molybdenum, avial, graphite, and nichromes). Others deal with the theory of neutron irradiation effects (physico-chemical transformations, relaxation of internal stresses, internal friction) and changes in the structure and properties of various crystals. Special attention is given to the effect of intense γ-radiation on the electrical, magnetic, and optical properties of metals, dielectrics, and semiconductors.

Card 2/14

The Effect of Nuclear Radiation (Cont.)

Card 11/ -

S/181/62/004/004/006/042
B108/B102

27000

AUTHOR: Orlov, A. N.

TITLE: Kinetics of joggy dislocations in a simple cubic lattice

PERIODICAL: Fizika tverdogo tela, v. 4, no. 4, 1962, 866 - 879

TEXT: The kinetic equations for the vacancies and the tensor components N_{ij} of the dislocation density are established for a simple cubic crystal lattice under uniform stress. The kinetics of these defects is described by the following system of equations:

$$\dot{m} = vN_0 - v\frac{m^2}{(1-a_0)},$$

$$\dot{n} = vmN_0\frac{}{b} - NDn,$$

$$\dot{\lambda} = \frac{}{}v(2\psi w_x N^2_{xy}(1 + \xi) + 4\pi\frac{N_{xy}}{l_0}, \text{ and}$$

$$N_{ij} = (1-\delta_{ij})\frac{}{4}Db^2n(t)\int_0^t \frac{m}{l_0}[(N_{ii} + N_{jj})v_k(\alpha_{ij}) +$$

Card 1/3

Kinetics of joggy dislocations in...

$$+(N_{jj}+N_{kk})v_k(\sigma_{jk})]dt'+2\pi\int_0^t\sum_{j'}[v_j(1-\delta_{ij})\delta_{j'i}+v_i\delta_{ij}(1-\delta_{j'i})]\times \quad (9,1),$$

$$\times q_{j'j}(t')\int_{t''}^{t}\omega(t'')\,dt''dt'+vN_{jj}^{3/2}(1-\delta_{ij})-2vN_{ii}^{2}N^{-\frac{1}{2}}\delta_{ij}-$$

$$-b\left(\frac{1}{2}v\zeta N_{ij}^{\frac{1}{2}}+Dnb\,2\ln(\sqrt{N}b)\right)N_{ij}^{3/2}(1-\delta_{ij}).$$

where v is the dislocation velocity, v_s is the velocity of migration of jogs along dislocations, m is the concentration of joggy dislocations, n is the vacancy concentration, α_p is the portion of all the vacancies rearranged in a (square) accumulation plane, D is the vacancy diffusion coefficient, N is the overall dislocation density, $N_0 = N_{ii}$, χ is the density of intersections of the boundary dislocations, $\zeta = \exp(-\frac{\chi l_s}{N})(1+\chi l_s/N)$, l_s is the minimum length of joggy dislocation, and $\Psi = \frac{N_{zy}}{N_{xy}}$. Two types of dislocation sources have been established,

Card 2/3

ORLOV, A.N.

Theory of the Frank-Read sources. Fiz.met.i metalloved. 13 no.1:18-23 Ja '62. (MIRA 15:1)

1. Institut fiziki metallov AN SSSR.
(Dislocations in metals)

L 3410-66 EWT(m)/EPF(c)/EPF(n)-2/T/EWP(t)/EWP(b)/EWA(c) JD/GG/GS

ACCESSION NR: AT5023809 UR/0000/62/000/000/0288/0293 62 Bh

AUTHOR: Orlov, A. N. 19

TITLE: Use of computers for calculating radiation-induced disturbances in metals

SOURCE: Soveshchaniye po probleme Deystviye yadernykh izluchenly na materialy. Moscow, 1960. Deystviye yadernykh izluchenly na materialy (The effect of nuclear radiation on materials); doklady soveshchaniya. Moscow, Izd-vo AN SSSR, 1962, 288-293

TOPIC TAGS: radiation effect, crystal lattice deformation, mathematic model, computer calculation, metal crystal

ABSTRACT: Computations of the dynamics of formation of radiation-induced disturbances in metals were begun in recent years at the Brookhaven National Laboratory. This survey is based on an article by J. B. Gibson, A. N. Goland, M. Milgram, and G. H. Vineyard (Brookhaven National Laboratory, Report BNL, 4871, 1960; Phys. Rev., 120, 1229, 1960). The computations were carried out for models of segments of a face-centered cubic lattice in the form of parellelepipeds bounded by planes of a cube and consisting of 5 x 4 x 4 = 80 cells (446 atoms), 2 x 6 x 7 = 84 cells (488 atoms) and 2 x 9 x 10 = 180 cells (998 atoms). An IBM-

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L 3410-66

ACCESSION NR: AT5023809

704 computer was employed. The method of computation and the static and dynamic problems considered are described, and some general conclusions are drawn. The potential of this method for studying condensed phases is not limited to the problems discussed: plans have been made to increase the number of atoms in the model and to refine the law of interatomic interaction. Orig. art. has: 6 figures and 3 formulas.

ASSOCIATION: none

SUBMITTED: 18Aug62 ENCL: 00 SUB CODE: MM, NP

NO REF SOV: 000 OTHER: 012

Card 2/2

ORLOV, A. N.

"Kinetic Equations for Dislocations."

report submitted for the Conference on Solid State Theory, held in Moscow, December 2-12, 1963, sponsored by the Soviet Academy of Sciences.

S/181/63/005/001/046/064
B108/B180

AUTHOR: Orlov, A. N.

TITLE: Formation of defects during the motion of undivided screw dislocations

PERIODICAL: Fizika tverdogo tela, v. 5, no. 1, 1963, 308-314

TEXT: The motion of jogs in screw dislocations is studied. This can cause point defects and dislocation loops during plastic deformation. Steps which arise when jogs moving in different planes meet are incipient vacancies. When jogs and steps collide this will result in a point defect plus a jog in another plane, or an incipient dislocation loop which would act as a stable "drain" for jogs. Solving the kinetic equations for jogs, steps, and incipient dislocation loops, the author arrives at estimates showing that with such a mechanism more point defects arise than on the steps that are caused by the intersection of dislocations with screw components. Few of the incipient loops (the steps can also be regarded as such) grow into real loops which can be detected under an electron microscope. There are 2 figures.

Card 1/2

Formation of defects during ...

S/181/63/005/001/046/064
B108/B180

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

SUBMITTED: August 13, 1962

Card 2/2

INDENBOM, V.L.; ORLOV, A.N.

Main objectives of investigations in the field of the physics of plasticity and strength. Fiz.met. i metalloved. 15 no.1:5-11 Ja '63. (MIRA 16:2)

(Physical metallurgy)

L 13403-63 EWP(q)/BDS/EWT(1)/EWT(m)/BEC(b)-2 AFFTC/ASD IJP(C)/
JT-2/JD

ACCESSION NR: AP3000090 S/0126/63/015/004/0481/0485

65
61

AUTHOR: Vasil'yev, L. I.; Orlov, A. N.

TITLE: Hardening of ordered alloys (Report of the Ukrainian SSR Council, concerning the ordering of atoms and its effect upon the properties of alloys, held in Kiev, April, 1962)

SOURCE: Fizika metallov i metallovedeniye, v. 15, no. 4, 1963, 481-485

TOPIC TAGS: ordered alloy hardening, dislocation immobilization

ABSTRACT: Certain hardening mechanisms specific for ordered crystals are discussed. Experiments have shown that dislocations in ordered alloys proceed in pairs. A dislocation pair slides under a stress smaller than the characteristic stress of the material. If a pair dislocation is interrupted either along its whole length or partially, the dislocations tend to be immobilized and only an excessive stress would make them continue. The anti-phase boundary (which coincided with the shearing plane before the interruption) would then acquire a jog that prevents further dislocations. A special case in which the dislocations have a helical component is discussed. In this case the formation of jogs proceeds more effectively because the height of a jog is doubled and its density is increased. The average deforma-

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L 13403-63
ACCESSION NR: AP3000090

tion is the dislocations up to the point at which a barrier is encountered may be evaluated mathematically. A formula based on certain assumptions concerning the density of dislocations is presented. The actual deformations may be of a smaller magnitude because of the presence of various other barriers. Experiments have shown that relatively large deformations are possible under stresses well below the characteristic stress. This is attributed to the formation of new dislocations rather than to the breaking of barriers (jogs) which were formed during the process of hardening. The authors express their appreciation to V. I. Syutkina and E. S. Yakovleva for the discussion. Orig. art. has: 3 formulas and 4 figures.

ASSOCIATION: Severo-Zapadnyy politekhnicheskiy institut (Northwestern Polytechnic Institute); Institut fiziki metallov AN SSSR (Institute of Physical Metallurgy, Academy of Sciences, USSR)

SUBMITTED: 310ct62 DATE ACQ: 12Jun63 ENCL: 00

SUB CODE: 00 NO REF SOV: 005 OTHER: 012

Card 2/2

KELAREVA, I.A.; ORLOV, A.N.

Theory of multiple-wall intergranular dislocation boundaries.
Fiz. met. i metalloved. 15 no.6:824-832 Je '63. (MIRA 16:7)

1. Institut fiziki metallov AN SSSR.
(Dislocations in metals)

ORLOV, A.N.

We render assistance to chemical enterprises. [illegible]
no.6.60 Je '64. (MIRA 18:7)

1. Starshiy inzh. upravleniya Abakanstroyput'.

ORLOV, A.N.

The white capped Sayan Mountains have been conquered. Transp. stroi. 14 no.10:32 O '64. (MIRA 18:1)

1. Starshiy inzh. upravleniya Abakanstroyput'.

ORLOV, A.N.

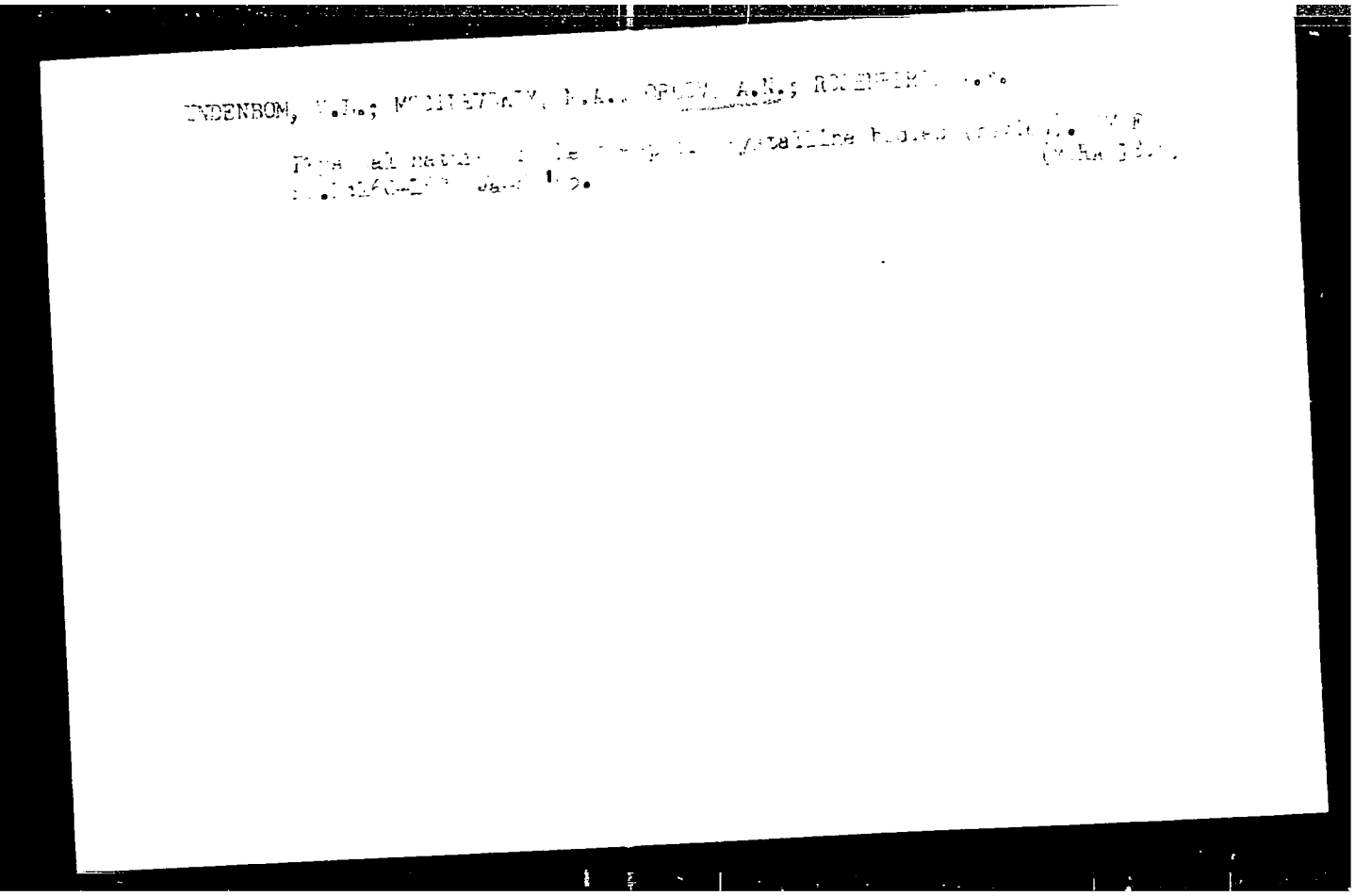
Kinetics of a nonuniform distribution of dislocations in a face-centered cubic lattice. Fiz. met. i metalloved. 20 no.1:12-20 Jl '65. (MIRA 18:11)

1. Fiziko-tekhnicheskiy institut AN SSSR imeni A.F.Ioffe.

ORLOV, A.N.

Double reflection of X rays from a crystal with a nonuniform distribution of dislocations. Fiz. met. i metalloved 20 no.1:131-132 Jl '65. (MIRA 18:11)

1. Fiziko-tekhnicheskiy institut imeni A.F.Ioffe AN SSSR.



L 6460-66 EWT(1)/EWT(m)/T/EWP(t)/EWP(b)/EWA(c) IJP(c) JD/GG

ACCESSION NR: AP5019845 UR/0181/65/007/008/2333/2338

AUTHOR: Orlov, A. N. 44,55

TITLE: Motion of dislocations with jogs 29

SOURCE: Fizika tverdogo tela, v. 7, no. 8, 1965, 2333-2338

TOPIC TAGS: crystal dislocation phenomenon, crystal defect 21,14,55

ABSTRACT: This is a continuation of earlier work by the author (FTT v. 5, 308, 1963), where the motion of a screw dislocation was considered and the rates of dislocation motion and of point-defect production was determined. In the present article, in analogy with the preceding one, the author compiles and solves balance equations for kinks, jogs, and kink-jog complexes on a mixed dislocation, and obtains an expression for the dislocation velocity. Taking into account the physical differences between the kinks and the screw dislocations, the conditions are obtained under which the dependence of the velocity v_D of screw and mixed dislocations on the stress σ has the same sign as the derivative $d(d \ln v_D / d \ln \sigma)/d\sigma$. Exact solutions of the balance equations are obtained for the limiting cases when the spontaneous decay of the complexes is much more frequent than the induced decay, and when the complexes decay primarily during collisions with kinks. The rate of production of point defects on the jogs is calculated, and its dependence on the

Card 1/2

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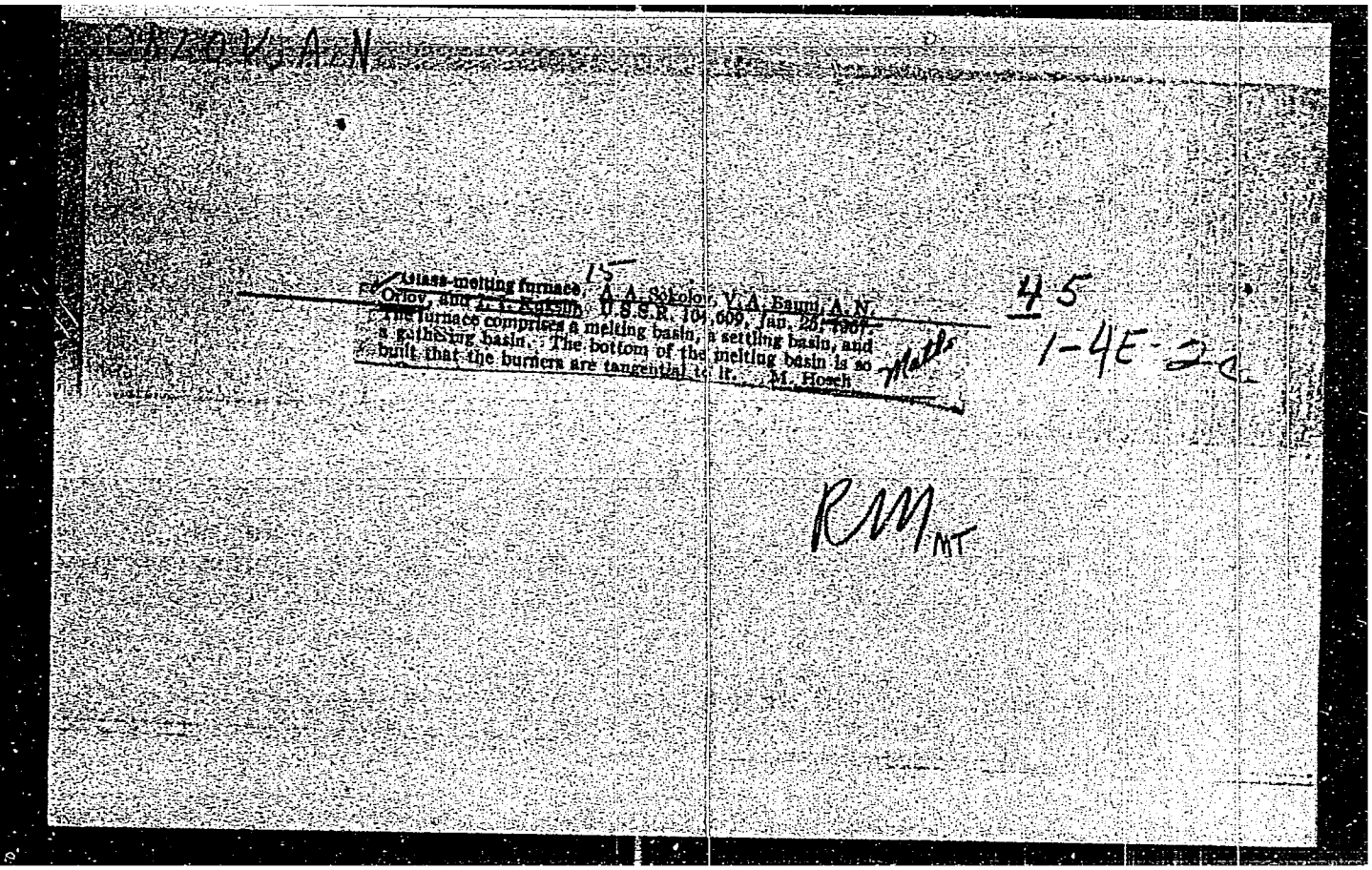
Card 2/2

ORLOV, Anatoliy Nikolayevich; IVANCHENKO, P.M. retsenzent; SINICHENKO, L.E., redaktor; MEDVEDEVA, L.A., tekhnicheskiy redaktor.

[Operation of the VShM semiautomatic glass press] Rabota na stekloformuiushchikh poluavtomatakh VShM. Moskva, Gos.nauchno-tekhn.izd-vo Ministerstva promyshl. tovarov shirokogo potrebleniia SSSR, 1955. 201 p. (MLRA 8:10)
(Glass manufacture)



Glass-melting furnace, A. A. Sokolov, V. A. Baum, A. N. Orlov, and Z. I. Rukavin. U.S.S.R. 104,049, Jan. 25, 1957. The furnace comprises a melting basin, a settling basin, and a gathering basin. The bottom of the melting basin is so built that the burners are tangential to it. M. Hosch

15

45

1-4E-2d

Glass

RMM MT

ORLOV, A.N.

Moistening the batch in the charging hopper of a glass furnace.
Stek. i ker. 14 no.12:21 D '57. (MIRA 11:1)
(Glass furnaces)

ORLOV, A.N.

Standardize the operation of annealing lehrs in the glass industry. Leg. prom. 17 no.1:38-41 Ja '57. (MLRA 10:2)

1. Glavnyy inzhener tresta Konservsteklotara.
(Glass manufacture)